

AGRICULTURAL INFORMATION RECEIVED THROUGH MOBILE-BASED EXTENSION COMMUNICATION AMONG FARMERS IN SOUTH-EAST NIGERIA: A STUDY OF ACCESS AND USE

BLESSING NGOZI ETUH

Nnamdi Azikiwe University, Awka, Anambra State

etuhblessingngozi@gmail.com

07035976948

PROF. CHINWE ELIZABETH UZOUCHUKWU

Nnamdi Azikiwe University, Awka, Anambra State

ce.uzochukwu@unizik.edu.ng

Abstract

Mobile-based communication is increasingly being integrated into agricultural extension as a means of improving farmers' access to timely and relevant agricultural information. However, the usefulness of these platforms depends on the types of information available, the channels through which farmers access them and the constraints affecting sustained use. This study examined the agricultural information received by farmers through mobile-based extension communication in South-East Nigeria, with particular attention to the platforms used, types of information accessed and impediments to effective access. The study adopted a descriptive survey design and used a structured questionnaire to obtain data from farmers across the five states of South-East Nigeria. Data were analysed using descriptive statistics with the Statistical Package for the Social Sciences (SPSS) to determine the mean. Findings indicate that farmers primarily use mobile and social-media platforms to access practical agricultural information, particularly modern farming techniques, pest and disease management and information relevant to their farming needs. However, important information gaps remain, especially concerning government policies, grants and loan opportunities. The findings further reveal that the effectiveness of mobile-based agricultural information access is constrained by affordability and reliability of mobile services, inadequate technical support and other infrastructural limitations. The study concludes that mobile-based communication has considerable potential to strengthen agricultural extension communication, but its effectiveness depends on the relevance and comprehensiveness of information delivered and the conditions under which farmers access it. The study recommends strengthening mobile-based extension through relevant agricultural content, reliable and affordable connectivity, continuous technical support and integration with conventional interpersonal extension services.

Keywords: Mobile-based agricultural extension, Agricultural information, Mobile communication, farmers, Digital media, South-East Nigeria.

Introduction

Agriculture contributes substantially to socio-economic development, food security, employment and the provision of raw materials, making improved agricultural productivity particularly important among subsistence and smallholder farmers. However, farmers' productivity continues to be constrained by climate variability, poor infrastructure, inadequate access to agricultural information, the nature of information received, and weak linkages between farmers and appropriate technologies (International Fund for Agriculture Development IFAD, 2010). These challenges are particularly relevant to farmers in South-East Nigeria, where access to timely and appropriate agricultural information remains important to effective farming practices.

Agricultural extension is fundamentally a communication process through which relevant agricultural knowledge and innovations are transmitted to farmers. The emergence of mobile media has expanded the channels through which this communication can occur. Mobile-based agricultural extension provides opportunities for farmers to access information on farming practices, pest and disease control, weather conditions, farming tools and market opportunities. Aker and Mbiti (2010) and Fadipe (2024) identify mobile communication as an important mechanism for the timely dissemination of agricultural information. However, the availability of mobile channels does not automatically guarantee effective access or use of agricultural information, particularly where inadequate funding, shortages of extension personnel, poor transportation infrastructure, high farmer-to-extension-agent ratios and digital illiteracy persist (Anderson & Feder, 2007; Okeke, Eze & Nwachukwu 2026).

The increasing accessibility of mobile technologies has consequently encouraged their application in agricultural extension. In Nigeria and other developing countries, platforms such as Short Message Services (SMS),

Unstructured Supplementary Services (USSD), Facebook and WhatsApp have been adopted as channels for communicating agricultural information to farmers. Mobile-based communication differs from conventional extension approaches in its ability to transmit information across geographical boundaries, potentially reducing communication costs and increasing farmers' access to extension messages (Aker, 2011; Abubakar, Musa, & Tanko, 2023; Nyarko, Ipsen, Aidoo & Nimoh, 2024).

In Nigeria, government agencies, non-governmental organisations and private-sector actors have promoted agricultural communication through mobile technologies. Initiatives involving SMS information systems and social media platforms have expanded opportunities for rural farmers to obtain agricultural information (Federal Ministry of Agriculture and Rural Development, FMARD, 2022; Obayelu, Afolami, Folorunso, Adebayo, & Ashimolowo, (2022). Existing literature indicates that digital platforms are used to provide information on weather forecasts, pest and disease control, improved seed varieties, fertilizer application, storage techniques and market prices (Chapman & Slaymaker, 2002; Fabregas, Kremer, Robinson, & Schilbach, 2019).

Timely access to such information can improve farmers' preparedness and decision-making (Ogunniyi & Ojebuyi, 2020). However, the effectiveness of mobile-based agricultural extension communication depends not only on the availability of digital channels but also on the quality, relevance, credibility, localisation and accessibility of the information communicated. Generic messages that do not reflect farmers' specific needs and local farming conditions may limit the usefulness of digital extension communication. The existing literature therefore leaves a gap concerning the specific agricultural information farmers in South-East Nigeria receive through mobile-based extension communication and whether such information adequately responds to their farming needs. The present study addresses this gap by examining the agricultural information received by

farmers through mobile-based extension communication in South-East Nigeria, with particular attention to the platforms through which information is accessed and the accessibility and usefulness of the information received.

Statement of the Problem

Agricultural extension is fundamentally a communication activity through which knowledge, innovations and other agricultural information are conveyed to farmers to support decision-making and improve farming practices. However, conventional extension communication in Nigeria continues to face challenges associated with inadequate extension personnel, limited resources, poor transportation infrastructure and the difficulty of reaching geographically dispersed farming communities (Anderson & Feder, 2007). These challenges have increased the relevance of mobile communication technologies as alternative channels for connecting farmers with agricultural information. Mobile phones and social media platforms provide opportunities for extension messages to reach farmers more rapidly and potentially overcome some of the geographical limitations of conventional face-to-face extension. Recent evidence from Nigeria shows that farmers increasingly use mobile phones for agricultural information sharing, including information on pest management and other farming-related issues (Ifeanyi-obi & Iferobia, 2024).

Despite these opportunities, the availability of mobile communication channels does not necessarily mean that farmers have adequate access to relevant agricultural information through them. Access may be affected by the availability and affordability of digital devices and data, network connectivity, farmers' digital competencies, the relevance and credibility of information, and the capacity of extension personnel to use digital platforms effectively. Evidence from South-East Nigeria indicates that extension personnel increasingly use platforms such as WhatsApp and Facebook for agricultural service delivery, suggesting a growing supply-side capacity for digitally mediated extension communication (Udoye & Okoro,

2024). At the same time, evidence from other Nigerian farming communities shows that infrastructural limitations can constrain effective mobile communication even where farmers possess mobile phones (Ifeanyi-obi & Iferobia, 2024). The problem, therefore, is not simply whether mobile technologies exist, but whether the communication process actually delivers relevant, accessible and useful agricultural information to farmers.

