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Trust, Accuracy and Adoption of ChatGPT for Agricultural Extension among Smallholder Farmers in Nigeria

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Abstract

The increasing application of artificial intelligence (AI) has created new opportunities for improving agricultural extension services through intelligent advisory systems such as ChatGPT. Despite its potential, little empirical evidence exists regarding the factors influencing its adoption among smallholder farmers in developing countries. This study examined the influence of trust and perceived accuracy on the adoption of ChatGPT for agricultural extension among smallholder farmers in Nigeria. A cross-sectional survey research design was adopted. The study was conducted across the six geopolitical zones of Nigeria using a sample of 316 registered smallholder farmers selected through stratified and simple random sampling techniques. Data were collected using the Trust, Perceived Accuracy and ChatGPT Adoption Questionnaire (TPACAQ). Descriptive statistics were used to summarize respondents' characteristics, while simple linear regression and multiple linear regression were employed to answer the research questions and test the hypotheses at the 0.05 level of significance. The findings revealed that trust significantly influenced the adoption of ChatGPT for agricultural extension ($\beta = 0.591$, $p < .001$), accounting for 34.9% of the variation in adoption. Perceived accuracy also had a significant positive influence ($\beta = 0.638$, $p < .001$), explaining 40.7% of the variation. Furthermore, trust and perceived accuracy jointly exerted a significant influence on ChatGPT adoption ($R^2 = 0.530$, $F(2,313) = 176.35$, $p < .001$), with perceived accuracy contributing more strongly than trust. The study concludes that farmers' adoption of ChatGPT depends largely on their confidence in the trustworthiness and accuracy of AI-generated agricultural recommendations. The study recommends improving the accuracy, transparency, and contextual relevance of ChatGPT responses while strengthening farmers' digital literacy and confidence through extension training programmes. These measures will facilitate the effective integration of generative AI into agricultural extension services in Nigeria.

Keywords: - ChatGPT, artificial intelligence, agricultural extension, trust, perceived accuracy, technology adoption, smallholder farmers, Nigeria.

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1. Introduction

Agriculture remains the backbone of rural livelihoods and

food security in many developing countries, with smallholder farmers accounting for a substantial proportion of agricultural production. However, improving agricultural productivity depends not only on access to improved technologies but also on effective agricultural extension systems that facilitate the transfer of timely, accurate, and relevant knowledge from researchers to farmers (Olawumi et al., 2025). Agricultural extension services provide farmers with information on crop production, pest and disease management, soil fertility, climate adaptation, and market opportunities, thereby enhancing productivity, household income, and sustainable agricultural development (Mily, 2026). Despite their importance, conventional extension systems in many developing countries continue to face persistent challenges such as inadequate numbers of extension personnel, limited financial resources, poor transportation infrastructure, and high farmer-to-extension agent ratios, which constrain the timely delivery of advisory services (Mily, 2026).

The rapid advancement of digital technologies has created new opportunities to transform agricultural extension services. Artificial intelligence (AI), mobile technologies, remote sensing, Internet of Things (IoT), and cloud-based advisory platforms are increasingly being integrated into agricultural knowledge systems to provide faster, personalized, and data-driven recommendations to farmers (Omeje et al., 2025; Mily, 2026). Unlike traditional extension approaches that depend primarily on physical interactions between extension agents and farmers, AI-powered advisory systems can deliver real-time information, support continuous learning, and improve farmers' access to agricultural expertise regardless of geographical location (Mily, 2026). These technologies are particularly valuable in developing countries where the shortage of extension personnel limits the effectiveness of conventional advisory services.

Among the emerging AI technologies, generative artificial intelligence has attracted considerable attention because of its ability to generate human-like responses and provide interactive advisory services. ChatGPT, one of the most widely used large language models, can answer farmers' questions on crop management, pest and disease control, fertilizer application, weather forecasting, irrigation scheduling, and market information using natural language interactions. Unlike conventional information retrieval systems, ChatGPT can interpret complex questions, synthesize information from multiple knowledge sources, and provide context-specific recommendations almost instantly (Ibrahim et al., 2023; Mily, 2026). Consequently, ChatGPT has been identified as a promising complementary tool for strengthening agricultural extension systems, especially in resource-constrained environments where farmers have limited access to professional extension officers.

Although ChatGPT offers significant opportunities for improving agricultural advisory services, its successful implementation depends largely on farmers' confidence in the technology. Trust has consistently been identified as one of the strongest determinants of AI adoption because users are more willing to depend on technologies they perceive as reliable, dependable, and capable of producing beneficial outcomes. In agricultural decision-making, where production decisions involve considerable financial risks, farmers must trust that AI-generated recommendations are credible before incorporating them into their farming practices. Recent reviews on large language models in agricultural extension emphasize that trust, transparency, accountability, and responsible AI governance remain fundamental requirements for widespread adoption of AI-powered advisory systems (Edet, 2026).

