Evaluation of Factors Influencing the use of Information and Communication Technologies (ICTS) Among Smallholder Rice Farmers in Kuje Area Council of Fct, Abuja

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ABSTRACT

The purpose of this study was to investigate the usage of ICTs, which ones are popular among the farmers and whether certain factors influenced usage. This study was to fill a research gap on ICT usage among smallholder rice farmers in rural communities of Kuje area council, Federal capital Territory. The study involved a simple random sampling of 100 smallholder rice farmers with varying numbers of respondents in the study area's communities. This study involved the use of structured interview questionnaires on the perceptions, level and constraints of ICT usage. The data concerning the demographics of farmers, perceptions, level and constraints of ICT usage were analyzed using simple descriptive statistics (frequencies, percentages) and data concerning factors influencing ICT usage among the smallholder rice farmers was analyzed using inferential statistics (Binary Logistic regression). The results indicated that majority of respondents (52%) together of the respondents were under 40 years. 82% of respondents strongly agreed and agreed respectively that the use of ICTs helps me to increase their income. 86% and 90% majority of respondents regularly used mobile phones and Radio devices on a frequent basis for rice farming activities respectively. The main constraints of the farmers in the study included, Poor network and reception, Inadequate power supply and Language barrier. Others being high cost of recharge credit, high cost of ICT tools and Expensive usage. There is the urgency of Agricultural Extension agencies to take effective measures to strengthen extension services in order to change the percentage use of ICTs by farmers.

Keywords: Smallholder, farmers, usage, ICTs, extension, rice

INTRODUCTION

Information and Communication Technologies (ICTs) offer a new way to spread knowledge among individuals in different parts of the world. ICTs, as defined by The Technical Centre for Agricultural and Rural Cooperation (CTA) 2003, are devices that process and transmit information through electronic channels including radio, television, fixed and mobile phones, computers, Pocket pcs, and the internet.

Examples of readily available ICT components/devices include radio, television, multi-media systems (VCDS, DVDS, VHS, overhead projectors), telephones (landlines and mobile phones), Internet (e-mailing, Web-browsing, telephoning), computers, and personal digital assistants (Fadiji, 2017; Ayeni et al. 2023). Among the others are media players, geographic information systems, GPS, cable television, online newspapers, e-books, journals, tablet computers, smart phones, iPod, and iPad. All necessary stakeholders, including farmers, extension agents, researchers, administrators, marketers, cooperatives, agro-processors, and non-governmental groups, must be informed to accomplish this, (Ladele, Igodan, Agunga and Fadairo, 2015). According to Nyarko and Kozari (2021), around the world, information and communication technology in agriculture has been identified as the key factor in the sector's growth. A few mobile payment systems give farmers access to Informational resources to which they have access to crucial data such as meteorological data and disease outbreaks, in addition to offering a quick means of communication (Campenhout, Spielman and Lecoutere, 2020).

Agricultural Extension has led the way in providing the farming community with sufficient information over the years, not only to boost productivity but also to enhance the level of their life (Danso-Abbeam, Ehiakpor and Aidoo, 2018). In order to successfully transmit technology into the farming community, evolutionary changes had been made while keeping in mind the need for agricultural growth. Fabregas, Harigaya and Ramrattan (2022) asserted that Information and communication technology (ICT) are one of the essential partners that helped to make agriculture extension more attractive and practicable.

In Africa, small-scale agriculture provides the majority of people with a living. Agents of development face a significant challenge in getting agricultural information to these rural residents (Toeniessen, Adesina and De Vries, 2008; Adeyemi et al., 2023). Notwithstanding the creation of various organizations and the support of numerous extensions approaches and strategies aimed at increasing farmers' production, agricultural performance is still lacking, leading to a continuation of food imports and an increase in the index of consumer prices (Emran, Krupnik, Aravindakshan, Kumar and Pittelkow, 2021). Information rates differ within and between people and range from decision-making to psychological to some more individualized needs (Alaybek, Dalal and Dade, 2022). While basic and frequently shared information needs are derived from physiological needs, individual needs vary from person to person. Individual information needs can be influenced by a variety of interconnected factors, such as social, cultural, and economic. Age, education, gender, and income of the information seeker are some other factors that can affect information needs (Adeshina, 2021).

