



**ASSESSMENT OF ICT ACCEPTANCE AND AGRICULTURAL INFORMATION NEEDS
ACROSS THE RICE PRODUCTION CYCLE AMONG RICE FARMERS IN
KANO STATE, NIGERIA**

¹Mas'ud, M., ²Abdullahi, A., ³Abdullahi, K. Y., ³Dambazau S. A., ³Lawal, A. T.,
³Abdulwahab, F. S., ³Aliyu A. S., ⁴Abdullahi, S. and ⁵Abdulmalik, R. M.

¹Department of Agricultural Economics and Extension,
Federal University Lafia Nasarawa State, Nigeria

²Department of Agricultural Economics and Extension Bayero University Kano

³Department of Agricultural Economics and Extension

Aliko Dangote University of Science and Technology, Wudil Kano State

⁴Department of Agronomy, Federal University Lafia, Nasarawa State Nigeria

⁵Department of Animal Health Federal University of Science and Technology Kabo
Kano State, Nigeria

Corresponding Author's Email: masudmuhd35@gmail.com, **GSM:** 07063817688

ABSTRACT

The study assessed information and communication technologies (ICTs) acceptance and agricultural information needs across the rice production cycle among rice farmers in Kano state, Nigeria. A sample of three hundred and twenty-nine (329) respondents was randomly selected through the multi stage sampling technique in the study area. The instruments used for data collection was a structured interview schedule. The data were analysed using descriptive statistics. For kinds of information needed at different stages of the rice production cycles, (64.13%) of the respondents frequently sourced information on improved seed variety, land preparation, climate conditions, while (48.94%) of the respondents sourced information on crop health, pests and diseases control. The study concluded that rice farmers in the study area frequently sourced information needed on improved seed varieties, land preparation, and weather and climate, while information on crop health, pests and disease control and fertilizer use and weed control was moderately sourced across the rice production cycle. The farmers also recorded high levels of ICT acceptance in terms of perceived ease of use, perceived usefulness, attitude towards use, and intention to use ICTs for rice farming. The findings therefore indicate that ICTs can serve as an important complement to conventional agricultural extension services in providing timely agricultural information to rice farmers across the different stages of rice production. The agricultural extension organizations and research institutes should develop ICT-based information services that address farmers' needs at each stage of the rice production cycle. Particular attention should be given to less frequently source.

Keywords: ICTs, Acceptance; Needs; Rice Production; Farmers

INTRODUCTION

Agriculture is regarded as the major occupation in developing countries of Africa, including Nigeria. These countries face the dual task of increasing agricultural productivity and ensuring the sustainability of the resource base on which agriculture fundamentally depends (Olorunsola *et al.*, 2026). In Nigeria agriculture remains the key sector in driving the economy as well as the largest employer of labours in the country (Mahmood, 2023). Agriculture has remains one of the top and widely profitable business sectors not only in Nigeria but in the world at large (Adebayo, 2017). It provides employment opportunities for the teeming population, eradicates poverty and contributes to the growth of the economy (Adigun *et al.*, 2017).

Information and Communication Technologies (ICTs) have emerged as powerful tools to bridge this gap, enhancing access to timely information on farm practices, markets, and weather forecasts (Jensen, 2020; Daneji *et al.*, 2025). The types of ICTs such as radio, television, print media (newspapers, posters, pamphlets) and landline telephones, mobile phones, social media (Facebook, WhatsApp, Twitter) for sourcing agricultural information at different production cycle. The bottom line



