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Assessment of the Use of Information and Communication Technologies (ICT) in Agricultural Extension Service Delivery among Farmers in Yobe State, Nigeria

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ABSTRACT

The study assessed the use of information and communication technologies (ICTs) in agricultural extension services delivery among farmers in Yobe state, Nigeria. The specific objectives of the study were to identify the ICTs available to the farmers in the study area, ascertain the level of access to ICTs among the farmers in the study area, determine the use of ICTs among the farmers in the study area, and identify the constraints to the use of ICTs among the farmers in the study area. A multistage sampling procedure was used to select 130 respondents for the study. The target populations were obtained from the sampling frame of all contact farmers in the state Agricultural Zones. Both Primary and secondary data were used in the study. Primary data were collected using a well-structured questionnaire and interview schedule, while secondary data were obtained from records of YOSADP, articles, and publications. Data were analyzed using frequency counts, percentages, mean, and Likert scale. The analysis results revealed that mobile phones, radio, internet, and television were the most available and accessible ICT tools used by the sampled respondents in the study area. The severity of the constraints to the use of ICT facilities among the respondents shows lack of electricity supply as the 1st ranked impediment among others (WMS of 3.6), followed by lack of funds and high illiteracy level (WMS of 3.2) each and inadequate access to ICT gadgets (WMS of 3.1). In conclusion, there was low usage of ICT facilities in the study area, and the respondents had low knowledge of useful information, as imposed by some constraining factors. Overcoming these challenges would ensure increased use of ICTs for agricultural activities in the study area. Recommendations such as awareness/sensitization on the use of ICT facilities such as the internet and computer to enable farmers utilize the tools effectively for agricultural information transfer and retrieval, dissemination of agricultural-related information through radio and television programs, as well as mobile phones, would be recommended for agricultural development, the use of renewable energy such as solar panels in the utilization of ICT tools particularly in rural areas and enactment of new government policy for the incorporation of ICT gadgets in extension services delivery to farmers to increase their confidence, competence and skills in using ICTs.

INTRODUCTION

Information and communication technologies (ICTs) play a pivotal role in shaping the global economy of the 21st century, revolutionizing the way people communicate, educate, learn, and conduct business within the past decade (UNESCO, 2002). ICT holds the potential to bridge communication gaps between extension personnel and farmers, enabling farmers to voice their needs, explore innovative production techniques, and streamline extension systems (CTA, 2003). The ICTs promise to accelerate information collection, processing, and dissemination, fostering bottom-up, interactive communication with farmers (Madukwe, 2006). The use of ICTs to improve information flow in rural areas suggests that illiteracy among farming communities may no longer be a barrier to receiving extension services (Nwachukwu, 2010). As such, access to new information sources through ICTs is crucial for the sustainable development of farming systems (Meera *et al.*, 2004). Additionally, the role of ICTs in accessing more information to bolster food security and support rural livelihoods has gained recognition and endorsement at events like the World Summit on the Information Society (WSIS) 2003-2005 (ICD, 2007).

Therefore, to benefit rural populations, extension personnel must explore ways to leverage ICTs to enhance rural livelihoods and facilitate better information exchange and access. In this context, extension practitioners are also eager to experiment with innovative e-extension initiatives (Saravanan, 2010). ICTs have been widely acknowledged as instruments for progress and development in the current "Global Information Age," either directly or indirectly (Ansari & Pandey, 2013). ICTs serve as potent tools for disseminating crucial information. Aker (2010) asserts that ICT is essential for accessing information and knowledge. Information plays a vital role in farmers' decision-making processes (Armstrong *et al.*, 2011), and the availability of ICT-enabled agriculture centers has increased awareness among farmers in Nigeria (Durojaiye *et al.*, 2013). Through ICTs, farmers can easily reach out to their peers, researchers, and scientists worldwide to obtain information. ICTs are a driving force in transforming extension services, aiding in the diagnosis of problems, data interpretation, and application of solutions within farming communities (Meera *et al.*, 2004).

In Nigeria, the use of ICT in agriculture has become a national concern, and its increasing application in

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every part of our life has been felt significant. With the problem that extension agents face in facilitating direct contact with farmers due to time constraints and capacity to cover all farm families, the Yobe State government has introduced a number of ICT training for extension personnel through Yobe State Agricultural Development Program (YOSADP) to transmit current agricultural information such as weather forecast, market information, pest and disease mitigation and control strategies, good agronomic practices (GAP), access to agricultural credit and loan schemes etc. to farming communities. They usually identify farmers' needs and provide necessary solutions through different forms of extension teaching methods and, to some extent, ICTs. These make most of the YOSADP programs to be included in the radio and TV programs, e.g., "Zauren Manoma" aired free on the state broadcasting networks.

