

Analysis of factors influencing the use of e-extension tools among extension workers in Gombe State, Nigeria

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ABSTRACT: The study was conducted to analyze the factors influencing the use of e-extension tools among the extension workers in Gombe State, Nigeria. The entire 117 Government extension workers in the state were sampled for the study. The data obtained were analyzed using mean, percentages and frequency and Logit regression model. The results revealed that the mean age of the respondents was 43 years and the mean working experience of 18.43 years. All respondents had formal education, with only 4.30% attaining up to M.Sc. level. The mean monthly income was ₦58,102.56. The entire model was significant, with an R-square of 0.4892, a chi-square value of 20.21, and a p-value of 0.0025. Age (-0.391) and government policy (3.302) had statistically significant effects on the outcome variable at a 95% confidence level. Unstable power supply and inadequate e-tool facilities were reported by all the respondents, poor internet connectivity by 94.02%, and government policy by 90.60%. The study concludes that age and government policy were the major factors influencing the use of e-tools by the respondents. The study recommends that the Government should provide alternative energy sources such as solar power or battery backups are to be provided to ensure consistent access to e-extension tools in the e-center, upgrading e-facilities in rural areas and service providers to reduce data costs to affordable rates.

Keywords: E-extension, extension workers, usage.

INTRODUCTION

Agriculture was the mainstay of Nigeria's economy upon which its nationalists founded their agitation for independence. Nigeria was a leading agricultural economy, being the largest producer of palm oil, groundnut, cotton, and cocoa globally. The sector employed over 70 per cent of the labour force and accounted for as much as 62.3 per cent of the nation's foreign exchange earnings (World Bank, 2020). The discovery of crude oil in the 1950s progressively led to the neglect of the sector, which has caused Nigeria to fall in the global market rankings for which it was taking the lead. Oge *et al.*, (2020). However, indices have shown that the sector has started witnessing a gradual but slow growth, this growth was a result of population growth and demand, changing climate, and technology needs with the

increasing population, estimated to reach 400 million by 2050 (FAO, 2021), enhanced agriculture productivity through adaptation of new technologies and innovations is necessary to ensure adequate food security. The emergence of new entrants into agricultural production has led to challenging the conventional methods of delivering important services to farmers and the transformation of traditional farming into modern technology-based farming which can be able to feed itself (Aderinto *et al.*, 2017). Agricultural extension services are responsible for transferring knowledge to farmers, advising and educating farmers in their decision-making, enabling farmers to clarify their own goals and possibilities, and stimulating desirable agricultural developments. In Nigeria as in most developing countries, ministry-based agricultural extension

services were adopted and established after the Second World War as part of American Aid for developing countries in 1959 (Agwu *et al.* 2023). For example, in Nigeria the ratio of farmers to extension officers is 1:10,000 (IFRI, 2023), while the recommended ratio by FAO is 1:800. The unfavourable ratio between extension agents and farmers in Nigeria makes it almost impossible for the extension agents to be efficient in information dissemination if they are to meet with all the farmers. Amid these challenges, extension workers have to look for the best methods to meet the information requirements of the farmers to improve their livelihoods. Therefore, the alter-native to making contact with farmers without necessarily maintaining face-to-face contact is the application of information and communication technologies (ICTs).

Information and Communication Technology (ICT) has become the most important and influential tool for disseminating information required by the audience of agricultural extension worldwide. Therefore, ICTs have become the cornerstone of agricultural development in contemporary times. It can be seen as an effective communication method, particularly where time and distance are constraints. It can also facilitate reaching information beyond the local/regional level to the national and international levels and bring new opportunities for farmers to improve their knowledge through knowledge transfer and exchange.

