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CONTRIBUTION OF DIGITAL PLATFORMS IN DISSIMINATION OF INNOVATIONS AMONG RURAL FARMERS IN SOUTHERN TARABA, AGRICULTURAL ZONE, NIGERIA

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Abstract

The study assessed the contribution of digital platforms in dissemination of innovations among rural farmers in Southern Taraba, Agricultural Zone, Nigeria. The specific objective were to; describe the socioeconomic characteristics of farmers, identify the types of digital platforms used by rural farmers, access the accessibility and usability of the identified platforms, assess the effectiveness of digital platforms in improving farming practices determine the socioeconomic factors that influence the adoption of the identified digital platforms and identify challenges faced by farmers in using digital platforms. A multi-stage sampling technique was employed to select 123 respondents from three local government areas, and primary data were collected using structured questionnaires. Descriptive statistics were used to analyze farmers' socioeconomic characteristics, types of digital platforms, accessibility, usability, effectiveness, and challenges, while Tobit regression analysis was applied to analyze the socioeconomic factors influencing adoption. Findings revealed that most respondents were in their economically active years wmean age = 37.6 years), predominantly male (69.9%), and fairly literate, with 84.6% having attained secondary or tertiary education. Facebook (75.6%), WhatsApp (48.0%), and YouTube (30.9%) emerged as the most widely used platforms, with farmers mainly accessing weather forecasts, pest and disease control information, and improved crop varieties. Digital platforms were found to be effective in improving yields (72.5%), enhancing market access (92.6%), and promoting the adoption of improved technologies (63.4%). However, challenges such as poor internet connectivity (94.3%), high data costs (89.4%), and unstable electricity supply (88.9%) limited usage were encountered by the respondents. The Tobit regression results indicated that Age (0.013) was significant at 1%, Farm size (0.060) was significant at 5%, Internet access (0.189) was significant at 10% and occupation (−0.148) was also significant at 1% which significantly influenced adoption, with smallholders and full-time farmers more likely to adopt digital platforms compared to large-scale and part-time farmers. The study concludes that digital extension platforms play a vital role in bridging agricultural knowledge gaps and improving rural farmers' productivity and livelihoods. It recommends strengthening ICT infrastructure, reducing data costs, and tailoring digital services to farmers' socioeconomic contexts for sustainable adoption.

KEYWORDS: *Digital platforms, Innovation, dissemination, adoption and rural farmers.*

INTRODUCTION

Globally, the agricultural sector plays a critical role in ensuring food security, sustaining livelihoods, and driving economic growth, contributing significantly to the Gross Domestic Product (GDP) of many nations and providing employment for millions International Food and Agriculture Development (IFAD, 2020); Food and Agriculture Organization (FAO, 2021; Despite this centrality, the agricultural sector faces persistent challenges, including climate change, population growth, and resource scarcity, which exacerbate the need for innovative solutions (World Bank, 2022).

Agricultural innovation dissemination among smallholder farmers is central to improving productivity, food security, and rural livelihoods, particularly in developing economies. In Nigeria, the conventional public extension system has continued to face limitations arising from inadequate manpower, funding constraints, and poor coverage of remote rural communities. As a result, many rural farmers have limited access to timely, accurate, and actionable agricultural innovations. Digital extension platforms have emerged as innovative solutions to bridge these gaps, providing a means to disseminate timely and relevant agricultural information (Aker, 2020). These platforms leverage modern technology to connect farmers with critical resources, expertise, and real-time data on weather conditions, pest control, and market trends (FAO, 2021; Adegbite *et al.,* 2023). They include diverse tools such as mobile applications, SMS services, interactive voice response (IVR) systems, and social media networks. In response to these systemic issues, digital extension platforms have emerged as viable alternatives to traditional methods. These platforms leverage technology to deliver timely and targeted agricultural information to farmers, by passing the resource-intensive nature of conventional extension systems (Meera *et al.,* 2020; Adegbite *et al.,* 2023).

Southern Taraba is predominantly rural, with agriculture serving as the primary livelihood activity. Despite increasing mobile phone penetration, empirical evidence on how digital platforms contribute to innovation dissemination, the factors influencing their adoption, and the constraints faced by farmers in this zone remains sparse. This knowledge gap limits the ability of policymakers and extension agencies to design context-specific digital agriculture interventions. Therefore, a systematic empirical assessment of the contributions of digital platforms to agricultural innovation dissemination among rural farmers in Southern Taraba is both timely and necessary, if the farmers can contribute their best efforts to food production as well as the expected improved livelihoods and living standards that comes with new innovation in extension services.