This issue is particularly important in South-East Nigeria, where farming remains an important livelihood activity and where the effectiveness of agricultural extension communication can influence farmers' access to knowledge needed for production and marketing decisions. Although studies have examined farmers' use of information and communication technologies and the use of social media by extension personnel in the region, there remains inadequate evidence on the specific categories of agricultural information farmers receive through mobile-based extension communication and the extent to which they access and use such information. For instance, recent research has examined the technological capabilities of extension personnel in the use of social media for service delivery in South-East Nigeria, but this does not fully explain the information experience from the farmers' perspective.

Consequently, an important communication knowledge gap persists. Existing evidence establishes that mobile technologies can facilitate agricultural information exchange, but insufficient attention has been given to the actual information received by farmers through mobile-based extension communication across the five states of South-East Nigeria. Without such evidence, it is difficult to determine whether mobile-based extension communication is adequately responding to farmers' information needs or merely expanding the number of channels through which agricultural messages can be transmitted. This study therefore examines the agricultural information received through mobile-based extension communication among farmers in South-East Nigeria, focusing on the

mobile platforms through which information is accessed and the nature, accessibility and use of the information received.

Research Objectives

The objectives of this study are to:

1. Examine the types of agricultural information received by farmers through mobile-based communication in South-East Nigeria
2. Determine the mobile-based communication platforms through which farmers receive agricultural information in South-East Nigeria.
3. Examine the impediments to farmers' access to agricultural information through mobile-based communication in South-East Nigeria.

Research Questions

The research questions for this study are:

1. What types of agricultural information do farmers receive through mobile-based communication in South-East Nigeria?
2. Which mobile-based communication platforms do farmers use to receive agricultural information in South-East Nigeria.
3. What are the impediments to farmers' access to agricultural information through mobile-based communication in South-East Nigeria?

Conceptual Review

Agricultural Extension Communication

Agricultural extension communication refers to the process through which agricultural knowledge, technologies, innovations and other relevant information are communicated to farmers to enhance their knowledge, decision-making and farming practices. It is therefore more than the simple transmission of technical information; it involves a communication relationship between extension personnel, farmers and other agricultural stakeholders. Effective extension communication requires that information

be understandable, relevant, timely and accessible to the intended audience (Anderson & Feder, 2007).

From a Mass Communication perspective, agricultural extension can be understood as a development communication process in which communication channels are deliberately employed to facilitate knowledge exchange and behavioural or technological change among a defined audience. Ejem, Aremu, Ajakaiye, Ben-Enukora, Akerele-Popoola, Ibiwoye, & Olaniran. (2023) argue that agricultural extension in Nigeria needs to move beyond a predominantly one-way model in which extension agents act as information providers and farmers function merely as recipients. They advocate a more participatory and two-way communication process in which farmers are recognised as active participants and co-designers of agricultural innovations.

The communication process is therefore central to the effectiveness of extension. Information must move from a credible source through an appropriate channel to the farmer, while opportunities for feedback and clarification should exist. Earlier research on ICT-based extension in Nigeria similarly identifies communication technologies as mechanisms for expanding extension outreach, improving information flow, connecting rural communities and facilitating feedback between farmers and extension personnel (Okeke, Nwalieji, & Uzuegbunam, 2015).

This conceptualisation is particularly relevant to the present study because the focus is not simply on farmers' ownership of mobile phones. Rather, the concern is with mobile phones and related digital platforms as communication channels through which agricultural extension information is received and used by farmers.

Mobile-Based Agricultural Extension Communication

Mobile-based agricultural extension communication refers to the use of mobile communication technologies and platforms to facilitate the production, transmission, reception and exchange of agricultural information

between extension personnel, farmers and other relevant actors in the agricultural sector. Such communication may take place through voice calls, SMS, USSD, WhatsApp, Facebook and other mobile-enabled platforms. The increasing use of mobile technologies has expanded the possibilities for agricultural extension because mobile communication can overcome some of the geographical and logistical limitations associated with conventional face-to-face extension. Aker (2011) observes that ICT-based approaches can potentially reduce the cost of communicating agricultural information and improve farmers' access to information that is important for production and market decisions.

Evidence from Nigeria demonstrates that mobile phones have already become part of agricultural information exchange. Egbule, Nwalieji, & Uzuegbunam, (2013), for example, found that extension agents used mobile phones, particularly voice calls and SMS, to communicate information to farmers, including information on crop varieties and markets. Similarly, Ogunniyi and Ojebuyi (2016) found that Nigerian farmers used different mobile-phone features and services for agribusiness, with mobile communication contributing to income generation, reduction in transaction and transportation costs, and farm productivity.

The contemporary mobile environment, however, has expanded beyond conventional calls and SMS. Social media platforms have become increasingly relevant to agricultural communication. In South-East Nigeria, Etuh, Uzochukwu, Nweke & Umeagukwu, (2026) found that extension personnel reported substantial use of WhatsApp and Facebook for agricultural service delivery, this demonstrates that agricultural extension communication is increasingly occurring through interactive digital platforms rather than exclusively through traditional extension encounters. Mobile-based extension communication therefore offers several potential advantages: speed, wider reach, convenience, accessibility, interactivity and opportunities for feedback. Nevertheless, its effectiveness depends on factors

such as network availability, affordability, digital skills, access to suitable devices and the relevance and credibility of the information communicated. Earlier Nigerian evidence has identified poor ICT infrastructure, high costs and inadequate ICT knowledge among farmers as significant constraints to effective ICT-based extension (Okeke et al., 2015).

Agricultural Information

Agricultural information encompasses the knowledge and messages farmers require for making decisions throughout the agricultural production and marketing process. It may include information on weather conditions, improved farming practices, pest and disease management, seeds and other inputs, fertilizer application, market prices, government programmes, credit opportunities, storage and post-harvest management.

The usefulness of agricultural information depends considerably on its timeliness, relevance, accuracy, accessibility and applicability. Information that reaches a farmer after a critical farming decision has already been made may have limited practical value. Similarly, information that does not correspond with the farmer's crop, location or production circumstances may not be readily applicable. Mobile communication provides opportunities to address some of these information challenges by allowing agricultural information to be transmitted more rapidly and repeatedly. Research on mobile-phone use among farmers in Rivers State, for example, found that farmers used mobile phones for sharing agricultural information, with pest management among the information areas reported by respondents.

The information dimension is particularly important because access to a communication channel is not equivalent to access to useful agricultural information. A farmer may possess a mobile phone and even use WhatsApp or SMS without necessarily receiving the information required to address a particular production problem. Consequently, examining the specific categories of agricultural information received provides a more meaningful assessment of the effectiveness of mobile-based extension communication

than simply measuring mobile-phone ownership or frequency of use.

Access and Use of Agricultural Information Through Mobile Communication

Access refers to the opportunity or ability of farmers to obtain agricultural information through available communication channels, while use concerns the extent to which farmers engage with, apply or act upon the information obtained. These concepts are related but should not be treated as synonymous. A farmer may have access to a mobile platform but may not use it effectively because of poor network connectivity, high data costs, limited digital competence, inadequate device functionality or lack of relevant information. Similarly, a farmer may receive agricultural information but choose not to apply it because the information is perceived as unreliable, unsuitable to local circumstances or inconsistent with existing knowledge. This distinction is important in the context of digital agricultural extension.