E-extension is also known as cyber extension; it uses the power of online networks, computer communications, and digital interactive multi-media to facilitate the dissemination of Agricultural Technology. According to Gichamba *et al.* (2017), e-extension is an extension system that enables extension officers to reach out to farmers using more efficient alternatives to a traditional system of agriculture. Mtega *et al.* (2014) revealed that agricultural extension staff can use e-resources to forward practical problems to research institutes and use the same tools to access information from different sources including research institutes back to the farmers. However, ICT is a complex process that requires comprehensive solutions built on detailed information which can be provided by e-readiness assessment (Adedeji, 2017). Application of ICTs requires awareness among development actors such as extension workers, and greater capabilities among the actors (Raksha *et al.*, 2015).

Electronic resources (e-resources) refer to those materials that require computer access (ICT devices), whether a personal computer, mainframe or handheld mobile device (Hall *et al.*, 2018), and may either be accessed remotely (network) or directly (local). According to the Library of Congress (2016), direct access to electronic resources refers to the use of electronic resources via physical carriers (e.g., discs/disks, cassettes, cartridges). According to McNamara *et al.*, (2018), e-resources require computer access or any electronic product that delivers a collection of data, be it text, referring to full-text bases, electronic journals image

collections, other multi-media products, and numerical, graphical, or time-based as a commercially available title that has been published with an aim to be marketed. The provision of agricultural e-extension services in Nigeria is constrained by inadequate infrastructure e.g. electricity, lack of awareness of e-resources among extension workers, complexity in the usage of e-resources, lack of internet connectivity, unavailability of e-resource tools, high cost of internet access, weak internet connectivity among others. Apantaku *et al.* (2016) went further to state that, there is a declining number of extension workers in Nigeria due to retirement that resulted in a wide gap in the extension worker-to-farmer ratio. With the mentioned challenges the objectives of Agricultural extension services of providing technical advice, guiding farmers on how to maximize yield and profit are defeated and leaving the rural populace with poor; production, low income, health conditions, poverty, and living standards, where Hunger emerged as a result of food insecurity and finally vices and death. In Gombe State, with a population of about 3.25 million people (National Bureau of Statistics (NBS, 2023) and 130 extension workers, the ratio of extension workers to farmers is approximately 1: 9,499 (ADP, 2023), and most of these extension workers are urban based. This could be due to inadequate mobility to reach the scattered farmers, lack of social amenities in the rural area, inadequate incentives to the extension workers, and recently the rising cost of fuel in the country. Therefore, using some e-resources to train extension workers to disseminate relevant agricultural information will boost farmer production, Per-capita income, health, and general improvement of the living standard of the populace and the country's GDP. For example; Facebook, Whatsapp, Zoom, and Telegram among others will bridge the gap of extension to farmers' ratio in the State.

There are few studies conducted in relation to e-extension in Gombe State. For example; a study by Sa'adu *et al.* (2022) assessed the factors affecting the use of information communication technologies among extension agents in North-East, Nigeria; Usman *et al.* (2020) analysed awareness and adoption of e-extension among poultry farmers in Gombe State, Nigeria. These studies were all conducted without recourse to e-extension use by extension workers in agricultural extension delivery. Hence there is a need to study e-extension use to overcome the gap through the most simplified ways in Gombe State, Nigeria. It is in this regard that this study intends to fill this knowledge gap if properly implemented. The specific objectives of the study were to:

1. describe the socio-economic characteristics of the respondents;
2. identify the factors influencing the use of e-extension tools among the respondents; and
3. identify the constraints to the use of e-extension in the dissemination of agricultural information among the respondents.

METHODOLOGY

The study was conducted in Gombe State, Nigeria. It is located in Northeast Nigeria, between latitude 10°28' to 10°16'N and longitude 11°17' to 11°10'E, with a mean annual temperature of 32°C. The study area is bordered by Borno, Yobe, Taraba, Adamawa, and Bauchi State. It occupies a total land area of about 18,768 km² and with an average annual rainfall of 863.2 mm (Mayomi *et al.*, 2018). The state is located in the Guinea and Sudan savannah belts with undulating hills and a few volcanic rocks. The study area has a population of 2,365,040 people (National Population Commission [NPC], 2006). Based on the 3.99% annual growth rate, the estimated population stands at 3.25 million people as of 2023 (National Bureau of Statistics [NBS], 2023). The main occupation of the people in the state is farming; both crop and livestock (Mohammed, 2011) such as maize, sorghum, soybeans, cattle, sheep, goats, poultry, and pig.