Objectives of the Study

The broad Objective is to assess how digital extension platforms contribute to bridging the knowledge gap among rural farmers in southern Taraba State. Specific Objectives include to:

i. describe the socioeconomic characteristics of rural farmers in the study area.
ii. identify the types of digital platforms available and used by rural farmers in Southern Taraba.
iii. access the accessibility and usability of the identified platforms.
iv. assess the effectiveness of digital platforms in improving farming practices.

v. Determine the socioeconomic factors that influence the adoption of the identified digital platforms
vi. identify challenges faced by farmers in using digital platforms.

MATERIALS AND METHODS

Study Area

Southern Taraba is located in the northeastern region of Nigeria, lying between latitude 6°30'N to 8°30'N and longitude 9°10'E to 11°50'E. It shares boundaries with the central part of Taraba State to the north, Benue State to the west, Cross River State to the south, and the Republic of Cameroon to the east (National Bureau of Statistics [NBS], 2022). This strategic location makes it a hub for both domestic and cross-border agricultural and economic activities. The region consists of several Local Government Areas (LGAs), including Wukari, Takum, Donga, Ussa, and parts of Kurmi and Ibi LGAs. These areas are characterized by diverse ecological zones ranging from tropical rainforest in the south to guinea savannah in the north.

Sampling Techniques

A multi-stage sampling technique was used to obtain relevant data for this research work. Stage one, Three (3) local government areas out of the five local government that made up southern Taraba was selected.

Data Collection Technique

Primary data was collected using structured questionnaires designed to capture the objective of the study. The questionnaire was divided into sections covering demographic characteristics, socioeconomic factors, and other relevant variables.

Data Analysis Technique

The data collected was analyze statistically using descriptive and inferential statistical techniques. Specifically objective i, ii, iii, iv and vi was analyze using Descriptive statistic such as frequencies, percentages, and measures of central tendency (mean, median, and mode) likert scale to summarize the demographic and socioeconomic profiles of respondents. While objective v (analyze the influence of socioeconomic characteristics on the adoption of digital platforms) was analyzed using tobit regression.

Model Specification

The study employed a tobit regression model to analyze the relationship between the dependent variable (Adoption of Facebook, WhatsApp, Tiktok, Youtube, Instagram and Twitter) and the independent variables (e.g., access to resources, level of education, and farming experience). The model is specified as follows:

Tobit regression

$$Y = \beta 0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + U \ldots\ldots (2)$$

Where; Y = Adoption of Facebook, WhatsApp, Tiktok, Youtube, Instagram and Twitter

$\beta 0$ = Constant

X_1 = Age of the farmer (years)

X_2 = Gender of the farmer (Male = 1 : Female = 0).

X_3 = Educational status of the farmer (Number of years).

X_4 = farm size (hectares)

X_5 = farming experience (Number of years)

X_6 = Marital status

X_7 = Annual Income (Amount in Naira)

X_8 = Access to internet service (Yes = 1: No = 0)

X_9= Occupation

U = Error term

RESULTS AND DISCUSION

Socioeconomic Characteristics of Digital Extension Platforms Users

The socioeconomic characteristics of the respondents provide valuable insights into their capacity and readiness to adopt and utilize digital extension platforms. The study revealed that 4.1% of the respondents were within the age are of 10-20 years, 26.6% within the age range of 21-30 years, 20.3% were within the age of 41-50 years while 35.8% of the respondents were within the age of 31– 40 years, with a mean age of 37.6 years. This indicates that most farmers are in their economically productive years. Farmers within this age group are generally more innovative and willing to try new technologies compared to older farmers (Rizzo et al., 2024). Younger farmers are also more likely to possess the digital literacy skills necessary for operating mobile phones, accessing internet-based agricultural information, and engaging with extension applications. Similar findings were reported by Alant and Bakare, (2021), who emphasized that age significantly influences the willingness to adopt ICT tools in agriculture. This suggests that the age structure of farmers in Southern Taraba is favorable for the adoption of digital platforms. However, the presence of older farmers (over 50 years, 13%) highlights the need for user-friendly digital platforms that can accommodate less tech-savvy users.