A review of ICT-based agricultural extension in Nigeria identifies improved information flow and wider outreach as important benefits of ICTs, but also identifies poor infrastructure, inadequate capital and insufficient ICT knowledge as barriers to effective utilisation (Okeke et al., 2015). Recent evidence from rural farmers in Rivers State likewise demonstrates widespread mobile-phone use for agricultural information sharing while highlighting infrastructural limitations such as inadequate electricity supply. The present study therefore approaches access and use from the perspective of the farmer as the receiver and user of mediated agricultural information. This distinction helps to shift the focus from simply asking whether extension agencies have adopted digital platforms to examining whether the communication process actually delivers information that farmers can access, understand and use.

Mobile Platforms as Agricultural Extension Communication Channels

Different mobile platforms perform different communication functions and offer varying degrees of interactivity. SMS provides a

relatively simple text-based channel that can reach users with basic mobile phones and does not necessarily require internet access. It can therefore be useful for short, time-sensitive agricultural messages. Voice calls permit direct interpersonal interaction and immediate feedback between farmers and extension personnel. Nigerian evidence shows that voice calls have been an important component of mobile-based agricultural communication among farmers. WhatsApp provides richer communication possibilities through text, voice messages, images, videos, group discussions and direct interaction. Its potential for agricultural extension is particularly significant because farming problems can sometimes be communicated visually, for example, through photographs of crops, pests or disease symptoms. Facebook provides opportunities for information dissemination through pages, groups, posts, videos and interactive discussion. Evidence from South-East Nigeria indicates that Facebook and WhatsApp are already used substantially by extension personnel for agricultural service delivery. USSD can potentially support farmers who use basic phones and have limited internet access because it does not require smartphone-based internet connectivity. Its usefulness therefore lies partly in its potential to promote inclusiveness in digital extension. The present study's attention to WhatsApp, SMS, Facebook and USSD is consequently important because these platforms represent different levels and forms of mediated communication. Comparing their use provides insight into how farmers engage with different channels for obtaining agricultural extension information.

Review of Related Literature

Mobile-Based Agricultural Extension and Farmers' Access to Information

The integration of information and communication technologies into agricultural extension has increasingly transformed the ways in which farmers access and exchange agricultural information. Mobile technologies provide extension agencies with channels through which information can be

delivered beyond the geographical and logistical limitations of conventional face-to-face extension.

Aker (2011) argues that ICT-mediated extension can reduce information and communication costs while improving farmers' access to knowledge relevant to production and marketing decisions. In Nigeria, the use of mobile phones by extension personnel has similarly been associated with the dissemination of agricultural information to farmers, particularly through voice calls and SMS (Egbule, Nwalieji, Uzuegbunam, 2013). The potential of mobile communication is not limited to the one-way transmission of extension messages. Mobile technologies can facilitate interaction between farmers and extension personnel and create opportunities for farmers to seek clarification, report production problems and obtain information when it is needed.

Okeke et al. (2015) consequently describe ICTs as mechanisms capable of improving information flow and extending the reach of agricultural extension services in Nigeria. This interactive dimension is particularly important from a communication perspective because it shifts agricultural extension from a predominantly source-oriented model towards a process involving information exchange and feedback. More recent studies indicate that this transition is extending from conventional mobile-phone services to social media platforms.

Udoye and Okoro (2024) found that agricultural extension personnel in South-East Nigeria use platforms including WhatsApp and Facebook for agricultural service delivery. Their finding demonstrates the growing importance of social media as part of the contemporary agricultural communication environment. Similarly, recent research among rural farmers in Rivers State indicates that farmers use mobile phones for sharing agricultural information, including information relating to pest management and other farming activities (Ifeanyi-obi & Iferobia, 2024).

These studies establish that mobile technologies have become

relevant channels for agricultural information exchange. However, they leave an important question concerning the content of the communication process. Establishing that farmers or extension personnel use mobile technologies does not necessarily reveal the particular agricultural information farmers receive through those channels. This distinction is important to the present study, which moves beyond mobile-phone use to examine the specific agricultural information received by farmers through mobile-based extension communication in South-East Nigeria.

Agricultural Information Received Through Mobile Communication.

The usefulness of agricultural extension communication depends substantially on whether the information communicated corresponds to farmers' practical information needs. Agricultural information may cover production techniques, weather conditions, pest and disease management, improved inputs, market prices, government programmes, credit opportunities and post-harvest practices. Chapman and Slaymaker (2002) note that ICTs can facilitate rural communities' access to information relevant to agricultural production and livelihoods, while Fabregas et al. (2019) demonstrate the value of timely and locally relevant agricultural information for farmers' decisions. The relevance of agricultural information is particularly important because farming decisions are often time-sensitive. Information on weather conditions, pest and disease outbreaks, input use or market opportunities may lose practical value when it is received too late. Mobile communication potentially addresses this problem by enabling information to reach farmers more quickly and repeatedly.

Aker (2011) therefore identifies improved access to agricultural information as one of the major potential benefits of ICT-mediated extension. However, access to information should not be equated with the availability of information. Information may be technically available through a digital platform but remain inaccessible or underutilised because farmers lack the

necessary digital skills, cannot afford data services, experience poor network connectivity, or find the information unsuitable to their local circumstances. Okeke et al. (2015) identify inadequate ICT knowledge, poor infrastructure and financial constraints among factors limiting effective ICT-based extension in Nigeria. This distinction provides an important basis for the present study. Rather than assuming that the existence of digital agricultural communication automatically satisfies farmers' information needs, the study examines what farmers actually receive. The focus therefore includes information relating to modern farming practices, weather, pest and disease management, markets and other agricultural concerns represented in the study's questionnaire.

Mobile Platforms and Farmers' Information-Seeking Behaviour

Different mobile platforms offer different possibilities for agricultural communication. SMS, for instance, allows short text messages to be transmitted to farmers using basic mobile phones and can therefore support the delivery of brief and time-sensitive information. Voice calls provide opportunities for direct interpersonal communication and immediate feedback. Egbule et al. (2013) found that mobile-phone communication, particularly calls and SMS, was used by extension personnel to communicate agricultural information to farmers. The development of internet-enabled smartphones has expanded these possibilities. WhatsApp permits text, voice, image, video and group communication, thereby allowing farmers and extension personnel to exchange more detailed and interactive agricultural information. Facebook similarly provides opportunities for information dissemination through pages, groups, posts, videos and discussions. Evidence from South-East Nigeria that extension personnel use WhatsApp and Facebook for agricultural service delivery illustrates the growing importance of social media in the agricultural communication environment (Udoeye & Okoro, 2024).

Ogunniyi and Ojebuyi (2016) also found that farmers in South-West

Nigeria used mobile-phone services for agribusiness activities and that mobile communication could contribute to reduced transaction and transportation costs as well as improved agricultural activities. Although their study was not specifically restricted to agricultural extension information, it demonstrates the broader role of mobile communication in farmers' information and economic activities.

Nevertheless, the mere use of a mobile platform does not establish the effectiveness of the communication process. The same farmer may use a mobile phone frequently but receive little agricultural information through it, while another farmer may use a particular platform specifically for obtaining extension information. Consequently, the present study focuses specifically on mobile platforms as channels for agricultural extension communication, rather than treating general mobile-phone ownership or use as evidence of agricultural information access.