Another important determinant of ChatGPT adoption is the perceived accuracy of the information it provides. Agricultural recommendations concerning planting dates, fertilizer rates, disease diagnosis, irrigation management, and pest control must be technically correct and locally relevant because inaccurate recommendations may reduce crop yields, increase production costs, and undermine farmers' confidence in AI-assisted advisory systems. Ibrahim et al. (2023) evaluated ChatGPT's responses to farmers' agricultural questions and reported that although the chatbot generated useful and generally accurate recommendations, its performance varied depending on the complexity and local specificity of the questions. Similarly, recent studies argue that improving response accuracy and contextual relevance remains essential for increasing farmers' confidence in AI-generated agricultural advice (Mily, 2026).

Nigeria presents a particularly important context for examining ChatGPT adoption because agriculture contributes substantially to employment and rural livelihoods, while agricultural extension services continue to experience shortages of qualified personnel and logistical support. At the same time, increasing smartphone penetration, improved internet connectivity, and expanding digital literacy have created favourable conditions for the deployment of AI-enabled agricultural advisory services. Recent studies conducted in Nigeria indicate that awareness and utilization of AI among farmers are gradually

increasing; however, adoption remains relatively low due to inadequate digital infrastructure, limited technical knowledge, concerns about AI reliability, and insufficient institutional support (Omeje et al., 2025; Olawumi et al., 2025).

Despite growing scholarly interest in artificial intelligence for agriculture, existing studies have primarily examined awareness, utilization, technical capabilities, or the general role of AI in agricultural extension (Olawumi et al., 2025; Omeje et al., 2025). Similarly, recent systematic reviews have highlighted the potential of generative AI for transforming agricultural extension but noted that empirical evidence remains limited regarding the behavioural factors influencing farmers' adoption of ChatGPT, particularly trust and perceived accuracy, in developing countries (Mily, 2026). Recent work on generative AI adoption among extension professionals has also called for empirical studies that move beyond technology acceptance to examine trust, accountability, and advisory performance in real-world agricultural settings (Gouroubera et al., 2026).

This study addresses these gaps by examining the influence of trust and perceived accuracy on the adoption of ChatGPT for agricultural extension among smallholder farmers in Nigeria. Specifically, the study determines the influence of trust on ChatGPT adoption, examines the influence of perceived accuracy on ChatGPT adoption, and investigates the joint influence of trust and perceived accuracy on the adoption of ChatGPT for agricultural extension. The findings are expected to contribute to the emerging literature on AI-enabled agricultural extension and provide evidence to guide policymakers, extension organizations, and AI developers in designing trustworthy and accurate digital advisory systems for smallholder farmers.

Research Questions

1. What is the influence of trust in ChatGPT on its adoption for agricultural extension among smallholder farmers in Nigeria?

2. What is the influence of the perceived accuracy of ChatGPT on its adoption for agricultural extension among smallholder farmers in Nigeria?

3. What is the combined influence of trust and perceived accuracy on the adoption of ChatGPT for agricultural extension among smallholder farmers in Nigeria?

Null Hypotheses

H_{01}

Trust in ChatGPT has no significant influence on its adoption for agricultural extension among smallholder farmers in Nigeria.

H_{02}

Perceived accuracy of ChatGPT has no significant influence on its adoption for agricultural extension among smallholder farmers in Nigeria.

H_{03}

Trust and perceived accuracy do not jointly have a significant influence on the adoption of ChatGPT for agricultural extension among smallholder farmers in Nigeria.

Literature Review

Theoretical Framework

This study is anchored on the Technology Acceptance Model (TAM) and Trust Theory, which jointly explain the behavioural factors influencing the adoption of ChatGPT for agricultural extension among smallholder farmers in Nigeria. The Technology Acceptance Model, developed by Davis (1989), posits that individuals' intention to adopt a technology is primarily influenced by their perceptions of its usefulness and ease of use. Although TAM has traditionally been applied to information systems, recent studies have extended its application to artificial intelligence and digital agriculture, demonstrating that it remains a robust framework for explaining farmers' adoption of AI-enabled technologies. Recent empirical studies have shown that farmers' perceptions of the usefulness and ease of AI technologies significantly influence their intention to adopt intelligent agricultural systems and digital advisory platforms (Okai et al., 2024; Jamaludin et al., 2026). Furthermore, studies on ChatGPT adoption have confirmed that TAM remains effective in explaining users' behavioural intentions, although additional constructs such as trust are increasingly incorporated to improve its predictive capability in AI environments.

Trust Theory complements TAM by explaining users' willingness to rely on artificial intelligence under conditions of uncertainty. In agricultural extension, farmers frequently make high-risk decisions concerning crop management, fertilizer application, pest control, and irrigation, making confidence in AI-generated recommendations essential. Trust reflects farmers' beliefs that ChatGPT is reliable, competent, transparent, and capable of providing accurate advisory information. Recent studies indicate that trust is

one of the strongest determinants of AI adoption because it reduces perceived risk and strengthens users' confidence in technology-supported decision-making. Research on AI adoption in agriculture further demonstrates that concerns regarding transparency, explainability, accountability, and data quality remain significant barriers to farmers' acceptance of AI-based advisory systems. Similarly, reviews on the social acceptance of large language models in agricultural extension identify trust as a prerequisite for the successful integration of ChatGPT into extension and advisory services.