The results also indicated that farming in Southern Taraba is male-dominated, with men constituting 69.9% of the sample while women made up 30.1%. This imbalance reflects cultural and structural barriers that limit women's participation in agricultural decision-making and access to digital technologies (Yakubu et al., 2024). Nevertheless, the participation of women, though smaller, is still significant because women play crucial roles in food production and household nutrition. Empowering women with access to digital extension services could bridge gender-based information gaps. The marital status shows that 35.8% of the respondents were single, 4.1% were Divorced, 1.6% were widowed and 58.5% of the respondents were married, which is typical of rural farming households. Marriage often implies a larger household labor force and greater responsibility for food security and income. Married farmers may be more motivated to seek agricultural information to enhance productivity and household welfare. A study by Aboagye-Darko and Mkhize, (2025), reported that married farmers are more likely to adopt digital innovations due to their desire to improve household food and income security. However, single farmers (35.8%) may have greater flexibility in decision-making and faster adoption of innovations, suggesting that both groups can benefit from targeted digital extension services.

Education emerged as a critical factor, with nearly half of the respondents (49.6%) having attained tertiary education, and another 35% having completed secondary education. Only 2.4% had no formal education. The mean years of schooling (12 years) suggest a fairly literate farming population. Education is a major determinant of the adoption of digital extension platforms since literacy enhances the ability to interpret messages, navigate applications, and trust digital information (Priya et al., 2025). Farmers with higher education are more likely to use platforms such as WhatsApp groups, mobile apps, and online farming communities effectively. These findings agree with Anadozie et al. 2022), who reported that education is positively associated with the use of mobile phones for agricultural information. This high level of educational attainment is a comparative advantage for farmers in Southern Taraba in bridging the knowledge gap through digital platforms.

Farming was the primary occupation for most respondents (72.4%), followed by civil service (16.3%) and trading (8.9%). The high percentage of full-time farmers underscores the relevance of extension services in improving productivity. The average monthly income of ₦97,017 indicates that farmers in the area have moderate financial capacity. Income is a critical determinant of digital platform adoption because affordability of smartphones, internet data, and subscription fees often limits usage (Chan et al., 2023). Farmers with higher incomes are more likely to sustain digital engagement, while low-income farmers may rely on free or subsidized services. Aker et al. (2016) observed that income disparities create digital divides in rural Africa, and this may explain variations in usage levels within the study area. Farming experience shows that most respondents (59.3%) had between 1–10 years of farming experience, with a mean of 13.7 years. This distribution shows that the farming population includes both relatively new entrants and long-term practitioners. While experienced farmers may rely on traditional practices and be resistant to change, younger and less experienced farmers are more likely to experiment with digital (Falah et al., 2025).

The result shows that crop farming dominated (49.6%), while 43.1% engaged in mixed farming (crops and livestock). This diversification suggests that digital extension platforms must

provide integrated information covering crop production, animal health, input supply, and marketing. According to Abiri et al. (2023), multipurpose digital platforms that address diverse farming needs have higher adoption rates because they provide holistic solutions for farmers. Access to digital devices and internet shows that 87.8% of respondents owned a mobile phone or digital device, and 91.9% had access to internet services. These statistics demonstrate a strong foundation for digital extension adoption in the study area. This aligns with national trends showing increasing mobile phone penetration in Nigeria's rural communities (Anadozie et al., 2021). High device ownership and internet access mean that farmers are well-positioned to benefit from platforms such as WhatsApp extension groups, online training, and SMS-based advisory services. However, challenges such as network instability, high data costs, and digital literacy gaps may still limit effective utilization (Aker et al., 2016).