Despite the improvements by YOSADP, farmers in the study area are still experiencing a lack of contact with the extension workers and poor access to current research findings that will enhance their agricultural production capacity. This made farmers to yearn for the incorporation of ICT in extension services because it has the widest range of responsibility for agricultural information transfer and retrieval. This will help improve their methods and techniques of farming to improve their methods of production, marketing, and processing activities. Therefore, farmers are eager for the integration of ICT in extension services to enhance their farming methods, improve production, marketing, and processing activities, and foster collaboration among researchers, farmers, extension agents, and other stakeholders (Farell, 2003).

Extension agents have employed various forms of one-on-one and group communication methods, such as meetings, lectures, group discussions, and local training sessions, to carry out their responsibilities. However, a significant challenge in the exchange of agricultural information is the delay in delivering current research findings to farmers. Furthermore, gender disparities and cultural barriers, particularly in traditional African Muslim societies; limit the use of individual contact methods like personal visits and face-to-face discussions, especially with female farmers. Given these challenges, it is clear that extension agents cannot effectively reach all farm families solely through traditional means. The farmers in the study area are not experiencing changes in their farming activities due to a lack of contact with the extension workers. This is attributed to the low number of active extension agents (51) across the whole State to cover all farming households. This results in many of the grassroots problems that affect farmers' productivity. The poor accessibility of farmers to current and relevant agricultural information on good agricultural practices, such as planting calendars based on NIMET reports, sources of seeds, etc., are some of the prerequisites that necessitate the emergence of ICTs as an information source. Extension agents should leverage ICTs to

disseminate agricultural information to farmers to address these gaps efficiently. However, whether farmers in the study area are adequately familiar with and utilizing ICTs in their farming activities remains uncertain. Therefore, this study aims to assess the extent to which farmers in the area use ICTs and how they incorporate them into the transmission and reception of agricultural information. The study's main objective was to assess the use of ICTs in agricultural extension services delivery among farmers in Yobe State, Nigeria. The specific objectives were to:

- i. Identify the ICTs available to the farmers in the study area;
- ii. Ascertain the level of access to ICTs among the farmers in the study area;
- iii. Determine the use of ICTs among the farmers in the study area;
- iv. Identify the constraints on using ICTs among the farmers in the study area.

LITERATURE REVIEW

Theoretical Framework

Motivation Theory

Fredrick Herzberg's motivation theory, as outlined in 1959, aligns with satisfaction theories, which propose that simply providing employees with basic hygiene factors does not necessarily lead to improved performance. Motivation, in essence, is the driving force that initiates, guides and sustains goal-oriented behaviors. The underlying forces that fuel motivation can have biological, social, emotional, or cognitive origins (Cherry, 2014). According to motivation theory, individuals are driven to undertake tasks primarily due to external rewards. In the context of my study, this theory implies that various ICT tools can motivate farmers to engage in agriculture, driven by the prospects of employment generation and an improved standard of living resulting from increased productivity and profitability.

With the ready availability of mobile phones, radio, television, and internet services, farmers can be motivated to pursue agriculture by introducing new mobile applications and comprehensive radio and/or television programs that provide current, relevant, and timely agricultural information, thereby establishing networks among farmers, enabling them to share success stories and experiences among themselves with the sole aim of maximizing their production capacities.

The Technology Acceptance Model

The Technology Acceptance Model (TAM), initially introduced by Davis *et al.* (1989) and adapted from the Theory of Reasoned Action, serves as an information systems theory designed to predict the acceptance and utilization of technology. At its core, TAM relies on two fundamental factors: individuals' perception of the technology's usefulness and its ease of use (Li, 2010). These two factors were believed to significantly influence an individual's intention and subsequent behavior regarding technology adoption.

TAM focuses squarely on the individual, seeking to understand their unique characteristics and attributes that play a role in technology acceptance. Due to this emphasis on the individual user perspective, Kim & Crowston (2011) underscore the importance of information systems in identifying the factors that impact individual users' decisions to adopt and utilize information and communication technologies (ICTs).

Diffusion of Innovation Theory

Diffusion is the process through which an innovation is communicated through specific channels over time among members of a social system. Everett Rogers' 1962 theory of the "Diffusion of Innovation" is one of the oldest social science theories initially developed in communication. It aims to elucidate how an idea or product gains momentum and spreads throughout a particular population or social system. The adoption of innovations typically starts at the top, progresses through various stages, and eventually reaches a point of saturation. The innovation-decision process consists of five stages: Knowledge, Persuasion, Decision, Implementation, and Confirmation (Nguthi, 2007). In the knowledge stage, individuals or households become aware of innovation and understand how it functions. However, even after acquiring information about an innovation, individuals may require persuasion to use it if they do not perceive it as relevant to their situation. The Implementation stage is when an individual puts the innovation into practical use. The final stage is Confirmation, during which the individual seeks validation for the decision made. Rogers (1995) further elaborates that the adoption

process involves several interrelated factors, including personal, cultural, social, and situational elements. This process comprises five distinguishable stages: awareness, gathering more information and knowledge, evaluation, trial, and adoption. The characteristics of a technology, such as its simplicity, the visibility of results, its usefulness in addressing existing needs, and its low capital requirements, influence its eventual adoption. These factors should be considered when attempting to introduce any new technology. Communication through various channels provides information to a social system to influence their awareness and assessment of the innovation.

