

Comparative Study of the Socioeconomic Characteristics and Digital Literacy Level of Agricultural Extension Personnel in Imo and Ebonyi States, South-East, Nigeria

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Abstract

The study comparatively analysed the socioeconomic characteristics and digital literacy level of Agricultural Extension personnel (AEP) in Ebonyi and Imo States, South-East, Nigeria. The specific objectives were to describe the socioeconomic characteristics of agricultural extension personnel in Ebonyi and Imo States, and to ascertain the digital literacy level of AEP in the studied states. Purposive sampling technique was used to select 312 Agricultural Extension personnel (132 from Ebonyi State Agricultural Development Program and 180 from Imo State Agricultural Development Program) for the study. Data were collected through the use of validated and structured questionnaire, and administered through the help of well-trained enumerators. Data were analysed using simple descriptive statistical tools such as percentages mean score, standard deviation and weighted mean. Findings indicated that they were more male in the both States (55.3% and 57.8%) for Ebonyi and Imo State respectively and that the average age of AEP in Ebonyi and Imo States were 44.7 years and 49.2 years respectively. It was further revealed that the majority (77.3% and 82.8%) had B.Sc./HND as their highest academic qualifications, belonged to professional organisations (62.1% and 75%), and were earning an average monthly income of N58,798 and N62,648 for Ebonyi and Imo State respectively. Also, it was revealed that their mean years of service were 12.4 years and 13.4 years for Ebonyi and Imo State respectively. Almost all of them (87.9% and 95.0%) own a smartphone, had access to the internet (80.3% and 90.0%), but do not own a laptop/ipad (82.6% and 72.8%) for Ebonyi and Imo State respectively. Results further revealed that Agricultural extension personnel in both Ebonyi and Imo State respectively had low digital

literacy level ($\bar{x} = 2.41$ and 2.32). The study concluded that AEP in Ebonyi and Imo State respectively had similar socioeconomic characteristics and low level of digital literacy. The study recommended that the management of ADPs in both Ebonyi and Imo State should ensure the training of AEP in digital skills to enhance their digital literacy level to enable them use digital technologies in their work.

Keywords

Agricultural Extension Personnel, Digital Literacy, Ebonyi State, Imo State, Socioeconomic Characteristics

1. Introduction

Agricultural extension personnel refer to the team of staff of agricultural organisations who work together to deliver extension services to farmers. According to [1], the organisational structure of the Agricultural Development Program (ADP), which is the extension arm of the Ministry of Agriculture in Nigeria, has different Departments that work as a team to provide extension services to farmers. [2], defined agricultural extension personnel to include all professional staff working in the extension organisations in Nigeria but, importantly, the staff of the extension component of the ADPs. These include the Directors at the headquarters, the Zonal officers and the field agents at the village levels. They all work together to provide extension services to farmers, and their ability to use cutting-edge technologies in their work will help address the most perennial problems confronting agricultural extension services delivery in Nigeria.

Agricultural extension is associated with agricultural technology transfer and the exchange of practical information on agriculture. Agricultural technology transfer is the formal process of disseminating novel agricultural discoveries, enhanced practices, or innovations from research institutions to the agricultural sector [3]. Extension organisations provide farmers with development information to solve widespread agricultural problems and adverse economic conditions affecting production levels [4]. Also, [3], argued that for agricultural technology transfer to be effective and meaningful, extension workers must be able to communicate efficiently and stimulate farmers to adopt the technologies.

[5], argues that the effectiveness of extension services depends mainly on extension workers' preparedness and professional competencies. Digital technologies are increasingly being used in various sectors, including agriculture. These smart technologies have the potential to revolutionise the way agricultural extension services are delivered, leading to increased efficiency and productivity. Agricultural extension personnel play a pivotal role in facilitating the integration of new technologies among farmers.

According to [6], extension workers are expected to continuously develop new capacities and keep abreast of technological developments, especially in agricul-

tural production practices and extension service delivery methodologies. [7], maintained that for the performance of any extension organisation to improve, systematic and continuous staff training is necessary. Supporting this, [8] noted that training enhances the quality of the agricultural labour force. Hence, extension personnel need regular training to improve their on-the-job effectiveness, especially in this era of rapid technological change.