Sampling techniques

A complete census of 117 extension workers was used for the study. The extension workers were from the State Agricultural Development Program (ADP) and Local Government Extension workers.

Analytical techniques

Both descriptive and inferential statistics were used for the analysis. The descriptive statistics used were means, percentages, and frequency. The Logit regression model was used to analyze the relationship between determinants and the level of use of e-extension tools by the respondents. The model is explicitly specified as follows;

$$\text{Log} (Y_i) = \ln \left[\frac{P_i}{1 - P_i} \right] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + e$$

$$Y_i = \begin{cases} 1, & \text{if an extension worker is a high user}^* \\ 0, & \text{if an extension worker is a low user} \end{cases}$$

Where: X_1 = Age of extension worker (years), X_2 = Educational level (Number of years spent in formal school), X_3 = Monthly salary (Naira per month), X_4 = Access to e-extension tool (1= yes, 0=No), X_5 = GSM network problem (1= Yes, 0=No), X_6 = Awareness of Government policy support (1= Yes, 0=No), β_1 to β_6 are parameters to be estimated, and e = constant term.

*Decision rule: If the percentage of e-extension resources used is greater than 50%, the extension worker is a high user, and if otherwise, he/she is a low use.

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

The socio-economic characteristics of the respondents are presented in Table 1. The results revealed that 46.15% of the respondents were within 37-48 years with a mean age of 43 years. This indicates that the respondents fall within the economically active age group, therefore, they can perform their duties with agility. Harry and Kejeh (2022) posited in their study on the influence of the use of information and communication technologies (ICTs) on agricultural extension workers job performance in Rivers State that most of the extension workers in the study were between 45 – 54 years and mean age of 31 years. Othman *et al.* (2020) indicated in a study on the use of information and communication technology among agricultural extension workers in Taraba State that the majority of the extension workers are young, active, and in their productive years with the age bracket of 31 to 40 years. Similarly, the finding agreed with the study of Anushree and Madan (2018) who reported that the majority of extension workers fall within the age category 35-50 in a study they conducted on factors governing the use of ICT in extension delivery services in the North-Eastern Region of India.

The distribution of the educational level of respondents is given in Table 1. About 30.8% of the respondents attended up to HND level, 22.22% B.Sc., and 19.7% had National Diploma, while 4.3% attained up to M.Sc level. Education generally has been found to enhance productivity among workers, apparently resulting in the efficient use of new technologies. Education can also aid in the search for appropriate technologies to alleviate production constraints. Harry and Kejeh (2022) posited in their study on the influence of the use of information and communication technologies (ICTs) on agricultural extension workers' job performance in Rivers State that most of the respondents had educational background of HND and B.Sc. The findings were similar to that of Onwubuya *et al.* (2015) and Nwabugwu *et al.* (2019) in their separate studies revealed that more than 30% of the respondent had attended higher institutions which is an advantage in utilization of e-extension tools to improve their work.

Results in Table 1 also show that Majority (62.39%) had working experience of more than 9 years with a mean experience of 18.43 years. Experience brings specialization and is possible in the sense that the higher the experience, the more will be expected from a respondent since he has gained more knowledge and technological ideas on how to tackle extension problems. The result of the study agreed with Harry and Kejeh (2022) that most of the extension workers had worked for 19 years in their study on the influence of the use of information and communication technologies (ICTs) on agricultural extension workers job performance. The study conducted by Anushree and Madan (2018) on factors governing the

Table 1. Socio-economic characteristics of the respondents.

