



Effect of Hybrid Extension Services on Agricultural Extension Workers' Productivity in Ondo State, Nigeria

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ABSTRACT

This study investigated the perceived effect of hybrid extension services on the productivity of agricultural extension workers in Ondo State, Nigeria. A complete enumeration covering all 50 extension workers in the Agricultural Development Programme (ADP) was done. Data were collected using a well-structured and validated questionnaire and analyzed with descriptive (frequency count, percentage, mean, and standard deviation) and inferential (Linear regression) statistics. Findings from the study showed that the workforce was predominantly female (56%), with a mean age of 47 years and an average of 18 years of experience. Results also revealed that the most used hybrid service components included integrated communication platforms such as WhatsApp platforms ($\bar{x}=2.5$), farmers' contact/call centres ($\bar{x}=2.36$) and hybrid farmer field schools ($\bar{x}=2.32$). It was also observed that hybrid services were mainly applied in crop management ($\bar{x}=3.48$), pests and disease control ($\bar{x}=3.32$), post-harvest handling ($\bar{x}=3.30$), and technology adoption ($\bar{x}=3.26$). The extent of hybrid extension service delivery had a significant and positive influence on the extension workers' productivity ($\beta=0.460$; $t=8.507$; $p<0.05$). The study concluded that hybrid extension services enhance productivity but require improved ICT infrastructure, digital skills training, and supportive policies for sustainability. It was therefore recommended that hybrid extension services should be positioned as complementary rather than a substitute for traditional extension delivery.

INTRODUCTION

Agricultural extension services remain crucial for transferring knowledge and innovations to farmers. Hybrid extension services, which combine traditional face-to-face outreach with digital tools and platforms, have emerged as an innovative solution (Aker, 2022). Hybrid extension services, which integrate face-to-face methods with digital platforms, have emerged as a promising solution to strengthen extension delivery. Similarly, Ajani (2022) posited that hybrid extension improves information delivery, reduces costs, and expands farmers' access to advisory services. Moreover, according to Ogunniyi and Sulaiman (2022), they observed that hybrid models bridge the gap between extension agents and farmers by promoting inclusiveness and improving productivity. Zulu and Tschirley (2022) also avowed that combining digital tools with traditional methods enhances service efficiency and fosters stronger interaction between extension agents and farmers. However, the traditional agricultural extension system is often criticized for being rigid and top-down with several limitations (source).

These include inadequate funding, lack of qualified personnel, poor logistics, and insufficient farmer participation (source). Furthermore, the system had been reported to struggle with weak linkages to research and other relevant institutions, limited access to technology, and a lack of responsiveness to diverse farmer needs (Olawoye, Ajayi and Kolawole, 2022). Therefore, this study examined how agricultural extension workers in Ondo State perceive the effect of hybrid extension services on their productivity, focusing on socio-economic characteristics, major components of hybrid extension services and level of use, **extension services carried out with hybrid extension and** extent of service delivery, perceived effect on extension workers' productivity and constraints to the use of hybrid extension services. The study hypothesized that the extent of hybrid extension service delivery will not influence productivity.

LITERATURE REVIEW

Agricultural extension services have long been recognized as a vital mechanism for transferring scientific research and new technologies to farmers to improve agricultural productivity, food security, and rural livelihoods (Food and Agriculture Organization, 2022). In Nigeria, where agriculture remains a key economic sector, effective extension services are essential for bridging knowledge gaps, encouraging adoption of innovations, and achieving national food security goals (Ogunniyi and Sulaiman, 2022).

Traditionally, extension services in Nigeria rely on in-person interactions such as farm visits, community meetings, and demonstration plots. While effective, this model has proven insufficient to meet the demands of modern agriculture due to high farmer-to-agent ratios, poor infrastructure, and limited funding (Abdullahi, Bello and Musa 2021). These challenges are compounded by the vastness and remoteness of many farming communities, making it difficult for extension workers to maintain consistent contact. Against this backdrop, the integration of information and communication technologies (ICTs) into extension

delivery often termed hybrid extension services has emerged as a practical innovation to complement physical outreach and expand service delivery (Aker, 2021). This literature review explores the concept, components, perceived benefits, and constraints of hybrid extension services, with a focus on their influence on the productivity of extension workers. However, the conventional extension system characterized by face-to-face visits, demonstration farms, and group meetings faces multiple constraints such as poor funding, high extension agent-to-farmer ratios, limited logistics, and infrastructural deficiencies (Abdullahi and Musa., 2021; Ajani, 2022). These challenges have necessitated innovative approaches to extension delivery, especially the integration of modern information and communication technologies (ICTs). The term “hybrid extension services” broadly refers to the blending of conventional face-to-face advisory methods with modern ICT tools and digital communication channels (Ajani, 2022). A hybrid extension system typically integrates various tools and platforms. The goal is to harness the strengths of both approaches to overcome limitations associated with each when used in isolation.