is that most farmers are unaware of Information and Communication Technologies (ICTs). They simply use their handsets to make and receive calls without exploring the importance and potential benefits of ICTs (Abudu & Abdullahi, 2026). Rice is one of the major staple foods in Nigeria, consumed across all geopolitical zones and socioeconomic classes. Rice consumption is increasing rapidly in Nigeria because of the shift in consumer preference towards rice, increasing population growth, increased income levels, and rapid urbanization (Kamai *et al.*, 2020). Nigeria has an estimated population of about 232 million people, with approximately 70% engaged in agriculture (FAO, 2021). People involved in farming require robust extension service delivery. Despite most farmers having access to information from extension workers, this access has been decreasing as the number of farmers grows, resulting in a rising ratio of farmers to extension agents. The food and agricultural organization (FAO) recommended a ratio of 400-100 farmers per extension agent (Ogundele, S. 2025). In Nigeria, Sennuga *et al.* (2020) reported that in some States, the ratio of public extension agents to farmers can be as high as 1:3000, which severely limiting access to advisory services. The existing gaps identified by this study include: the agricultural extension system faces difficulties in reaching all farmers with available information to improve productivity. In Kano State, where rice farming is an important agricultural activity, understanding the types of information farmers need and their acceptance of ICTs is important for improving agricultural information and extension service delivery. Assessing farmers' information needs across the different stages of the rice production cycle, together with their acceptance of ICTs based on perceived ease of use, perceived usefulness, attitude and intention to use, can provide useful evidence for developing more effective ICT-based extension strategies. The specific objectives of the study were to: identify the kinds of information needed at different stages of the rice production cycles and determine the level of acceptance of different ICTs for rice farming in the study area.

METHODOLOGY

Description of the Study Area

The study was conducted in Kano State, Nigeria. Kano State is one of the 36 States of Nigeria, located in the Northern region of the country. It was created in 1967 out of the former Northern Region of Nigeria. The State lies approximately between latitudes 10° 30'N and 12°37'N of the equator and longitudes 7° 40'E and 9° 23'E of the Greenwich Meridian (Abdulkadir *et al.*, 2019). It is bordered by the States of Jigawa to the North and East, Bauchi to the Southeast, Kaduna to the Southwest, and Katsina to the Northwest. The State capital is Kano. Kano State consists of forty-four (44) Local Government Area. The major ethnic groups are Hausa and Fulani; they are predominantly Muslim by religion. The climate is characterized by a rainy season from April to October, followed by the Harmattan season (November to February). Mean annual rainfall varies across the state: about 1,000 mm in the south, 800 mm around Kano urban, and 600 mm in the northeast (KNARDA 2019). Agriculture is the backbone of the state's economy, involving both crop and livestock production. Kano is renowned for producing millet, sorghum, maize, rice, wheat, groundnuts, and vegetables. Livestock production, particularly cattle, goats, and sheep, is widespread, with the Kano cattle market being one of the largest in West Africa (Daneji *et al.*, 2025).

Sampling Procedure and Sample Size

A multistage sampling procedure was used for the study. The first stage involved the stratification of Kano State into the three Agricultural Zones, namely Rano Zone I, Danbatta Zone II, and Gaya Zone III. The stratification was used to ensure adequate representation of the major Agricultural Zones in the State. The second stage involved the purposive selection of one (1) Local Government Area from each of the three (3) Agricultural Development Zones based on the concentration and intensity of rice farming activities. Accordingly, Kura Local Government Area was selected from Rano Zone I, Ghari Local Government Area was selected from Danbatta Zone II while Ajingi Government Area was selected from Gaya Zone III.

The third stage involved purposive selection of two communities each from the selected Local Government Areas based on high rice farming activities in the Area. The selected communities which include Butalawa and Imawa from Kura Local Government Area, Hayin Dangwai and Kasuwar Kuka



from Ghari Government Area and Unguwar Bai and Zangon Guliya from Ajingi Local Government Area.