Some reports have shown that agricultural extension service has not fared well in many developing countries, resulting in poor dissemination of agricultural technologies [9] [10] [11]. In Nigeria, policy inconsistency, poor funding, lack of continuity in project implementation, insecurity, language barriers, diverse cultures and norms and values are among the challenges to efficient extension services delivery [9]. [12], highlighted a weak research-extension-farmer-input linkage system, dysfunctional institutions, low private sector participation, supply-driven extension approaches and low extension agent-to-farm family ratio as problems facing extension service in Nigeria. While the difficulties confronting agricultural extension services in Nigeria are enormous, the good news remains that recent developments in digital technologies are providing alternative routes to the solution to these problems.

Digital technologies encompass a wide array of electronic tools, systems, devices, and resources involved in data generation, storage, or processing [13]. Similarly, [14] added that digital technologies include electronic tools, automated systems, technological devices, and resources for generating, processing or storing information. Within the agricultural and food sector, mobile technologies, services related to remote sensing, and distributed computing are already making notable improvements in enhancing smallholders' access to vital information, necessary inputs, markets, financing options, and educational opportunities.

According to [15], lack of digital skills can lead to the misuse or under-use of digital technologies. Although digital penetration in Africa is increasing, not everybody can access and use it properly, thereby adding to societal inequalities [16]. [17] noted that a lack of digital skills would not only impair the effective and efficient application of digital technologies in agriculture but would also slow down the pace of attainment of self-sufficiency in food production. The report further suggested that closing the digital divide has become pertinent for the digital revolution to benefit every sector, especially in Africa. This underscores the need to urgently enhance the agricultural workforce's capabilities to effectively and efficiently use digital technologies.

In Nigeria, many socioeconomic aspects of individuals hinder digital literacy. For example, the low average income among extension workers across the country means that not many of them would have access to these technologies [18] [19]. Additionally, a deficient educational system makes a large part of the population perceive technological innovations as complex and challenging to use. These characteristics of extension workers may act as obstacles to the diffusion

of digital technologies in the country and negatively impact development and growth in the agricultural sector [20]. The relationship between digital literacy and socioeconomic variables has increasingly become an object of study due to constant technological developments in agriculture and its impact on society. It is against this backdrop that this study was conceived to provide empirical data and contribute to reliable literature on the socioeconomic characteristics and digital literacy level of agricultural extension personnel in the area of study. The study aims to address the following specific objectives:

- To comparatively describe the socioeconomic characteristics of agricultural extension personnel in Imo and Ebonyi States, and
- To ascertain the level of digital literacy of agricultural extension personnel in Imo and Ebonyi States, South-East, Nigeria.

2. Methodology

The study was carried out in Ebonyi and Imo States, South-East, Nigeria. The South-East, Zone comprises five states: Abia, Anambra, Ebonyi, Enugu and Imo. It lies primarily in the tropical rainforest Agro-ecological Zone of the country. The region is located within longitudes 5°30' and 9°30'E and latitudes 4°30' and 7°00'N, and occupies a land area of 75,488 km² [21]. The region has a population of 16,381,726 people and is characterised by two distinct climatic seasons: the rainy season (April to November) and the dry season (December to March) [21].

The mean annual rainfall of the region varies from 1500 mm in the northern border of Enugu and Ebonyi States to over 2000 mm in the southern fringes of Anambra, Imo and Abia States [21]. Farming is the significant economic activity of the people of the region. The dominant food crops cultivated include cassava, yam, maize, vegetables and agroforestry such as oil palm, mangoes, oranges, and pear. Livestock such as poultry, goats, sheep, and pigs are the major livestock reared in the area. The states are further explained below:

3. Ebonyi State

Ebonyi State, established in 1996 with Abakaliki as its capital city, emerged from the former Abakaliki division of Enugu State and the former Afikpo division of Abia State. It earned the moniker “the Salt of the Nation” due to its substantial salt reserves in the Okposi and Uburu salt lakes. The state is compartmentalised into 13 Local Government Areas and boasts an estimated population of 5 million residents, encompassing an area of 5935 square kilometres [21]. Predominantly inhabited by the Igbo ethnic group, and hosts various minority communities hailing from neighbouring regions. Its economic backbone lies in agriculture, where it excels as a prominent producer of rice, yam, potatoes, maize, beans, and cassava.

Additionally, the state possesses reserves of crude oil and natural gas, while fishing is a prevalent activity in Afikpo. Ebonyi State is linguistically diverse, with nine primary native languages, all falling within the Igbo subgroups spoken by

the Igbo populace in South Eastern Nigeria. Notable urban centres within Ebonyi State encompass Abakaliki, Afikpo, Amasiri, Edda, Ikwo, Ishiagu, Nkalagu, Okposi, Onicha, Onueke, Uburu, Unwana, among others [22].