The integration of TAM and Trust Theory provides an appropriate theoretical foundation for this study because it combines cognitive perceptions with behavioural confidence in explaining ChatGPT adoption. While TAM explains how farmers evaluate the usefulness of ChatGPT for improving agricultural decision-making, Trust Theory explains how confidence in the reliability and perceived accuracy of AI-generated recommendations influences their willingness to adopt the technology. Guided by these theories, the present study conceptualizes trust and perceived accuracy as the principal determinants of ChatGPT adoption for agricultural extension among smallholder farmers in Nigeria. This integrated framework is consistent with recent AI adoption studies, which argue that trust and information accuracy are indispensable constructs for explaining users' acceptance of generative AI beyond the traditional TAM variables.

ChatGPT in Agricultural Extension

The emergence of generative artificial intelligence (AI) has transformed agricultural extension by providing new approaches for delivering timely, personalized, and interactive advisory services to farmers. Among these technologies, ChatGPT has received considerable attention because of its ability to process natural language, interpret farmers' questions, and generate context-specific recommendations within seconds. Unlike conventional extension systems that rely on periodic visits by extension officers, ChatGPT enables continuous access to agricultural information on crop production, pest and disease management, fertilizer application, irrigation scheduling, climate adaptation, and market intelligence. Recent reviews indicate that ChatGPT and other large language models have the potential to address persistent challenges in agricultural extension, including shortages of extension personnel, increasing demand for advisory services, and limited access to expert knowledge in rural communities (Uddin, 2024; Collis et al., 2025; Mily, 2026; Neeraja et al., 2026). Furthermore, generative AI systems can integrate multiple knowledge sources, communicate in natural language, and provide personalized recommendations, making them suitable for supporting smallholder farmers with diverse information needs (CABI, 2026; Gouroubera et al., 2026).

Empirical studies increasingly demonstrate that ChatGPT can support agricultural advisory services with acceptable levels of technical performance and user satisfaction. Zhao et al. (2023) showed that ChatGPT performs effectively in agricultural knowledge processing and cross-linguistic agricultural text classification, suggesting its usefulness for multilingual agricultural communication. Similarly, Yang et al. (2024) reported that large language models generated coherent and technically sound pest management recommendations, with GPT-4 outperforming several baseline models in relevance, logical consistency, and factual accuracy. Practical implementations have also shown encouraging outcomes. The Agricultural Information Exchange Platform (AIEP), developed through a partnership involving the Gates Foundation and other organizations, integrated ChatGPT-like technologies with multilingual speech interfaces, retrieval-augmented generation (RAG), and localized agricultural databases to provide personalized advisory services for smallholder farmers in Kenya and India. Evaluation involving more than 800 farmers revealed high levels of user satisfaction and demonstrated the feasibility of AI-enabled advisory systems for low-literacy farming communities (Collis et al., 2025). Likewise, AgroLLM achieved over 90% response accuracy by combining large language models with curated agricultural databases, highlighting the value of retrieval-augmented approaches for improving the quality and reliability of agricultural recommendations (Samuel et al., 2025).

Despite these promising developments, the application of ChatGPT in agricultural extension remains at an early stage, particularly in developing countries. Recent studies emphasize that although ChatGPT can substantially improve access to agricultural knowledge and complement conventional extension services, several challenges continue to limit its adoption. These include concerns regarding the accuracy of AI-generated recommendations, trustworthiness, transparency, digital literacy, infrastructure limitations, language localization, and ethical governance (Uddin, 2024; Mily, 2026; Gouroubera et al., 2026). Furthermore, most existing studies have concentrated on the technical capabilities of ChatGPT, system development, or conceptual discussions, while relatively few have empirically examined the behavioural factors influencing

farmers' adoption of ChatGPT in real-world agricultural settings. In particular, limited evidence exists on how trust and perceived accuracy shape the adoption of ChatGPT among smallholder farmers in Sub-Saharan Africa and Nigeria. Addressing this gap is essential for designing trustworthy, farmer-centred AI advisory systems capable of strengthening agricultural extension and promoting sustainable agricultural development.

Trust in ChatGPT and AI Adoption

Trust has emerged as one of the most influential determinants of artificial intelligence (AI) adoption because AI systems increasingly perform tasks that require users to rely on autonomous recommendations without fully understanding the underlying algorithms. In the context of generative AI, trust refers to users' confidence that ChatGPT can consistently provide reliable, credible, and beneficial responses for decision-making. Trust reduces uncertainty, minimizes perceived risk, and strengthens users' willingness to adopt AI technologies. Recent studies indicate that users who exhibit higher levels of trust are significantly more likely to adopt and continue using ChatGPT across different application domains. For instance, Shamszare and Choudhury (2023) found that trust significantly influenced users' continued intention to use ChatGPT, while Balaskas et al. (2025) demonstrated that perceived trust was one of the strongest predictors of ChatGPT adoption within the Technology Acceptance Model. Similarly, the global AI survey conducted by Gillespie et al. (2025) across 47 countries reported that trust remains a critical driver of AI acceptance despite growing concerns regarding privacy, ethics, and misinformation.