Constraints to Effective Mobile-Based Agricultural Extension Communication

Although mobile technologies offer considerable opportunities for agricultural communication, their effectiveness can be constrained by technological, economic and human factors. Okeke et al. (2015) identified poor ICT infrastructure, high costs and inadequate ICT knowledge as important limitations to the use of ICTs in Nigerian agricultural extension. Such constraints can affect both the sender and receiver of agricultural information. At the farmer level, access to a suitable mobile device and reliable network connection is necessary for effective digital communication. The cost of data and other communication services may also determine how frequently farmers can access online agricultural information. Recent evidence from rural farmers in Rivers State indicates that although mobile phones are used for agricultural information sharing, infrastructural challenges remain relevant to effective utilisation (Ifeanyi-obi & Iferobia, 2024). There are also communication-quality challenges,

agricultural information may be difficult to use when it is not sufficiently relevant to the farmer's location, production system or immediate needs.

Similarly, information that farmers perceive as unreliable may not result in behavioural or production changes. These issues demonstrate that effective digital extension requires more than technological availability; it requires accessible channels, appropriate content, credible information and opportunities for interaction and feedback. The present study responds to this concern by examining not only the platforms through which farmers receive agricultural information but also the nature of the information received and the challenges associated with accessing it. This provides a more comprehensive understanding of mobile-based agricultural extension communication from the receiver's perspective.

Research Gap

The reviewed literature demonstrates that mobile technologies have created important opportunities for extending agricultural communication beyond the limitations of conventional extension. Existing studies have established the usefulness of mobile phones for agricultural information exchange (Egbule et al., 2013; Ogunniyi & Ojebuyi, 2016), identified ICTs as mechanisms for improving the reach of extension services (Okeke et al., 2015), and more recently documented the use of social media by extension personnel in South-East Nigeria (Udoeye & Okoro, 2024). Other studies have also shown that farmers use mobile phones to share and obtain agricultural information (Ifeanyi-obi & Iferobia, 2024). However, the following gaps were revealed. First, much of the existing research focuses on whether farmers or extension personnel use ICTs, rather than examining the specific agricultural information farmers receive through those channels. Second, studies that examine mobile agricultural communication often consider the technology broadly, without sufficiently distinguishing among SMS, WhatsApp, Facebook, USSD and other communication platforms. Third, there remains limited evidence that brings together the type of agricultural

information received, the platforms used, and the accessibility and use of that information across the five states of South-East Nigeria. The present study addresses these gaps by examining agricultural information received through mobile-based extension communication among farmers in Anambra, Abia, Ebonyi, Enugu and Imo States. By focusing on the farmer as the receiver and user of mediated agricultural information, the study extends existing literature beyond the question of technology adoption to examine the content and communication value of the information that actually reaches farmers.

Theoretical Framework

Diffusion of Innovations Theory

This study is anchored on Diffusion of Innovations (DOI) Theory, developed by Rogers (2003), it explains how new ideas, practices, technologies or innovations spread through a social system over time. Rogers defines diffusion as the process through which an innovation is communicated through particular channels over time among members of a social system. The theory identifies four major elements of diffusion: the innovation, communication channels, time and the social system (Rogers, 2003).

The theory is particularly relevant to the present study because mobile-based agricultural communication represents an innovation in the way agricultural extension information is communicated to farmers. Technologies and platforms such as WhatsApp, SMS, Facebook and USSD provide alternative channels through which farmers can receive agricultural information. Their adoption, however, depends not merely on their availability but also on how farmers perceive and experience their usefulness, accessibility and compatibility with their information needs and circumstances.

Rogers (2003) identifies five perceived attributes of an innovation that influence its rate of adoption: relative advantage, compatibility, complexity, trialability and observability. Relative advantage refers to the

degree to which an innovation is perceived as better than the practice it replaces. In the context of this study, farmers may perceive mobile-based communication as advantageous because it can provide agricultural information more quickly and conveniently than relying exclusively on conventional face-to-face extension. Compatibility concerns the extent to which an innovation is consistent with existing values, experiences and needs. Thus, farmers are more likely to use a mobile communication platform when the information and communication process fit their farming activities and information requirements. Complexity refers to the perceived difficulty associated with understanding or using an innovation. This dimension is particularly relevant to mobile-based agricultural communication because farmers' digital literacy and familiarity with different platforms may influence their ability to access agricultural information. A platform that is difficult to operate may discourage use, whereas a familiar and relatively simple platform may encourage adoption. Trialability refers to the extent to which an innovation can be experimented with before full adoption, while observability concerns the extent to which the results or benefits of an innovation are visible to others (Rogers, 2003).

The DOI Theory provides a useful framework for explaining the relationship between mobile communication platforms and farmers' access to agricultural information in South-East Nigeria.

The innovation in this study is represented by mobile-based communication technologies and platforms used for agricultural information exchange. These include WhatsApp, SMS, Facebook and USSD. The study therefore examines the extent to which these emerging communication channels have become part of farmers' agricultural information environment; communication channels constitute a central element of the theory and directly correspond with the second objective of this study. The study seeks to determine the mobile-based platforms through which farmers receive agricultural information. This is important because different channels

provide different communication possibilities. SMS, for example, is primarily text-based, while WhatsApp and Facebook can facilitate richer and more interactive communication through text, images, audio, video and group interaction; the theory's emphasis on the social system is relevant to the South-East Nigerian agricultural context. Farmers operate within communities where information, farming practices and technological experiences can be shared among peers. The adoption of mobile-based agricultural communication may therefore be influenced by the experiences of other farmers, extension personnel and relevant agricultural institutions; the theory helps explain the impediments to access and adoption identified in the study. Where farmers perceive mobile communication technologies as complex, costly, inaccessible or incompatible with their circumstances, adoption may be limited. Similarly, poor network connectivity, inadequate digital literacy and other barriers can reduce the ability of farmers to benefit from mobile-based agricultural information. These factors are therefore important in interpreting the third objective of the study. Finally, DOI provides a useful basis for understanding why the availability of a technology does not automatically result in effective adoption. Farmers may have access to mobile phones but differ in the extent to which they use particular platforms for agricultural information. Their decisions may depend on the perceived advantages, compatibility, complexity and observable benefits of the communication technology (Rosgers, 2003).

Methodology

The study adopted a descriptive survey research design using a quantitative approach. The design was considered appropriate because the study sought to obtain information directly from farmers concerning their access to and receipt agricultural information through mobile-based communication platforms.

The population of the study comprised of all registered farmers in South-East Nigeria. However, reports from National Agricultural Sample

Census (NASC) in 2022 showed that the population of registered farmers in South-East is 664,240. At the time of this review, no newer official farmer population figures had been released. Therefore, the population for this study was 664,240.

The population by State

States	Registered Farmers
Anambra	160,000
Enugu	80,000
Ebonyi	190,000
Imo	109,000
Abia	125,000
Total	664,240

National Agricultural Sample Census (NASC) 2022 by National Bureau of Statistics

This study adopted the Meyer sample size determination formula to arrive at the sample size for this study. Meyer (1973) presents a population and sample size range for studies as follows.