4. Imo State

Imo State, established in 1976 and named after the Imo River, has its capital and largest city in Owerri. It comprises 27 Local Government Areas and was previously part of the defunct East Central State. Imo State, with an estimated population of around 5 million, exhibits varying population densities from 230 to 1400 individuals per square kilometre. Covering an area of approximately 5100 square kilometres, the state is home to culturally homogeneous Igbo-speaking people with a rich cultural heritage expressed through clothing, music, dance, festivals, arts and crafts, and warm hospitality.

Geographically, Imo State shares borders with Abia State to the east, the River Niger and Delta State to the west, Anambra State to the north, and Rivers State to the south. The state boasts abundant natural resources such as crude oil, natural gas, lead, zinc, iroko, mahogany, obeche, rubber trees, and oil palms. It experiences a rainy season from April to October, with annual rainfall ranging from 1500 mm to 2200 mm, while the dry season includes a two-month Harmattan period from late December to late February. The hottest months occur between January and March. Other notable cities and towns within Imo State include Mbaise, Orlu, Oguta, Okigwe, Uzoagba, Emekuku, Mgbidi, Nkwere, Agu, Ori, Obowu, Ideato, among others [21].

Generally, agricultural extension service in Nigeria (South-East inclusive) is dominantly provided by the Agricultural Development Program (ADP), which is a parastatal under the state Ministries of Agriculture (MoA). Every state in the South-East has an ADP, which is administratively structured into headquarters, zones, blocks and circles. Each state in the zone is divided into various agricultural zones; Ebonyi has three Zones: Ebonyi North, Ebonyi South and Ebonyi Central, while Imo State is divided into three Zones: Owerri, Okigwe and Orlu Agricultural Zones.

The population for this study comprised all agricultural extension staff and the Subject Matter Specialists (SMSs) under the ADP system in Imo and Ebonyi States. From the list obtained from the state ADP headquarters, the two states had a total of 302 extension staff and 30 Subject Matter Specialists (SMSs), giving a total of 332 respondents sampled in the study. However, only 312 copies of the questionnaire were properly completed and retrieved for analysis as explained in **Table 1** below. To ensure inclusivity, all the extension personnel, comprising the Directors of extension (DoE), Zonal Extension Officers (ZEOs), Block Extension Supervisors (BESs), Block Extension Agents (BEAs), Village Extension Agents (VEAs), and Subject Matter Specialists (SMSs), in the two states, were used for the study (see **Table 1**).

Table 1. Distribution of extension personnel sampled for the study.

State	Extension personnel					Total
	DoE	ZEOs	SMSs	BEAs/BESs	VEAs	
Ebonyi	1	3	15	24	98	141
Imo	1	3	15	27	145	191
Total	2	6	30	51	243	332

Source: Field survey data, 2023.

The data for the study were sourced from primary outlets; with data collection conducted using a meticulously structured and validated questionnaire. The questionnaire was designed to encompass all the intended study objectives. The data collection instruments were subjected to validity and reliability tests to minimise errors, and were administered to the respondents through the help of well-trained enumerators under the supervision of the researchers.

Data were analysed using SPSS software version 26.0. Specifically, data on the socioeconomic variables were analysed using percentages, mean scores and standard deviation. Also, data on digital literacy level were analysed using weighted mean, obtained from a 4-point Likert-type scale of Very Well (VW) = 4, Fairly Well (FW) = 3, Not Very Well (NVW) = 2 and Not At All (NAA) = 1. The values of the scales were added together and divided by the number of scales to obtain the discriminating index (e.g., $\frac{4+3+2+1}{4} = 2.5$). Therefore, this mean value (*i.e.*, 2.5) was used as a minimum threshold for digital literacy. For instance, statements with mean values of 2.5 and above were regarded as high digital literacy level, while those with mean values less than 2.5 were regarded as low digital literacy level.

5. Results and Discussion

• Socioeconomic characteristics of Agricultural Extension Personnel (AEP) in Imo and Ebonyi States

The socioeconomic characteristics of agricultural extension personnel are essential variables in this study. These variables were investigated to comprehend their pre-disposing influence on their digital literacy levels. The socioeconomic characteristics of extension personnel considered in the study were sex, age, educational qualification, marital status, household size, membership of professional organization, average monthly income, work experience, ownership of a smartphone, ownership of ipad/laptop and access to internet services. The distribution of the agricultural extension personnel in Imo and Ebonyi States, South-East, Nigeria, according to socioeconomic characteristics is presented in **Table 2**.

