



Factors influencing extension agents' use of Information Communication Technologies (ICTs) for extension services in South East, Nigeria



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ABSTRACT

This study investigated the factors influencing the use of Information Communication Technologies (ICTs) among agricultural extension agents in South-East Nigeria. A descriptive survey design was employed, with data collected from 240 respondents selected through a multi-stage sampling procedure. Data were analyzed using descriptive statistics and multiple regression analysis. The results indicated that extension agents predominantly utilize basic ICT tools such as mobile phones, smartphones, WhatsApp, and radio for communication and information dissemination, while the use of advanced ICT tools such as computers, email, and internet-based platforms remains low. The regression results revealed that access to ICT tools, ICT training, and education level significantly influenced ICT use, whereas age and years of experience were not significant. Major constraints identified include epileptic power supply, high cost of data, and high cost of ICT devices. The study concludes that although ICT adoption is increasing, its effective utilization is constrained by infrastructural, financial, and capacity-related factors.

KEY WORDS: *ICT use; Extension agents; Agricultural extension; Technology adoption; Nigeria*

1. Introduction

In this internet era, agricultural extension has been recognized as an essential medium of disseminating information and advice to farmers and this can be achieved through the application of Information Communication Technologies (ICTs) (Nabara *et al.*, 2023). Agricultural extension service facilitates the transfer of knowledge and good practices to farmers. According to Ali *et al.*, 2020; Zulqarnain *et al.*, 2020; Sa'udu *et al.*, 2022), a successful

agricultural extension program depends on sharing information, knowledge exchange, and effective communication and interaction among researchers, agricultural extension agents and farmers. Sa'udu, *et al.* (2022) stated that agricultural sector needs transition toward modern technologies, with ICT playing a key role in enhancing knowledge management processes to achieve sustainable development goals.



The analog agricultural extension is mainly accomplished by an extension officer visiting a farmer or farmer field schools but as it today, extension work can be done through Information Communication Technologies (ICT) application (Okafor and Umebali, 2019). The ADP is primarily an extension organ established by the Federal government to advance food and fiber production in Nigeria through extension agents. The program came into existence in 1975 with the aim of increasing food production and farmers' income through an integrated farm inputs supply and overall development of agriculture and this makes the ADPs the real agent of extension delivery in the new system.

In Nigeria today, the concept of ICTs has generated a global concern and the increasing application of the technology in every aspect of our natural life, mainly through the GSM, radio, television, projectors, internet, video, camera, computers, e-wallet, has been observed (Nabara *et al.*, 2023). The application of Information Communication Technology (ICT) across different sectors of the global economy has been seen as a game changer in boosting work efficiency and productivity (Nyarko & Kozári, 2021). Agriculture sector in the global economy is one of the industries experiencing numerous ICT applications in all spheres of its operations. The sector has experienced a new technological revolution for the past ten years. Compared to a decade earlier, this new technological revolution has the potentials to respond to farmers' needs accurately and swiftly.

Akintonde *et al.* (2021), observed in their research that ICTs had become one of the main driving tools used by farmers to manage the essential factors of production (land, labour, capital, and soil) in agriculture. Wolfert *et al.* (2017) also

observed that technological advancement in the area of digital platforms, such as e-commerce, agro-advisory apps, big data, computational power, and satellite systems like remote sensing, among others, fastened communication and information sharing among farmers in recent years. Mobile phones that have internet connectivity (smartphones) are the most widely used ICT devices across the globe (Nabara *et al.*, 2023). Research published by Choudrie *et al.* (2020), showed that the number of smartphone users around the world were 3.2 billion in 2019, and predicted that this figure could reach 3.8 billion by 2021. The speed at which ICT application is growing in every sector of the world has triggered the development of different ICT applications in the agriculture sector to aid the rapid access to information by farmers, extension services, and other players within the sector.

Globally, the objective of agricultural extension services remains the development of rural populaces and raising the standard of living of the farmers through increased farm production and income Nabara *et al.* (2023). According to the International Food Policy Research Institute (IFPRI), agricultural extension (also known as agricultural advisory services) plays a crucial role in promoting productivity, increasing food security, improving rural livelihoods, and promoting agriculture as a pro-poor economic growth engine (Laborde *et al.*, 2020). Effective communication of agricultural information to farmers is crucial in achieving optimum efficiency in agricultural extension administration and practice in Nigeria. Agricultural extension in this information age has been recognized as an essential medium of disseminating information and advice to farmers and this is achieved through the ICT, Nabara *et al.* (2023). ICT as the biggest

factor for change in extension service plays important roles in enhancing agricultural extension administration such as helping in producing knowledgeable and well informed farming communities, individually and collectively through diagnosing problems, interpreting data (Audu, 2017).