Table 1: Socioeconomic characteristics

Socioeconomics	Frequency	Percentage	Mean (Standard deviation)
Age			
10-20	5	4.1	
21-30	33	26.8	
31-40	44	35.8	
41-50	25	20.3	
51-60	16	13.0	37.6(10.4)
Gender			
Female	37	30.1	
Male	86	69.9	
Marital Status			
Single	44	35.8	
Married	72	58.5	
Divorced	5	4.1	
Widowed	2	1.6	
Level of education			
No formal education	3	2.4	
Primary	16	13.0	
Secondary	43	35.0	
Tertiary	61	49.6	
Years spent in School			
1-6	28	22.8	
7-12	42	34.1	
13-18	50	40.7	
19-24	3	2.4	12(4.5)
Occupation			
Farming	89	72.4	
Trading	11	8.9	
Civil servant	20	16.3	
Artisan	3	2.4	
Estimated income			
1-50000	37	30.1	
50001-100000	41	33.3	
100001-150000	25	20.3	
150001-200000	20	16.3	9.7(56318.9)
Farming experience			
1-10	73	59.3	
11-20	26	21.1	

21-30	9	7.3	
31-40	15	12.2	13.7(10.6)
Type of crops / livestock produce			
Crops	61	49.6	
Livestock	9	7.3	
Both crops and livestock	53	43.1	
Do you own a mobile phone or digital device			
No	15	12.2	
Yes	108	87.8	
Do you have access to internet service			
No	10	8.1	
Yes	113	91.9	
Total	123	100.0	

Source: Field survey, 2025

Type of Digital Platforms Used by Farmers

The results in Table 2 provide insights into the types of digital platforms used by rural farmers in Southern Taraba and the nature of agricultural information they access. The findings indicate that Facebook (75.6%) was the most widely used digital platform among respondents, followed by WhatsApp (48.0%), YouTube (30.9%), TikTok (27.6%), Instagram (23.6%), and Twitter (22.8%). The predominance of Facebook suggests that farmers prefer platforms with strong community-building and interactive features, which allow them to engage with extension officers, fellow farmers, and agribusiness actors in a user friendly environment. This result is consistent with Ayandiji et al. (2021), who found Facebook to be the most common platform for agricultural information dissemination in rural Nigeria. Similarly, Uwagbai (2023) emphasized that Facebook and WhatsApp dominate in African rural communities because of their relatively low data consumption and familiarity among users.

The adoption of WhatsApp (61.0%) further highlights its role as a convenient, low-cost communication tool that supports group discussions, photo/video sharing, and instant messaging. Previous studies also show that WhatsApp is widely used in extension services, as it enables real-time communication between extension agents and farmers (Khatri et al., 2024). Interestingly, YouTube (43.9%) was also a major platform, indicating farmers' interest in audiovisual content for learning new techniques. This aligns with Prajapati et al. (2025), who argued that visual demonstrations are highly effective in bridging literacy gaps among rural farmers. The relatively lower adoption of Twitter, TikTok, and Instagram suggests that while these platforms are gaining popularity, they are not yet primary sources of agricultural information. These platforms are more entertainment-driven, and their use for agricultural purposes may still be in the early stages. However, the presence of TikTok (34.1%) and Instagram (24.4%) users points to the potential of these platforms in disseminating short, engaging agricultural content targeted at younger farmers.

The result for the primary digital platform for agricultural information shows that Facebook (47.2%) remained the most dominant, followed by YouTube (22.8%) and WhatsApp (15.4%). This indicates that while multiple platforms are used, Facebook stands out as the core

hub of agricultural information for farmers in the study area. The importance of YouTube as a primary platform highlights the growing trend of video-based extension, where farmers prefer step-by-step demonstrations over textual information.

The study also revealed that extension officers (56.9%) were the leading source of awareness for digital platforms, followed by family members (13.8%), social media (13.8%), and other farmers (12.2%). This finding underscores the continuous relevance of extension agents in promoting digital innovations. As Silvert et al. (2022) noted, farmers are more likely to trust digital technologies when introduced by extension workers, as opposed to informal networks. Nonetheless, the role of peers and social media in spreading awareness suggests that diffusion of innovations also relies on interpersonal influence (Rogers, 2003). Types of Agricultural Content Accessed revealed that Farmers primarily accessed weather forecasts (50.4%), pest and disease control information (26.0%), and new farming techniques (12.2%), while fewer farmers accessed market price information (8.9%) and government programs (2.4%). The high demand for weather-related information is unsurprising given the increasing impact of climate variability on agricultural productivity in Nigeria (Awolala et al., 2022). Access to timely and localized weather information helps farmers plan planting, harvesting, and irrigation more effectively. Similarly, the importance of pest and disease control reflects farmers' immediate production challenges.