Table 2 shows that there were slightly more male (55.3%) and (57.8%) agricultural extension personnel in Ebonyi and Imo States, respectively than female. From the result, it can be deduced that the proportion of female extension per-

sonnel in the studied states was quite encouraging, considering the importance of gender inclusivity in extension services. This result is consistent with the findings of [23] [24] [25], who reported that there were more male extension workers than female in Nigeria.

The result also shows that most (72.7% and 60.6%) agricultural extension personnel in Ebonyi and Imo States respectively, were within the age bracket of 38 - 47 years. The mean age of agricultural extension personnel in Ebonyi and Imo States was approximately 45 years and 49 years, respectively. This implies that most agricultural extension personnel in the states under consideration were still young and in their active service years. This result agrees with the findings of [26], who noted that extension personnel in Delta State were between the ages of 30 and 49 years. This is good because young people are more prone to innovation and change. They can quickly adopt digital technologies if given the necessary training and supporting environment. Younger agricultural extension personnel are more likely to cope with the initial changes involved in migrating from analogue to digital extension services. These findings are also supported by the results of [27] [28], who observed that young people have more risk-taking attributes, innovative abilities and mental capacity to cope with changes in the work environment.

Table 2. Distribution of the respondents according to socioeconomic characteristics.

Socioeconomic variables	Ebonyi State (n = 132)			Imo State (n = 180)		
	%	Mean	SD	%	Mean	SD
Sex						
Male	55.3			57.8		
Age (years)						
38 - 47	72.7	44.73	6.08	60.6	49.2	7.58
Educational level						
B.Sc./HND	77.3			82.8		
Marital status						
Married	90.9			87.2		
Household size						
6 - 10	56.1	6.2	2.70	58.9	5.98	1.66
Organisation membership						
Yes	62.1			75.0		
Monthly income (naira)						
50,001 - 100,000	53.0	58,798.3	6.79	74.4	62,648.75	8.49
Work experience						
11 - 15	57.6	12.4	6.37	45.0	13.4	8.58
Ownership of smartphone						
Own	87.9			95.0		
Ownership of ipad/laptop						
Own	17.4			27.2		
Access to internet						
Yes	80.3			90.0		

Source: Field survey data, 2023, SD = Standard deviation.

Also, the data in **Table 2** reveals that the highest proportion (77.7% and 82.8%) of agricultural extension personnel in Ebonyi and Imo States respectively possessed a Bachelor's degree (B.Sc.) or a Higher National Diploma (HND) as their highest educational qualification. A noteworthy observation is that most of the extension personnel in the two states had good formal educational training. Their academic background is crucial as it equips them with solid comprehension and communication skills, pivotal for effective information dissemination to farmers and the ability to understand and appreciate the importance of digital technologies in their work. Also, a sound educational background exposes individuals to continuous learning techniques for career improvement, enabling them to employ new methodologies in engaging with farmers for enhanced productivity. This result is in line with the conclusions drawn by [29], who posited that education serves as an invaluable instrument for acquiring new knowledge, its practical application to problem-solving, fostering the adoption of contemporary adaptive strategies, and effectively navigating the intricacies of new technologies within extension services.

Furthermore, the data in **Table 2** indicate that most (90.9% and 87.2%) of agricultural extension personnel in both states were married. Marriage encourages pooled resources, joint assets and provides emotional and psychological support for coping with challenging tasks. Also, the result further reveals that the mean household size of agricultural extension personnel was 6 persons per household for both states. This reveals that the agricultural extension personnel in the study area have relatively large household sizes, slightly higher than the national average of five (5) persons per household (Statista, 2019). Large household sizes would convey a considerable responsibility to the household heads in a bid to cater for the household. The study aligns with [30], who reported that people appear to be more committed to whatever they do when they have a large household size that depends on them for food, shelter, and clothing.

