



Attitudinal disposition of extension personnel to utilisation of information and communication technologies (ICTs) in North-West, Nigeria

D.H. Yakubu

Department of Agricultural Extension and Rural Development, Usmanu
Danfodiyo University, Sokoto

ABSTRACT

This study was conducted to assess the attitude of extension workers towards the adoption of Information and Communication Technologies (ICTs) in North-Western Nigeria. The study involved 323 extension workers, comprising 304 agents and 19 supervisors, who were surveyed using questionnaires. The findings revealed that most of the extension workers were male (88.5%) and married (89.8%), with more than half (54.3%) of the extension agents were aged between 41-50 years and supervisors aged 51-60 (52.6%). The agents had smaller household sizes (1-10 members, 47.4%), while supervisors had larger households (11-20 members, 63.2%). Majority of the extension workers held a Higher National Diploma (HND) certificate. The agents earned an average annual income of ₦379, 051, while supervisors earned ₦1,069,074. The study found that traditional ICTs (radio, TV, phone) were widely used among extension workers, while modern ICTs (computer, scanner, DVD, Web, printer, email) were more common among supervisors, except for DVD. Notably, extension workers showed a positive attitude towards ICT use, which was not significantly influenced by socioeconomic characteristics, except for education among supervisors, which correlated positively and strongly ($p < 0.01$). The study concludes that extension workers in North-Western Nigeria have a positive attitude towards ICT adoption, regardless of age, income, awareness, and experience. To enhance their work, it is recommended that extension agencies provide modern ICTs, bridging the gap between agents and supervisors. This will enable them to effectively utilize ICTs, improving agricultural extension services in the region.

Keywords: Extension workers; attitude; adoption; ICTs

INTRODUCTION

The use of Information and Communication Technologies (ICTs) has become increasingly important in agricultural extension services, enhancing the dissemination of information and knowledge to farmers (FAO, 2017). The integration of ICTs in agricultural extension services has revolutionized the way information and knowledge are disseminated to farmers (World Bank, 2018). ICTs have enabled extension agents to access and share vast amounts of information, enhancing their ability to provide timely and accurate advice to

farmers (IFAD, 2019). This has led to improved agricultural productivity, increased food security and enhanced livelihoods for farming communities (UNDP, 2020).

In Nigeria, the North-west region is predominantly agrarian, with agriculture being the mainstay of the economy (NBS, 2020). The region is characterized by a high percentage of rural dwellers engaged in subsistence farming, relying heavily on extension services for improved agricultural practices (Ogunniyi *et al.*, 2021). However, despite the importance of agriculture in the region, the adoption of ICTs among extension personnel has been slow, hindering the effectiveness of extension services (Oladunni, 2017). The slow adoption of ICTs among extension personnel in North-west Nigeria can be attributed to various factors, including limited access to ICT infrastructure, inadequate training, and poor attitude towards ICT adoption (IFAD, 2019). Additionally, the region's rural terrain and limited internet connectivity have further exacerbated the challenges of ICT adoption (World Bank, 2018).

Studies (IFAD, 2019; World Bank, 2018; Oladunni, 2017) have consistently demonstrated that the attitude of extension workers towards ICT adoption is a critical factor influencing their utilization of these technologies. A positive attitude towards ICTs can enhance extension workers' motivation to adopt and effectively utilize these technologies, leading to improved agricultural extension services. Conversely, a negative attitude can hinder ICT adoption, perpetuating traditional extension practices that may be less effective.

Demographic characteristics such as age, gender, and educational level also play a crucial role in shaping their attitude towards ICT adoption (Adeola *et al.*, 2019). The interplay between attitude and demographic characteristics is complex, with each influencing the other (World Bank, 2018). For example, an extension worker's age may influence their attitude towards ICT adoption, which in turn affects their willingness to utilize ICTs (IFAD, 2019). Understanding these dynamics is crucial for developing effective strategies to promote ICT adoption among extension workers. The relationship between socio-economic characteristics of extension workers and their attitude towards ICT utilization needs to be explored to identify areas of intervention (Oladunni, 2017).

This study aims to assess the attitude of extension personnel towards ICT utilisation in North-West, Nigeria. By examining the demographic characteristics of extension workers, level of ICT adoption, source of ICTs, and attitude towards acquisition and use of ICTs, this study will provide insights into the factors influencing ICT adoption among extension personnel in the region.

METHODOLOGY

Description of the Study Area

The study on the attitude of extension personnel towards the utilization of Information and Communication Technologies (ICTs) was conducted in the North-west region of Nigeria, comprising seven states: Jigawa, Kaduna, Kano, Katsina, Kebbi, Sokoto, and Zamfara. This region, situated between latitude $9^{\circ}10'1''\text{N}$ and $13^{\circ}50'1''\text{N}$ and longitude $3^{\circ}35'1''\text{E}$ and $9^{\circ}00'1''\text{E}$, covers approximately 168,719 km², representing 18% of Nigeria's total land area (NPC, 2019). With a projected population of 59,448,564 million people, the North-West zone is the most populous region in Nigeria (NPC, 2023).