The result further shows that majority (70.7%) of respondents had been using digital platforms for 1–5 years, with an average of 4.7 years. This suggests that the adoption of digital extension tools is relatively recent in Southern Taraba. The short usage history indicates both opportunities and challenges: while farmers are becoming increasingly familiar with digital platforms, sustained engagement and digital literacy programs are needed to ensure long-term effectiveness. These findings mirror those of Abubakar (2024), who found that Nigerian farmers' engagement with ICT-based platforms is a growing but relatively new phenomenon. Overall, the results show that farmers in Southern Taraba are actively using social media platforms as substitutes or complements to traditional extension systems. The dominance of Facebook and WhatsApp underscores the need for policymakers and development agencies to leverage these existing platforms rather than creating entirely new digital infrastructures. However, the relatively low use of platforms for market and policy-related information suggests that content diversification is necessary. Extension agencies, NGOs, and government programs should develop tailored strategies for using Facebook and WhatsApp to deliver timely, relevant, and credible agricultural information.

Table 2: Type of digital platforms used by farmers

Type of digital platforms used	Frequency	Percentage	Mean(Standard deviation)
Digital platform used for agricultural information in the past 12 months			
Facebook	93	75.6	
WhatsApp	59	48.0	
YouTube	38	30.9	
Twitter	28	22.8	
Tiktok	34	27.6	
Instagram	29	23.6	
Primary digital platform for agricultural			

information			
Facebook	58	47.2	
WhatsApp	19	15.4	
YouTube	28	22.8	
Twitter	5	4.1	
Tiktok	7	5.7	
Instagram	6	4.9	
How did you first learn about using digital platforms for farming information			
Extension officers	70	56.9	
Other farmers	15	12.2	
Family members	17	13.8	
Radio/TV	4	3.3	
Social media	17	13.8	
Type of agricultural content do you access most			
Weather forcast	62	50.4	
Pest / Disease control	32	26.0	
Market prices	11	8.9	
New farming techniques	15	12.2	
Government programs	3	2.4	
How long have you been using digital platforms for agricultural information			
1-5	87	70.7	
6-10	31	25.2	
11-15	4	3.3	
16-20	1	.8	4.7(3.1)
Digital platforms adopted			
Facebook	100	81.3	
WhatsApp	75	61.0	
YouTube	54	43.9	
Twitter	34	27.6	
Tiktok	42	34.1	
Instagram	30	24.4	
Total	**123**	**100.0**	

Source: Field survey, 2025

Accessibility and Usability of Digital Platforms

The findings from Table 3 reveal that the vast majority of respondents (88.6%) reported that accessing digital platforms for agricultural information was very easy, while only 11.4% indicated difficulties. This suggests that most farmers in the study area have overcome initial barriers to digital inclusion, likely due to increasing smartphone penetration and improved familiarity with digital tools in rural Nigeria. This finding aligns with (Tulinayo et al., 2022), who emphasized that the growing availability of mobile phones in sub-Saharan Africa has significantly improved rural farmers' access to digital platforms for agricultural knowledge sharing. Despite the ease of access, challenges remain, with high data costs (52%) and poor network coverage (32.5%) identified as major barriers to frequent platform use. This is consistent with the findings of Kamal and Bablu, (2023), who reported that affordability of mobile data remains a critical constraint limiting farmers' effective use of ICT tools in rural areas. Similarly, poor network coverage has been cited as a structural barrier to rural connectivity in many parts of

Nigeria (Ezeudu, and Fadeyi 2024). Addressing these infrastructural and economic constraints is therefore essential for optimizing the use of digital platforms in agricultural extension delivery.

Technical challenges were also evident, as 43.9% of farmers experienced problems sometimes, while 42.3% reported such challenges were rarely. This indicates that while digital platforms are generally accessible, intermittent technical disruptions still hinder smooth information flow. Comparable findings were reported by Mapiye et al. (2023) who noted that rural farmers often encounter intermittent disruptions in ICT services, affecting timely access to agricultural information. In terms of platform features, video tutorials (44.7%) and group chats (34.1%) were rated as the most useful by farmers. This reflects a growing preference for visual and interactive content, which tends to be more effective for knowledge transfer among farmers with varying literacy levels (Rose et al., 2021). The usefulness of video-based learning also resonates with the increasing adoption of YouTube and WhatsApp as learning tools for smallholder farmers (Salamon, 2025). On the other hand, features like voice messages (1.6%) and image sharing (7.3%) were rated less useful, possibly due to limited interactivity or poor relevance for technical agricultural knowledge dissemination.