Also, the result in **Table 2** shows that most (62.1% and 75.0%) of agricultural extension personnel in Ebonyi and Imo States respectively belonged to a professional organisation. This is good considering that professional organisations provide members with the platform for interactions, exchange of ideas and group learning. Their involvement in group activities allows them to gain insights into the happenings around them. The findings align with those of [10] [31] [32]. They posited that membership in cooperative societies allows members to share information on modern production techniques, purchase inputs in bulk, and exchange labour. This result also aligns with the study of [33]. It has been established that individuals who participate in social organisations such as cooperative societies, community development associations, and other self-help groups adopt more innovations than those who do not belong.

Also, the result in **Table 2** shed light on a disquieting pattern related to the earnings of agricultural extension personnel. It was revealed that most (53.0% and 74.4%) of extension personnel earned between N50,001.00 and N100,000.00

monthly. Their mean monthly income was N58,798.30 and N62,648.75 for Ebonyi and Imo States respectively. These figures collectively reveal a prevalent low-income situation among agricultural extension personnel in the studied states. Comparatively, the result reveals that extension personnel in Anambra State earns approximately N4000.00 higher than their counterparts in Ebonyi State. This result aligns with the observation of [9] [34], and [35], who noted that agricultural extension workers in Nigeria are poorly remunerated. This financial predicament may adversely affect the motivation and willingness to embrace innovations that could enhance organisational performance or their ability to invest in acquiring digital technologies or devices and skills without external support. It is worth noting that improved incentives have been identified as effective motivators for individuals, as observed in the study by [36], which suggested that providing better incentives can lead to increased performance and overall organisational success.

Table 2 also shows that most (57.6% and 45.0%) of agricultural extension personnel had working experience ranging between 11 and 15 years, with an average years of experience of 12.4 and 13.4 years for Ebonyi and Imo States respectively. Years of experience are very crucial in organisational performance. The more extended agricultural extension personnel have been in service, the more practical expertise they will have in dealing with the challenges that come with extension services. Working expertise is also valuable for developing ideas and implementing improved working practices to increase efficiency and output. This finding aligns with that of [37], who stated that increased working experience leads to improved performance efficiency by assisting individuals in adopting better working methodologies.

Table 2 also shows that most (87.9% and 95.0%) of agricultural extension personnel own a smartphone. This indicates that smartphones are important and commonly used digital gadgets among agricultural extension personnel in the study area. The reason for this result may be that smartphones are handy and can be used to perform many functions [38]. This can help them carry out their work more effectively if they understand its uses and relevance for extension services delivery outside of making and receiving calls.

The result in **Table 2** further shows that only few (17.4% and 27.2%) of agricultural extension personnel own a laptop or iPad. This suggests that most agricultural extension personnel in the studied states were not using laptops or iPads and may be missing some of the opportunities to enhance their efficiency and networking with farmers if they had such important digital devices. The reason for this could be that most of them could not afford a laptop or iPad.

Also, **Table 2** shows that most (80.3% and 90.0%) of agricultural extension personnel in Ebonyi and Imo States respectively had access to internet services in their area. This implies that internet penetration into the rural areas has improved. This will help them source information from the Internet and use various Internet-enabled digital technologies to advance their extension services to

farmers.

- **Level of digital literacy of agricultural extension personnel in Ebonyi and Imo States**

The results of the assessment of the digital literacy level of extension personnel are presented in **Table 3**.

The result in **Table 3** shows that agricultural extension personnel (AEP) in Ebonyi and Imo State collectively had low digital literacy level, with a grand mean of 2.41 and 2.32 respectively. The result also reveals that the extension personnel in the area do not possess adequate digital literacy in all the five core competency areas used in assessing their level of digital literacy. This suggests the need for training of agricultural extension personnel to equip them with the requisite competence to use digital technologies. Lack of digital skills has been reported by several studies [13] [39] [40] [41] as a major setback to the integration of digital technologies into extension services delivery in Nigeria.

However, the result further shows that agricultural extension personnel (AEP) in both Ebonyi and Imo States had little grasp of some digital operations and can only execute few specific tasks using digital devices. For instance, their proficiency in information and data management is demonstrated by their ability to power on and off digital devices (\bar{x} = 3.04 and 2.96) for Ebonyi and Imo State respectively. The result further reveals that the extension personnel in Imo State, possessed the capability to establish login accounts and manage passwords (\bar{x} = 2.59). It was revealed also, that the extension personnel in both states, understood how to use digital devices to search for information and data in the digital landscape (\bar{x} = 2.54 and 2.59).