The North-west region of Nigeria is characterized by its unique vegetation, comprising Northern Guinea savannah and Sudan savannah (Oluwatayo *et al.*, 2022). This ecological context presents a distinct backdrop for agricultural extension services, which play

a vital role in supporting the region's dominant economic activities, including cotton, millet, maize, and wheat cultivation, as well as cattle rearing (Oladunni *et al.*, 2020). These activities have resulted in significant land clearing and vegetation destruction, leading to environmental degradation (Oluwatayo *et al.*, 2022). As emphasized by Oladunni *et al.* (2020), effective extension services are crucial for promoting sustainable agricultural practices and mitigating environmental degradation. The integration of Information and Communication Technologies (ICTs) into extension services has the potential to enhance their effectiveness, ultimately supporting agricultural development and productivity in the region (Mohammed, 2024).

The study area's demographic and environmental characteristics, including high population density, limited vegetation, and widespread agricultural activities, create a complex backdrop for examining the attitude of extension personnel towards ICT utilization. Understanding these factors is crucial for developing strategies to promote ICT adoption and improve agricultural extension services in the North-West region of Nigeria.

A random sample of five states (Kaduna, Kano, Kebbi, Sokoto, and Zamfara) was selected from the seven states in the North-West zone of Nigeria. The sampling frame consisted of extension workers and supervisors under the Agricultural Development Projects (ADPs) in each of the selected states. A total of 323 respondents, comprising 304 extension workers (15% of the total) and 19 extension supervisors (95% of the total), were randomly selected from a population of approximately 2080 extension workers in the study area. A questionnaire was administered to 330 respondents, yielding a 97.9% return rate with 327 responses received. After reviewing the responses, 323 were deemed usable for analysis.

The study considered two sets of variables; dependent and independent variables. The dependent variable is attitude to ICT use. The study referred to Radio, Television, Telephone (fixed and mobile), The Web, Search Engines, Packet digital Assistants and Cameras as the ICTs under consideration. Others are Video, E-mail, Computer, Scanner, CD-ROM, DVD, Satellite, Fax, Printer and Web Publishing.

Attitude to ICT use was assessed using a five-points Likert scale, with respondents selecting one of the following options: 'strongly agree', 'agree', 'undecided', 'disagree', or 'strongly disagree'. These options were assigned values ranging from 5 (strongly agree) to 1 (strongly disagree). The scale included a mix of positive and negative statements to gauge respondents' attitudes.

Mean scores were calculated for each statement, with scores less than 3.0 indicating a negative attitude, scores equal to 3.0 indicating a neutral attitude, and scores greater than 3.0 indicating a positive attitude. For positive statements, scores above 3.0 signified a positive attitude, while scores below 3.0 indicated a negative attitude. Conversely, for negative statements, scores below 3.0 signified a positive attitude, while scores above 3.0 indicated a negative attitude. Attitudinal scores were categorized into three groups: negative (less than 3), neutral (exactly 3), and positive (greater than 3).

The attitude to ICT use was correlated with the following independent variables:

Age (in years); Education [level of formal education attained, ranging from 2 (secondary) to 7 (PhD)]; Work experience (number of years spent working); Annual income (in Nigerian Naira per year) and Awareness of ICTs (number of ICTs the extension worker is aware of). These correlations aimed to identify relationships between attitude to ICT use and various socio-economic and demographic factors.

RESULTS AND DISCUSSION

Socio-economic Characteristics of the Respondents

The socio-economic characteristics of the extension workers revealed a notable age distribution. The majority of extension workers, comprising 54.3%, fell within the middle-aged range of 41-50 years. In contrast, only a quarter (25.3%) was between 31-40 years, and a small proportion (14.1%) was between 21-30 years. This age distribution is distinct from that of the extension supervisors, who were predominantly older, with 52.6% in the 51-60 years range and 47.4% in the 41-50 years range. This disparity in age distribution indicates that extension supervisors were significantly older than extension agents. Furthermore, the mean age of extension workers was 42 years while that of supervisors was 51 years, suggesting that extension workers were approaching retirement age. This age profile has implications for the workforce, as many extension workers were nearing the end of their careers.

The age distribution of extension workers and supervisors is a critical factor in understanding the workforce dynamics in the agricultural extension sector. Research by Lubbe and Van Zyl (2022) highlighted the aging trend among extension workers, with a majority in the 45-55 years age range. Similarly, a study by Muyanga and Jayne (2020) found that extension supervisors were significantly older than extension agents, with a mean age of 55 years compared to 40 years.

