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Use of ICT among Small Scale Yam Farmers in Southern Taraba, Taraba State, Nigeria

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Abstract- ***This study examines the adoption and utilization of Information and Communication Technologies (ICT) among small-scale yam farmers in Southern Taraba, Taraba State, Nigeria. In a region where yam cultivation is central to livelihoods and food security, access to timely agricultural information is critical. However, rural farmers often lack adequate extension services and market access, placing them at a disadvantage in terms of productivity and competitiveness. ICT presents an opportunity to bridge these gaps by enhancing information flow, market linkages, and farming efficiency. The study specifically assesses farmers' awareness of ICT tools, the types of technologies used, the purposes for which they are applied in yam farming, as well as the perceived benefits and limitations of such adoption. A total of 100 farmers were selected through a simple random sampling technique. Data were collected using structured questionnaires, interviews, and field observations, and analyzed using descriptive statistics and chi-square tests. Findings reveal that while awareness of ICT is relatively high (70%), actual use is largely limited to mobile phones (95%) and radio (60%), with fewer farmers using more advanced tools such as internet-based platforms. Farmers primarily use ICT for communication with buyers, accessing market price information, and receiving weather updates. Key benefits include timely access to agricultural information, reduced post-harvest losses, and improved decision-making. However, ICT adoption is hindered by poor network coverage, low digital literacy, high costs of smartphones and data, and limited access to electricity. The study concludes that ICT has the potential to significantly enhance yam farming in Southern Taraba by increasing productivity and efficiency. However, realizing this potential requires targeted interventions, including infrastructure development, digital literacy training, and the provision of localized, crop-specific ICT content. The study recommends multi-stakeholder engagement among government, NGOs, private ICT firms, and farmer cooperatives to promote inclusive digital transformation in rural agriculture.***

Keywords: Information and Communication Technologies (ICT), small-scale yam farmer, market linkage, farmers' awareness, yam production, Nature Gift of the Nation

I. INTRODUCTION

Agriculture plays a pivotal role in Nigeria's economy, contributing significantly to employment, food security, and rural development. In Taraba State widely regarded as the "Nature Gift of the Nation" yam production is a vital economic activity, particularly in Southern Taraba where small-scale farming predominates. Despite the importance of yam cultivation in ensuring food availability and income generation, smallholder farmers continue to face numerous challenges such as unpredictable weather patterns, lack of timely market information, limited access to agricultural extension services, and inefficient farming practices (Ogunlade & Adebayo, 2009).

In recent years, Information and Communication Technology (ICT) has emerged as a transformative tool in agricultural development. ICT encompasses a range of technologies including mobile phones, radios, televisions, internet platforms, and digital applications that facilitate the collection, processing, storage, and dissemination of information (FAO, 2024). For small-scale farmers, particularly those in remote or underserved regions, ICT offers an opportunity to bridge the information gap by providing real-time access to critical agricultural data such as weather forecasts, input prices, pest and disease management, financial services, and market linkages (Aker, 2025).
The application of ICT in agriculture has been shown to improve productivity, reduce post-harvest losses, and enhance farmers' decision-making capacity

(World Bank, 2024). However, in many rural areas in Nigeria, including Southern Taraba, ICT adoption among smallholder farmers remains low due to several socio-economic and infrastructural barriers such as limited digital literacy, poor network connectivity, cost of digital devices, and lack of targeted extension support (Ayoade, 2024).

Furthermore, the relevance of ICT in yam farming a crop that is seasonal, labor-intensive, and susceptible to environmental conditions cannot be overemphasized. Efficient information flow enabled by ICT can help farmers plan planting and harvesting periods, monitor weather trends, and negotiate better market prices. However, there is limited empirical evidence on the specific patterns, benefits, and constraints associated with ICT use among yam farmers in rural communities such as Southern Taraba.

This study, therefore, seeks to assess the use of ICT tools by small-scale yam farmers in Southern Taraba, Taraba State. It aims to explore the extent of ICT awareness and adoption, identify the types of technologies in use, evaluate their perceived effectiveness, and highlight key constraints affecting their utilization. The findings will contribute to ongoing discussions on rural digital inclusion and provide recommendations for improving ICT-driven agricultural interventions in yam-producing communities

1.1 Statement of the Problem

Yam farming remains a critical livelihood activity for many rural households in Southern Taraba, Taraba State, contributing substantially to food supply, income generation, and cultural heritage. However, small-scale yam farmers in the region face persistent challenges, including inadequate access to agricultural inputs, market fluctuations, low yields, post-harvest losses, and the impacts of climate variability. One major underlying factor contributing to these issues is the limited access to timely, accurate, and relevant agricultural information (Ogunlade & Adebayo, 2024).