However, it was shown from the result that AEP in Imo and Ebonyi States exhibited deficiencies in most core digital skills and knowledge areas. They lacked the expertise needed to create and update personal search strategies for effective navigation among online information sources (\bar{x} = 2.21 and 2.14), and could hardly analyse and assess the credibility and reliability of online information and data sources (\bar{x} = 2.19 and 2.04) respectively. It was also revealed that they lacked the skills to organise, store, and retrieve information, data, and content within a digital environment (\bar{x} = 2.19 and 2.21), respectively.

In terms of communication and collaboration tasks, skills, and knowledge, AEP in Imo State can share data, information, and digital content with others through appropriate digital technologies (\bar{x} = 2.71), while their Ebonyi State counterparts could not (\bar{x} = 2.46), though they understood referencing and attribution practices in a digital environment (\bar{x} = 2.84).

Assessment of the skills and knowledge of AEP in Ebonyi and Imo States in creating digital content, the result in **Table 3** shows that they can only express themselves through digital means (\bar{x} = 2.79 and 2.56), respectively, but only the extension personnel from Ebonyi State that possessed the digital skills and knowledge to create and edit digital content in different formats (\bar{x} = 2.79). In the both states, the extension personnel lacked the skill to modify, refine, and inte-

grate new information and content into an existing body of knowledge and resources to develop new content (\bar{x} = 2.21 and 2.09), cannot plan and develop

Table 3. Mean responses of agricultural extension personnel on their level of digital literacy.

Digital tasks, skills and knowledge	Ebonyi State (n = 132)		Imo State (n = 180)	
	Mean	SD	Mean	SD
(a) Information and data management tasks, skills and knowledge				
i. I can turn on and turn off digital devices	3.04**	0.82	2.96**	1.02
ii. I can create a login account and manage my password	2.44*	1.10	2.59*	0.52
iii. I can use digital devices to search for information and data in a digital environment	2.54**	0.99	2.59**	0.81
iv. I can create and update personal search strategies to navigate among information sources online	2.14*	0.21	2.21*	0.93
v. I can analyse and evaluate the credibility and reliability of the sources of information and data online	2.04*	1.01	2.19*	0.72
vi. I can organise, store and retrieve information, data and content in a digital environment	2.21*	0.81	2.19*	0.83
(b) Digital communication and collaboration tasks, skills and knowledge				
i. I can interact through a variety of digital technologies	2.09*	0.56	2.56**	0.34
ii. I understand appropriate communication means for any given context	2.39*	1.21	2.46*	0.97
iii. I can share data, information and digital content with others through appropriate digital technologies.	2.46*	0.35	2.71**	0.64
iv. I know about referencing and attribution practices in a digital environment	2.48*	0.86	2.19**	0.14
v. I can use digital tools and technologies for collaborative processes and co-construction and co-creation of data, resources and knowledge	2.79**	0.22	2.09*	0.48
vi. I am aware of behavioural norms while using digital technologies and interacting in digital environments	2.26*	1.56	2.34*	0.91
vii. I can adapt communication strategies to a specific audience	2.36*	0.38	2.34*	0.49
viii. I can create and manage one or multiple digital identities to be able to protect my reputation in a digital environment	2.48*	0.44	2.44*	1.04
(c) Digital content creation tasks, skills and knowledge				
i. I can create and edit digital content in different formats	2.79**	0.12	2.09*	0.19
ii. I can express myself through digital means	2.74**	0.47	2.56**	0.10
iii. I can modify, refine and integrate new information and content into an existing body of knowledge and resources to create new content	2.21*	0.42	2.09*	0.21
iv. I understand how copyrights and licenses apply to digital information and content	2.26*	0.48	2.36*	0.47
v. I can identify simple rules of copyright and licenses that apply to data, digital information and content	2.49*	0.28	2.56**	0.68
iv. I can plan and develop a sequence of understandable instructions for a computing system to solve a given problem or to perform a specific task	2.11*	0.92	2.34*	1.03
(d) Safety tasks, skills and knowledge				
i. I can identify simple ways to protect my devices and digital content in a digital environment	2.51**	0.14	2.44*	0.32
ii. I understand and can differentiate simple risks and threats in a digital environment	2.39*	0.12	2.09*	1.01
iii. I know about safety and security measures and have due regard for reliability and privacy when interacting with digital devices	2.64**	0.92	2.39*	0.42
iv. I understand how to use and share personally identifiable information while being able to protect myself and others from damage in a digital environment	2.39*	0.94	2.34*	1.03