This theory implies that ICTs are often effective in creating awareness of innovation, while personal contacts are more influential in shaping opinions about a new idea. Effective interpersonal communication is facilitated when those conveying information are similar to the receivers in specific attributes. Furthermore, greater education and participation in farmer associations can enhance access to information about new techniques and help farmers adapt to the changes necessitated by new technologies (Feder *et al.*, 1985; Rogers, 1995). Hence, information appears to be a crucial factor in influencing farmers' productivity in agricultural extension services.

METHODOLOGY

The Study Area

The study was conducted in Yobe State, Nigeria. The state is located in the Northeastern part of Nigeria and lies between latitudes 12° 00' N and longitudes 11° 30' E of the equator (Google map, 20018). The state shares an

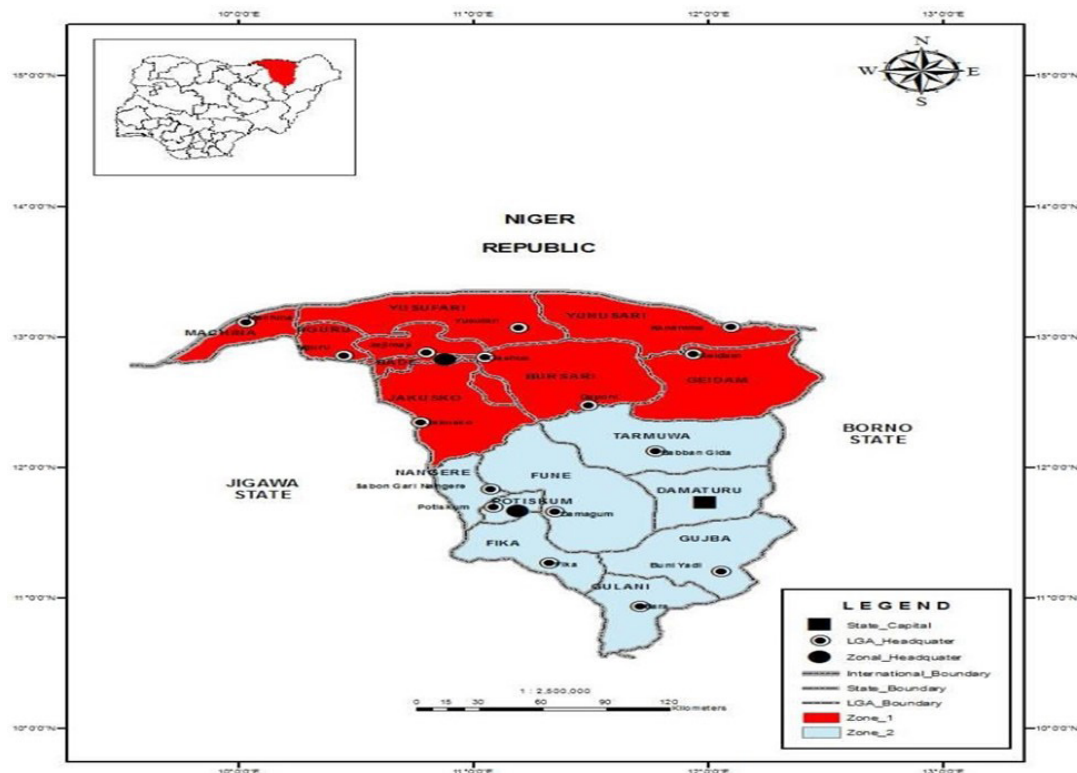


Figure 3: Map of Yobe State Showing the Selected Agricultural Zone

Source: Department of Geography, University of Maiduguri

international border to the north with Diffa and Zinder Region in the Republic of Niger and state boundaries with Bauchi to the west, Borno to the east, Gombe to the southwest and Jigawa state to the northwest (Fig. 3). The State has a total land area of 45,502 km² with a population of 2,321,339 and 2023 projected population estimate of 3,965,457 based on 3.2% population growth rate (NPC, 2006). The annual temperature of the state ranges from 39°C - 42°C. The area experiences 500mm - 1000mm of annual rainfall. The period of rainy season in the state varies from place to place, but generally lasts for about 120 days (i.e. June to September) in the north and more than 140 days (May to October) in the south. Greater proportions of the population in the area are farmers followed by civil servants and some inhabitants who are engaged in tailoring, trading, fishing, craft, etc. The major crops cultivated in the area include millet, sorghum, rice, cowpea, groundnut and sesame. Livestock such as sheep, goat and cattle are kept for domestic purposes including poultry and fisheries.