Globally, Information and Communication Technology (ICT) is recognized as a powerful enabler in improving agricultural efficiency, enhancing market access, and empowering smallholder farmers with knowledge-based decision-making tools (Aker, 2025; FAO, 20224). ICT tools such as mobile phones, radio, and internet platforms offer the potential to close the information gap by delivering real-time data on weather, input prices, pest management, and market trends. In theory, this could transform traditional yam farming systems into more productive and resilient agribusinesses.

However, despite the growing availability of ICT infrastructure in Nigeria, many small-scale yam farmers in Southern Taraba remain digitally excluded. Empirical observations suggest that adoption levels are low, and the effective use of ICT tools is constrained by poor digital literacy, high costs of ICT devices, unreliable electricity supply, and weak mobile network coverage (Ayoade, 2024; World Bank, 2024). Moreover, there is a lack of localized digital content tailored to the specific information needs of yam farmers, which limits the practical utility of available ICT platforms (Asenso-Okyere & Mekonnen, 2025).

In addition, limited research has focused on understanding the actual usage patterns, benefits, and challenges of ICT among yam farmers in specific regions like Southern Taraba. Most existing studies generalize ICT adoption across agriculture as a whole, without considering crop-specific contexts or local variations. This lack of detailed, location-specific data creates a gap in policy and intervention design aimed at improving digital inclusion and agricultural productivity.

Therefore, there is a critical need to investigate the current state of ICT usage among small-scale yam farmers in Southern Taraba. Understanding the extent of adoption, the tools being used, the challenges faced, and the outcomes experienced can provide vital insights for stakeholders—such as policymakers, agricultural extension agents, and technology providers—to develop inclusive and targeted ICT-based solutions.

1.2 Objectives of the Study

ii) To determine the level of awareness and access to ICT tools among small-scale yam farmers in Southern Taraba.

iii) To identify the types of ICT tools used and their purposes in yam farming activities.
iv) To evaluate the perceived benefits and limitations of ICT adoption.
v) To recommend strategies for improving ICT use among rural farmers.

II. RELATED LITERATURES REVIEWED

2.1 ICT in Agriculture: Global and Regional Perspectives

The role of Information and Communication Technologies (ICTs) in transforming agriculture has gained considerable attention in recent years, especially in developing countries. ICT facilitates timely access to information on weather, market prices, input availability, pest and disease management, and improved agronomic practices (Qiang *et al*., 2024). These tools enhance decision-making, reduce uncertainty, and improve overall farm productivity.

In sub-Saharan Africa, mobile technology has been recognized as a major driver of agricultural innovation due to the high penetration of mobile phones, even in rural communities (World Bank, 2024). However, the use of more advanced ICT platforms, such as mobile apps and internet-based services, remains low among rural farmers due to infrastructural and socioeconomic barriers (Aker, 2025).

2.2 ICT Use in Nigerian Agriculture

In Nigeria, ICT use in agriculture is expanding but remains unevenly distributed. According to Adedoyin et al. (2021), while mobile phone ownership among rural farmers is high, its application is mostly limited to voice calls and SMS. Internet access, digital applications, and e-extension platforms are less frequently utilized due to digital illiteracy, lack of local content, and poor infrastructure.

Studies by Olaniyi and Adedoyin (2020) observed that although extension officers are beginning to use ICT to reach more farmers, the coverage remains poor, and few platforms are tailored specifically to yam production, despite its economic significance in states like Taraba.

2.3 ICT and Yam Farming in Nigeria

Yam, as a staple and culturally significant crop in Nigeria, faces production challenges such as climate variability, pest outbreaks, and post-harvest losses. ICT tools have been proposed as a solution to many of these challenges. For example, Agbo and Iwuchukwu (2019) found that yam farmers who received market price updates and agronomic tips via SMS recorded better post-harvest income than those who relied solely on traditional extension channels.

In a study focusing on yam farmers in southern Nigeria, Eze et al. (2020) reported that access to ICT tools significantly improved planting decisions, particularly in relation to weather forecasts. However, they emphasized the importance of local language translations and culturally appropriate communication methods for improving ICT adoption.

2.4 Digital Literacy and Infrastructure Challenges

Several studies underscore the limitations that constrain ICT effectiveness among small-scale farmers. Ayoade (2024) identified digital illiteracy, high cost of ICT devices, unreliable electricity, and lack of mobile network coverage as key obstacles in southwestern Nigeria. These findings mirror those of Ayanlade et al. (2021), who argued that without addressing infrastructural challenges, ICT adoption would remain superficial and unsustainable.

In Taraba State specifically, Terungwa and Agada (2022) discovered that while many yam farmers are aware of ICT tools, very few use them beyond calling buyers. They recommended that ICT initiatives be designed around farmers' existing behavior patterns and economic capacities.