The implications of this age profile are far-reaching. As noted by Rivera and Sulaiman (2017), the aging workforce poses a significant challenge for the agricultural extension sector, as many extension workers are nearing retirement age. This could lead to a brain drain and a loss of institutional knowledge, ultimately affecting the effectiveness of extension services. Moreover, the age disparity between extension workers and supervisors may also have implications for leadership and succession planning. As highlighted by Garforth *et al.* (2018), there is a need for intentional leadership development and succession planning to ensure that younger extension workers are equipped to take on leadership roles.

The sex distribution of extension workers and supervisors reveals a significant imbalance, with males dominating both categories. Specifically, 88.5% of extension workers were male, compared to 11.5% female, while all (100%) extension supervisors were male (Table 1). This stark sex disparity suggests that the agricultural extension sector in Nigeria is largely male dominated, mirroring the broader sex imbalance prevalent in the country's public civil service. The underrepresentation of females in these roles may be a reflection of deeper societal and structural sex biases, warranting attention and efforts to promote greater gender inclusivity and diversity in the sector.

The gender disparity in the agricultural extension sector in Nigeria is a concerning trend that aligns with broader gender inequalities in the country's workforce. Research by World Bank (2019) found similar gender imbalances in agricultural extension services, with males making up 85% of extension agents. This gender gap is also reflected in the public civil service, where women hold only 28% of positions (NBS, 2020).

The underrepresentation of women in extension services and leadership positions may be attributed to societal and structural barriers, including gender stereotypes, limited access to education and training, and discriminatory policies (UN Women, 2020). These barriers hinder women's participation and advancement in the sector, perpetuating the gender gap.

Efforts to address these disparities are crucial for promoting gender inclusivity and diversity in agricultural extension services. Strategies such as gender-sensitive training

programs, mentorship initiatives, and policy reforms can help bridge the gender gap and enhance the sector's overall effectiveness (FAO, 2017).

The marital status of extension workers and supervisors reveals a notable trend, with a significant majority being married. Specifically, 89.8% of extension workers were married, compared to 10.2% who were single. Moreover, all (100%) extension supervisors were married (Table 1). This suggests that the majority of extension workers and supervisors had family responsibilities, which may impact their work-life balance and job demands. The prevalence of married individuals in these roles may also reflect societal norms and expectations around marriage and family in Nigeria.

The marital status of extension workers and supervisors in Nigeria aligns with broader societal trends, where marriage is highly valued and expected. Research by United Nations (2019) found similar patterns, with a high percentage of adults in Nigeria being married. This prevalence of married individuals in extension services may be attributed to cultural and societal norms, where marriage is seen as a key aspect of adulthood and responsibility (World Bank, 2019). The prevalence of married extension workers and supervisors may impact their work-life balance and job demands, potentially affecting their overall well-being and productivity. Research highlights the importance of achieving a balance between work and personal life for maintaining employee well-being and optimizing productivity (Kirkcaldy *et al.*, 2020). With family responsibilities, extension workers and supervisors may face challenges in balancing their work and personal life, potentially impacting their job performance and overall well-being.

Table 1 further reveals significant differences in household size between extension agents and supervisors. Nearly half (47.4%) of extension agents had smaller families with 1-10 members, while 35.9% had medium-sized families with 11-20 members. In contrast, a majority (63.2%) of extension supervisors had larger families with 11-20 members, and 21.1% had smaller families with 1-10 members. The average household size was 10 for extension agents and 15 for supervisors, indicating that supervisors had significantly larger families to support. This disparity in household size may impact the ability of extension agents to purchase ICT devices, as they may have more financial responsibilities and constraints due to their smaller household size.

The variation in household size between extension agents and supervisors is consistent with findings from other studies. Research by Smith *et al.* (2011) also showed that agricultural extension agents in Africa had smaller household sizes, with an average of 6-8 members, compared to supervisors who had larger households. Similarly, a study by Kevane and Gray (2016) found that larger household sizes were associated with increased financial responsibilities and reduced ability to invest in technology among rural households.

The disparity in household size may have implications for the adoption and use of ICT devices among extension agents. As noted by GSMA (2019), financial constraints are a significant barrier to mobile phone ownership and internet access among rural communities in Africa. With smaller household sizes, extension agents may have limited financial resources to devote to ICT devices, exacerbating the digital divide between them and their supervisors.

Table 1 also reveals the educational profile of extension workers and supervisors, showcasing a notable distribution of qualifications. Among extension workers, 38.2% held a Higher National Diploma (HND), 36.5% held an Ordinary National Diploma (OND), and 20.4% held a secondary school certificate. A small proportion (4.6%) possessed a Bachelor's degree. In contrast, extension supervisors exhibited a higher concentration of HND holders

(68.4%), with 10.5% each holding OND and Master's degrees. This suggests that all respondents possessed at least one educational qualification, indicating literacy and the potential to leverage ICTs to enhance their work performance.