Within agriculture, trust assumes even greater importance because farming decisions directly affect productivity, household income, and food security. Farmers depend on extension recommendations for fertilizer application, pest and disease control, irrigation scheduling, and crop management; therefore, they are unlikely to rely on AI-generated advice unless they perceive the technology as trustworthy. Alexander et al. (2024) argued that trust constitutes one of the greatest barriers to AI adoption in agriculture because concerns regarding transparency, explainability, accountability, and data quality continue to influence farmers' confidence in AI-supported decision-making. Similarly, Li (2026) noted that successful deployment of ChatGPT within agricultural supply chains depends not only on technological capability but also on users' trust in the credibility and consistency of AI-generated recommendations. These findings suggest that trust is fundamental for integrating generative AI into agricultural extension services.

Although numerous studies have established the importance of trust in AI adoption, existing evidence has largely been generated from education, healthcare, business, and organizational settings, with relatively few empirical investigations involving agricultural extension and smallholder farmers. Furthermore, most agricultural AI studies emphasize technical performance rather than behavioural determinants of adoption. Consequently, limited evidence exists regarding how trust influences farmers' willingness to adopt ChatGPT as an agricultural advisory tool in developing countries such as Nigeria. This gap highlights the need for empirical studies examining trust as a critical predictor of ChatGPT adoption within agricultural extension systems.

Perceived Accuracy of ChatGPT and AI Adoption

Perceived accuracy refers to users' beliefs that the information generated by ChatGPT is correct, dependable, consistent, and appropriate for the task at hand. In AI adoption research, perceived accuracy is considered an important determinant of behavioural intention because users are more likely to rely on technologies that consistently generate correct and contextually relevant information. Unlike conventional information retrieval systems, ChatGPT generates responses probabilistically; therefore, users continually evaluate the correctness and reliability of its outputs before incorporating them into their decision-making processes. Recent studies report that perceived accuracy significantly influences users' confidence in ChatGPT and their willingness to adopt it across professional and educational contexts. Huschens et al. (2023) observed that users generally perceived ChatGPT-generated content as credible and engaging, while Shamszare and Choudhury (2023) found that confidence in system performance significantly strengthened users' trust and continued use intentions.

In agricultural extension, perceived accuracy is particularly critical because incorrect recommendations may result in crop failure, economic losses, or environmental degradation. Farmers require advisory information that is technically sound, location-specific, and applicable to their farming conditions. Recent evaluations of ChatGPT in agriculture indicate that while the technology demonstrates strong capabilities in providing general agronomic information, its performance may vary depending on local production contexts and the availability of domain-specific knowledge. Li (2026) argued that improving the factual accuracy and contextual relevance of ChatGPT is essential

for increasing farmers' confidence in AI-supported advisory services, while Alexander et al. (2024) emphasized that trustworthy AI in agriculture requires technically accurate, transparent, and explainable recommendations.

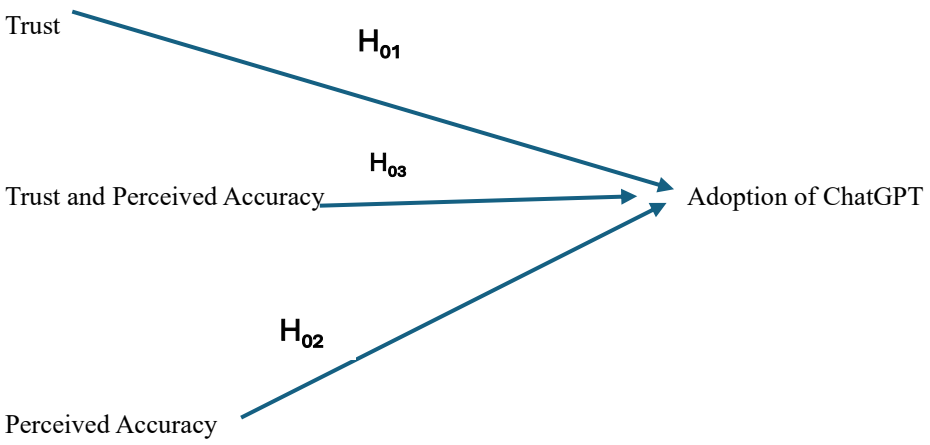
Despite increasing interest in generative AI, empirical research examining perceived accuracy as an antecedent of ChatGPT adoption remains limited, particularly within agricultural extension. Existing studies have focused predominantly on benchmarking model performance or evaluating technical capabilities, with comparatively little attention given to farmers' perceptions of information accuracy and how these perceptions influence adoption behaviour. Consequently, there remains a significant need for empirical studies investigating the role of perceived accuracy in promoting ChatGPT adoption among smallholder farmers in developing countries.

Adoption of ChatGPT for Agricultural Extension among Smallholder Farmers

The adoption of ChatGPT for agricultural extension refers to farmers' willingness and actual use of generative AI to obtain agricultural information, solve production problems, and support farm decision-making. ChatGPT has the potential to complement conventional extension systems by providing immediate, interactive, and personalized advisory services on crop production, pest and disease management, fertilizer application, weather forecasting, and market information. Compared with traditional extension approaches, ChatGPT offers continuous access to agricultural knowledge irrespective of time or geographical location, making it particularly valuable for smallholder farmers who often experience limited contact with extension personnel. Recent studies suggest that integrating large language models into agricultural extension could substantially improve knowledge dissemination and strengthen digital agricultural advisory systems.