Reliability Test

The study’s approach offers an excellent way to gather and generate firsthand information from ground reality. The questionnaires were validated by experts in the field of agricultural extension. The split-half method was used to test the reliability of the research instruments for data collection. The coefficient of determination of (r) obtained was 0.65. This indicates that 65% of the questionnaires administered to the respondents were

valid for the study.

Sampling Techniques

A multi-stage sampling procedure was employed to select the respondents for the study. In the first stage, the study considered the two (2) Agricultural Zones; Bade (zone I) and Potiskum (zone II), since; they are the only zonal headquarters of Agricultural Development Program (ADP) in the state. In the second stage, a proportionate selection of thirteen (13) agricultural blocks out of the thirty-three (33) agricultural blocks in the zones was made using Taro Yamane’s formula. In the third stage, the 13 agricultural blocks obtained from zones (I) and (II) were selected randomly from the sampling frame of all blocks in zones I and II. In the fourth stage, out of eight (8) cells under each of the selected blocks in the zones, two (2) cells were selected at random from the 13 sampled blocks to give a total of 26 cells. In the fifth stage, five (5) contact farmers out of twenty five (25) were selected from each of the selected 26 cells using simple random sampling to give a total of 130 farmers that were used for the study. The proportionate selection of the agricultural blocks was done using Taro Yamane’s formula (1967) as expressed below:

$$n = \frac{N}{1 + N(e)^2} \tag{i}$$

Where,
 n =Number of respondents
 N = Population size
 e = Error term (0.30)

Table 1: Summary of Sampling Procedures and Sample Size

Zones	Zonal Headquarters	No. of Agric. Blocks	No. of Agric. Blocks Sampled and their Names		No. of Cells Sampled and their Names		No. of Sampled Farmers
1	Bade	15	6	Amshi	2	Dachi’a Bizi	5 5
				Baimari	2	Kankare Garin dole	5 5
				Yunusari	2	Toshi’a Dilala	5 5
				Geidam	2	Kalgeri Kelluri	5 5
				Gashu’a	2	Usur Dawayo	5 5
				Yusufari	2	Kachallari Takashi’a	5 5
2	Potiskum	18	7	Mamudo	2	Maje Adaya	5 5
				Babban gida	2	Koromari Jumbam	5 5
				Bumsa	2	Bara Kukuwa	5 5
				Damaturu	2	Maisandar Malamatar	5 5

				Buni yadi	2	Buni gari Kotorko	5 5
				Kukar gadu	2	Daya Garinbuba	5 5
				Jajere	2	Mashio Kollere	5 5
Total:		33	13		26		130

Source: Field Survey, 2024

Measurement of Variables

Level of Access

To determine the respondents level of access to ICTs in accessing agricultural information in the study area, a five point Likert type scale with options and score values; Very high (5), High (4), Low (3), Very low (2) and No access (1) were used (i.e. objective ii). The values were added and divided by 5 to give 2.50, which serves as the decision rule. Therefore, the decision rule for objective (ii) showed that any value ≥ 2.5 indicates high access, while any value <2.5 indicates low access.

Constraint to the Use of ICT

A four point Likert type scale with options and score values; strongly agree (4), agree (3), disagree (2), and strongly disagree (1) were used to determine the constraints to the use of ICT among the respondents in the study area (i.e. objective iv). The values were added and divided by 4 to give 2.50, which serves as the decision rule. Therefore the decision rule showed that any value ≥ 2.5 indicates a severe constraint while any value < 2.5 indicates not a severe constraint.

The Likert formula (X_s) is expressed as follows:

$$X_s = \frac{\sum fn}{Nr} \tag{ii}$$

Where,

X_s = Mean score

∑ = Summation

F = Frequency of each (i.e. the values; 5, 4, 3, 2, 1 or 4, 3, 2, 1 option respectively)

n = Likert numerical or nominal values (responses of the respondents)

Nr = Number of respondents to each response category (total number of respondents).

Analytical Technique

Descriptive statistics, such as frequency counts and percentages, were used to analyze objectives (i) and (iii).

RESULTS AND DISCUSSION

Availability of ICTs among the Respondents

The data regarding the availability of ICTs among farmers in the study area is presented in Table 1.2. The results reveal that mobile phones (83.8%) and radio (81.5%) are the most prevalent ICTs among farmers in the study area. This indicates that mobile phones and radios are the most accessible ICTs, largely due to their

cost-effectiveness, user-friendliness, low requirement for computer literacy, suitability for remote areas and social settings, and portability. Furthermore, the findings suggest limited adoption of other ICT tools due to their