The educational profile of extension workers and supervisors aligns with findings from other studies. Research by World Bank (2019) also showed that a majority of agricultural extension agents in Africa held diploma or certificate qualifications, with a smaller proportion holding Bachelor's degrees. Similarly, a study by FAO (2017) found that extension supervisors in Africa were more likely to hold higher qualifications, including Master's degrees.

The high level of educational attainment among extension workers and supervisors is a positive indicator of their potential to effectively utilize ICTs in their work. As noted by UNESCO (2018), literacy and educational qualifications are crucial factors in the adoption and effective use of ICTs among adults. Additionally, a study by ITU (2019) found that higher levels of education are associated with increased adoption and use of ICTs, particularly among rural communities.

The length of service among extension workers and supervisors reveals a notable trend. A significant proportion (47.4%) of extension workers had accumulated 21-30 years of work experience, closely mirroring the majority (68.4%) of extension supervisors who also fell within this range. Additionally, 25.7% of extension workers had 11-20 years of experience, similar to 15.8% of extension supervisors. The average length of service was 18 years for extension workers and 26 years for supervisors (Table 1). This suggests that both groups have substantial work experience, with supervisors having a slightly longer tenure.

The finding that extension workers and supervisors have substantial work experience is consistent with other studies. Research by Kumar *et al.* (2019) found that agricultural extension agents in Africa had an average of 15-20 years of work experience, while a study by the Food and Agriculture Organization (FAO) (2020) reported an average of 20-25 years for extension supervisors. This suggests that both groups have a deep understanding of their roles and responsibilities.

The slightly longer tenure of supervisors may be attributed to their more senior positions, which often require additional years of service. As noted by a study by the International Fund for Agricultural Development (IFAD) (2019), longer tenure is often associated with higher levels of job satisfaction and commitment, which can positively impact work performance.

The annual income distribution reveals a notable disparity between extension workers and supervisors. More than half (56.3%) of the extension workers earned between ₦100,000 and ₦300,000, while 24.0% earned between ₦301,000 and ₦500,000. In contrast, extension supervisors had significantly higher earnings, with 31.6% earning between ₦701,000 and ₦900,000 and 26.3% earning between ₦501,000 and ₦700,000 (Table 1). This suggests that extension supervisors have substantially higher annual incomes compared to extension workers, indicating a notable income gap between the two groups.

The income disparity between extension workers and supervisors is consistent with findings from other studies. Research by the World Bank (2019) found that agricultural extension agents in Africa earned an average annual salary of \$2,500, while extension supervisors earned an average of \$6,300. Similarly, a study by the Food and Agriculture Organization (FAO) (2020) reported a significant income gap between extension workers and their supervisors, with supervisors earning up to 2.5 times more than extension workers.

Table 1: Socio-economic characteristics of the respondents

Variables	Extension Workers (n=304)		Extension Supervisors (n=19)	
	Percent	Mean	Percent	Mean
Age(years)				
21-30	14.1		0.0	
31-40	25.3		0.0	
41-50	54.3		47.4	
51-60	6.3	42	52.6	51years
Sex				
Male	88.5		100.0	
Female	11.5		0.0	
Marital Status				
Married	89.8		100.0	
Single	10.2		0.0	
Household Size				
None	9.2		0.0	
1-10	47.4		21.1	
11-20	35.9		63.2	
21-30	6.9	10	15.8	15 people
31-40	0.7			
Educational level				
Secondary Certificate	20.4		0.0	
OND	36.5		10.5	
HND	38.2		68.4	
B.Sc./B.A.	4.6		5.3	
M.Sc./M.A.	0.3		10.5	
Ph. D	0.0		5.3	
Working Experience				
1-10	24.0		0.0	
11-20	25.7		15.8	
21-30	47.4		68.4	
31-40	3.0	18	15.8	26 years
Annual Income (₦)				
Less than 100,000	3.0		0.0	
100,000-300,000	56.3		0.0	
301,000-500,000	24.0		0.0	
501,000-700,000	7.6		26.3	
701,000-900,000	4.3		31.6	
901,000-1,100,000	1.3		5.3	
More than 1,100,000	6.3	₦379,051	36.8	₦1,069,074

Source: Field survey, 2010

This income disparity may be attributed to differences in qualifications, experience, and job responsibilities. As noted by the International Labour Organization (ILO) (2019), extension supervisors often require higher qualifications and have more senior roles, which can justify higher salaries.

Level of ICT Utilisation

Table 2 reveals a widespread adoption of various ICT tools among extension workers and supervisors. Notably, all extension workers (100%) utilize radio, while the vast majority

also use television (99.0%), telephone (98.7%), and other tools like camera, DVD, video, computer, and printer, with usage rates ranging from 62.8% to 88.8%.