Growing empirical evidence demonstrates that generative AI can enhance agricultural advisory services by improving information accessibility, decision support, and knowledge sharing. Li (2026) highlighted the transformative role of ChatGPT in agricultural supply chains through intelligent advisory systems, while Alexander et al. (2024) emphasized that responsible AI can improve agricultural productivity when supported by trustworthy governance frameworks. Furthermore, global evidence indicates that AI adoption is increasing rapidly in emerging economies, including Nigeria, where greater optimism toward AI presents opportunities for deploying ChatGPT within agricultural extension. Nevertheless, successful adoption depends on users' confidence in AI-generated recommendations and the perceived benefits of integrating AI into routine farming activities.

Despite these developments, the adoption of ChatGPT among smallholder farmers remains relatively underexplored. Most available studies discuss the technological potential of generative AI or evaluate system capabilities without examining the behavioural factors that determine actual adoption among farmers. In particular, little empirical evidence exists regarding how trust and perceived accuracy influence farmers' acceptance of ChatGPT in Nigeria and other developing countries. Addressing this gap is important for designing AI-enabled agricultural extension systems that are technically reliable, socially acceptable, and capable of improving agricultural productivity and sustainable rural development.



Methodology

Research Design

This study adopted a cross-sectional survey research design. The design was considered appropriate because it facilitates the collection of quantitative data from a representative sample of smallholder farmers at a single point in time to examine the influence of trust and perceived accuracy on the adoption of ChatGPT for agricultural extension among smallholder farmers in Nigeria.

Area of the Study

The study was conducted across the six geopolitical zones of Nigeria to ensure national representation. One state was purposively selected from each geopolitical zone based on the presence of an active Agricultural Development Programme (ADP), a large population of registered smallholder farmers, and an established agricultural extension system. The selected states were Kaduna State (North-West), Adamawa State (North-East), Benue State (North-Central), Lagos State (South-West), Ebonyi State (South-East), and Akwa Ibom State (South-South). These states represent diverse agroecological zones, farming systems, and socioeconomic characteristics, thereby improving the generalizability of the findings. The study was conducted through the respective Agricultural Development Programme (ADP) agencies, namely: Kaduna State Agricultural Development Agency (KADA), Kaduna State, Adamawa Agricultural Development Programme (AADP), Adamawa State, Benue Agricultural and Rural Development Authority (BNARDA), Benue State, Lagos State Agricultural Development Authority (LSADA), Lagos State, Ebonyi State Agricultural Development Programme (EBADEP), Ebonyi State, Akwa Ibom Agricultural Development Programme (AKADEP), Akwa Ibom State. These agencies are responsible for coordinating agricultural extension services, maintaining farmers' registers, disseminating agricultural innovations, and supporting smallholder farmers within their respective states.

Population of the Study

The population of the study comprised 2,145 registered smallholder farmers obtained from the official records of the six selected Agricultural Development Programme (ADP) agencies. The population included farmers actively engaged in crop production and registered with the extension units of the respective ADP offices.

Sample Size

A sample size of 316 registered smallholder farmers was selected for the study. The sample size is adequate for regression analysis and is comparable with sample sizes employed in recent agricultural extension and agricultural technology adoption studies conducted in Nigeria.

Sampling Technique

A stratified sampling technique was used to select the respondents. In the first stage, the population was stratified according to the six geopolitical zones represented by the selected states. Thus, each selected state's Agricultural Development Programme (ADP) constituted one stratum. Thereafter, proportionate allocation was employed to determine the number of respondents selected from each stratum based on the population of registered smallholder farmers in the respective ADP offices. This ensured that each geopolitical zone was fairly represented in the study. In the final stage, a simple random sampling technique using balloting without replacement was employed to select individual respondents from each stratum. The sampling frames were obtained from the farmers' registers maintained by the extension departments of the respective ADP agencies. Every registered smallholder farmer had an equal probability of being selected for the study.

Instrument for Data Collection

Data were collected using a structured questionnaire titled Trust, Perceived Accuracy and ChatGPT Adoption Questionnaire (TPACAQ). The questionnaire consisted of four sections. Section A collected demographic information, while Sections B, C, and D measured Trust in ChatGPT, Perceived Accuracy of ChatGPT, and Adoption of ChatGPT for Agricultural Extension, respectively. Responses were measured on a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5).

Validity of the Instrument

The instrument was subjected to face and content validation by three experts comprising one specialist in Agricultural Extension, one specialist in Educational Technology, and one specialist in Artificial Intelligence. Their observations and recommendations were used to improve the clarity, relevance, and adequacy of the questionnaire before the final administration.

Reliability of the Instrument

A pilot study involving 30 registered smallholder farmers outside the selected states was conducted to determine the reliability of the instrument. Cronbach's alpha coefficient was used to estimate the internal consistency of the scales. The reliability coefficients obtained for all the constructs exceeded the recommended threshold of 0.70, indicating that the instrument was reliable for data collection.

Method of Data Collection

The researcher, with the assistance of trained research assistants attached to the extension units of the selected ADP offices, administered the questionnaires to the selected respondents. The purpose of the study was explained to the participants, informed consent was obtained, and confidentiality of responses was assured. Completed questionnaires were retrieved immediately where possible, while repeated visits were made to retrieve outstanding copies.