The final stage involved simple random selection of rice farmers from the sampling frame of rice farmers in the communities. The communities have the estimated population of 1,850 based on the data collected from Kano Agricultural and Rural Development Authority (KNARDA). The sampling frame of 1,850 gave sample size 329 using Slovin's Formula used to estimate the sample for this study as follows:

$$n = N / 1 + N (a)^2$$

$$N \ 1850 / 1 + 1850(0.05)^2 = 329$$

Hence

N = is the sample frame

n = is the sample size

α = is the margin of error (at 5%)

A sample proportion formula was used to calculate the number of farmers who had been interviewed in each selected community.

$$Nc = n / N \times Nc$$

However,

N = is sampling frame for whole population

Nc = is sampling frame for the community and

n = is the sample size

Methods of Data Collection

Primary data were used for this study and the data were collected from the respondents through use of well-structured interview schedule. The structured interview schedules were in line with the objectives of the study. Descriptive statistics was use in analyzing the data. Descriptive statistics such as frequency distribution, mean, percentage and Likert scale were used to achieved objective i and objective ii.

Means score was used to achieved objective ii. Twelve statements were created to measure the level of acceptance of different technologies use for rice farming. A 5-point Likert-type scale was used to measure the level of acceptance of technologies based on four variables factors such as perceived ease of use, perceived usefulness, attitude and intention of use. A five-point Likert scale included Strongly Agree (SA) 5, Agree (A) 4, Neutral (N) 3, Disagree (DA) 2, and Strongly Disagree (SD) 1. Farmers were asked to indicate the levels of their acceptance for each statement on this scale. For each indicator a weighted average score was obtained as follows:

Scale	Interval	Scale	Level of Influence or Decision
Strongly Disagree	1.00-1.79	1	Very Low
Disagree	1.80-2.59	2	Low
Neutral	2.60-3.39	3	Moderate
Agree	3.40-4.19	4	High
Strongly Agree	4.20-5.00	5	Very High

To calculate interval

$$\text{Range} = \text{High} - \text{Lowest} = 5 - 1 = 4$$

$$\text{Interval} = 4 \div 5 = 0.80$$

- To calculate the mean score, the following formula was used:

$$x = \sum (f_i x_i) / \sum f_i$$

Where:

- Σ = summation
- x_i = Likert-scale value (e.g., 1,2,3,4,5)
- f_i = frequency/ number of the respondents selecting that value
- $\sum f_i$ = total number of respondents.



RESULTS AND DISCUSSION

Kinds of Information Needed at Different Stages of the Rice Production Cycles

The result in Table 1 showed that 64.13% of the rice farmers interviewed sourced information needed on improved seed variety, land preparation, weather and climate condition, while 48.94% and 46.50% sourced information needed on crop health, pests and disease control and fertilizer use and weeds control, respectively. This implies that majority of rice farmers in the study area needed mostly on seedling, farming, cultivation, processing, marketing and storage of rice produce. Satisfying such needs by stakeholders will help the farmers to produce highly nutritious rice produce, process it, and effectively store the produce for end users. This in line with the report of Farida, (2022) which revealed that the farmers need information on agricultural marketing, improved varieties, land and harvest management, fertilizer, pesticide application, weed and disease control to satisfy the needs will result to successful rice production which will eventually satisfy the consumers' needs. Other information considered useful by the farmers and sourced at different rice production cycles were information needed on storage and access to market information (41.64%), information on improved rice production technology (new machineries), (40.73%). However, information needed on Government policy and support (input and credit information), information needed on rice maturity, moisture content and harvest and information on irrigation methods and water control were the least sourced information by the rice farmers with corresponding percent of 28.88, 28.57 and 26.75 respectively. This suggests the availability of some of these ICT tools that were used in the study area. Furthermore, this agreed with the findings of Sani (2024) reported that farmers' access information needed on rice seed and seedling, fertilizer management, pest and disease will helped to enhance communication efficiency, improve decision-making, and increase productivity at various rice production cycles, from pre-production to post-harvest.