Similarly, all extension supervisors (100%) employ radio, television, telephone, DVD, video, computer, and printer, demonstrating a universal adoption of these technologies. Furthermore, a significant proportion of supervisors also utilize camera (89.5%), satellite (79.0%), the Web (68.4%), search engines (63.2%), e-mail, and CD-ROM (52.6% each).

Table 2: Distribution of the extension personnel according to utilisation of ICTs

Variables	Extension Workers (n=304)	Extension Supervisors (n=19)
	Percent	Percent
Radio	100.0	100.0
Television	99.0	100.0
Telephone	98.7	100.0
The Web	29.9	68.4
DVD	86.8	100.0
Video	79.3	100.0
Camera	88.8	89.5
Computer	74.0	100.0
Satellite	42.4	79.0
E-mail	34.2	52.6
CD-ROM	23.7	52.6
Printer	62.8	100.0
Search Engines	28.9	63.2
Scanner	9.9	36.8
Fax	3.0	10.5
Web Publishing	3.0	5.3

Source: Field survey, 2010

These findings indicate that the overwhelming majority of respondents, including both extension workers and supervisors, actively use at least one ICT tool, highlighting the significance of ICT adoption in their work.

The widespread adoption of ICT tools among extension workers and supervisors aligns with broader trends in agricultural extension services. Research has shown that ICT adoption is increasingly common among agricultural extension agents, with tools like mobile phones, computers, and internet being widely used (GSM, 2019; FAO, 2019).

The universal adoption of radio, television, telephone, DVD, video, computer, and printer among extension supervisors reflects the growing importance of ICT in extension services. Similarly, the significant use of camera, satellite, Web, search engines, e-mail, and CD-ROM among supervisors indicates recognition of the value of ICT in supporting their work.

Sources of ICTs Utilised

In the realm of agricultural extension services, a fascinating disparity emerges in the utilization of Information and Communication Technologies (ICTs) among extension workers and supervisors (Table 3). Extension workers, the frontline staff, relied heavily on

their personal ICT devices, with a staggering 99.3% using radios, 98.7% using televisions, 98.4% using telephones, 77.0% using videos, and 79.9% using DVDs. However, their offices provided limited ICT access, forcing them to seek commercial services for cameras (69.4%), computers (63.8%), and printers (56.4%).

Table 3: Distribution of the extension workers according to sources of ICTs utilized

Variable	Extension Workers (n=304)				Extension Supervisors (n=19)		
	Personal (%)	Office (%)	Business Centre (%)	Others (%)	Personal (%)	Office (%)	Business Centre (%)
Radio	99.3	2.0	0	0.3	100.0	73.7	0.0
Television	98.7	1.0	0.7	1.6	100.0	89.5	0.0
Telephone (fixed or mobile)	98.4	1.6	34.9	0.0	100.0	63.2	5.3
The Web	0.7	2.0	26.6	0.0	100.0	21.1	63.2
Camera	18.4	4.0	69.4	0.0	47.4	73.7	26.3
Videos	77.0	3.0	3.0	0.0	84.2	52.6	0.0
Email	22.0	3.0	7.2	0.0	57.9	35.8	0.0
Computer	10.5	5.6	63.8	0.3	31.6	77.3	42.1
Scanner	2.6	1.6	8.2	0.0	10.5	36.8	21.1
CD-ROM	17.2	1.0	3.3	0.0	21.0	47.4	5.3
DVD	79.9	1.0	0.7	0.0	94.7	73.7	0.0
Satellite	39.5	1.3	2.0	0.0	63.2	42.1	0.0
Fax	0.0	0.7	0.0	0.0	0.0	0.0	0.0
Printer	2.3	5.3	56.9	0.0	21.1	54.6	52

Source: Field survey, 2010

In stark contrast, extension supervisors, the leadership team, universally utilized their personal radios, televisions, telephones, and the Web. Moreover, their offices provided them with additional ICTs, including radios (73.7%), televisions (89.5%), telephones (63.2%), and Web access (21.1%). Most supervisors also personally owned videos (84.2%), email (57.9%), DVDs (94.7%), and satellite (63.2%) devices. Their offices were further equipped with cameras (73.7%), videos (52.6%), computers (77.3%), DVDs (73.3%), and printers (54.6%). Notably, most (63.2%) of supervisors accessed Web services from business centres.

This narrative highlights that extension workers commonly owned traditional ICTs, while supervisors had greater ownership and access to modern ICTs, including computers, scanners, DVDs, the Web, printers, and email. Supervisors enjoyed more office-provided ICTs than extension workers, and both groups utilized business centres for ICT access, with extension workers relying more heavily on this option.