Continued

(e) Digital Problem-solving tasks, skills and knowledge

i. I can identify and fix technical problems when operating devices and using digital environments (e.g. troubleshooting)	2.26*	0.13	2.04*	0.84
ii. I understand how to adjust and customise digital environments to personal needs	2.04*	0.47	2.29*	0.89
iii. I know how to use digital tools and technologies to create knowledge, innovation processes, and products	2.19*	0.90	2.01*	1.03
iv. I understand how to seek opportunities for self-development and to keep up-to-date with the digital evolution	2.26*	1.22	2.19*	0.87
v. I understand where my digital competence needs to be improved or updated and support others with their digital competence development	2.31*	0.27	2.04*	0.93
Grand Mean	2.41*	0.67	2.32*	0.82

Source: Field survey data, 2023, SD = Standard deviation, ** = High digital literacy level, * = Low digital literacy level.

a sequence of understandable instructions for a computing system to solve a given problem or to perform a specific task (\bar{x} = 2.11 and 2.34), and do not understand how copyrights and licenses apply to digital information and content (\bar{x} = 2.26 and 2.36), respectively. The AEP in Imo State can identify simple rules of copyright and licenses that apply to data, digital communication, and content (\bar{x} = 2.56). The results point to the need for skill up of AEP in these areas of digital operations.

Also, when they were asked to indicate their knowledge of digital safety, the result showed that the AEP in Ebonyi State), had knowledge of safety and security measures and have due regard for reliability and privacy when interacting with digital devices (\bar{x} = 2.64), could identify simple ways to protect their devices and digital content in a digital environment (\bar{x} = 2.51). The result further showed that the extension personnel in the both states do not understand how to differentiate simple risks and threats in a digital environment (\bar{x} = 2.39 and 2.09), and how to use and share personally identifiable information while being able to protect themselves and others from damage in a digital environment (\bar{x} = 2.39 and 2.34), respectively. These results suggest a severe training need for the AEP in digital safety skills and knowledge in both Ebonyi and Imo States.

Likewise, the result of their digital problem-solving abilities indicated that both AEP in Ebonyi and Imo States revealed low digital skills in this area of digital operations. It was revealed that they lacked the expertise to identify and resolve technical issues while operating devices and navigating digital environments, often referred to as troubleshooting (\bar{x} = 2.26 and 2.04), and lacked the ability to customise digital settings to suit their individual preferences (\bar{x} = 2.04 and 2.29), respectively. They also lacked the proficiency to utilise digital tools and technologies for knowledge creation and innovation processes (\bar{x} = 2.19 and 2.01), and they also do not understand how to recognise opportunities for self-improvement and staying updated with the digital revolution (\bar{x} = 2.26 and 2.19) and they could hardly identify areas where their digital competence requires improvement or updates and to support others in enhancing it (\bar{x} = 2.31 and 2.04). This outcome further underscores the urgent need for training

interventions to augment the digital literacy level of AEP in these states. Equipping them with the skills needed to harness digital technologies in their work would have the potential to generate a ripple effect with positive impacts on food security and poverty reduction among farmers in both Ebonyi and Imo States respectively. The result generally revealed that the digital literacy level of AEP in these states is low and will affect their job performance if something is not done to address the identified gap in digital literacy. The findings are in alignment with [29] and [42], who stated that digital incompetence affects staff effectiveness and successful services delivery.

6. Conclusions

The study concluded that most agricultural extension personnel in Ebonyi and Imo States were still in their active years of life, and had B.Sc/HND as their highest educational qualification, and were poorly remunerated. The digital literacy level of agricultural extension personnel in both Ebonyi and Imo States was low.

The study therefore recommended that:

- 1) The management of both Ebonyi State (EBADP) and Imo State ADP (IMADP), should ensure the training and continuous re-training of extension personnel on the use of digital technologies as part of efforts to integrate digital technologies into extension services delivery in Nigeria. This will help to enhance the personnel's digital skills and improve the effectiveness and efficiency of extension services delivery, leading to better agricultural productivity, food security and poverty reduction in the both states.
- 2) The government of Ebonyi and Imo States should review upward the salaries and allowances of agricultural extension personnel. This will help to enhance their motivation and dedication to duty.
- 3) The Management of the ADPs should liaise with the state governments to provide laptop or ipad as tool kits for extension workers in the various states under study. This will help in enhancing their digital literacy level as they continue to practice and make use of the devices in their work.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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