While conventional methods ensure personal contact, demonstration of practices, and trust-building, ICT methods provide speed, wider coverage, and facilitate cost-effective service delivery (Ayoola, Musa and Ayanwuyi, 2023). Globally, hybrid extension systems gained traction as mobile technology penetration expanded across Africa and Asia. Aker (2021) notes that the use of mobile phones for agricultural advice became more prominent in the early 2000s when governments and development partners began testing SMS-based weather updates, input price alerts, and pest outbreak warnings for farmers. According to Akpan and Yusuf (2023) the commonly used components include:

a) Conventional/Physical methods (face-to-face) methods: On-farm demonstrations, Farmer field schools,

Community meetings. Advisory farm visits and Village-level workshops.
(b) ICT-based methods: Mobile phone calls/SMS (including bulk messages for pest outbreaks), Interactive Voice Response (IVR) systems, Community radio programs in local languages, Agricultural TV segments, WhatsApp and Telegram groups for farmer clusters, E-learning modules for continuous training, and online video tutorials. In line with this, Ayoola, Musa and Ayanwuyi (2024) noted that these components work best when carefully aligned. For example, an extension agent may visit a community physically once a month but send weekly updates via WhatsApp or radio programs in the local language. Community radio programs in local languages have also proven effective for reaching low-literacy farmers who may not use smartphones (Ajani, 2022).

MATERIALS AND METHODS

The study was conducted in Ondo State, Nigeria. Ondo State is one of the 36 states of Nigeria, located in the South-West geopolitical zone. The state was created in 1976, with Akure as its capital. It shares boundaries with Ekiti and Kogi States to the north, Edo State to the east, Ogun and Osun States to the west, and the Atlantic Ocean to the south. Ondo State has an estimated population of over 4

million people, most of whom reside in rural areas and depend largely on agriculture for their livelihoods.

Geographically, the state covers a land area of about 15,500 square kilometers and lies between latitudes 5°45' and 7°52'N and longitudes 4°20' and 6°05'E. The climate is tropical with distinct rainy (April–October) and dry (November–March) seasons. Average annual rainfall ranges between 1,200 mm and 2,500 mm, while the temperature varies from 22°C to 32°C. These conditions favor the cultivation of arable crops like maize, yam, cassava, and rice, as well as cash crops such as cocoa, kola nut, and oil palm. Ondo State is particularly renowned as the largest cocoa-producing state in Nigeria, playing a critical role in the country's economy.

The Ondo State Agricultural Development Programme (ADP) was established as part of the nationwide ADP initiative to strengthen agricultural extension delivery and bridge the gap between research institutions and farmers. The ADP provides farmers with timely agricultural information, improved technologies, inputs, and technical services through its network of extension workers.

Zonal Structure of ADP in Ondo State: To ensure effective grassroots coverage, the ADP in Ondo State is structured into three zones: Northern Zone – covering local government areas such as Owo, Akoko North, and Akoko South. Central Zone – covering areas like Akure North, Akure South, Idanre, and Ifedore. Southern Zone – covering coastal and riverine areas such as Okitipupa, Ilaje, and Ese-Odo.

Each zone is further divided into **blocks**, with Block Extension Supervisors (BES) coordinating activities. At the grassroots, Extension Agents (EAs) interact directly with farmers through regular visits, training sessions, and group meetings. The population comprised all 50 extension workers under the state Agricultural Development Programme, hence a complete enumeration was adopted. Quantitative method of data collection was employed through the use of well-structured and validated questionnaire. Primary data were gathered through the use of well-structured and validated questionnaire. Secondary information was obtained from relevant sources including textbooks, journals, desk review, conference proceedings, Newspapers, and e- articles. The research instrument was subjected to face validity by presenting it to experts in the field of Agricultural Extension and Rural Development. Test re-test method was used to test for reliability within an interval of two week to 20% (10) of the sample size outside the area of study but with similar characteristics and the R-value of 0.74 was obtained. Data were analyzed using descriptive and inferential statistics. The descriptive statistical tools used were frequency counts, percentages, mean, standard deviation while the inferential statistics used to test the stated hypothesis was linear regressions.