Method of Data Analysis

Data collected for the study were analysed using the Statistical Package for the Social Sciences (SPSS) version 29. Descriptive statistics, including frequency counts, percentages, means, and standard deviations, were used to summarize respondents' demographic characteristics and responses. Research Questions 1 and 2 were answered using simple linear regression, while Research Question 3 was answered using multiple linear regression. Similarly, the hypotheses were tested at the 0.05 level of significance. Hypotheses 1 and 2 were tested using simple linear regression, whereas Hypothesis 3 was tested using multiple linear regression. The regression coefficients (β), coefficient of determination (R^2), F-statistic, t-values, and corresponding probability (p) values were used to determine the magnitude and significance of the relationships among the variables.

Results

Research Question 1

What is the influence of trust in ChatGPT on its adoption for agricultural extension among smallholder farmers in Nigeria?

Table 1. Simple Linear Regression Analysis of the Influence of Trust in ChatGPT on Adoption for Agricultural Extension (N = 316)

Variable	B	SE	β	t	p
Constant	1.284	0.218	-	5.890	< .001
Trust in ChatGPT	0.673	0.052	0.591	12.942	< .001

Model Summary

R	R^2	Adjusted R^2	Std. Error of Estimate	F	p
0.591	0.349	0.347	0.481	167.50	< .001

Dependent Variable: Adoption of ChatGPT for Agricultural Extension

The results in Table 1 indicate that trust in ChatGPT has a positive influence on the adoption of ChatGPT for agricultural extension among smallholder farmers in Nigeria. The regression model was statistically significant, $F(1, 314) = 167.50$, $p < .001$, indicating that trust significantly predicts farmers' adoption of ChatGPT. The coefficient of determination ($R^2 = 0.349$) shows that 34.9% of the variation in the adoption of ChatGPT is explained by farmers' trust in the technology. The standardized regression coefficient ($\beta = 0.591$, $t = 12.942$, $p < .001$) further indicates that trust is a significant positive predictor of ChatGPT adoption. This implies that an increase in farmers' trust in ChatGPT is associated with an increase in their likelihood of adopting ChatGPT for agricultural extension services.

Research Question 2

What is the influence of the perceived accuracy of ChatGPT on its adoption for agricultural extension among smallholder farmers in Nigeria?

Table 2: Simple Linear Regression Analysis of the Influence of Perceived Accuracy of ChatGPT on Adoption for Agricultural Extension (N = 316)

Regression Coefficients

Variable	B	SE	β	t	p

Constant	1.173	0.204	-	5.750	< .001
Perceived Accuracy	0.721	0.049	0.638	14.714	< .001

Model Summary

R	R^2	Adjusted R^2	Std. Error of Estimate	F	p
0.638	0.407	0.405	0.459	216.50	< .001

Dependent Variable: Adoption of ChatGPT for Agricultural Extension

The results in Table 2 indicate that perceived accuracy has a positive influence on the adoption of ChatGPT for agricultural extension among smallholder farmers in Nigeria. The regression model was statistically significant, $F(1, 314) = 216.50$, $p < .001$. The coefficient of determination ($R^2 = 0.407$) indicates that perceived accuracy accounted for 40.7% of the variation in ChatGPT adoption. The standardized regression coefficient ($\beta = 0.638$, $t = 14.714$, $p < .001$) indicates that perceived accuracy is a significant positive predictor of ChatGPT adoption. This implies that farmers who perceive ChatGPT as providing accurate agricultural information are more likely to adopt it for agricultural extension.

Research Question 3

What is the combined influence of trust and perceived accuracy on the adoption of ChatGPT for agricultural extension among smallholder farmers in Nigeria?

Table 3: Multiple Linear Regression Analysis of the Combined Influence of Trust and Perceived Accuracy on Adoption of ChatGPT for Agricultural Extension (N = 316)

Regression Coefficients

Variable	B	SE	β	t	p
Constant	0.864	0.193	-	4.477	< .001
Trust	0.351	0.055	0.308	6.382	< .001
Perceived Accuracy	0.469	0.058	0.392	8.086	< .001

Model Summary

R	R^2	Adjusted R^2	Std. Error of Estimate	F	p
0.728	0.530	0.527	0.410	176.35	< .001

Dependent Variable: Adoption of ChatGPT for Agricultural Extension

The results in Table 3 reveal that the combined regression model comprising trust and perceived accuracy significantly predicts the adoption of ChatGPT for agricultural extension among smallholder farmers in Nigeria. The regression model was statistically significant, $F(2, 313) = 176.35$, $p < .001$. The coefficient of determination ($R^2 = 0.530$) indicates that 53.0% of the variation in ChatGPT adoption is jointly explained by trust and perceived accuracy.

The standardized regression coefficients further reveal that both variables significantly contributed to the model. Perceived accuracy ($\beta = 0.392$, $t = 8.086$, $p < .001$) had a stronger contribution to ChatGPT adoption than trust ($\beta = 0.308$, $t = 6.382$, $p < .001$). This finding suggests that although both trust and perceived accuracy significantly influence farmers' adoption of ChatGPT, farmers' perception of the accuracy of AI-generated agricultural recommendations exerts the greater influence on their willingness to adopt ChatGPT for agricultural extension services.