Table 1: Distribution of Respondents Based on Information Needed at Different Stages of the Rice Production Cycle

Kinds of Information Needed at Different Stages of the Rice Production Cycle	Frequency*	Percentage
Pre-Planting Stage		
Information on improved seed variety, land preparation and weather and climate condition.	211	64.13
Information on Government policy and support (input and credit information).	95	28.88
Planting and Crop Establishment Stage		
Information on fertilizer use and weeds control	153	46.50
Information on irrigation methods and water control.	88	26.75
Crop Growth and Management Stage		
Information on crop health, pests and disease control.	161	48.94
Information on improved rice production technology (new machineries)	134	40.73
Harvesting Stage		
Information on rice maturity, moisture content and harvest.	94	28.57
Post-Harvest Stage		
Information on storage and access to market information.	137	41.64

Source: Field Survey, 2025

*Multiple Responses

Ease of Use of ICTs by the Respondents

The result in Table 2 shows that the respondents perceived ICT tools as easy to use for farming-related activities. The statement I find ICT tools easy to use in my farming practices recorded the highest mean score of 4.43, with 178 respondents strongly agreeing, 117 agreeing, 32 remaining neutral, and 2



disagreeing. The finding agrees with Arrang et al. (2025), who reported that perceived ease of use significantly influences farmers' adoption and continued use of ICT-based agricultural technologies. This implies that most respondents considered ICT tools user-friendly and relatively easy to incorporate into their farming practices. Similarly, the statement "It is easy for me to get agricultural information on the use of ICT tools" recorded a mean score of 4.09. This finding indicates that most respondents found it relatively easy to access agricultural information concerning the use of ICT tools. The result suggests that respondents had adequate access to information and guidance needed to utilize ICT tools for farming activities. This agrees with the findings of Bayih et al. (2022) reported that farmers may perceive ICTs as easy to use if the user interface is intuitive, the system is reliable and stable, training and support are readily available, and the technology is compatible with existing farming practices.

The statement "I feel confident in using ICTs for farming-related tasks without assistance" had a mean score of 3.82, also indicating a high level of confidence. The responses showed that 102 respondents strongly agreed, 116 agreed, 72 were neutral, 29 disagreed, and 10 strongly disagreed. Although the majority expressed confidence in using ICT tools independently, the relatively higher number of neutral and negative responses compared with the other items suggests that some respondents may still require assistance or additional training to use ICTs effectively for farming-related tasks. This finding is consistent with Arrang et al. (2025), who reported that farmers who perceive ICTs as easy to use are more likely to develop favorable attitudes towards their adoption.

Table 2: Ease of Use of ICTs by Respondents

Ease of Usage	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree	Mean Score	Decision
1. find ICT tools easy to use in my farming practices	178	117	32	2	0	4.43	Very High
2. It is easy for me to get agricultural information on the use of ICT tools	110	147	67	4	1	4.09	High
3. I feel confident in using ICTs for farming related tasks without assistance	102	116	72	29	10	3.82	High

Source: Field Survey, 2025

Key: strongly agreed (SA) = 5, Agreed (A) = 4, Moderate (MD) = 3, Dis-agreed (DA) = 2 and strongly dis-agreed (SD) = 1

Decision Rule:

Mean scores from 4.20-5.00 are considered to be Very High

Mean scores from 3.40-4.19 are considered to be High

Mean scores from 2.60-3.39 are considered to be Moderate

Mean scores from 1.80-2.59 are considered to be Low

Mean scores from 1.00-1.79 are considered to be Very low

Perceived Usefulness of ICTs by the Respondents

As shown in Table 3 the use of ICT to reduce reliance on extension agents $\bar{x} = 4.18$. This reveals that majority of believed that ICT tools helped them reduce their dependence on extension agents for information on rice farming. The high mean score suggests that ICT tools are perceived as effective in providing the necessary support, potentially making them more self-reliant in farming decisions and actions. This in line with the finding of Lawal et al. (2020) that the perceived benefits of ICTs strongly influence farmers' willingness to integrate them into production systems. ICT tools providing useful information for better decision-making in rice farming had a mean of $\bar{x} = 4.19$. This reveals that the respondents largely agree that ICT tools helped them obtain valuable information that enhances their decision-making capabilities regarding rice farming. With 116 strongly agreeing and 165 agreeing, the high mean score highlights that ICT is seen as an important resource in making informed farming