According to Nabara *et al.* (2023), the ICT facilitates and promotes the collaboration between agricultural researchers, farmers, extension agents and other stakeholders. For the laudable objectives of agricultural extension to be achieved, extension agents have to play a vital role as they are responsible for transferring useful information necessary for change to the farmers. The extension agents also perform the function of counseling the farmers on how to make wise decisions in farm management (Okafor and Umebali, 2019). Having the knowledge of the determinants of extension agents' use of Information Communication Technologies (ICTs) in extension services in South East Nigeria can as well help to revitalize the rate of information dissemination among farmers.

According to Enwelu *et al.* (2017), factors influencing extension agents' use of ICTs in Anambra State, Nigeria, are primarily driven by the high accessibility of mobile phones but constrained by poor infrastructure, low ICT skills, and inadequate institutional support. While mobile phones and radio are frequently used, advanced tools like computers and internet services face bottlenecks including erratic electricity, high maintenance costs, and limited training.

Agricultural extension services in Nigerian government face a significant manpower shortage, with an estimated extension worker-to-farmer ratio of 1:3000 compared to the recommended

ratio of 1:500 (Sennuga, 2019). This large gap limits the ability of extension agents to effectively reach and support the growing number of farmers, particularly in rural communities, making regular face-to-face communication difficult. However, the use of Information Communication Technologies (ICTs), such as mobile phones, radio, and internet-based platforms, offers a practical solution by enabling wider and more cost-effective communication with farmers. ICTs can therefore complement traditional extension methods by improving outreach and service delivery. In view of this, it becomes necessary to examine the extent to which extension agents in Nigeria utilize ICT tools in the provision of agricultural extension services. The specific objectives were to; identify levels of use of ICT by extension agents in South East, ascertain the factors influencing the ICT usage by the EAs and determine the constraints to the use of ICTs by EAs in the study area.

2. Methodology

The study was conducted in the South-East geopolitical zone of Nigeria, and it comprises five states named: Abia, Anambra, Ebonyi, Enugu, and Imo State. The region is predominantly agrarian, with a strong reliance on agricultural extension services for dissemination of innovations. A descriptive survey research design was adopted for the study. This technique enables the researcher to collect data from extension agents and analyze factors influencing their use of Information Communication Technologies (ICTs). The population comprised all agricultural extension agents working under the Agricultural Development Programmes (ADPs) in the South-East zone of Nigeria. A multi-stage sampling technique was used: in the first stage, three states

were randomly selected from the five states in the South-East zone. Second Stage, two agricultural zones were randomly selected from each chosen state, making a total of six zones. However, from each agricultural zone, two extension blocks were selected, giving a total of twelve blocks. In the fourth Stage, from each block, 20 extension agents were randomly selected; this gave a total sample size of 240 respondents. Data were collected through direct administration of questionnaires by the researcher and trained assistants. This ensured proper understanding of questions and a high response rate. Data were analyzed using Descriptive statistics (frequency, percentage, mean, and standard deviation) and inferential statistics (multiple regression analysis) to determine factors influencing ICT use.

Model specification:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e$$

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e$$

Where:

Y = Level of ICT use

X₁ = Age

X₂ = Education level

X₃ = Years of experience

X₄ = Access to ICT tools

X₅ = ICT training

X₆ = Internet access

X₇ = Access to power supply

X₈ = Marital status

X₉ = Sex

e = Error term

3. Results and Discussion

3.1 Level of ICT use among extension agents

The findings revealed that extension agents in the study area make extensive use of mobile phones, smartphones, WhatsApp, and radio, all of which recorded mean scores above the cut-off point (Table 1). This indicates that extension agents rely heavily on accessible and user-friendly ICT tools for information dissemination and communication with farmers. This finding is consistent with the work of Nabara *et al.* (2023), who reported that mobile phones are the most widely used ICT tools in agricultural extension due to their affordability and ease of use. Similarly, Choudrie *et al.* (2020) noted the rapid global increase in smartphone usage, reinforcing the importance of mobile technologies in modern communication systems.