Factors influencing the usage of ICT

Agricultural technology adoption factors have been extensively studied, according to James (2015). According to Loevinsohn, Sumberg, Diagne and Whitefield (2013) claim that farmers' actions about whether and how to utilize novel technologies are influenced by the continuous interplay between the technology's characteristics and a variety of situations and circumstances. After analyzing the chosen studies and chosen experiences from developing nations, Macire, Robert, and Christopher (2016) highlighted that the relative advantage, simplicity, compatibility, observability, social influence, and information quality of ICTs were found to be factors favoring the use of ICTs on agricultural input information in the access to and use of agricultural input information. The cost of ICT services has been noted as one factor that negatively impacts the use of ICTs for agricultural input information. The following study's discussion of these elements in more detail:

Relative advantage

Relative advantage (or superiority) is the measure of how much an innovation is thought to be superior to the concept it replaces. It is more often defined by means of economic profitability and/or social benefit. They also referred to the perceived usefulness of an innovation, or "the degree to which the consumer

perceives that using a particular scheme will maximize his or her economic output," as the relative advantage of the innovation (Macire *et al.,* 2016).

Simplicity

Macire *et al.,* (2016) explained that the extent to which an innovation is considered to be understandably and practically straightforward is determined by how simple it is. Any revolutionary idea can be characterized along the range of complexity and simplicity. Some innovations are immediately evident in what they mean to potential users, while others are not. The majority of studies use simplicity rather than complexity because it has a positive impact on how an innovation is used (Sahin, 2006).

Compatibility

According to James (2015), one of the most important variables affecting how quickly a new innovation is adopted is the perception of its compatibility or acceptability. According to the author, an innovation's compatibility is measured by how closely it is thought to adhere to the values, experiences, and needs of potential adopters. In order to give the new idea meaning and make it seem more recognizable, the person needs compatibility.

Cost

The cost of ICT services makes one 's use for agricultural input data prohibitive. For instance, the high cost of mobile devices and services prevented many Tanzanian rural farmers from using tigokilimo. According to estimates by Palmer, Ciccarelli, Falkmer, and Parsons (2014), the majority of SENEKELA users in Mali thought the cost was prohibitive. The empirical study led to the conclusion that the expense prevents farmers in developing nations from using ICTs to access information about agricultural inputs.

Social Influence

In their research, Muhammad, Adesiji, Tyabo, Muhammed, and Loko (2019) found that age, marital status, and educational level all had positive relationships with and had a significant impact on ICT use. The author also stated that education helps farmers become more aware of, have access to, and use ICT. This suggests that farmers are more likely to use ICT to look up agricultural information and thus increase productivity if they are more educated. Contrarily, married farmers had parental responsibilities, which affected their level of experience, decision-making, and use of ICT.

Applications of Information and Communication Technologies

ICT as a yardstick for effective communication

Agricultural extension communication specifically aims to raise participants' quality of life (farmers and extension personnel) through sharing agricultural information with others in the context of development. As a result, the effectiveness of the communication methods, channels, and techniques may be a factor in whether or not the suggested technologies and packages are adopted. The limitations and constraints found in traditional and official communication channels have made ICT use more relevant. Due to its broad reach and coverage, according to Omotayo (2015), a more helpful and effective method for creativity in communication in the context of agriculture is necessary.

ICT as a yardstick for access to improved seed varieties

Over 13.55 million smallholder farmers got subsidized inputs (better seeds and fertilizers) in 2014 via their mobile phones and the Electronic Wallet (e-wallet) system, according to data from the Federal Ministry of

Agriculture and Rural Development (FMARD). As of 2014, around 14 million smallholder farmers were registered on the system, despite problems with network coverage, awareness, and the availability of fertilizer in some regions. This began in Nigeria (FMARD 2014). Nigeria, the first country in Africa, was where the electronic wallet system for transferring subsidized supplies to farmers was first implemented.