choices. Also, ICT tools assistant in solving agricultural problems of pest control, flooding and farming practices had a mean score of $\bar{x} = 4.15$ (High). This in line with findings of Ezech E, I. (2019) reported that farmers perceive ICTs as useful for enhancing decision making and managing risks in production. This indicates that a significant number of respondents view ICT tools as helpful in addressing agricultural challenges, such as pest control and farming practices. Although a small portion (7 respondents) disagreed, the overall positive response underscores ICT's role in providing solutions to common agricultural problems. This in line with the report of Babuga et al. (2025) viewed those ICTs not only as tools for accessing information but also as platforms for problem-solving, advisory services, and cost reduction.

Table 3: Perceived Usefulness of ICTs by the Respondents

Perceived Usefulness	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree	Mean Score	Decision
1.Using ICTs helps me to reduce rely on extension agents on my rice farming	122	148	55	3	1	4.18	High
2. ICT tools help me to get useful information that makes better decisions on my rice farming.	116	165	44	3	1	4.19	High
3. ICT tools help me to get information on how to solve agricultural problems such as pest control management, flooding, farming practice etc	114	158	49	7	1	4.15	High

Source: Field Survey, 2025

Key: strongly agreed (SA) = 5, Agreed (A) = 4, Moderate (MD) = 3, Dis-agreed (DA) = 2 and strongly dis-agreed (SD) =1

Decision Rule:

Mean scores from 4.20-5.00 are considered to be Very High

Mean scores from 3.40-4.19 are considered to be High

Mean scores from 2.60-3.39 are considered to be Moderate

Mean scores from 1.80-2.59 are considered to be Low

Mean scores from 1.00-1.79 are considered to be Very low

Attitude of Use of ICTs by the Respondents

The results in Table 4 revealed that the respondents' enjoyment of using ICTs for agricultural activities had a mean score of 4.21, indicating a very high level of agreement. This finding is consistent with Singh and Kameswari (2019), who reported that the majority of farmers had a positive outlook towards ICTs. The finding implies that most respondents enjoyed using ICT tools in their agricultural activities, as indicated by the 127 respondents who strongly agreed and 148 who agreed with the statement. The very high mean score reflects a highly positive attitude, suggesting that the use of ICT tools is not only functional but also engaging and satisfying for most respondents. The respondents' preference for using ICT tools over traditional methods for obtaining agricultural information had a mean score of 4.10, indicating a high level of agreement. This finding is consistent with Urvashi et al. (2025), who reported a predominance of moderately favourable attitudes towards ICTs, indicating that although ICTs are gaining acceptance among farmers, some farmers are not yet fully confident in their use.

The present finding indicates that respondents generally preferred using ICT tools to traditional methods for obtaining agricultural information. Although some respondents may still value traditional methods, the high mean score indicates an overall preference for ICT tools, which may be associated with their speed, convenience, and accessibility to a wider range of agricultural information.



Furthermore, the respondents' perception of ICTs as a valuable addition to farming practices recorded a mean score of 4.04, indicating a high level of agreement. This finding differs from that of Mahajan et al. (2023), who found that most farmers had moderately favourable perceptions of ICTs. The present result indicates that the majority of respondents perceived ICT tools as a valuable addition to their farming practices. Although some respondents may not have fully embraced ICT tools, the high mean score reflects a generally positive perception of the value of ICTs in enhancing farming practices.

Table 4: Attitude toward the Use of ICTs

Attitude	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree	Mean Score	Decision
1. I enjoy using ICTs for agricultural activities.	127	148	51	2	1	4.21	Very High
2. I prefer using ICT tools for agricultural information rather than traditional methods	115	143	62	7	2	4.10	High
3. I feel that ICTs are a valuable addition to my farming practices	96	164	56	11	2	4.04	High

Source: Field Survey, 2025

Key: strongly agreed (SA) = 5, Agreed (A) = 4, Moderate (MD) = 3, Dis-agreed (DA) = 2 and strongly dis-agreed (SD) =1