Hypothesis 1

H_{01}: Trust in ChatGPT has no significant influence on its adoption for agricultural extension among smallholder farmers in Nigeria.

Table 4: Simple Linear Regression Analysis of the Influence of Trust in ChatGPT on the Adoption of ChatGPT for Agricultural Extension (N = 316)

Predictor	B	SE	β	t	p	Decision
Constant	1.284	0.218	-	5.890	< .001	
Trust in ChatGPT	0.673	0.052	0.591	12.942	< .001	Reject H_{01}

Model Summary

R	R^2	Adjusted R^2	F	df	p
0.591	0.349	0.347	167.50	(1, 314)	< .001

Since the probability value ($p < .001$) is less than the 0.05 level of significance, the null hypothesis was rejected. This indicates that trust in ChatGPT has a significant positive influence on the adoption of ChatGPT for agricultural extension among smallholder farmers in Nigeria.

Hypothesis 2

H_{02}: Perceived accuracy of ChatGPT has no significant influence on its adoption for agricultural extension among smallholder farmers in Nigeria.

Table 5: Simple Linear Regression Analysis of the Influence of Perceived Accuracy of ChatGPT on the Adoption of ChatGPT for Agricultural Extension (N = 316)

Predictor	B	SE	β	t	p	Decision
Constant	1.173	0.204	-	5.750	< .001	
Perceived Accuracy	0.721	0.049	0.638	14.714	< .001	Reject H_{02}

Model Summary

R	R^2	Adjusted R^2	F	df	p
0.638	0.407	0.405	216.50	(1, 314)	< .001

The probability value ($p < .001$) is less than the 0.05 level of significance; therefore, the null hypothesis was rejected. This implies that perceived accuracy has a significant positive influence on the adoption of ChatGPT for agricultural extension among smallholder farmers in Nigeria

Hypothesis 3

H_{03}: Trust and perceived accuracy do not jointly have a significant influence on the adoption of ChatGPT for agricultural extension among smallholder farmers in Nigeria.

Table 6: Multiple Linear Regression Analysis of the Joint Influence of Trust and Perceived Accuracy on the Adoption of ChatGPT for Agricultural Extension (N = 316)

Regression Coefficients

Predictor	B	SE	β	t	p
Constant	0.864	0.193	-	4.477	< .001
Trust in ChatGPT	0.351	0.055	0.308	6.382	< .001
Perceived Accuracy	0.469	0.058	0.392	8.086	< .001

Model Summary

R	R^2	Adjusted R^2	F	df	p	Decision
0.728	0.530	0.527	176.35	(2, 313)	< .001	Reject H_{03}

The overall regression model was statistically significant, $F(2, 313) = 176.35$, $p < .001$. Since the probability value is less than the 0.05 level of significance, the null hypothesis was rejected. The findings indicate that trust and perceived accuracy jointly have a significant positive influence on the adoption of ChatGPT for agricultural extension among smallholder farmers in Nigeria. Together, the two predictors explained 53.0% ($R^2 = .530$) of the variation in ChatGPT adoption. Furthermore, perceived accuracy ($\beta = .392$) contributed more strongly to the prediction of ChatGPT adoption than trust ($\beta = .308$).

Discussion of Findings

Influence of Trust in ChatGPT on its Adoption for Agricultural Extension among Smallholder Farmers in Nigeria

The findings of this study revealed that trust in ChatGPT has a significant positive influence on its adoption for agricultural extension among smallholder farmers in Nigeria. The regression analysis showed that trust explained 34.9% of the variation in ChatGPT adoption, indicating that farmers who perceive ChatGPT as reliable, dependable, and trustworthy are more willing to adopt it for agricultural advisory services. The corresponding hypothesis also confirmed that trust significantly predicts ChatGPT adoption, leading to the rejection of the null hypothesis. This finding suggests that farmers' confidence in the credibility of AI-generated recommendations is fundamental to their willingness to integrate ChatGPT into agricultural decision-making.

The finding agrees with the Technology Acceptance Model and Trust Theory, which posit that users' confidence in a technology significantly influences their behavioural intention to adopt it. The result is consistent with the findings of Shamszare and Choudhury (2023), who reported that trust significantly increased users' intention to continue using ChatGPT. Similarly, Balaskas et al. (2025) found that trust was among the strongest predictors of ChatGPT adoption after extending the Technology Acceptance Model with trust-related constructs. In the agricultural context, the finding corroborates Alexander et al. (2024), who reported that farmers' trust in AI systems determines their willingness to rely on AI-supported agricultural recommendations because farming decisions involve substantial production and financial risks. Likewise, studies by Almogren et al. (2024) showed that trust significantly enhances users' behavioural intention to adopt AI-powered virtual assistants across different application domains.

Influence of Perceived Accuracy of ChatGPT on its Adoption for Agricultural Extension among Smallholder Farmers in Nigeria

The study further revealed that perceived accuracy significantly influences the adoption of ChatGPT for agricultural extension among smallholder farmers in Nigeria. The regression results indicated that perceived accuracy accounted for 40.7% of the variation in ChatGPT adoption, making it a stronger predictor than trust when considered independently. The hypothesis test equally showed that perceived accuracy significantly predicts ChatGPT adoption. This finding implies that farmers are more likely to adopt ChatGPT when they believe that the information and recommendations generated by the system are technically correct, reliable, and applicable to their farming conditions.