ICT as a yardstick for better market linkage services

According to Sennuga (2020), his study's qualitative interviews showed that smallholder farmers used their mobile phones in a wide range of ways. The ability to access market information on agricultural inputs such as fertilizers, herbicides, enhanced seeds, current market pricing, and direct interaction with traders and purchasers were some of these. Others included finding out the availability and amount of a given item in the markets and exchanging market information and experiences with surrounding farmers in order to boost income. These results demonstrated that respondents typically utilized their mobile devices in a timely fashion, enabling them to successfully carry out market research in a number of markets. The ability of farmers to access markets and conduct business may be greatly enhanced by mobile phones, which are clearly beneficial (Achukwu et al., 2023).

Constraints of ICTs usage among farmers

There are many obstacles to farmers using ICT in developing nations, especially in rural areas. Several of these obstacles undoubtedly prevent farmers from using ICTs to their advantage. William (2018) in this section in his study presented several significant ones.

Poor Technical infrastructure

There is often a lack of adequate technical infrastructure in rural areas. According to Satish and Thompson (2012), this is because the resources required to establish any significant infrastructure are too restrictive in terms of the availability of crucial ICTs facilities, equipment, and structures.

Lack of access to ICT

Given the foregoing, it makes sense that rural areas will have constrained access to ICT services because of a lack of ICT infrastructure. Poor individuals lack access to education, communication, and information, according to Fassil and Maria (2012). The majority of Africans who reside in rural areas most frequently use radio, television, and newspapers, according to Wulystan and Ronald (2013). According to Dokubo et al., (2023) traditional media such as radios, movies, televisions, slides, photos, exhibitions, and field demonstrations have all been employed to speed up information flow in rural areas of developing nations.

High cost of ICTs

In addition, contemporary ICTs like computers, Internet cafes, Telecenters, GPS, and others are essentially nonexistent in rural communities if they have not been provided by NGOs, private operators, or in the case of government projects funded by development agencies, which typically end with the project duration.

Research objectives

The broad objective of this study is to evaluate the factors influencing the use of information and communication technology among smallholder rice farmers in Kuje area council of F.C.T to address the problem of inadequate provision of agricultural information. Therefore, the specific objectives of this study are to:

1. describe the socio-economic characteristics of smallholder rice farmers in the study area
2. assess the perceptions of smallholder rice farmers towards ICT usage

3. determine the factors that influences ICT usage among smallholder rice farmers
4. assess the level of ICT usage for the acquisition of agricultural information among smallholder rice farmers
5. identify constraints influencing ICT usage among smallholder rice farmers.

METHODOLOGY

Description of Study area

This investigation took place in the Federal Capital Territory's Kuje Area Council. Its about 40 kilometers southwest of Abuja. Kuje is a short drive from the brand-new Centenary City Development. Kuje is frequently referred to as the "food basket of Abuja" because of the abundance of farmland and greenery there. Kuje's most developed area right now is Kuchiyako. According to the 2006 census, it has a 1.644 km2 area and 97.367 residents.

Sampling techniques and size

Simple random sampling was the sample selection method used in this research study. To be sure, every unit or department in the population of the study has a known chance of being included in the sample, making this sampling technique the most appropriate for this research project. 100 farmers from the five villages in the Kuje Area council were used for the project.

Table 1: Sampled population and farming communities

No.	Farming Communities	Number of farmers
1	Dafara	20
2	Bamishi	20
3	Gaube	20
4	Zango	20
5	Kusaki	20
	Total	100

Source: Field survey, 2023

Method of data collection

A formalized schedule or form that includes a collection of thoughtfully crafted questions for data collection is known as a questionnaire (Wong *et al.,* 2012). Structured questionnaires are one of the data collection methods that was used for the study. Data from the respondents was gathered using the questionnaires. For randomly chosen members of the different groups, the questionnaire included both open-ended and closed-ended questions. A survey's questionnaire was also created to be used by a diverse sample of respondents drawn from the large respondent population (Burns, 2015).