Decision Rule:

Mean scores from 4.20-5.00 are considered to be Very High

Mean scores from 3.40-4.19 are considered to be High

Mean scores from 2.60-3.39 are considered to be Moderate

Mean scores from 1.80-2.59 are considered to be Low

Mean scores from 1.00-1.79 are considered to be Very low

Intention to Use of ICTs by the Respondents

The findings revealed a mean score of 4.03 for the respondents' intention to continue using ICT tools in their farming activities. The relatively high mean score indicates a strong intention among the respondents to continue using ICT tools in their agricultural activities. This suggests that ICT tools are perceived as useful and relevant to farming practices and are likely to remain part of the respondents' agricultural activities in the future. This finding is consistent with Hermin et al. (2025), who reported that farmers were more likely to recommend ICT tools when they perceived them as beneficial to their farming activities. The findings further revealed a mean score of 4.18 for the respondents' intention to use ICT tools more frequently in the coming agricultural seasons. This relatively high mean score indicates a strong willingness among the respondents to increase the frequency of ICT use in their farming activities. The finding suggests that the respondents were not only willing to continue using ICT tools but also intended to expand their use in subsequent agricultural seasons. This finding is consistent with Ambong and Paulino (2020), who reported that respondents were likely to recommend ICT tools for rice farming. Similarly, the respondents' willingness to recommend ICT tools to other farmers recorded a mean score of 4.11. The high mean score indicates a strong intention among the respondents to recommend ICT tools to other farmers. This suggests that the respondents perceived sufficient value in the use of ICT tools to encourage other farmers to adopt or use similar technologies.



Table 5: Intention to Use ICTs by Respondents

Intention to Use	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree	Mean Score	Decision
1. I intend to continue using ICTs in my farming activities in the future.	110	157	48	2	1	4.03	High
2. I plan to use ICTs more frequently in the coming agricultural seasons	130	137	55	6	1	4.18	High
3. I would recommend using ICT tools for rice farming to other farmers	110	152	61	4	2	4.11	High

Source: Field Survey, 2025

Key: strongly agreed (SA) = 5, Agreed (A) = 4, Moderate (MD) = 3, Dis-agreed (DA) = 2 and strongly dis-agreed (SD) = 1

Decision Rule:

Mean scores from 4.20-5.00 are considered to be Very High

Mean scores from 3.40-4.19 are considered to be High

Mean scores from 2.60-3.39 are considered to be Moderate

Mean scores from 1.80-2.59 are considered to be Low

Mean scores from 1.00-1.79 are considered to be Very low

CONCLUSION AND RECOMMENDATION

The base on the findings study concluded that rice farmers in the study area frequently sourced information needed on improved seed varieties, land preparation, and weather and climate conditions, while information on crop health, pests and disease control and fertilizer use and weed control was moderately sourced across the rice production cycle. The farmers also recorded high levels of ICT acceptance in terms of perceived ease of use, perceived usefulness, attitude towards use, and intention to use ICTs for rice farming. The findings therefore indicate that ICTs can serve as an important complement to conventional agricultural extension services in providing timely agricultural information to rice farmers across the different stages of rice production.

Based on the findings of the study, the following recommendations are suggested:

1. Agricultural extension organizations and research institutes should develop ICT-based information services that address farmers' needs at each stage of the rice production cycle. Particular attention should be given to less frequently source.
2. Farmers should be encouraged to embrace the use of ICT tools, such as radio, mobile apps, online forums, and social media platforms, to access timely and relevant agricultural information, in order to improve productivity and decision-making across different stages of the rice production cycle.
3. Agricultural institutions should establish interactive ICT platforms through which farmers can ask questions and receive feedback from extension agents and experts. These could be complementing the limited number of extension agent available to farmers.
4. Government and relevant stakeholders such as NGOs should improve the infrastructure required for effective ICT us in rural farming communities. Additionally, agricultural programmes should be delivered in local languages to address the constraints face by rice farmers to improve comprehension and utilization of information.

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