Finally, when asked about assistance, about 62% of farmers reported sometimes, often, or always needing help to use digital platforms effectively, while only 13% never required assistance. This highlights the persistence of digital literacy gaps among rural farmers. Similar observations were made by Gumbi et al. (2023), who stressed that the successful adoption of digital technologies in agriculture depends not only on infrastructure but also on farmers' digital skills. Therefore, capacity-building interventions such as training and user-friendly interfaces are essential to ensure sustained adoption and independent use of these platforms. Overall, these results underscore both the opportunities and limitations of digital platforms in agricultural extension. While accessibility is relatively high, recurring barriers such as data costs, poor network coverage, and digital literacy gaps continue to undermine full utilization. Addressing these issues through targeted policy measures and capacity-building programs will be critical to enhancing the role of digital platforms in agricultural information dissemination

Table 3: Accessibility and usability of digital platforms

Accessibility and usability of digital platforms	Frequency	Percentage
How easy is it for you to access these platforms		
Very difficult	14	11.4
Very easy	109	88.6
What prevents you from accessing these platforms more frequently		
No smartphone	7	5.7
High data costs	64	52.0
Poor network coverage	40	32.5
Language barriers	9	7.3
Difficult to use	3	2.4
How often do you experience technical problems when using these platforms		
Very often	6	4.9

Often	9	7.3
Sometimes	54	43.9
Rarely	52	42.3
Never	2	1.6
Which platform features do you find most useful		
Group chats	42	34.1
Video tutorials	55	44.7
Voice messages	2	1.6
Image sharing	9	7.3
Live broadcasts	15	12.2
Do you need assistance to use these platforms effectively		
Always	25	20.3
Often	15	12.2
Sometimes	36	29.3
Rarely	31	25.2
Never	16	13.0
Total	**123**	**100.0**

Source: Field survey, 2025

Effectiveness of Digital Platforms

The findings from Table 4 reveal that digital extension platforms have played a pivotal role in transforming farming practices among rural farmers in Southern Taraba. A role of digital platforms in enhancing productivity by bridging the extension service delivery gap, a finding consistent with Khatri *et al.* (2024), who reported that mobile-based agricultural extension services contribute significantly to productivity growth in developing countries. The results also demonstrate that information credibility remains a central issue. Nearly 69% of respondents reported that they "always" or "often" verify information received via digital platforms, while only 3.3% never verify. This indicates that farmers are aware of significant majority of respondents (63.4%) indicated that they had adopted new crops or improved varieties as a result of information received through these platforms. This aligns with the observation of Priya *et al.* (2025) that digital technologies provide timely and location-specific agricultural information that accelerates the adoption of innovations. The relatively lower proportions reporting improvements in pest control (18.7%), water management (8.1%), and planting schedules (6.5%) suggest that while digital platforms are effective, their content may be more skewed toward crop and variety innovations compared to integrated pest management and resource use practices.

Regarding yield outcomes, 72.5% of farmers reported yield increases (31.7% significantly, 40.7% moderately), while only 4.9% indicated no change. This underscores the potential misinformation online and engage in triangulating knowledge sources. This cautious approach resonates with Yeo and Keske (2024), who emphasized that trust and credibility are critical determinants of digital extension adoption.

A striking finding is that 92.6% of respondents experienced better market prices through digital platforms, with 65% indicating significant improvements. This suggests that digital

extension goes beyond agronomic knowledge, empowering farmers economically by improving market access and bargaining power. According to Abdulquadri et al. (2024), mobile and digital platforms reduce transaction costs and information asymmetry in markets, thereby enabling farmers to secure better returns. Finally, the overwhelming majority (92.7%) of respondents expressed willingness to recommend these platforms to other farmers. This demonstrates strong user satisfaction and points to potential for scaling. As argued by Lasdun (2021), peer recommendations and farmer-to-farmer diffusion play a critical role in scaling digital agricultural innovations, especially in rural communities. The results affirm that digital platforms are highly effective in enhancing farming practices, improving yields, and strengthening market access. However, the varying levels of impact across different farming domains highlight the need for more diversified and context-specific content delivery.