Table 1: Level of ICT used by the extension agents

ICT tools	Mean	Description
Mobile phone	3.45	High
Smart phone	3.31	High
WhatsApp	3.10	High
Radio	2.45	High
Facebook	1.92	Low
Television	1.72	Low
Telegram	1.63	Low
youTube	1.45	Low
Laptop/desktop computer	1.26	Low
Email communication	1.04	Low

Source: Field survey, 2025. Cut off mark=2 and above

The high use of WhatsApp further supports the findings of Akintonde *et al.* (2021), who observed that ICT tools, particularly mobile-based applications, are increasingly used by extension agents to facilitate training and communication with farmers. In addition, the continued relevance

of radio aligns with the findings of Audu (2017), who emphasized that traditional ICT tools still play a vital role in agricultural extension, especially in rural communities where access to advanced technologies is limited. On the other hand, the low usage of computers, email, YouTube, and other internet-based platforms suggests limited adoption of advanced ICT tools. This finding agrees with Enwelu *et al.* (2017), who reported that extension workers in Nigeria face challenges such as inadequate ICT skills and poor infrastructure, which hinder the use of more sophisticated technologies.

In conclusion, the findings indicate that ICT usage among extension agents is largely basic and communication-oriented, rather than advanced and knowledge-intensive. This means that most extension agents use ICT mainly for simple tasks such as communication (calls, messages), rather than for more advanced uses like deep analysis, research, or specialized knowledge work.

3.2 Factors influencing ICT use among extension agents

The regression results showed that education level, access to ICT tools, and ICT training significantly influenced ICT use among extension agents. The negative but significant relationship

between education level and ICT use suggests that formal education alone may not guarantee effective ICT utilization. This finding contrasts with the expectation that higher education leads to higher technology adoption, as suggested by Zulqarnain *et al.* (2020), who found that education positively influences technology adoption attitudes. However, the present study indicates that practical ICT competence may be more important than formal qualifications (Table 2).

Access to ICT tools was found to significantly influence ICT use, which supports the findings of Nyarko and Kozári (2021), who emphasized that the availability of ICT infrastructure is a key determinant of ICT utilization among extension officers. This implies that without adequate access to devices, extension agents cannot effectively integrate ICT into their work.

ICT training also showed a strong positive influence on ICT use. This finding is in line with Sa'udu *et al.* (2022), who reported that training enhances extension agents' ability to use ICT tools effectively in service delivery. It also supports the view of Ali *et al.* (2020), who highlighted the importance of knowledge exchange and skill development in improving ICT adoption. However, variables such as age and years of experience were not significant. This finding agrees with Akintonde *et al.* (2021), who

Table 2: Factors influencing the use of ICT among extension agents in South East

Variables	Linear	Exponential	Doublelog	Semilog
Age	0.0467(0.51)	0.0305(0.68)	0.0335(0.72)	0.0485(0.56)
Education level	-0.0092(-4.93)***	-0.0030(-2.94)**	-0.0914(-2.79)**	-0.9690(-4.89)**
Years of experience	0.1108(0.97)	0.0594(0.84)	-0.02075(-0.40)	.1064(0.93)
Access to ICT tools	0.0460(3.26)**	-0.0987(-2.52)**	0.0595(3.08)**	-.4509(-2.76)**
ICT training received	0.2098(3.57)***	-9.08(-4.56)***	-1.09(-2.65)**	-.1556(-3.10)**
Internet access	-.00109(-0.14)	0.0107(0.81)	-0.0094(0.72)	-0.01850(-0.60)
Access to power supply	-.02357(-0.14)	-0.0138(-0.565)	-0.0140(-0.53)	-.0229(-0.47)

Source: Field survey, 2025

found that demographic factors are less important, compared to access and training in determining ICT use.

In all, the findings suggest that institutional and resource-based factors are more critical than personal characteristics in influencing ICT adoption. It means things like an organization's support, funding, equipment, and infrastructure have a bigger impact on whether people use ICT than their personal traits (like age, gender, or individual preferences).