Table 2: Distribution of the Respondents According to Availability of ICTs

Variables	Frequency (f)	Percentages (%)
Computer		
Available	18	13.8
Not available	112	86.3
Radio		
Available	106	81.5
Not available	24	18.5
Television		
Available	61	46.9
Not available	69	53.1
Mobile Phone		
Available	109	83.8
Not available	21	16.2
Internet		
Available	49	37.7
Not available	81	62.3
Social Media		
Available	50	38.5
Not available	80	61.5
Viewing Center		
Available	16	12.3
Not available	114	87.7
DVD/VCD		
Available	42	32.3
Not available	88	67.7
Prints		
Available	18	13.8
Not available	112	86.2
Projector		
Available	5	3.8
Not available	125	96.2
Total	130	100

Source: Field Survey, 2024

restricted availability and accessibility in rural areas. Therefore, if these technologies are integrated and employed effectively to transfer agricultural information, they can potentially yield significant benefits in remote regions. Mobile phones and radios have consistently been reported as the most prevalent ICT tools among farmers in prior studies (Okello *et al.*, 2010; Ndaghu, 2012). These findings align with those of Akweta *et al.* (2018), who observed that radio, mobile phones, and television are the most commonly used ICTs.

Level of Access to ICTs among the Respondents

Table 1.3 displays the respondents’ distribution based on their access to ICT facilities. Mobile phones, radio, and internet, as well as social media, emerged as the most accessible ICT facilities for the respondents, with Weighted Mean Scores (WMS) of 3.9, 3.7, and 3.1, respectively. This discovery suggests that the majority of farmers in the study area have superior access to mobile phones, radio, internet and social media in comparison to all other ICT facilities considered in the study. This implies that majority of the farmers had access to current agricultural information such as weather forecast; market information, agricultural credit schemes, and good agronomic practices (GAP) that could significantly improve production. Farmers in the study areas noted that internet services as well as social media were accessible, primarily through their mobile phones. This finding is consistent with Agwu *et al.* (2008) research, which indicated that 33% of farmers had access to ICT facilities. The fact that, majority (67%) of farmers lack access underscores that many rural areas in the study region

are devoid of essential ICT facilities, and consequently, these communities are unlikely to be well-informed about significant agricultural developments. This issue is often linked to the challenges of underdevelopment, as a substantial portion of the global population struggles to access and effectively utilize ICTs (UNDP, 2001). Additionally, these findings align with Ogbonna & Agwu (2013) assessment of access to and use of ICTs by rural farmers in Enugu North Senatorial Zone, Enugu State, Nigeria. Their study revealed that mobile phones ($\bar{x} = 1.83$), radio ($\bar{x} = 1.82$), and television ($\bar{x} = 1.50$) were the most accessible ICT facilities for farmers in the study area. The effectiveness of information transfer is greatly enhanced by these ICTs, and their inaccessibility in the study area results in less efficient information communication. The implication of this research is that farmers in the region have limited or no access to modern information technologies, which may adversely affect their production capacity due to their limited exposure to current agricultural innovations. Furthermore, Syiem & Raj (2015) conducted a study on the access and usage of ICTs for agriculture and rural development by tribal farmers in Meghalaya State, Northeast India. Their study revealed that all the farmers had mobile phones (100%). Since the farmers included in the study were registered under various ICT initiatives, particularly mobile-based initiatives, it can be inferred that 100% of the farmers in the selected district had access to mobile phones. This suggests that mobile phones have a higher level of accessibility compared to other ICT tools because they are affordable, portable, and highly practical, especially in emergency situations.

Table 3: Distribution of the Respondents According to Level of Access to ICTs

Variables	Very High	High	Low	Very Low	No Access	Total	WMS	Rank
Mobile Phone	57 (43.8)	43 (33.1)	8 (6.2)	2 (1.5)	21(16.2)	506	3.9	1
Television	31 (23.8)	28 (21.5)	5 (3.8)	5 (3.8)	61(46.9)	353	2.7	4
Radio	55 (42.3)	37 (28.5)	10 (7.7)	4 (3.1)	24(18.5)	485	3.7	2
DVD/VCD	24 (18.5)	11 (8.5)	7 (5.4)	0 (0.0)	88(67.7)	273	2.1	5
Prints	10 (7.7)	4 (3.1)	23 (17.7)	11 (8.5)	82(63.1)	239	1.8	6
Internet	48 (36.9)	39 (30.0)	14 (10.8)	8 (6.2)	21(16.2)	475	3.7	2
Viewing Centre	1 (1.0)	2 (1.5)	2 (1.5)	11 (8.5)	114(87.7)	155	1.2	8
Social Media	46 (35.4)	23 (17.7)	9 (6.9)	2 (1.5)	50(38.5)	403	3.1	3
Computer	3 (2.3)	10 (7.7)	4 (3.1)	1 (1.0)	112(86.2)	181	1.4	7
Projector	1 (1.0)	2 (1.5)	1 (1.0)	1 (1.0)	125(96.2)	143	1.1	9