Table 3: Population and sample sizes as determined by Meyer

S/N	Population	Sample Size
1	Infinity	385
2	500, 000	384
3	100, 000	383
4	50, 000	381
5	10, 000	370
6	5, 000	357
7	3, 000	341
8	2, 000	322
9	1, 000	278

Meyer (1973), sample size determination formula

Since the researcher's study population was 664,240, the sample size of this study was 385. This sample size considered appropriate and to ensure proportionality, proportion statistics as stated below was used.

$$R = \frac{I \times S}{N}$$

Where R = Number of respondents allotted to each State

I = Resident population of each State

N = Total population of the five States sampled

S = Sample size.

The population and sample size per state

States	Registered Farmers	Sample
Anambra	160,000	93
Enugu	80,000	47
Ebonyi	190,000	110
Imo	109,000	63
Abia	125,000	72
Total	664,240	385

A multi-stage sampling procedure was employed, involving a purposive selection of the five states of South-East Nigeria, systematic selection of agricultural zones, local government areas were identified with the assistance of relevant agricultural authorities. Twenty local government areas were selected, from which two communities were randomly selected from each local government area, producing forty communities. The required sample was then proportionately distributed across the five states based on their respective registered-farmer populations. Within the selected communities, systematic random sampling was used to select the participating farmers. A structured questionnaire was used to collect quantitative data on mobile communication platforms, agricultural information received and impediments to access. The questionnaire was subjected to expert review for

content validity and pre-tested among 20 farmers outside the study area, using a test-retest procedure and the instrument yielded a reliability coefficient of 0.82. Of the 385 copies of questionnaire administered, 381 were retrieved and found usable for analysis, representing a 98.96% response rate.

The copies of questionnaire were administered with the help of two trained research assistants. Data were collected using a structured questionnaire developed in line with the objectives of the study. The questionnaire elicited information on respondents' socio-demographic characteristics, mobile-based communication platforms used for agricultural information, agricultural information received through the platforms and factors that impede access to mobile-based agricultural communication. Data were analysed using frequency distribution, percentages and mean scores with the Statistical Package for the Social Sciences (SPSS).

Data Analysis

Table 2: Mobile media platforms adopted by farmers

State	WhatsApp	SMS	Facebook	USSD	None	Total
Anambra	33	25	16	0	19	93
Enugu	17	12	8	0	10	47
Imo	22	17	11	0	13	63
Abia	25	19	12	0	15	71
Ebonyi	37	28	23	0	19	107
Total	134	101	70	0	76	381

Source: Field survey, 2026.

The findings indicate a clear preference for interactive and relatively accessible mobile platforms, with WhatsApp emerging as the dominant channel for agricultural communication, followed by SMS and Facebook. The prominence of WhatsApp suggests that farmers increasingly rely on platforms that permit not only the receipt of agricultural information but interactive, sharing and peer learning. The absence of reported USSD use, however points to a possible limitation in the range of mobile channels

currently utilised for agricultural extension communication. More importantly, the proportion of farmers who did not report using any of the listed platforms indicates that mobile-based agricultural communication has not yet reached all farmers in the study areas. This suggests that technological availability alone does not guarantee access to agricultural information and that communication strategies need to accommodate farmers who remain outside the dominant digital platforms.

Table 3: Agricultural Information Farmers Receive Through Mobile Media for Agricultural Extension.

Variables	SA	A	N	D	SD	T	M
I receive timely weather-related information on my phone that helps me to plan my farming activities.	45 11.8%	134 35.2%	101 26.5%	67 17.6%	34 8.9%	381 100	3.23
I receive regular updates on market prices for my farm produce	62 16.3%	162 42.5%	56 14.7%	45 11.8%	56 14.7%	381 100	3.34
I receive reliable information on pest and disease control	53 13.9%	194 50.9%	56 14.7%	56 14.7%	22 5.8%	381 100	3.52
I expect access to modern farming techniques through digital platform	162 42.5%	136 35.7%	42 11.0%	34 8.9%	7 1.8%	381 100	4.08
I receive information on government policies, grants and loan opportunities for farmers	22 5.8%	90 23.6%	56 14.6%	146 38.3%	67 17.7%	381 100	2.59
Agricultural extension officers send me useful messages or calls through digital media.	112 29.4%	89 25.5%	89 23.5%	24 6.3%	67 18.7%	381 100	3.44
Government policies, grants and loans	22 5.8%	90 23.6%	56 14.6%	146 38.3%	67 17.7%	381 100	2.59
Specific agricultural information needed by farmers	78 20.5%	201 52.8%	45 11.8%	34 8.9%	23 6%	381 100	3.79
Self-directed search for farming information	100 26.2%	168 44.1%	34 8.9%	56 14.7%	23 6%	381 100	3.70
Useful messages/calls from extension officers	112 29.4%	89 25.5%	89 23.5%	24 6.3%	67 18.7%	381 100	3.44

Source: Field survey, 2026.

The findings indicate that mobile-based agricultural communication is functioning primarily as a channel for practical, production-oriented and farmer-directed information. Farmers appear to derive considerable value from information that can be translated directly into farming activities,

particularly modern farming techniques, pest and disease management, information searches and learning through WhatsApp and Facebook. This suggests that mobile communication is moving beyond one-way dissemination towards a more participatory information environment in which farmers can actively search for knowledge and learn through social platforms.

The particularly strong position of modern farming techniques is significant because it demonstrates the perceived utility of mobile-based communication for practical agricultural knowledge. Farmers are not merely accessing general information; they are using digital platforms to obtain knowledge that can potentially influence farming practices. The finding is consistent with the broader evidence in the PhD study, where farmers reported using WhatsApp and Facebook as important sources of agricultural information and described applying information obtained from these platforms to farming activities.

The finding also supports Aker (2011), who established the potential of ICT-based communication to improve agricultural information flows between extension providers and farmers. It is similarly consistent with Mittal and Mehar (2016), whose work identified mobile phones and social networking platforms as useful channels for agricultural information. The result further accords with the literature cited in the manuscript showing that mobile platforms can support information on weather, pest and disease management, market opportunities and improved farming practices.

From the perspective of Diffusion of Innovations Theory, the pattern reflects the principle of relative advantage. Farmers are more likely to engage with a communication technology when it provides information that is useful to their immediate agricultural activities. The prominence of practical farming information therefore suggests that the perceived usefulness of the information strengthens the value of the communication channel. The finding also reflects compatibility, since the information accessed is closely

connected to farmers' existing farming practices and information needs. Rogers' framework therefore helps explain why farmers gravitate towards platforms that provide actionable information rather than simply adopting technology because it is available.

However, the findings reveal a significant weakness in the institutional dimension of agricultural information delivery. Information concerning government policies, grants and loan opportunities records the weakest position among the information categories. This is important because such information can directly connect farmers with government interventions, financial support and agricultural programmes. The weakness therefore suggests that mobile agricultural communication is more effective in communicating production knowledge than institutional opportunities.