3.3 Constraints to ICT use among extension agents

The study identified epileptic power supply, high cost of data, and high cost of ICT gadgets as the most serious constraints to ICT use (**Table 3**). The issue of unstable electricity supply strongly supports the findings of Enwelu *et al.* (2017), who identified erratic power supply as a major barrier to ICT utilization among extension workers in Nigeria. Similarly, the high cost of ICT gadgets and data aligns with the findings of Sennuga (2019), who reported that financial limitations significantly affect the adoption of ICT among extension workers and farmers. Poor network connectivity, which was also identified as a constraint, agrees with the findings of Nabara *et al.* (2023), who noted that infrastructural challenges such as weak internet coverage hinder effective ICT use in agricultural extension. Although inadequate training recorded a lower mean score, it still reflects a constraint consistent with Sa'udu *et al.* (2022), who emphasized that lack of training limits the effective use of ICT tools. These findings collectively confirm that ICT adoption is constrained more by systemic and

infrastructural challenges than by willingness to use the technology.

Table 3: Constraints to ICT use among extension agents in the study area

Constraints	Mean
Epileptic power supply	3.50
High cost of data	3.21
High cost of ICT gadgets	3.19
Poor network connectivity	2.09
Inadequate training and skill gaps	1.65
Cultural and end-user constraints	1.30
Limited financial resources	1.25
Inadequate extension services	1.03

Source: Field work, 2025

3.4 Implications of the findings for nation building

The findings reinforce the argument that ICT plays a crucial role in improving agricultural extension services. As observed by Laborde *et al.* (2020), agricultural extension services are essential for improving productivity and rural livelihoods, and ICT enhances the effectiveness of these services. However, the study shows that the full potential of ICT cannot be realized without addressing key barriers such as poor infrastructure, high costs, and inadequate training. This aligns with the observations of Wolfert *et al.* (2017), who highlighted that technological advancements in agriculture require strong support systems to be effective. These results confirm that while ICT adoption is growing, it is still shaped by accessibility, affordability, and capacity factors (It means that even though more people are starting to use ICT, how much they actually use it still depends on things like whether they can access it, afford it, and have the skills to use it properly).

4. Conclusion

The findings of this study revealed that the use of Information and Communication Technology (ICT) among agricultural extension agents in South-East Nigeria is largely limited to basic communication and information-sharing activities. Although the adoption of ICT tools has shown a gradual increase over the years, the utilization of more advanced digital technologies in extension service delivery remains relatively low. The study further established that the effectiveness of ICT utilization depends more on institutional support, availability of infrastructure, access to ICT resources, and continuous capacity development than on the personal characteristics of the extension agents. Persistent challenges such as inadequate electricity supply, poor internet connectivity, limited access to modern ICT devices, and financial constraints continue to hinder the effective integration of ICT into agricultural extension services. Addressing these challenges is therefore essential for improving the quality, efficiency, and reach of extension service delivery in the region.

Based on the findings of this study, it is recommended that the government and other relevant stakeholders prioritize investments in rural infrastructure, particularly in ensuring reliable electricity supply and expanding internet connectivity across farming communities. Improved digital infrastructure will provide a conducive environment for extension agents to effectively utilize ICT tools in disseminating agricultural information and advisory services.

Furthermore, ICT devices, software applications, and internet data services should be made more affordable through government subsidies,

institutional support, or public-private partnerships. Reducing the financial burden associated with acquiring and maintaining ICT facilities will encourage wider adoption and sustained use of digital technologies among extension personnel.

There is also a need for regular training, retraining, and capacity-building programs aimed at enhancing the digital competencies of agricultural extension agents. Continuous professional development will equip extension workers with the knowledge and practical skills required to effectively utilize emerging ICT tools, digital platforms, and innovative communication technologies for improved agricultural advisory services. In addition, agricultural development agencies should allocate adequate financial resources and provide strong institutional support to facilitate the integration of ICT into extension operations. This includes the provision of modern ICT equipment, technical support services, and appropriate monitoring mechanisms to ensure the efficient implementation of digital extension programs.

Finally, policymakers should formulate and implement comprehensive policies that encourage the adoption and utilization of advanced ICT technologies in agricultural extension services. Such policies should promote digital innovation, strengthen institutional collaboration, and create an enabling environment for the sustainable integration of ICT into agricultural extension systems. The successful implementation of these recommendations will enhance information dissemination, improve extension service efficiency, and ultimately contribute to increased agricultural productivity, food security, and sustainable rural development in South-East Nigeria.

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