Data analysis

Using the Statistical Package for Social Sciences (IBM SPSS software version 25.0), the data acquired was examined. Calculating frequencies and percentages for the purpose of defining the socioeconomic characteristics of small-scale rice farmers, level of ICT usage, perception of ICT usage and constraints influencing ICT usage among smallholder farmers in the study region required the use of descriptive statistics. While the determination of the factors that influence the usage of ICTs required inferential statistics.

RESULTS AND DISCUSSION

Table 2: Socioeconomic Characteristics of Respondents

Socioeconomic characteristics	Frequency (n=100)	Percentage (%)
Age (years)		
Below 30	16	16.0
31-40	36	36.0
41-50	37	37.0
51 and above	11	11.0
Gender		
Female	53	53.0
Male	47	47.0
Marital status		
Married	76	76.0
Single	18	18.0
Widowed	6	6.0
Educational status		
No formal education	38	38.0
Primary school	26	26.0
Middle secondary school	16	16.0
Secondary school	12	12.0
Tertiary education	8	8.0
Household size		
1-5	14	14.0
6-10	61	61.0
11 and above	25	25.0
Household headship status		
I am not a household head	48	48.0
I am a household head	52	52.0
Rice farming experience in years		
1-5	10	10.0
6-10	23	23.0
11-20	43	43.0
21 and above	24	24.0
Farmland size		
less than 1 ha	32	32.0
1-5 ha	58	58.0
6-10 ha	10	10.0
Annual income (₦)		
100,000 – 400,000	24	24.0
401,000 – 700,000	37	37.0
701,000 – 1,000,000	27	27.0
1,000,000 and above	12	12.0

Source: Field Survey, 2022

The results from this study revealed that there was a larger majority of females (53.0%) engaged in rice farming compared to males (47.0%) owing to a larger perceived participation of women in agriculture. According to the results of the respondents' marital status survey, 76% of respondents were married, compared to 18% who were single and 6 who had been widowed (have lost their spouse). The nature of societal conventions and ideas that people living in a rural community are expected to get married as early as late twenties for men and early-mid-twenties for women makes this finding seem valid and true. The idea that most farmers only have a very low level of education is a common 3misconception about their literacy. The study's conclusions indicate that only 38.0% of farmers' education is formal. Table 2 above reveals that only 26% of respondents completed primary school, 28% completed secondary school, and only 8% went on to further their education in tertiary institutions. According to the aforementioned findings, 62% of respondents had some level of literacy, albeit to varying degrees. The results contradict the widely held belief that most farmers are uneducated. As a result, it may be thought that the farming community in the study area is a suitable setting for the adoption of technologies. A large household with at least 6 members was anticipated to be the perceived size of the respondents' households in the study area. According to the results of this study, 61 respondents had families withbetween 6 and 10 members (an average of 8 people per household), followed by 25 respondents withfamilies with 11 or more members, and 14 respondents with families with between 1 and 5 members. According to the research's findings, a slightly higher proportion of respondents who were not household heads (52%) than those who were (48%) was discovered. Six respondents had widowed status, (as shown by Table 2); as a result, it was necessary for one person to assume more responsibility for household duties, including farming, as the only head of the household.

The result from this study showed that 10% of farmers only had farming experience of 1-5 years (3 years on average), with 23% of respondents having farming experience of 6-10 years (8 years on average), followed by a 43% majority of farmers who have 11-20 years (16 years on average) experience and a 24% minority of farmers who have 21 years of experience and above. Data shown in the table above revealed that a 67% majority of farmers had farming experience of 11 years and above. This shows that majority Farmers in the study area were well conversant and indulgent in the cultivation of rice. However, results from this study contradicts Sennuga's observation as a joint majority of 68% respondents had access to cultivate 1-10 hectares of farmland, though their source of acquisition of land were unknown. Only 32 percent of respondents had access to less than 1 hectare in cultivating rice while a 58% and 10% of respondents cultivated rice on 1-5 hectares (3 hectares on average) and 6-10 hectares (8 hectares on average) of land respectively.