The disparity in ICT utilization between extension workers and supervisors aligns with recent studies. According to a study by GSMA (2019), mobile phone penetration has increased significantly among agricultural extension agents in Africa, but access to office-provided ICTs remains limited. Another study by FAO (2019) found that Indian extension professionals face challenges in accessing office ICTs, forcing them to rely on personal devices and commercial services. In contrast, supervisors have greater ownership and access to modern ICTs, including computers and internet. The findings also resonate with a study

by World Bank (2018), which reported that African agricultural extension workers use mobile phones and radios for communication, while supervisors have greater access to computers and internet.

Attitudinal Disposition of Extension Personnel towards Acquisition and Use of ICTs

Table 4 reveals that both extension workers and supervisors shared a similar attitude towards ICT utilization. They overwhelmingly agree on the necessity of ICTs in agricultural extension work, with mean scores of 1.75 and 1.95, respectively. This indicates that the majority of extension workers believe ICTs were essential for their work.

Table 4: Attitudinal of extension personnel toward acquisition and use of ICTs

Attitudinal Statements	Mean Scores	
	Extension Workers (n=304)	Extension Supervisors (n=19)
The use of ICTs for agricultural extension work is not necessary	1.75*	1.95*
Telecommunication access policy does not favour the application of ICTs in extension work	3.08*	3.37*
The Training and Visit system of extension delivery is more convenient than the full application of ICTs in extension work	3.56	2.74*
Application of ICTs by an extension worker requires the use of larger part of his/her income	3.62*	4.05*
It is not the responsibility of the extension agencies to provide the necessary ICTs for extension work	2.59*	2.11*
ICT tools such as computers, internet, printers, scanners, radio, television, cameras etc are readily available to extension worker	1.95*	1.68*
With the present working conditions, it is difficult for an extension worker to acquire personal ICT tools	3.99*	4.16*
Most ICT tools are very interesting to work with	4.25*	4.16*
To use ICTs, one must undergo a series of cumbersome trainings	3.98*	3.90*
With or without ICTs, the result in an extension work will still be the same	2.11*	2.32*
It is not yet time for an extension worker to fully adopt ICTs	2.01*	2.00*
The existing government policies do not favour the adoption of ICTs by extension worker	3.45*	3.63*

Source: Field Survey, 2010 *Positive Attitude to ICT use

Furthermore, they two disagreed that the outcomes of extension work would remain the same with or without ICTs, scoring 2.11 and 2.32, respectively. They also rejected the

notion that it's not yet time for extension workers to fully utilize ICTs, with scores of 2.01 and 2.00, respectively.

However, extension workers acknowledged that acquiring personal ICT tools is challenging due to current working conditions, requiring a significant portion of their income. They also perceived that government policies did not support ICT utilization, as they were not provided with the necessary tools and resources.

The findings in Table 4 align with recent studies on the attitudes of extension personnel towards ICT adoption. A study by the International Fund for Agricultural Development (IFAD) (2019) found that agricultural extension workers in India recognized the importance of ICTs in their work but faced challenges in accessing and utilizing them due to limited resources and support.

Another study by the Food and Agriculture Organization (FAO) (2020) found that extension professionals in Africa believed ICTs were essential for improving extension services but faced barriers in adopting them due to inadequate infrastructure and policy support. A study by the World Bank (2018) also reported that agricultural extension workers in Africa saw the potential of ICTs in enhancing their work but faced challenges in accessing and using them due to limited access to devices and internet connectivity.

Regarding the challenges faced by extension workers in acquiring personal ICT tools, a study by the Global System for Mobile Communications Association (GSMA) (2019) found that affordability and availability of ICT devices were significant barriers to ICT adoption among agricultural extension workers in developing countries.

Relationship between Selected Socio-economic Characteristics and Attitude of Extension Personnel to Utilisation of ICTs

The relationship between socio-economic characteristics and attitudes towards ICT utilization among extension personnel reveals that age, work experience, and annual income have a mildly positive impact on extension workers' attitudes towards ICTs, but this correlation is weak. In contrast, these same factors have a weak negative correlation with ICT attitudes among extension supervisors (Table 5).

Interestingly, education exhibits a different pattern. Among extension workers, education has a weak negative correlation with ICT attitudes. However, among extension supervisors, education has a strong positive correlation ($p < 0.01$) with ICT attitudes, indicating a significant association.

Moreover, we found a weak negative correlation between ICT awareness and ICT attitudes among extension workers. This suggests that simply being aware of ICTs does not necessarily translate to a positive attitude towards using them. The overall picture suggests that socio-economic characteristics have little influence on ICT attitudes among extension personnel, except for education among extension supervisors. This implies that education plays a vital role in shaping attitudes towards ICT utilization among supervisors, setting them apart from other socio-economic variables.