Table 4: Effectiveness of digital platforms in improving farming practices

Effectiveness of digital platforms in improving farming practices	Frequency	Percentage
How has using digital platforms changed your farming methods		
Adopted new crops / varieties	78	63.4
Improved pest control	23	18.7
Better water management	10	8.1
Changed planting schedules	8	6.5
No significant change	4	3.3
Have these platforms helped you increase your crop yields		
Yes, significantly (50%+)	39	31.7
Yes, moderately (20-50%)	50	40.7
Yes slightly (<20%)	26	21.1
No change	6	4.9
Not sure	2	1.6
How often do you verify agricultural information received through these platforms		
Always	26	21.1
Often	59	48.0
Sometimes	22	17.9
Rarely	12	9.8
Never	4	3.3
Have these platforms helped you get better market prices for your produce		
Yes, significant	80	65.0
Yes, slightly	34	27.6
No difference	5	4.1
Made it worse	4	3.3
Would you recommend these platforms to other farmers		
No	9	7.3

Yes	114	92.7
Total	**123**	**100.0**

Source: Field survey, 2025

Socioeconomic Factors Influencing Adoption of Digital Platforms

The results of the tobit regression analysis reveal the socioeconomic determinants influencing the adoption of digital platforms for innovation dissemination among rural farmers in Southern Taraba State. The model was statistically significant (LR $\chi^2 = 73.03$; $p < 0.01$), with a pseudo R^2 of 0.4127, indicating that approximately 41% of the variability in adoption is explained by the selected socioeconomic variables. This suggests that the included factors provide a good explanatory power for understanding digital platform adoption among rural farmers in Southern Taraba State. The result revealed that age, farm size, internet access and occupation were statistically significant. The result shows that Age was positive and statistically significant at the 1% probability level (Coef. = 0.013; p = 0.000). This implies that older farmers are more likely to adopt digital platforms. This result aligns with Khatri et al. (2024), who reported that older farmers in rural communities tend to adopt ICT tools when they perceive high benefits in accessing agricultural innovations and extension services. In Southern Taraba, this outcome may reflect the role of elderly household heads in decision-making and agricultural information sourcing.

The result further shows that Farm size was positive and significant at 5% level (Coef. = 0.060; p = 0.048). Farmers cultivating larger land areas were more likely to adopt digital platforms because they typically have greater motivation to improve productivity and market access. This is consistent with Naika et al. (2021), who reported that larger farm holdings increase farmers' demand for timely innovation and extension information. Internet access was positive and significant at 10% level (Coef. = 0.189; p = 0.068). This result underscores the importance of connectivity in enabling digital platform adoption for agricultural innovation. Similar findings were reported by Idris-Adeniyi et al., (2024), who emphasized that rural broadband access strongly predicts technology-based extension usage in Nigeria. The significance of internet access in this study reinforces the need for infrastructure investment in underserved rural areas. Occupation was negative and statistically significant at 5% level (Coef. = −0.148; p = 0.017). This suggests that households not primarily engaged in farming are less likely to adopt digital agricultural platforms. Farmers whose major livelihood depends on agriculture tend to demand more innovation information, consistent with Kabir et al. (2022), who noted that occupation type strongly influences responsiveness to ICT-based extension tools.

Table 5: Socioeconomic Factors Influencing Adoption of Digital Platforms

Variables	Coef.	Std. error	t value	P>/t/
Age (X_1)	0.0134834	0.0030256	4.46	0.000***
Gender (X_2)	0.0692639	0.0811021	0.85	0.395
Education (X_3)	-0.0360779	0.0516697	-0.70	0.486
Farm size (X_4)	0. 0603472	0.0302199	2.00	0.048**
Farming experience (X_5)	-0.0076379	0.012596	-0.61	0.545

Marital status (X_6)	0.0824653	0.0840818	0.98	0.329
Income (X_7)	0.0205244	0.1210945	0.17	0.866
Internet access (X_8)	0.1894815	0.1027301	1.84	0.068*
Occupation (X_9)	-0.1475686	0.0608408	-2.43	0.017**
Constant	1.303269	0.2622379	4.97	0.000***
Pseudo R^2	0.4127			
LR chi^2(9)	73.03			
Prob > chi^2	0.0000			
Log-likelihood	-51.97086			
Number of observations	123			

Source: Field Survey, 2025 *** = 1%, ** = 5% and * = 10%

Challenges in Using Digital Platforms

The results presented in Table 6 highlight the major challenges farmers face in utilizing digital platforms. The findings indicate that poor internet connectivity ranked as the most significant challenge with a mean of 3.34, with 41.5% strongly agreeing and 52.8% agreeing. This aligns with studies by Astuti and Ayinde (2025), which report that unreliable network coverage remains a critical barrier to digital adoption in rural areas of sub-Saharan Africa. Limited broadband penetration and weak ICT infrastructure restrict the efficiency of mobile-based agricultural services, thereby hindering farmers' access to timely market and extension information (Mapiye et al., 2023).