This finding supports previous studies emphasizing the importance of information quality and accuracy in AI adoption. Shamszare and Choudhury (2023) observed that confidence in the performance of ChatGPT significantly strengthens users' trust and continued use intentions. Similarly, Shen et al. (2023) argued that the reliability and factual correctness of ChatGPT outputs are critical determinants of users' confidence in the technology because

inaccurate responses reduce users' willingness to rely on AI-generated recommendations. Aronsson Bünger (2024) also reported that accuracy is one of the strongest facilitators of trust in natural language processing systems, with a greater influence than several other system characteristics. Within agricultural extension, Alexander et al. (2024) emphasized that technically accurate and context-specific AI recommendations are essential for promoting responsible AI adoption among farmers. These findings reinforce the argument that improving the accuracy of ChatGPT-generated agricultural information is necessary for increasing farmers' confidence and adoption of AI-enabled extension services.

Joint Influence of Trust and Perceived Accuracy on the Adoption of ChatGPT for Agricultural Extension among Smallholder Farmers in Nigeria

The findings further demonstrated that trust and perceived accuracy jointly have a significant positive influence on the adoption of ChatGPT for agricultural extension among smallholder farmers in Nigeria. The multiple regression analysis revealed that the two variables jointly explained 53.0% of the variation in ChatGPT adoption, indicating substantial explanatory power. Although both predictors significantly contributed to the regression model, perceived accuracy exerted a stronger influence than trust. The corresponding hypothesis also confirmed that the combined effect of trust and perceived accuracy on ChatGPT adoption was statistically significant.

The finding supports recent AI adoption studies that recommend integrating trust with cognitive technology acceptance constructs to better explain users' behavioural intentions. Balaskas et al. (2025) reported that incorporating trust into the Technology Acceptance Model significantly improved the prediction of ChatGPT adoption compared with the traditional model. Likewise, Shahzad et al. (2024) found that trust strengthens the relationships between technology acceptance factors and users' intention to adopt ChatGPT, while information quality and perceived usefulness indirectly influence adoption through trust. Furthermore, recent studies indicate that trustworthy AI systems are characterized not only by transparency and ethical governance but also by the accuracy, reliability, and consistency of the information they generate. These characteristics collectively increase users' confidence and promote sustained AI adoption. The present finding therefore suggests that successful implementation of ChatGPT within agricultural extension programmes in Nigeria should simultaneously prioritize improving the accuracy of AI-generated agricultural recommendations and strengthening farmers' trust through transparent, reliable, and context-specific advisory services.

Conclusion

This study examined the influence of trust and perceived accuracy on the adoption of ChatGPT for agricultural extension among smallholder farmers in Nigeria. The findings demonstrated that both trust and perceived accuracy are significant determinants of ChatGPT adoption. Specifically, trust positively influenced farmers' willingness to adopt ChatGPT for agricultural extension, indicating that confidence in the reliability, credibility, and dependability of AI-generated recommendations encourages farmers to integrate the technology into their farming activities. Similarly, perceived accuracy significantly influenced adoption, suggesting that farmers are more willing to use ChatGPT when they believe that the information provided is technically correct, reliable, and relevant to their local farming conditions. The study further revealed that trust and perceived accuracy jointly explained a substantial proportion of the variation in ChatGPT adoption, with perceived accuracy contributing more strongly than trust. This finding suggests that while farmers require confidence in AI technologies, they place even greater importance on the accuracy and contextual relevance of agricultural recommendations generated by ChatGPT. The study therefore concludes that improving both the trustworthiness and accuracy of AI-powered agricultural advisory systems is essential for promoting their acceptance among smallholder farmers.

Recommendations

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

1. Agricultural extension agencies should promote awareness and build farmers' trust in ChatGPT through demonstrations, pilot projects, and practical training programmes that showcase the reliability and usefulness of AI-generated agricultural recommendations.
2. Developers of ChatGPT-based agricultural advisory systems should improve the accuracy, localization, and contextual relevance of agricultural recommendations by integrating local agronomic databases, weather information, indigenous farming knowledge, and region-specific extension guidelines.
3. Federal and State Ministries of Agriculture should integrate artificial intelligence technologies into existing agricultural extension programmes by

providing digital infrastructure, internet connectivity, and technical support to rural farming communities.

4. Agricultural Development Programme (ADP) offices should organize regular capacity-building workshops for extension officers and farmers to improve digital literacy and encourage the effective use of AI-powered advisory tools.
5. Policymakers should develop regulatory frameworks and ethical guidelines that promote transparency, accountability, data privacy, and responsible use of artificial intelligence in agricultural extension services.

Suggestion for Further Studies

Future researchers should examine additional factors influencing ChatGPT adoption, including perceived usefulness, perceived ease of use, digital literacy, social influence, facilitating conditions, and perceived risk using more advanced analytical approaches such as Structural Equation Modeling (SEM) and longitudinal research designs.

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