RESULTS AND DISCUSSION

Selected Socio-Economic Characteristics Of The Extension Workers

The workforce was predominantly female (56%), with a mean age of 47 years and an average of 18 years of experience, indicating a mature but less digitally flexible population. Most respondents (70%) had a tertiary education, suggesting potential for digital skills adoption with appropriate training. This finding aligns with Sani, Mamman, and Adejare (2025), who reported higher educational attainment among extension workers in Northwestern Nigeria, which often translates to greater adaptability and openness to new methods of service delivery. The implication is that while age and long years of service may limit quick adaptation to digital tools, the high level of formal education provides a strong foundation for capacity building in hybrid extension services.

Table 1: Distribution of the Respondents Based on Their Selected Socio-Economic Characteristics.

Variables	Freq	%	Mean	SD
Sex				
Male	22	44		
Female	28	56		
Age				
39-44	14	28		
45-50	22	44	47	4.31
51 and above	14	28		
Level of Educational Attainment				
No formal Education	-	-		
Adult Literacy	-	-		
Primary Education	-	-		
Secondary Education	-	-		
Tertiary Education	35	70		
Others	15	30		
Years of Experience				
9-16	19	38		
17-23	29	58	18	4.142
24 and above	2	4		
How often do you provide extension services to farmers?				
Daily	2	4		
Weekly	25	50		
Monthly	14	28		
Occasionally	9	18		

Source: Field Survey, 2026

Major Components of Hybrid Services and Level of Use

Results in Table 2 showed that the Integrated Communication Platform, including WhatsApp ($\bar{x} = 2.5$), farmers' contact/ call centres ($\bar{x} = 2.36$) and hybrid Farmer Field School ($\bar{x} = 2.32$) were the hybrid extension components with high use among the extension workers. The findings agree with Devanand and Kamala (2019) who had earlier reported that WhatsApp groups were the most

convenient and suitable way of communicating innovations to farmers. This suggests that these hybrid extension tools should be leveraged to ensure sustainable agricultural extension service delivery among the extension workers.

Table 2: Major Components of Hybrid Extension Services and their level of use

Variables	Yes	Low	Moderate	High	Mean
Farmers contact/Call centers	50	9	14	27	2.36
Farmer Field School (Online or Hybrid)	50	2	30	18	2.32
Integrated Communication Platform (WhatsApp or other messaging apps)	50	-	25	25	2.5
Social media platforms (e.g., Facebook, Instagram, Twitter)	49	6	27	16	2.22
Virtual knowledge network	50	4	31	15	2.22
E-training of farmers	48	11	25	12	2.02
E-climate change knowledge advertorial	50	17	21	12	1.9
GPS (global positioning system) for guided farm visits and data-driven advice to farmers	46	21	20	5	1.7
Use of community radio	43	21	19	3	1.62
E-agriculture apps for precision agriculture	40	21	17	2	1.58
E-commerce	40	26	10	4	1.4
E-resources, e.g., AGORA, OARE	31	20	8	3	1.24

Source: Field Survey, 2026

Extension Services Carried Out With Hybrid Extension Services And The Extent Of The Service Delivery

Findings on Table 3 revealed that hybrid services were mostly applied in crop management (Mean = 3.48), pest and disease control (Mean = 3.32), post-harvest management (Mean = 3.30), and technology adoption (Mean = 3.26). Limited applications were observed in financial literacy (Mean = 2.60) and climate adaptation (Mean = 2.92). This finding is in line with Aker (2022), who emphasized that digital and hybrid extension tools are often first adopted in core production areas where farmers see immediate benefits, while areas like financial services and climate adaptation receive less attention due to lower awareness and specialized knowledge requirements. The implication is that extension training and policy support should focus on expanding hybrid service applications beyond crop-focused practices, ensuring that farmers also gain critical skills in finance and climate resilience.

Table 3: Extension Services Carried Out with Hybrid Extension Services and Extent of the Service Delivery

Variables	Yes	Rarely	Sometimes	Often	Always	Mean
Agricultural advisory services	49		4	30	16	3.24
Crop management (e.g., planting, fertilization)	50		3	20	27	3.48
Pest and disease control	50		4	26	20	3.32
Livestock management (e.g., feeding, health care)	50		7	24	19	3.24
Weather forecasting and climate adaptation strategies	49		15	24	11	2.92
Market price information and market linkages	50		5	30	13	3.2
Post-harvest management and storage techniques	49		2	31	17	3.30
Financial literacy and access to credit	45	11	9	19	11	2.6
Technology adoption in agriculture	50	1	3	28	18	3.26

Source: Field Survey, 2026

Mean \geq 2.0- High service delivery

Perceived Effects Of Hybrid Extension Services On Productivity

Respondents strongly agreed that hybrid extension improved productivity (Mean = 4.38) and timeliness of information delivery (Mean = 4.06). However, concerns included unreliability of platforms, technical issues, inadequate training, and perceived impersonality of digital methods. This finding is in line with Ogunniyi and Sulaiman (2022), who reported that while hybrid services enhance efficiency and output, challenges of digital infrastructure and limited technical support often reduce effectiveness. The implication is that sustained investment in reliable ICT infrastructure, regular capacity building, and strategies to humanize digital interactions are essential to maximize the benefits of hybrid extension services.