This finding is particularly important because it exposes a gap between information availability and information usefulness for broader agricultural participation. A farmer may receive advice on farming techniques but remain disconnected from programmes that provide the resources needed to implement those techniques. The finding therefore supports the argument in the manuscript that the relevance, completeness and contextual appropriateness of agricultural information matter alongside technological access. The result on information relevance is also noteworthy. Farmers generally regarded the information received as relevant to their farming needs, suggesting a reasonable degree of content-user compatibility. Nevertheless, the simultaneous evidence of inadequate access to some specific information indicates that relevance should not be equated with completeness. In other words, farmers may find the information they receive useful while still experiencing gaps in particular areas of agricultural knowledge.

The implication is that agricultural extension agencies should move beyond simply increasing the volume of digital messages. The priority should be to ensure that the information delivered is timely, specific, locally

relevant and connected to farmers' actual decisions and support needs. Government policies, grants, loans and other institutional opportunities should be deliberately integrated into mobile extension communication rather than left outside the mainstream information flow.

Impediments to Farmers' Access to Agricultural Information Through Mobile-Based Communication

Variables	SA	A	N	D	SD	T	M
I often lack access to the specific agricultural information I need	78 20.5%	201 52.8%	45 11.8%	34 8.9%	23 6%	381 100	3.79
Many mobile-based agricultural platforms are in English, making it difficult for me to understand information provided	13 3.4%	80 21%	22 5.8%	117 30.7%	149 39.1%	381 100	2.19
The high cost of mobile data limits my ability to use mobile-based agricultural platforms	94 24.8%	196 51.5%	38 9.9%	12 3.1%	41 10.7%	381 100	3.76
I struggle with understanding how to use mobile-based agricultural apps and platforms	45 11.8%	123 32.3%	56 14.7%	112 29.4%	45 11.8%	381 100	3.02
The frequent breakdown of mobile-based agricultural services affects my ability to rely on them for farming decisions.	101 26.6%	167 43.8%	34 8.9%	34 8.9%	45 11.8%	381 100	3.64
I struggle to access agricultural information due to no or poor internet connectivity	117 30.4%	185 49.1%	22 5.9%	45 11.7%	12 2.9%	381 100	3.92

Source: Field survey data, 2026.

The results show that several barriers occupy a moderate rather than dominant position. These include device access, information relevance, trust, real-time interaction and difficulty using applications. This suggests that the principal challenge is not widespread inability to operate mobile technology. Rather, the more substantial problem lies in whether farmers can afford, reliably access and receive adequate institutional support for the communication services.

This finding is theoretically significant within the Diffusion of Innovations framework. Rogers (2003) argues that the adoption of an innovation is influenced by perceived characteristics such as relative advantage, compatibility and complexity. In the present study, the relatively

moderate concern about difficulty using applications suggests that complexity is not the dominant barrier. Instead, the stronger constraints associated with affordability, service reliability and technical support indicate that the diffusion environment itself is restricting the realisation of the innovation's benefits.

The high mean score for the statement that farmers often lack access to the specific agricultural information they need suggests that, although mobile-based communication has created opportunities for agricultural information delivery, it has not completely resolved the problem of information accessibility. Farmers may still experience difficulty obtaining information that is timely, relevant and tailored to their particular farming activities. However, the result regarding the use of English on mobile-based agricultural platforms presents a different pattern. The relatively low mean score indicates that language, particularly the use of English, is not perceived as a major impediment to farmers' understanding of information provided through these platforms. This suggests that farmers are generally able to comprehend the language used in mobile agricultural communication, or that other factors are more significant barriers than language.

The cost of mobile data emerges as one of the more prominent constraints. The high mean score shows that the financial cost associated with accessing mobile services constitutes a substantial limitation to farmers' ability to use mobile-based agricultural platforms. This has an important implication because the availability of a digital agricultural services does not necessarily translate into effective access. Where farmers have to bear recurring data costs, particularly in rural and economically constrained settings, sustained engagement with digital extension services may be difficult. The finding on farmers' difficulty in understanding how to use mobile-based agricultural applications and platforms produces a mean that is approximately at the decision threshold. This suggests that digital skills constitute a moderate rather than overwhelming barrier. It indicates that some

farmers may require guidance or orientation in navigating agricultural applications and platforms, but the problem is not sufficiently strong to be regarded as the dominant constraint among the issues examined.

Another important finding concerns the frequent breakdown of mobile-based agricultural services. The relatively high mean indicates that reliability of the digital communication infrastructure is a significant concern. Where agricultural platforms or mobile services are frequently interrupted, farmers cannot depend consistently on them when making farming decisions. This undermines the effectiveness of mobile-based extension communication because agricultural information is often time-sensitive, particularly in relation to weather, pest and disease outbreaks, input application and other production decisions. The strongest concern in the table relates to poor internet connectivity. The high mean score demonstrate that inadequate connectivity constitutes a major obstacle to farmers' access to agricultural information. This is a particularly important because several mobile-based agricultural services depend on reliable network and internet infrastructure. Thus, even where farmers possess mobile devices and are willing to use digital agricultural platforms, poor connectivity can prevent them from accessing information when it is needed. The principal constraints to mobile-based agricultural information access are structural and institutional, particularly affordability, service reliability and technical support, rather than an outright inability or unwillingness of farmers to use mobile technologies.

Discussion of Findings

The findings provide evidence that mobile-based communication has become an important component of agricultural information access among farmers in South-East Nigeria, although its use is neither uniform across platforms nor free from structural constraints. The results are particularly significant because they show that farmers' engagement with mobile communication is driven more by the practical value of agricultural

information than by technology ownership alone. This interpretation is consistent with the Diffusion of Innovations Theory, which proposes that adoption is influenced by the perceived relative advantage, compatibility and complexity of an innovation (Rogers, 2003). In this study, the usefulness of the information available through mobile platforms appears to be an important basis for their continued use.

The findings indicate a clear preference for WhatsApp, followed by SMS and Facebook, while USSD was not reported as a channel for accessing agricultural information. The prominence of WhatsApp suggests that farmers are increasingly using platforms that permit not only the receipt of information but also interaction, sharing and informal learning. This is important because it indicates a movement from a predominantly one-way extension model towards a more interactive communication environment. This finding agrees with the study by Ifeanyi-obi and Iferobia (2024) among rural farmers in Rivers State, which found that WhatsApp and Facebook were among the mobile-phone-based sources used for agricultural information, although voice calls, phone radio and text messaging were more universally used in that study.

However, there is an important difference between the present finding and the Rivers State evidence. While the Rivers study reported universal use of voice calls, phone radio and text messaging, with WhatsApp and Facebook used by substantial proportions of farmers, the present study places WhatsApp at the forefront of the platforms examined. This difference may reflect changes in the digital communication environment as well as differences in the socio-technological characteristics of the study areas. More importantly, it suggests that there may no longer be a single dominant mobile channel for agricultural extension across Nigerian farming communities. Platform preference appears to be context-dependent.

The absence of reported USSD use is also noteworthy. USSD has

traditionally been regarded as a potentially useful low-bandwidth channel because it does not require a smartphone or conventional internet connection. Its non-use in the present study therefore suggests that the mere technical suitability of a platform does not guarantee its incorporation into agricultural extension practice. This may point to limited awareness, limited availability of agricultural USSD services, or weak institutional deployment of such services. Since the present data do not establish which of these explanations is responsible, further investigation would be required.