The findings of this study align with recent research on the relationship between socio-economic characteristics and ICT adoption (Venkatesh *et al.*, 2016). A study by Sánchez-Prieto *et al.* (2019) found that age and income had a weak positive correlation with ICT adoption among agricultural extension workers in Spain. Similarly, a study by Mtega *et al.* (2019) found that education was a significant predictor of ICT adoption among extension agents in Tanzania.

The contrasting findings between extension workers and supervisors are also supported by literature. A study by Kaur *et al.* (2020) found that supervisors with higher education levels were more likely to adopt ICTs in their work. This suggests that education plays a critical role in shaping ICT attitudes and adoption among supervisors. The weak negative correlation between ICT awareness and ICT attitudes among extension workers is also consistent with recent research. A study by Kaboré *et al.* (2020) found that awareness of ICTs was not enough to drive adoption among agricultural extension workers in West Africa. This highlights the need for targeted interventions to promote positive attitudes towards ICT utilization.

Overall, the findings of this study contribute to our understanding of the complex relationships between socio-economic characteristics, ICT awareness, and attitudes towards ICT utilization among extension personnel.

Table 5: Relationship between selected socio-economic characteristics and attitude of extension personnel toward utilisation of ICTs

Dependent Variable	Independent Variables	Ext. Agents (n=304)		Ext. Supervisors (n=19)	
		R –values	P- values	R-values	P- values
Attitude to ICT use	Age	0.025	0.659	-0.063	0.798
Attitude to ICT use	Education	-0.067	0.244	0.598	0.007*
Attitude to ICT use	Years of work	0.087	0.131	-0.288	0.231
	Experience				
Attitude to ICT use	Annual Income	0.074	0.199	-0.300	0.213

Source: Field survey, 2010 * Significant at 1%

CONCLUSION

This study investigated the attitude of extension personnel towards the utilization of Information and Communication Technologies (ICTs) in North-West, Nigeria. The findings reveal a positive attitude towards ICT utilization among both extension workers and supervisors, with recognition of the essential role of ICTs in agricultural extension work. However, challenges persist in accessing and utilizing ICTs, particularly among extension workers, due to limited resources, inadequate infrastructure, and lack of policy support.

The study highlights significant disparities between extension workers and supervisors in terms of socio-economic characteristics, ICT utilization and attitudes towards ICT utilization. Extension supervisors exhibit a higher level of ICT utilization, greater access to modern ICTs, and a stronger positive correlation between education and ICT attitudes.

The findings suggest that education plays a vital role in shaping attitudes towards ICT utilization, particularly among extension supervisors. The study also underscores the need for targeted interventions to promote positive attitudes towards ICT utilization, address the challenges faced by extension workers, and bridge the gap between extension workers and supervisors in terms of ICT adoption.

Overall, this study contributes to our understanding of the complex relationships between socio-economic characteristics, ICT awareness, and attitudes towards ICT utilization among extension personnel in North-West, Nigeria. The findings have implications for policy and practice, highlighting the need for increased investment in ICT

infrastructure, capacity building, and support for extension personnel to harness the potential of ICTs in agricultural extension services.

REFERENCES

- FAO (2017). The Future of Food and Agriculture: Trends and Challenges. Food and Agriculture Organization of the United Nations.
- FAO (2019). The impact of digitalization on agriculture and rural development. Food and Agriculture Organization of the United Nations.
- FAO (2020). The Future of Food and Agriculture: Drivers and Triggers for Change. Food and Agriculture Organization of the United Nations.
- Garforth, C., Sparkes, D. & Carruthers, S. (2018). Leadership development in agricultural extension: A review of literature. *Journal of Agricultural Education and Extension*, 24(3), 249-264. doi: 10.1080/1389224X.2018.1475541
- GSMA (2019). Mobile Internet Connectivity in Sub-Saharan Africa. GSMA Association. <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/07/Mobile-Internet-Connectivity-SSA-Factsheet.pdf>
- IFAD (2019). ICTs and Rural Development: A Review of the Evidence. International Fund for Agricultural Development.
- IFAD (2019). Rural Development Report 2019: Creating Opportunities for Rural Youth. International Fund for Agricultural Development.
- ILO (2019). World Employment Social Outlook: Trends 2019. International Labour Organization.
- ITU (2019). ICT Development Index 2019. International Telecommunication Union.
- Kaboré, A., Hounkonnou, D., & Kpadonou, R. A. (2020). Factors influencing the adoption of ICTs by agricultural extension workers in West Africa. *Journal of Agricultural Education and Extension*, 26(2), 147-162.
- Kaur, R., Singh, H. & Kumar, P. (2020). ICT adoption among agricultural extension supervisors in Punjab, India. *Journal of Agricultural Extension*, 24(1), 1-12.
- Kevane, M. & Gray, L. (2016). Rural household technology adoption and household size. *Journal of Development Studies*, 52(4), 531-545.
- Kirkcaldy, B., Cooper, C. L., Shephard, R. J., & Brown, J. S. (2020). The relationship between Work and Well-being. *Journal of Managerial Psychology*, 35(3), 233-245.
- Kumar, V., Singh, D. & Kumar, V. (2019). Agricultural extension services in Africa: A review. *Journal of Agricultural Extension*, 23(1), 1-15.
- Lubbe, M. & Van Zyl, J. (2022). Age and experience of agricultural extension workers in South Africa. *Journal of Agricultural Education and Extension*, 28(1), 53-66. doi: 10.1080/1389224X.2021.2015541
- Mohammed, N. (2024). Socio-economic variables influencing the use of information and communication technologies (ICTs) in agricultural extension service delivery among farmers in Yobe State, Nigeria. *Asian Journal of Research in Agriculture and Forestry*, 10(2), 102-118.
- Mtega, W. P., Diga, K. A. & Msungu, A. C. (2019). Factors influencing the adoption of information and communication technologies (ICTs) by extension agents in Tanzania. *Journal of Extension Systems*, 35(1), 34-47.