The high cost of data was the second most pressing issue with a mean of 3.13, with 89.4% of respondents agreeing or strongly agreeing. This is consistent with the findings of Kamal and Bablu (2023), who observed that data affordability significantly affects the adoption and sustained use of mobile platforms among smallholder farmers. Despite the increasing penetration of smartphones, recurrent data expenses continue to constrain rural households, especially those operating at subsistence levels. Power supply challenges were also prominent with a mean of 3.07, with 88.9% of respondents agreeing that unstable electricity negatively impacts their access to digital services. Similar studies by Mapiye et al. (2023).confirm that poor electricity infrastructure limits farmers' ability to charge devices and access online platforms consistently. This indicates that energy access is a vital complementary factor in the successful integration of ICT into agriculture.

On the other hand, lack of technical skills with a mean of 2.28 and fragile digital facilities with a mean of 2.10 were ranked lower, although they remain important. About 71.5% of respondents either disagreed or strongly disagreed that language barriers hindered their use of digital platforms with a mean of 1.72. This finding suggests that most platforms in the study area are accessible in widely understood languages, making them relatively inclusive. However, as noted by Yuan et al. (2025), digital literacy remains crucial for maximizing the benefits of agricultural innovations, particularly for less educated farmers. The results underscore that infrastructural challenges particularly internet access, data affordability, and electricity supply pose greater barriers to digital platform adoption than socio-cultural or literacy-related constraints. This implies that improving ICT infrastructure, reducing the cost of mobile data, and investing in rural electrification are critical policy measures to enhance farmers' digital inclusion.

Table 6: Challenges in using digital platforms

Challenges	Strongly agree Freq. (%)	Agree Freq. (%)	Disagree Freq. (%)	Strongly disagree Freq. (%)	Mean	Rank
Poor internet connection limits my access	51(41.5)	65(52.8)	5(4.1)	2(1.6)	3.3415	1st
High cost of data prevents frequent usage	34(27.6)	76(61.8)	8(6.5)	5(4.1)	3.1301	2nd
Power supply issues affect my access.	31(25.5)	78(63.4)	5(4.1)	9(7.3)	3.0650	3rd
Lack of technical skills affects my use of digital tools.	9(7.3)	26(64.2)	79(64.2)	9(7.3)	2.2846	4th
Fragile facility	6(4.9)	35(28.5)	47(38.2)	35(28.5)	2.0976	5th
I face language barriers on digital platforms.	4(3.3)	15(12.2)	47(38.2)	57(46.3)	1.7236	6th

Source: Field survey, 2025

CONCLUSION AND RECOMMENDATIONS

It was concluded that digital extension platforms (Facebook, WhatsApp, and YouTube) have become vital sources of agricultural information, improving knowledge of weather forecasts, pest and disease management, and modern farming techniques, hence bridging the knowledge gap among rural farmers in Southern Taraba.. The use of these platforms was found to enhance adoption of innovations, increase productivity, and improve market access.

Based on the findings from this research, the following recommendations were proffered:

i. Digital extension services should be made simple, low-cost, and interactive platforms for smallholders, while large-scale farmers should be offered advanced digital tools that complement traditional advisory services.
ii. Age friendly digital training that supports older farmers and enhances their confidence in using digital tools should be developed.
iii. Digital advisory services designed to support the needs of medium- and large-scale farmers should be introduced.
iv. Expand rural broadband coverage and establish community Wi-Fi hubs to improve access.
v. Design digital services that fit the schedules of farmers who are engaged in multiple occupations, should be encouraged.
vi. Train extension agents to use digital tools effectively in delivering agricultural information.
vii. Implement continuous digital literacy programs to build farmers' technical capacity.

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