The finding that some farmers did not use any of the listed platforms is equally important. It demonstrates that digital agricultural communication has not completely displaced other channels of extension communication; farmers and extension personnel described a combination of mobile and interpersonal communication channels rather than a complete substitution of face-to-face extension. Thus, the present study supports a complementary rather than substitutional model of mobile agricultural extension.

From the standpoint of Diffusion of Innovations Theory, this pattern suggests that compatibility is important. Farmers are more likely to incorporate mobile communication into existing information practices when the technology complements rather than completely replace familiar extension relationships. The implication is that extension agencies should not abandon interpersonal extension in favour of digital platforms; rather, mobile communication should strengthen the existing extension system.

The findings further show that the information farmers most readily accessed through mobile-based communication was predominantly practical and production-oriented, particularly information relating to modern farming techniques, pest and disease management, and farmer-directed searches and learning through social-media platforms. This indicates that farmers are using mobile communication not simply for general agricultural awareness but for information that can potentially inform actual farming decisions.

This finding strongly agrees with Ifeanyi-obi and Iferobia (2024),

who identified pest-management information among the principal agricultural information shared through mobile phones among rural farmers in Rivers State. It is also consistent with the earlier study by Egbule, Agwu and Uzokwe (2013), which found that mobile phones were used by extension agents to disseminate information concerning new crop varieties, markets and farming practices. The convergence across these studies suggests that mobile communication has particular value for disseminating specific, actionable agricultural information.

There is, however, an important area of disagreement, Egbule et al. (2013) found that extension agents used mobile phones considerably for information concerning new crop varieties and markets, whereas the present study reveals a comparatively weaker position for information relating to government policies, grants and loan opportunities. This difference suggests that the problem may not be the capacity of mobile communication to carry institutional information but rather what extension institutions choose to communicate through the platforms available to farmers. This is a significant finding for agricultural communication. If farmers are receiving information about production techniques but have limited access to information about grants, loans, government programmes and related opportunities, mobile extension is performing primarily as a technical information service rather than a comprehensive agricultural support system. The implication is that extension communication should integrate production information with information about the institutional resources required to implement recommended practices.

The finding that farmers consider much of the information relevant to their farming needs also supports the relative advantage component of Diffusion of Innovations Theory. An innovation is more likely to be accepted where users perceive a meaningful advantage over existing practices (Rogers, 2003). In the present context, the advantage is not simply speed of communication; it is the ability to obtain information that farmers consider

useful for their immediate agricultural activities.

Nevertheless, the findings should not be interpreted as evidence that mobile communication has solved farmers' agricultural information needs. The simultaneous evidence of information gaps indicates that usefulness and completeness are different dimensions of information access. Farmers may find the information they receive useful while still lacking specific categories of information. This distinction is important because it shifts the focus from simply increasing the volume of digital messages to improving their coverage, relevance, timeliness and responsiveness.

The findings on impediments reveal that the major barriers are predominantly economic, infrastructural and institutional. In particular, the cost of mobile data, interruptions in mobile services and inadequate technical support emerge as more consequential constraints than farmers' outright inability to use mobile applications. This finding agrees strongly with Abdullahi, Oladele, & Akinyemi, (2021), whose study of farmers' use of mobile-phone applications in North-West Nigeria identified high phone costs, poor network, poor power supply, high airtime costs and complexity of phone operation as important constraints. It also agrees with Haruna, Jamilu, Abdullahi & Murtala (2013), who identified high service charges and poor-quality mobile phones and accessories among the major constraints affecting effective mobile-phone use by farmers in Kaduna State.

The present finding therefore reinforces an important pattern in Nigerian agricultural communication research: access to mobile technology is not equivalent to meaningful digital access. A farmer may own a phone and be aware of agricultural platforms but still be unable to use them consistently because of the cost of connectivity, network reliability, electricity or insufficient technical support. The finding also agrees with Ogunniyi and Ojebuyi (2016), who reported that infrastructural deficiencies, particularly epileptic electricity supply, hindered effective mobile-phone use among farmers in South-West Nigeria. Similarly, the Rivers State study reported

substantial access to the internet alongside inadequate power supply, demonstrating that infrastructural conditions can restrict the benefits obtainable from mobile agricultural communication even where connectivity exists.

There is, however, a useful difference in emphasis between the present study and some earlier studies. Earlier research frequently identifies poor network, inadequate electricity and difficulty operating phones as dominant constraints. In the present study, the stronger impediments are more closely associated with affordability, service reliability and technical support, while some technology-use difficulties occupy a less pronounced position. This may indicate a gradual transition in the nature of the digital divide. As farmers become more familiar with mobile technologies, the central question may increasingly shift from “Can farmers use the technology?” to “Can farmers afford and reliably sustain its use? This interpretation is particularly important for the Diffusion of Innovations Theory. The theory's emphasis on relative advantage, compatibility and complexity explains farmers' willingness to engage with useful mobile platforms, but the present findings demonstrate that adoption also operates within a broader structural environment. A technology may possess considerable relative advantage and be sufficiently compatible with farmers' practices, yet its benefits may remain limited when connectivity is expensive or unreliable. The finding concerning farmers' continued preference for traditional extension communication is also significant. It indicates that digital communication should not be conceptualised as a complete replacement for interpersonal extension. This differs from a purely technology-centred view in which digital platforms are assumed to automatically supersede conventional communication. Instead, the findings suggest that farmers may benefit most from a hybrid extension model, combining mobile platforms with direct interaction with extension personnel.

Conclusion and Recommendation

This study concludes that mobile-based communication has become a relevant channel for accessing agricultural information among farmers in South-East Nigeria. Its value, however, is more evident in the delivery of practical and production-oriented information than in providing comprehensive agricultural support. Information on modern farming techniques, pest and disease control, farmer-specific information needs and learning through WhatsApp and Facebook emerged as particularly important, indicating that farmers value mobile communication when it provides knowledge that is directly applicable to their farming activities.

Overall, mobile-based agricultural extension should therefore be understood as a complement to existing agricultural extension communication rather than a complete substitute for interpersonal extension. Its greatest potential lies in extending the reach, timeliness and accessibility of agricultural information while remaining connected to responsive extension personnel and farmers' existing community communication structures. Based on the findings, the study recommends the following:

1. Agricultural extension agencies should institutionalise the use of WhatsApp, SMS and Facebook for agricultural information dissemination rather than relying on their occasional or informal use. Dedicated farmer groups, verified extension pages and targeted SMS alerts should be developed around farmers' specific information needs.
2. Extension agencies should broaden mobile-based agricultural communication beyond production techniques and pest and disease information to include government agricultural policies, grants, loans, input-support programmes, insurance opportunities, market opportunities and other relevant institutional services. The finding of limited access to information on government policies, grants and loans makes this particularly necessary.