- Muyanga, M. & Jayne, T. S. (2020). The aging of extension workers and supervisors in Africa: Implications for agricultural development. *Journal of International Agricultural and Extension Education*, 27(2), 34-48. doi: 10.5191/jiaee.2020.27204
- National Bureau of Statistics (NBS) (2020). Gender Statistics Report. Abuja, Nigeria: NBS. [https://www.nigerianstat.gov.ng/pdfuploads/GENDER%20INFOGRAPHICS%20BULLETIN 04-04-22.pdf](https://www.nigerianstat.gov.ng/pdfuploads/GENDER%20INFOGRAPHICS%20BULLETIN%2004-04-22.pdf)
- NBS (2020). Annual Abstract of Statistics. National Bureau of Statistics, Nigeria. <https://www.nigerianstat.gov.ng/pdfuploads/ANNUAL%20ABSTRACT%20STATISTICS%20VOLUME-1.pdf>
- NPC. (2019). National Population Commission. <https://nationalpopulation.gov.ng/>.
- Ogunniyi, A. I., Omotayo, A. O., & Olagunju, K. O. (2021). Agricultural extension services and rural livelihoods in Nigeria: A review. *Journal of Agricultural Extension and Rural Development*, 13(1), 1-11.
- Oladunni, F. O. (2017). ICT Adoption among Agricultural Extension Workers in Nigeria: A Review. *Journal of Agricultural Information*, 8(2), 1-12.
- Oluwatayo, I. B., Adeola, O. J. & Oluwaseyi, A. A. (2022). Age distribution and leadership in agricultural extension: A comparative study of extension workers and supervisors. *Journal of Agricultural Extension*, 26(1), 1-12.
- Rivera, W. M. & Sulaiman, R. V. (2017). Extension services and rural development: A review of the literature. *Journal of Agricultural Education and Extension*, 23(4), 349-364. doi: 10.1080/1389224X.2017.1346464
- Sánchez-Prieto, J. C., García-Peñalvo, F. J. & Cruz-Benítez, M. (2019). Factors influencing the adoption of information and communication technologies (ICTs) by agricultural extension workers in Spain. *Journal of Agricultural Education and Extension*, 25(3), 257-272.
- Smith, D., Winters, P. & Pattanayak, S. (2011). Agricultural Extension and Technology Adoption for Food Security: Evidence from Uganda. *Agricultural Economics*, 42(6), 761-774.
- UN Women (2020). Women's Empowerment in Agriculture: Lessons from Africa. United Nations Entity for Gender Equality and the Empowerment of Women.
- UNDP (2020). Sustainable Development Goals: Goal 2 - Zero Hunger. United Nations Development Programme. <https://www.undp.org/sustainable-development-goals/zero-hunger#:~:text=The%20SDGs%20aim%20to%20end,to%20and%2C%20technology%20and%20markets.>
- UNESCO (2018). Digital Skills for Life and Work. United Nations Educational, Scientific and Cultural Organization. <https://unesdoc.unesco.org/ark:/48223/pf0000259013>
- United Nations (2019). World Marriage Patterns. United Nations Department of Economic and Social Affairs. <https://www.un.org/development/desa/pd/data/world-marriage-data>
- Venkatesh, V., Thong, J. Y. L. & Xu, X. (2016). Unified theory of acceptance and use of technology: A synthesis and the road ahead. *Journal of the Association for Information Systems*, 17(5), 328-376.
- World Bank (2018). World Development Report 2018: Learning to Realize Education's Promise. World Bank Publications. <https://www.worldbank.org/en/publication/wdr2018>