Source: Field Survey, 2024

- * “Very High” scored 5 point
- * “High” scored 4 point.
- * “Low” scored 3 point
- * “Very Low” scored 2 point
- * “No Access” scored 1 point
- * Decision Rule: Any score ≥ 2.5 is regarded as high access, while any score < 2.5 is regarded as low access.
- Figures in parentheses are percentage (%)

Use of ICTs among the Respondents

The analysis outcomes in Table 1.4 show the percentage distribution of different ICT usage patterns among the respondents. The results indicated that mobile phones and the Internet were utilized by 83.8% of the respondents. Radio usage was reported by 81.5% of the respondents. These findings highlight that mobile

phones, internet, and radio were the most frequently employed ICT tools for agricultural extension services among the study's participants. This suggests that respondents predominantly relied on mobile phones, the internet, and radios for their ICT needs, possibly due to the various advantages associated with these ICT facilities in sourcing agricultural information such as market price information, weather information, pest, and disease control strategies, source of inputs, access to credits/loans, extension services, and programs, good agronomic practices (GAP) etc.

This finding aligns with those of Akinnagbe & Oladipupo (2018), who reported that arable crop farmers primarily used the following ICTs: radio (81.7%), mobile phones

(79.2%), and television (73.3%). According to their research, radio, mobile phones, and television were the most accessible and commonly used ICTs among farmers. This also implies that farmers utilized digital ICT facilities, such as the Internet and computers, to a much lesser extent. This limitation could result in farmers missing out on valuable information on the internet, which is a substantial source of recent developments in agricultural extension services (Agwu & Chah, 2007). Consequently, this highlights the importance of concerned stakeholders in the agricultural development process advocating for the integration of ICT access, availability, and utilization mandates into national and state extension system policies. This would ensure that verified agricultural information is readily accessible to farmers for their use.

Table 4: Distribution of the Respondents According to Use of ICTs

Variables	Frequency (f)	Percentages (%)
Computer		
Yes	18	13.8
No	112	86.3
Radio		
Yes	106	81.5
No	24	18.5
Television		
Yes	69	53.1
No	61	46.9
Mobile Phone		
Yes	109	83.8
No	21	16.2
Print Materials		
Yes	48	36.9
No	82	63.1
Social Media		
Yes	80	61.5
No	50	38.5
Viewing Center		
Yes	16	12.3
No	114	87.7
DVD/VCD		
Yes	42	32.3
No	88	67.7
Internet		
Yes	109	83.8
No	21	16.2
Projector		
Yes	5	3.8
No	125	96.2
Total	130	100

Source: Field Survey, 2024

Constraints to the Use of ICTs among the Respondents

Table 1.5 presents an overview of the identified obstacles hindering the effective utilization of ICT facilities among the respondents. The foremost challenge, highlighted as the top constraint in terms of severity, is the absence of a stable electricity supply, garnering a Weighted Mean Score (WMS) of 3.6. Following closely are the constraints of insufficient funds and a high illiteracy level, both receiving a WMS of 3.2 each? Ranking third in terms of severity, with a WMS of 3.1, is inadequate access to ICT devices. It is worth noting that the provision of electricity and consistent power supply is an absolute prerequisite for the utilization of contemporary ICT systems. This suggests that farmers encounter specific impediments that impede their effective use of ICT facilities. The findings underscore the need for stable electricity supply, financial resources, awareness, and improved access to purchase and employ these ICT tools efficiently. The absence of these critical factors could impede their availability and utilization. Consequently, this may prevent a majority of farmers from acquiring these devices, ultimately restricting their access to valuable agricultural knowledge and information.

This study aligns with the discoveries made by Albert (2014) in their examination of constraints affecting the effective use of ICTs among extension professionals and farmers in the delivery of extension services in Rivers State, Nigeria. Their research indicated that the primary constraints revolved around issues of illiteracy ($\bar{x} = 3.25$), a lack of financial resources ($\bar{x} = 3.20$), and low computer literacy ($\bar{x} = 3.15$). This implies that human capital development, financial resources, and computer literacy emerge as pivotal factors for the effective utilization of ICT in agricultural extension services. The findings underscore that a requisite understanding of ICT knowledge and operational procedures is essential for achieving successful extension service delivery and the level of literacy among farmers significantly influences their ability to harness technology.

Table 5: Distribution of the Respondents According to Constraints to the Use of ICTs

Variable	S.A	A	D	S.D	Total	WMS	Rank
Lack of electricity supply	59(45.4)	52(40.0)	18(13.8)	1(0.8)	465	3.6	1
Lack of fund	63(48.5)	41(31.5)	18(13.6)	8(6.2)	419	3.2	2
High illiteracy level	61(46.9)	44(33.8)	12(9.2)	13(10.0)	413	3.2	2
Inadequate access to ICT gadget	48(36.9)	56(43.1)	19(14.6)	7(5.4)	405	3.1	3
High cost of ICT procurement	40(30.8)	49(37.5)	28(21.5)	13(10.0)	376	2.9	4
Inadequate technical know-how	47(36.2)	37(28.5)	30(23.1)	16(12.3)	375	2.9	4
Lack of ICT training	32(24.6)	52(40.0)	34(26.2)	12(9.2)	364	2.8	5
Low incorporation of ICT in extension service delivery	27(20.8)	9(37.7)	39(30.0)	15(11.5)	348	2.7	6
High cost of maintenance	34(26.6)	24(18.5)	44(33.8)	28(21.7)	324	2.5	7
Inadequate ICT infrastructure	21(16.2)	41(31.5)	49(37.7%)	19(14.6%)	324	2.5	7