Variables	Frequency	Percentage	Mean
Age			
25-36	27	23.08	43 years
37-48	54	46.15	
49-60	36	30.77	
Educational Level			
Master (M.Sc)	5	4.30	
Degree (B.Sc)	26	22.20	
Higher National Diploma (HND)	36	30.80	
National Diploma (ND)	26	22.20	
Secondary	23	19.70	
Primary	1	9.00	
Working experience			
5-9	44	37.61	18.43 years
10-14	2	1.71	
15-19	19	16.24	
20-24	9	7.69	
25-29	23	19.66	
30-34	20	17.09	
Monthly salary in Naira (₦)			
32,000-45,200	59	50.43	₦ 58,102.56
45,201-58,401	3	2.56	
58,402-71,602	13	11.11	
71,603-84,803	20	17.10	
84,804-98,004	22	18.80	

Source: Field Survey (2024).

use of ICT in extension delivery services in the North-Eastern Region (NER) of India reported that the work experience of the extension workers ranges between 5-15 years notwithstanding the fact that they have exposure to tackle farmers problems due to vocational training on the use of ICT for agriculture. Onwubuya *et al.* (2015) reported that the majority of the extension workers had above 15 years of job experience in a study they conducted on educational and communication strategies used by extension workers in Onitsha Agricultural Zone of Anambra State. Therefore, the work experience of extension workers to a large extent affects their managerial know-how as well as the use of various extension methods including mass media methods.

The monthly salary of the respondents is presented in Table 1. The result revealed that 50.43% of the respondents earned between ₦32,000 – ₦45,200 monthly with an average monthly salary of ₦58,102.56. The salary of the respondents is generally poor considering the inflation rate in Nigeria (29.9%) (National Bureau of Statistics, 2024). This may affect their level of e-extension use. The monthly salary may not be enough to cater for

their household in light of the present economic situation of the country. The result of the study agreed with the findings of Othman *et al.* (2020), Nwabugwu *et al.* (2019), and Onwubuya *et al.* (2015) who reported that the majority of their respondents received not more than ₦50,000 as monthly salary.

Factors influencing use of e-extension tools by the respondents

The result logistic regression in Table 2 shows that the variables chi-square (20.21) along with p-value (0.0025) suggested that there is a statistically significant relationship between the independent variables and the outcome variable (Y) i.e. level of use of e-extension tools by the respondents in the study area. The model's R-square (0.4892) indicates that about 49% of the variance in the dependent variable is explained by the independent variables included in the model. Age (-0.391) and government policy (3.302) have statistically significant effects on the outcome variable at a 95% confidence level

Table 2. Relationship between determinants and use of E-extension by the respondents.

Variables	Coefficient	Standard error	z-Statistic	P> z
Age (X1)	-0.3908	0.1920	-2.04**	0.042
Educational Level (X2)	0.1484	0.5588	0.27	0.791
Monthly income (salary) (X3)	-9.981	0.00006	-0.16	0.876
Access to e-tools (X4)	-0.2808	2.368	-0.12	0.906
Network problem (X5)	-1.169	1.3590	-0.86	0.390
Government Policy (X6)	3.302	1.7902	1.84**	0.065
Constant				
LR chi2(6)	= 20.21	20.33	11.771	1.73
Prob > chi2	= 0.0025			
Pseudo R2	= 0.4892			

**significant at 5%, *significant at 10% (Source: Field Survey 2024).

Table 3. Constraints associated to the use of E-extension tools by the respondents.

Constraints	Frequency*	Percentage (%)
Poor and unstable power supply	117	100
Inadequate ICT facilities	117	100
Poor internet connectivity	110	94.02
Government policy on agriculture	106	90.60
GSM network problem	98	83.80
High cost of Data subscription	97	82.91
Poor attitudes of extension workers to E-extension tools	85	72.65
Time consuming	83	70.94
Complexity of e-extension tools	53	45.30
Poor awareness of e-extension tools by extension workers	51	43.59
Inadequate Technical know how	46	39.32
Others please specify (e-resource center not fully utilize)	1	0.85

*Multiple responses (Source: Field Survey, 2024).