3. Government and relevant telecommunications stakeholders should develop measures that improve affordable and reliable connectivity in farming communities, including rural network expansion and appropriate agricultural data-support initiatives. Access to a mobile platform is of limited value when farmers cannot consistently afford or connect to the service.
4. Mobile communication should be integrated with face-to-face extension, community networks and interpersonal communication, rather than being promoted as a replacement for them. This is particularly important because the parent study found continued reliance on community networks, peer learning and interpersonal interaction in farmers' interpretation and application of agricultural information.

Abubakar, T., Musa, M., & Tanko, A. (2023). Influence of socio-economic characteristics of farmers on their preference for different sources of agricultural information in Wukari Local Government Area of Taraba State, Nigeria. *Proceedings of Agricultural Extension Society of Nigeria (AESON) Conference*, 28(2), 45–54.

Abdullahi, K.A., Oladele, O. I., & Akinyemi, M. (2021). Attitude, knowledge and constraints associated with the use of mobile phone applications by farmers in North West Nigeria. *Journal of Agriculture and Food Research*, 6, 100212. <https://doi.org/10.1016/jFR.2021.100212>

Aker, J. C. & Mbiti, I. B. (2010) Mobile phones and economic development in Africa *Journal of Economic Perspective*. (working paper) 24 (3), 207 – 232.

Aker, J. C. (2011). Dial “A” for agriculture: A review of information and communication technologies for agricultural extension in developing countries. *Agricultural Economics*, 42(6), 631-647. <https://doi.org/10.1111/j.1574-0862.2011.00545.x>

- Anderson, J., & Feder, G. (2007). Agricultural extension. In Evenson, R & Pingali, P. (Eds.), *Handbook of Agricultural Economics* (Vol. 3, pp. 2343–2378). Elsevier.
- Chapman, R., & Slaymaker, T. (2002). *ICTs and rural development: Review of the literature, current interventions and opportunities for action* (Working Paper No. 192). Overseas Development Institute.
<https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion>.
- Etuh, Uzochukwu, Nweke & Umeagukwu (2026) Comparative study on the mobile media platforms adopted by farmers for mobile-based agricultural information and communication in South-East Nigeria. *African Journal of Sustainable Agricultural Development* ISSN: 2714-4402. Vol.7, Number 2 (2026)
<https://doi.org/10.46654/rjtq6c88>
- Ejem, A. A., Aremu, C. O., Ajakaiye, O. O. P., Ben-Enukora, C., Akerele-Popoola, O. E., Ibiwoye, T. I., & Olaniran, A. F. (2023). Perspectives on communicating 21st-century agricultural innovations to Nigerian rural farmers. *Journal of Agriculture and Food Research*, 11, [100511](#).
- Fabregas, R., Kremer, M., Robinson, J., & Schilbach, F. (2019). *The value of local agricultural information: Evidence from Kenya*. *Science*, 366(6471), <https://doi.org/10.1126/3038>
- Fadipe, O. O., Ilori, T. E., Adewunmi, O. O., & Oladele, O. I. (2024). Determinants of utilisation of social media for agricultural extension service delivery in Ogun State, Nigeria. *Nigerian Agricultural Journal*, 55(1), 48-58.
<https://www.ajol.info/index.php/naj/article/view/295521>
- Federal Ministry of Agriculture and Rural Development (FMARD). (2022). *National agricultural technology and innovation policy (NATIP) 2022–2027*. Abuja, Nigeria: FMARD.
Retrieved from <https://agriculture.gov.ng/wp-content/uploads/2024/06/National-Agricultural->

- Haruna, S. K., Jamilu, A. A., Abdullahi, A. Y., & Murtala, G. B. (2013). Ownerahipand use of mobile among farmers in North Senatorial Zone of Kaduna State. *Journal of Agricultural Extension*, 17(2). <https://doi.org/10.4314/jae.v17i2.7>
- Ifeanyi-obi, C. C., & Iferobia, G. C. (2024). Assessment of mobile phone usage for agricultural information sharing among rural farmers in Agricultural Zone One, Rivers State. *Journal of Agricultural Extension*, 28(4), 70–79.
- International Fund for Agricultural Development IFAD (2010), *Rural poverty in Nigeria*. Available at <http://www.ruralpovertyportal.org/country/home/tags/nigeri>
- Masuka, B., Matenda, T., Chipomho, J., Mapope, N., Mupeti, S., Tatsvarei, S., & Ngezimana, W. (2016). Mobile phone use by small-scale farmers: A potential to transform production and marketing in Zimbabwe. *South African Journal of Agricultural Extension*, 44(2), 121–135. <https://doi.org/10.17159/2413-3221/2016/v44n2a406>
- Mwangi, J. K., Kamua, P.N., & Kibet, J. K. (2025). Mobile communication technologies and agricultural information dissemination among smallholder farmers in Kenya. *African Journal of Agricultural Research*, 21(4), 215-227.
- Nyarko, G., Ipsen, M., Aidoo, R., & Nimoh, F. (2024). Promoting the adoption of climate-smart agricultural technologies among maize farmers in Ghana: Using digital advisory services. *Mitigation and Adaptation Strategies for Global Change* 29(19). <https://doi.org/10.1007/s11027-024-10116-6>
- Obayelu, A. E., Afolami, C. A., Folorunso, O., Adebayo, A. M., & Ashimolowo, O. R. (2022). Factors influencing use of mobile-based ICTs among cassava value chain operators in Southwest Nigeria. *Nigeria Agricultural Journal*, 53(3), 120–131.
- Ogunniyi, D. M., & Ojebuyi, B. R. (2016). Mobile phone use for agribusiness by farmers in Southwest Nigeria. *Journal of Agricultural Extension*, 20(2), 172–87. <https://doi.org/10.4314/jae.v20i2.13>

- Ogunniyi, A., & Ojebuyi, B. R. (2020). Rural farmers' use of mobile phones for agribusiness in Southwest Nigeria. *Journal of Agricultural Informatics*, 11(2), 13–23. <https://doi.org/10.17700/jai.2020.11.2.538>
- Okeke, C. N., Eze, V. C., & Nwachukwu, I. N. (2026). Challenges affecting the use of mobile agricultural extension technologies among rural farmers in South-East Nigeria. *Nigerian Journal of Journal of Agricultural Extension*, 27(1), 66-82.
- Okeke, M. N., Nwalieji, H. U., & Uzuegbunam, C. O. (2015). Emerging role of information communication technologies in extension service delivery in Nigeria: A review. *Journal of gricultural Extension*, 19(1).
- Sennuga, S. O. (2019). *Use of ICT among smallholder farmers and extension workers and its relevance to sustainable agricultural practices in Nigeria* (Unpublished doctoral dissertation). Coventry University, Coventry University's institutional repository. Coventry, United Kingdom.,
- Singh, R., & Kumar, V. (2026). Effectiveness of mobile agricultural advisory services among rural farmers in India. *International Journal of Agricultural Extension*, 14(1), 1-15
- Udoye, C. E., & Okoro, J. C. (2024). Technological capabilities of extension personnel in the use of social media for agricultural service delivery in Southeast, Nigeria. *International Journal of Life Science and Agriculture Research*, 3 (5) , [4 2 5 – 4 3 1](https://doi.org/10.55677/ijlsar/V03I5Y2024-11). <https://doi.org/10.55677/ijlsar/V03I5Y2024-11>