Source: Field Survey, 2024

*Strongly Agreed "SA" scored 4 point

*Agreed "A" scored 3 Point

*Disagreed "D" scored 2 point

*Strongly Disagreed "SD" scored 1 point

*Decision Rule: Any score ≥ 2.5 is regarded as severe constraints while any score < 2.5 is regarded not severe.

Figures in parentheses are percentage (%)

CONCLUSION

The study concludes that mobile phones, internet, and radio were the most prevalent, accessible, and frequently used ICTs among the farmers. These ICTs hold significant potential for enhancing agricultural extension services in the state and the country. However, the study also highlights the limited usage of digital ICT facilities in the area and the respondents' limited knowledge of valuable information that will improve their production capacities. These limitations are attributed to various challenges, including unreliable or absence of electricity power supply, high illiteracy level, insufficient funding, and inadequate access to ICT gadgets, among others. To promote the broader adoption of ICTs in agricultural activities, addressing these challenges and creating a supportive environment that encourages farmers to embrace ICTs more extensively towards effective extension services and better agricultural production is crucial.

RECOMMENDATIONS

The following recommendations were made:

1. Farmers must be aware and sensitized to effectively utilized ICT tools like the Internet, projectors, and computers. This will empower them to efficiently access and retrieve agricultural information such as improved varieties, certified seed, access to credits, input supply, climate mitigation, market information, etc.
2. It is advisable to disseminate agricultural information through radio and television programs such as "Zauren Manoma" and mobile phones. These platforms are recommended for reaching a wider audience of farmers.
3. Encouraging rural youth to use ICT to access

extension services delivery to enhance communication patterns, improve production, and facilitate the flow of agricultural information among themselves and extension personnel, thereby effectively utilizing agricultural messages.

4. To address the issue of poor, erratic, and fluctuating power supply, it is recommended that renewable energy sources like solar panels be explored, especially in rural areas of the state, so that computers, projectors, televisions, viewing centers, and DVD/VCDs can be utilized.

5. Government intervention is essential, and policy enactment is recommended to facilitate the integration of ICT devices or ICT-enabled centers into extension services for farmers to source for and access relevant agricultural information. This will boost farmers' confidence, competence, and skills in utilizing ICTs, contributing to agricultural development. It is essential to ensure that government policies align with the effective application of ICTs in extension services.

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REFERENCES

- Agwu, A. E. & Chah, J. N. (2007). Access and Utilization of Modern Information Communication Technologies among Extension Personnel in Benue State of Nigeria. *Proceedings of the 12th Annual Conference of Agricultural Extension Society of Nigeria (AESON)*, Maiduguri 4th-7th July, p. 7-21.
- Agwu, A. E., Uche-Mba, U. C. & Akinagbe, O. M. (2008). Use of Information Communication Technologies (ICT's) among Researchers, Extension Workers and Farmers in Abia and Enugu States: Implications for a National Agricultural Extension Policy on ICT's. *Journal of Agricultural Extension*, 12(1), 37-49.
- Aker, J. C. (2010). Dial "A" for Agriculture using ICTs for Agricultural Extension in Developing Countries.