Table 4: Perceived Effect of Hybrid Extension Services on Productivity

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Mean	SD
Items	Freq %	Freq %	Freq %	Freq %	Freq %		
Hybrid extension services have improved my overall agricultural productivity	23 46	23 46	4 8	0	0	4.38	0.635
Access to both in-person and digital extension support makes information more timely and useful	6 12	41 82	3 6	0	0	4.06	0.424
Hybrid extension services have made it easier to adopt modern farming techniques	7 14	32 64	10 20	1 2	0	3.9	0.647
Combining traditional and digital methods provides a more comprehensive support system	3 6	34 68	11 22	1 2	1 2	3.74	0.694
I feel more confident in making farm decisions because of hybrid extension services	9 18	21 42	16 32	4 8	0	3.7	0.863
Hybrid extension services are more flexible and convenient than traditional methods alone	3 6	24 48	23 46	0	0	3.6	0.606
I am able to access expert advice more frequently due to digital extension platforms	1 2	20 40	20 40	9 18	0	3.26	0.777
Hybrid extension services are too complicated to understand and use effectively	1 2	14 28	21 42	14 28	0	2.96	0.807
Digital platforms used in hybrid extension services are often unreliable or inaccessible	0	10 20	21 42	18 36	1 2	3.2	0.782
I prefer traditional methods because digital tools feel impersonal and less trustworthy	0	13 26	20 40	1 32	1 2	3.1	0.814
There is little to no improvement in productivity	0	13 26	13 26	17 34	7 14	3.36	1.025

	Strongly agree	Agree	Undecided	Disagree	Strongly disagree	Mean	SD
Items	Freq %	Freq %	Freq %	Freq %	Freq %		
from using hybrid extension services							
Technical issues often hinder my ability to benefit from the digital part of the service	1 2	14 28	11 22	20 40	4 8	3.24	1.021
I don't feel adequately trained to use the technology involved in hybrid services	0	16 32	23 46	8 16	3 6	2.96	0.856
Hybrid extension services favor tech-savvy farmers, leaving others behind	0	12 24	18 36	16 32	4 8	3.24	0.916

Source: Field Survey, 2026

Mean ≥ 3.0- High usage

CONSTRAINTS TO THE USE OF HYBRID EXTENSION SERVICES

Key barriers included limited ICT devices (100%), high cost of digital services (100%), low digital literacy (98%), and poor network coverage. These constraints restricted the adoption of advanced hybrid services. This finding is in line with Zulu and Tschirley (2022), who observed that infrastructural deficits, affordability issues, and inadequate digital skills remain major obstacles to effective integration of technology in agricultural extension systems across sub-Saharan Africa. The implication is that overcoming these barriers will require government support, private sector investment, and targeted training programs to ensure equitable access and sustainable adoption of hybrid extension services.

Table 5: Constraints to the Use of Hybrid Extension Services

	A Constraint	Not a Constraint	Mean	SD
Items	Freq %	Freq %		
Limited ICT devices		50 (100)	2	0
Low digital literacy among extension workers	1 (2)	49 (98)	1.98	0.141
High cost of accessing digital services	-	50 (100)	2	0
Farmers' resistance to change	1 (2)	49 (98)	1.98	0.141
Lack of consistent follow-up or support from extension agents	1 (2)	49 (98)	1.98	0.141
Security and data privacy concerns		50 (100)	2	0
Lack of policy support or institutional framework	7 (14)	43 (86)	1.86	0.351
Language barriers and content barriers	6 (12)	44 (88)	1.88	0.328
Digital divide between rural and urban areas	4 (8)	46 (92)	1.92	0.274

Limited hybrid service offerings in rural areas	11 (22)	39 (78)	1.78	0.418
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Source: Field Survey, 2026

HYPOTHESIS TESTING

Linear regression results on Table 5 revealed a strong and positive influence of the extent of hybrid extension service delivery on productivity ($\beta=0.460$; $t = 8.507$; $p < 0.05$), confirming that hybrid extension service delivery enhances productivity. This finding is in line with Ajani (2022), who reported that hybrid extension approaches significantly improve the efficiency and output of extension workers by combining the strengths of digital and face-to-face methods. The implication is that scaling up hybrid extension delivery through supportive policies and adequate resources can serve as a strategic pathway to boost extension workers' effectiveness and overall agricultural productivity.