Results on the annual income of rice farmers revealed that a larger majority (61%) had an income from cultivating rice between 100,000 and 700,000 naira, followed by 27% who had an income between 701,000 and 1,000,000 naira, and the least proportion (12%), who had an annual income of 1,000,000 naira and above. The majority of farmers in rural communities were able to feed their families and send their kids to school, according to Sennuga and Conway (2020), who also show that this result is supported by their research. Additionally, because rice is a staple food and there is a high demand from consumers across Nigeria, the annual income level from the study's results shows the viability in the cultivation of rice crops.

Perceptions of rural farmers towards the use of ICTs

Table 4: Perception of smallholder farmers towards IC usage

n (no' of respondents who used ICTs) = 51	Percentage					
PERCEPTION OF ICT USAGE	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total%
The use of ICTs helps me to increase my income	18.00%	82.00%	0.00%	0.00%	0.00%	100%

ICT promotes access to credit	4.00%	31.00%	59.00%	6.00%	0.00%	100%
The use of ICT saves time	26.00%	66.00%	5.00%	3.00%	0.00%	100%
The use of ICT in rice farming leads to improved productivity	14.00%	86.00%	0.00%	0.00%	0.00%	100%
ICT would be more effective if local language is used	53.00%	35.00%	10.00%	2.00%	0.00%	100%

Source: Field survey, 2022

Data revealed rice farmers' responses to certain perceptions towards ICT usage and are thus:12% and 82% of respondents strongly agreed and agreed respectively that the use of ICTs helps me to increase their income. The perception that ICT promotes access to credit was attested to by 34% majority of respondents, followed by 59% undecided alongside only 6% perceiving that ICT does not promote access to ICT. 92% of respondents agreed to the perception that the use of ICT saves time with 5% being indifferent in their choice and only 3% disagreed to this claim. Respondents all agreed that the use of ICT in rice farming leads to improved productivity. 88% of respondents also perceived that ICT would be more effective if local language is used, while 10% and 2% remained indifferent and disagreeing respectively on the said claim. Results from this study show that majority of the respondents had a positive perception of ICT use towards its benefits to their farming activities.

Factors that influences ICT usage among smallholder rice farmers

It was found that age was insignificant in the use of ICT tools by 116% (with p= 0.834). Middle aged farmers were more predisposed to using ICTS than younger farmers. Marital status of farmers had an influence on their use of ICT tools where married farmers were less likely to use ICTs significantly (p=0.058) by 7.3%. In addition, farmers with large household sizes were not keen on using ICT tools by 76.5% with the p-value of 0.784. In addition, Farmers who had more education were found to increase their ICT tool usage significantly (p=0.000) by 131.530%. Rice farmers who were heads of households were not inclined to using ICT tools by 90% with a p-value of 0.893. Farmers with more years in farming were relatively less likely to use ICT tools by 48.10% with the p-value of 0.358. Farmers' who cultivated more farmland size were less likely to engage in the usage of ICT tools by 95.7% with p-value of 0.966. In this study, low annual income of farmers was more likely to engage in the usage of ICT tools by 62.30% (p= 0.452).

Table 5: Factors influencing farmers use of ICT tools by Binary Logistic Regression Analysis

Table 5: Factors influencing farmers use of ICT tools by Binary Logistic Regression Analysis				
Variables	**S.E.**	**B**	**Exp (B)**	**P-Value**
Age	.716	.150	1.162	.834
Marital status	1.380	-2.613*	.073*	.058
Household size	.980	-.268	.765	.784
Educational level	.614	2.577***	1.315***	.000
Household headship status	.790	-.106	.900	.893
Farming experience	.796	-.732	.481	.358
Farmland size	1.031	-.044	.957	.966
Annual income	.629	-.474	.623	.452
Constant	3.142	3.992	54.186	.204

Number of observations   100
Probability>Chi² (8)   0.00

Log Likelihood Ratio	**55.393**
Nagelkerke R²	**0.753**

Note: The asterisks [*, **, and *] represent statistical significance at 10%, 5% and 1% levels respectively**