- Tufts University. A Paper Presented at the Conference on Agriculture and Development, University of California, Berkely, p. 160-172.
- Akinagbe, O. M & Oladipupo, G. T. (2018). Attitudes of Arable Crop Farmers towards the Use of Information Communication Technologies in Ekiti State, Nigeria. *Journal of Agricultural Science and Food Technology*, 4(9), 182-189.
- Akweta, J. N., Tata, L. A. & James, A. N. (2018). Information Needs of Farmers in Song Local Government area, Adamawa State, Nigeria. *Journal of Agriculture, Food security and Sustainable environment*, 1(1), 11-16.
- Albert, C. O. (2014). Constraints to Effective Use of ICT's among Extension Professionals and Farmers in Extension Service Delivery in Rivers State, Nigeria. *Singaporean Journal of Business, Economics, and Management Studies*, 2(11), 136-142.
- Ansari, M. A. & Pandey, N. (2013). Assessing the Potential and Use of Mobile Phones in Agriculture. *Karnataka Journal of Agricultural Sciences*, 26(3), 388-392.
- Centre for Tropical Agriculture (CTA) (2003). ICTs Transforming Agricultural Extension: An e-discussion, 20th August-29th September 2003.
- Cherry, K. (2014). Theories of Motivation, Psychology.
- Davis, F. D., Bagozzi, R. P. & Warshaw, P.R. (1989). User Acceptance of Computer Technology: A Comparison of two Theoretical Models. *Management Science*, 35(1), 982-1003.
- Durojaiye, L. O., Abubakar, S. Z., Omeneza, Z. E., Muhammed, S., Wahab, A. A., Ismail, F.O. & Musa, R. A. (2013). An ICT-Based Agricultural Extension Service Delivery for Nigeria. *Journal of Agricultural Extension*, 17(2), 16-22.
- Farrell, C. O. (2003). Virtual Extension-Research Communication Network (VERCON). Proceedings of the ICTs Observatory Meeting, 23rd -25th September, 2003. *Wageningen, the Netherlands*, 9, 27-39.
- Ferder, G., Just, R. E. & Zilberman, D. (1985). Adoption of Agricultural Innovations in Developing Countries: A Survey. *Economic Development and Cultural Change*, 33(2), 255-298.
- Google Map, (2018): GIS, Department of Geography, University of Maiduguri, Borno state, Nigeria.
- IICD, (2007). How ICT can make a Difference in Agricultural Livelihood. The Common Wealth Ministers Reference Book-2007. <http://www.iicd.org/files/ICT%20and%20agricultural%20livelihoods.pdf>.
- Kim, Y. & Crowston, K. (2011). Technology Adoption and Use Theory Review for Studying Scientists Continued Use of Cyber-infrastructure. Available at: <http://crowston.syr.edu/system/files/ASIST2011.pdf>.
- Li, L. (2010). A Critical Review of Technology Acceptance Literature. Southwest Decision Sciences Institute. Available at: <http://www.swdsi.org/swdsi2010/PA104.pdf>
- Madukwe, M. C. (2006). Delivery of Agricultural Extension Services to Farmers in Developing Countries. Markets in Niger state, Nigeria. *American Economic Journal: Applied Economics*, 2(3), 46-59.
- Meera, S. N., Jhamtani, A. & Rao, D. U. M (2004). Information and Communication Technology in Agricultural Development: A Comparative Analysis of Three Projects from India. *Agricultural Research and Extension Network paper No. 135*, p. 20.
- National Population Commission (NPC) (2006). A Blueprint on Official Population of Yobe State, Nigeria.
- Ndaghu, A. A. (2012). Use of Information Communication Technologies (ICTs) among Women Farmers in Northeastern Nigeria. An Unpublished Thesis in the Department of Agricultural Development, University of Ibadan, Nigeria, p. 131-183.
- Nguthi, F. (2007). Adoption of Agricultural Innovations in the Context of HIV/AIDS: Adoption of Agricultural Innovations in the Context of HIV/AIDS: The Case of the Tissue-Cultured Banana in Central Kenya. Ph.D. Thesis, Wageningen University.
- Nwachukwu, I. (2010). Communication for development: Concept, principles and practice. In *Proceedings of the South-east Zonal Workshop on effective Extension Communication Methods and Techniques for Agricultural Staff/Personnel from ADPs, LGAs, RBDAs, NARIs, Polytechnics and NGOs*, Umuahia, Abia State, Nigeria (pp. 14-20).
- Ogbonna, O. I. & Agwu, A. E. (2013). Access and Use of Information and Communication Technologies by Rural Farmers in Enugu North Senatorial Zone, Enugu State, Nigeria. *Scholarly Journal of Agricultural Science*, 3(7), 264-270.
- Okello, J., Juma, J., Okello, R. M., & Adera, O. E. (2010). Awareness and the use of mobile phones for market linkage by smallholder farmers in Kenya. In B. M. Maumbe (Ed.), *e-Agriculture and e-Government for Global Policy Development: Implications and Future Direction* (pp. 1-18). Hershey, PA: Information Science Reference.
- Rogers, E. M. (1995). *Diffusion of Innovations*, (4th ed.). New York, Free Press.
- Saravanan, R. (Ed.). (2010). India. In R. Saravanan (Ed.), *ICTs for agricultural extension: Global experiment, innovations and experiences* (2nd ed., pp. 115-168). New Delhi, India: New India Publishing Agency.
- Syiem, R. & Raj, S. (2015). Access and Usage of ICTs for Agriculture and Rural Development by the tribal farmers in Meghalaya state of North-east India. *Journal of Agricultural Informatics*, 6(3), 24-41.
- UNDP (2001). Information Communications Technology for Development. Essentials ICTD 31. Synthesis of Lessons Learned. Evaluation Office No. 5 September. New York. <http://www.undp.org/eo>
- UNESCO (2002). ICT's in Teacher Education: A Planning Guide. Division of Higher Education, UNESCO, 2, p. 9.
- Yamane, T. (1967). *Statistics: An Introductory Analysis*, (2nd ed.). New York, Harper and Row.