Table 6: Significant Influence of the extent of hybrid extension service delivery on extension workers' productivity

Variables	β -value	Standard Error	R ² -value	T	P-value
	0.460	0.054	0.775	8.507	0.000*

Source: Field Survey, 2026

CONCLUSION

The study concludes that hybrid extension services positively influence extension workers' productivity but require improved ICT infrastructure, digital skills training, and supportive policies for sustainability in Ondo State. While simple tools such as WhatsApp and Farmers 'call/ contact centres have enhanced communication and outreach, advanced ICT applications remain underutilized due to structural and capacity-related barriers. Therefore, hybrid services should be positioned as complementary rather than a substitute for traditional extension. With adequate ICT infrastructure, digital literacy training, and supportive policies, hybrid services can transform extension delivery in Nigeria.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

1. provision of ICT devices should be ensured by relevant stakeholders including the government. policy makers, donor agencies, farmers groups;
2. government should invest in continuous hands-on digital capacity-building programmes for all the categories of extension workers .
3. hybrid extension platforms and content should be tailored to local languages, literacy levels, and cultural contexts to ensure inclusivity and adoption. This is particularly important for older extension workers and underserved rural farmers who may struggle with complex or foreign-language platforms.

4. promoting public-private partnerships (ppps), Stakeholders such as telecom companies, agritech startups, NGOs, and development organizations should be encouraged to partner with public extension agencies.

5. monitoring and evaluation framework should be developed to assess the performance and impact of hybrid extension services. Feedback from both extension workers and farmers should be used to refine and improve the tools, content, and delivery methods.

6. integration of advanced digital tools with simple platforms such as WhatsApp and call centers. Extension agencies should partner with tech companies, universities, and agricultural research institutes to train workers on these tools and adapt them to local realities. For example: Precision agriculture apps can guide fertilizer use, irrigation schedules, and pest control measures using GPS data, E-commerce platforms can help farmers sell directly to buyers in a manner that can improve their profit margins,

REFERENCES

- Abdullahi, A., Bello, M., & Musa, A. (2021). Challenges and opportunities in adopting ICT for agricultural extension services in Northern Nigeria. *Journal of Agricultural Extension*, 25(3), 45–56.
- Aker, J. (2021). Information and Communication Technology in Agricultural Extension. *World Development*, 109: 282–293.
- Akpan, J. B., & Yusuf, M. (2023). Work-life balance and digital extension tools: Perspectives from Nigerian extension workers. *African Journal of Agricultural Extension*, 27(2), 89–102.
- Ajani, O. (2022). Hybrid Extension Systems in Africa: Challenges and opportunities. *Journal of Agricultural Extension*, 26(2): 45–59
- Ayoola, J., Musa, T., & Ayanwuyi, E. (2024). Institutional support and the use of hybrid extension services in Nigeria. *Journal of Rural Studies*, 98, 45–59. <https://doi.org/10.1016/j.jrurstud.2024.01.002>
- Devanand, I. & Kamala, I.M. (2019). Innovative Extension Approach for Sustainable Agricultural Development: WhatsApp Groups for Farming Solution. *Current Journal of Applied Science and Technology*, 37(3): 1-8. DOI: 10.9734/CJAST/2019/v37i330292
- Food and Agriculture Organization of the United Nations. (2022). The state of food and agriculture 2022: Leveraging digital technologies. <https://www.fao.org/documents/card/en/c/cb9479en>
- Ogunniyi, A., & Sulaiman, T. (2022). ICT Adoption and Agricultural Extension Productivity in Southwest Nigeria. *African Journal of Agricultural Research*, 17(3): 112–121.
- Olawoye, J., Ajayi, O., & Kolawole, A. (2022). Age and education as predictors of ICT adoption in agricultural extension. *African Journal of Agricultural Extension*, 26(3), 34–48.
- Sani, M., Mamman, M., & Adejare, T.G. (2025). Assessment of the Trainee Needs of agricultural Extension Personnel in Northwestern Nigeria. *Federal University, Dutsin-Ma (FUDMA) Journal of Agriculture and Agricultural Technology (Special Issue)*, 11(2): 103-114 DOI: <https://doi.org/10.33003/jaat.2025.1102.013>
- Zulu, B., & Tschirley, D. (2022). Digital Platforms and Smallholder Farmers: Implications for Extension Delivery. *Food Policy*, 107: 102–132.