Source: Survey Data, 2022

n (no' of respondents whoused ICTs) = 51	Percentage						
ICT tools	Very often (5)	Often(4)	Someti mes (3)	Rarely (2)	Very Rarely (1)	Not at all used (0)	Total %
Mobile phone	61.0%	25.0%	2.0%	2.0%	8.0%	2.0%	100%
Computer	24.0%	66.0%	2.0%	6.0%	0.0%	2.0%	100%
Radio	0.0%	25.0%	22.0%	29.0%	18.0%	6.0%	100%
Television	4.0%	6.0%	27.0%	31.0%	22.0%	10.0%	100%
Email	10.0%	27.0%	27.0%	14.0%	16.0%	6.0%	100%
Social media applications	24.0%	66.0%	2.0%	6.0%	0.0%	2.0%	100%

Source: Survey Data, 2022

Level of ICTs usage among smallholder rice farmers

An 86% majority of respondents regularly used mobile phones for rice farming activities with 12% barely using the ICT device. It was also discovered that only 2% of Respondents did not use mobile phones at all. A vast majority of 75% respondents refrained from the use of Computer devices, though 8% used the device often and from time to time, followed by an 18% minority of respondents barely using The ICT tool. Results showed as expected that a large majority (90%) of respondents listened to Radio devices in a frequent basis for their rice farming activities. In addition, 25% of respondents made use of Television more often than others, followed by large majority (47%) barely using the said device. Respondents who used Electronic mail (Email) on a frequent basis were reported to be 10%, with 27% being undecided in their responses. A 53% majority of respondents barely used email for rice farming. The frequent use of Social media applications (such as WhatsApp, Facebook, Twitter, Facebook, LinkedIn, Zoom, Skype) among respondents were measured at 37%, followed by 27% making use of the applications once in a while and only 30% of the respondents barely used these applications.

Table 4.7: Constraints influencing ICT usage among smallholder rice farmers

n (no' of respondents who used ICTs) = 51			
Constraints faced in the usage of ICTs	**Frequency**	**Percentage (%)**	**Rank**
Language barrier	41	80.0	3rd
Poor network and reception	46	90.0	1st
Time consuming	4	8.0	7th
Expensive usage (High cost of recharge credit)	36	71.0	4th
Inadequate power supply	44	86.0	2nd
Distance to recharge centers	10	20.0	6th
High cost of ICT tools	36	71.0	5th

Source: Survey Data, 2022 (*Multiple response)

The constraints identified were ranked in order of severity beginning with Poor network and reception (90%), Inadequate power supply (86%), Language barrier (80%), High cost of ICT tools (71%), Expensive to use; High cost of recharge credit (71%), Distance to Recharge centers (20%) and Time consuming (8%).

RECOMMENDATIONS

Based on the conclusions of this study, the following recommendations are made:

1. It is advised that Agricultural Extension agencies take effective measures to strengthen extension services in order to change the percentage use of ICTs by farmers with regard to the urgent need of increasing ICT use.
2. Since the respondents' educational background had a significant positive influence on how they used ICTs. Thus, it might be advised that Extension agents run a number of awareness programmes, sensitization and training workshop for the uneducated and less-educated farmers.
3. Their (farmers) use of ICTs was significantly positively impacted by their marital status. Therefore, it might be advised that Extension agencies run more awareness campaigns about the potential advantages of ICTs for married farmers to access essential agricultural information in collaboration with social community-based non-governmental organizations (NGO).
4. It might be advised that the relevant Telecommunications agencies choose to invest in technical advancements given the frequent issue of poor network connectivity to better meet the needs of potential ICT users.
5. The goal of the current study was to examine the relationship between eight (8) chosen characteristics of farmers and their use of ICTs. Therefore, it may be advised that additional research be conducted while taking into account other agricultural and non-agricultural activities as well as other characteristics of the farmers that may have an impact on how they use ICTs.
6. Age, household size, household headship status, farming knowledge, farmland size, and annual income did not significantly influence the participants' use of ICTs in the current study. More research is, however, required in this regard.

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