Specifically, age (-0.391) has a negative coefficient, and government policy (3.302) has a positive coefficient, meaning, that increases in age are associated with decreases in the likelihood of the outcome (slow adoption due to difficulty/ complexity e-resource use), while increases in the awareness of government policy are associated with increases in the likelihood of the outcome (extension agents' use of e-tools due to their availability, subsidized data subscription and good internet connection). This is similar to the findings of research conducted by Ifeanyi-obi and Corbon (2023) in their study on the use of digital tools in extension service delivery amongst extension agents in Akwa Ibom State, Nigeria, which revealed that educational level and age were among the factors influencing the usage of digital tools by extension agents in the study area. In the same vein, Alhassan *et al.* (2022) found that social media usage by Agricultural Extension Agents for extension services is influenced by age, education, income, and sex while Ajena (2017) in the study, Agriculture (Smart) Agro-ecology

emphasized digital tools could be viable drivers of innovation adoption particularly when socioeconomic factors are addressed.

Constraints to the use of e-extension tools for agriculture extension delivery

Results in Table 3 show the constraints faced by the respondents in using e-tools in agricultural extension delivery. All (100%) of the respondents reported poor and unstable power supply and inadequate e-tools facilities as the major problem; poor internet connectivity (94.02%); 90.60% Awareness of government policy on agriculture; 83.80%, GSM network problems; 82.91%, high cost of data subscription; 72.65%, poor attitudes of extension workers to e-extension tools; 70.94%, time consuming; 45.30%, complexity of e-extension tools; 43.59, poor awareness of e-extension tools by extension workers; 39.32%, inadequate technical know-how, and 0.85%, e-

resource center were not fully utilized were considered as major problems in using e-tools in extension work in the study area. The result in Table 3 revealed that extension agents in the study are faced with many constraints in using e-extension tools for agriculture extension delivery and will lead to poor outcomes if not fully addressed with all the potentials available. The results are similar to the findings of Enwelu *et al.* (2017) who reported three factors extracted as problems; user personal related, office/work, and ICT technicality in their study on access and use of information and communication technologies by extension workers in Anambra State Agricultural Development Programme. The results also agreed with the findings of Sa'adu *et al.* (2022) and Ifeanyi-obi and Corbon (2023) in separate studies, who reported the cost of digital tools, poor internet connectivity, and poor electricity supply as the major constraints hindering the effective use of digital tools in Nigeria. The finding also corroborates the study of Izuogu *et al.* (2023), a review of the digitalization of agriculture in Nigeria, that the availability of government and extension support with consistence government policies are the factors that affect the digitalization of the agricultural sectors in Nigeria.

Conclusion

The study was conducted to analyze the factors influencing the use of e-extension tools among the extension workers in Gombe State, Nigeria. The entire 117 extension workers in the state were sampled for the study. The results of the study revealed that the average age of the respondents was 43 years while that of working experience and monthly salary were 18.43 years and ₦58,102.56 respectively. There was a significant relationship between age (-0.3908) and government policy (3.302) with e-tools usage at 1% and 5% levels of significance. Poor internet connectivity (94.02%), government policy on agriculture (90.6%), GSM network problems (83.8%), and high cost of data subscription (82.91%) were the major constraints to e-extension tool mutilation by extension workers in the study area. Therefore, the factors influencing the use of e-extension tools among the extension workers in Gombe State, Nigeria are age and government policies toward agriculture.

Recommendations

Based on the findings of the research, the following recommendations were made:

1. The government should implement alternative energy solutions such as solar power or battery backups to ensure consistent access to e-extension tools in the e-center.
2. Ministry should invest in developing/building

e-resource centers, upgrading e-facilities in rural areas, and capacity building on e-extension irrespective of age.

3. The government should intervene through the ministry by providing free internet access to reduce the costs of data or incentives on data to extension workers.

CONFLICT OF INTEREST

The authors declared that no competing interest exists.

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