2.5 ICT as a Tool for Empowerment and Efficiency

Beyond productivity, ICT has been recognized as an empowering tool for rural farmers. According to Asenso-Okyere and Mekonnen (2025), ICT contributes to social inclusion by enabling farmers to interact with broader markets, participate in cooperatives, and access financial services. Similarly, Okike et al. (2023) emphasized that ICT adoption leads to greater autonomy, particularly for youth and

women farmers, in managing yam sales and accessing government subsidies.

The literature affirms that ICT holds transformative potential for small-scale yam farmers in Southern Taraba and similar agrarian communities. While awareness and mobile phone penetration are relatively high, the functional use of ICT remains limited due to structural, educational, and economic constraints. There is a consistent call for localized, affordable, and farmer-centered ICT interventions, supported by policy frameworks that promote digital agriculture in rural Nigeria.

III. METHODOLOGY

This study was conducted in Southern Taraba ,Taraba State, Nigeria, a region known for its high concentration of small-scale yam farmers and its significant contribution to yam production in the country. Southern Taraba is situated in the central part of Taraba State and is characterized by fertile soil and a favorable climate that supports extensive yam cultivation.

The target population for this study comprised small-scale yam farmers operating within selected rural communities in Southern Taraba. These farmers typically rely on traditional agricultural practices and operate on limited landholdings, often with minimal access to technological resources.

A sample size of 100 farmers was selected using the simple random sampling technique to ensure that each eligible farmer had an equal chance of being included in the study. This sampling approach was adopted to reduce selection bias and to enhance the representativeness of the findings across the entire farming population in the area.

Primary data for the study were collected using a combination of structured questionnaires, oral interviews, and field observations. The questionnaire was designed to capture quantitative and qualitative data on farmers' demographic profiles, types of ICT tools used, purposes of use, perceived benefits, and challenges. Interviews were conducted to supplement questionnaire responses, allowing for deeper insight into farmers' experiences, while field observations helped verify the actual usage of ICT tools on farms. For the data analysis, descriptive statistical tools such as frequencies and percentages were employed to summarize the responses and identify common patterns of ICT use among the respondents. Additionally, the chi-square test of independence was used to examine the statistical association between ICT usage and key indicators of farm productivity, such as yield levels, income improvement, and access to market information. This combination of quantitative and qualitative methods provided a comprehensive understanding of the dynamics of ICT adoption among yam farmers in the study area.

IV. RESULTS AND DISCUSSION

Objective 1: Awareness and Usage of ICT Tools among Small-Scale Yam Farmers in Southern Taraba.

This objective seeks to evaluate the extent to which small-scale yam farmers in Southern Taraba are aware of, and actively use, various Information and Communication Technology (ICT) tools in their farming practices. The objective provides a foundational understanding of the current ICT penetration level and informs strategies for enhancing digital inclusion and agricultural productivity.

Table 1: Awareness and Usage of ICT Tools

Variable	Percentage of Respondents (%)
Awareness of ICT tools	70%
Use of Mobile Phones	95%
Use of Radio	60%
Use of WhatsApp Groups	30%

Table 2: Purpose of ICT Use

Purpose	Percentage of Respondents (%)
Communication with buyers	75%
Access to market price information	68%
Receiving weather alerts	35%

Purpose	Percentage of Respondents (%)
Accessing extension services	25%

Table 3: Barriers to ICT Use

Barrier	Percentage of Respondents (%)
Poor network coverage	65%
Low literacy and ICT skills	58%
High cost of smartphones and data	45%

Table 4: Perceived Benefits of ICT Use (Qualitative Responses)

Perceived Benefit	Description
Timely access to market/input information	Farmers can respond faster to price changes and locate affordable inputs.
Reduced post-harvest losses	Improved coordination reduces delays and spoilage during harvest and sales.
Improved decision-making	Access to weather data and extension advice helps farmers plan effectively.

- Discussion

The findings of this study reveal that 70% of respondents were aware of at least one form of ICT relevant to agricultural activities, indicating a moderate level of digital awareness among small-scale yam farmers in Southern Taraba. The mobile phone emerged as the most widely used ICT tool (95%), followed by radio (60%) and WhatsApp groups (30%). This reflects the accessibility and familiarity of mobile technology in rural farming communities, aligning with earlier studies that show mobile phones as a key driver of ICT adoption in agriculture (Aker, 2025).

The primary purposes of ICT use were centered on enhancing market access and communication: 75% of farmers used ICT for buyer communication, 68% for market price information, 35% for weather alerts, and only 25% for accessing extension services. This suggests that while ICTs are facilitating market-related activities, their role in technical support and education remains underutilized.

The study also uncovered several barriers to ICT use. Poor network coverage (65%) was the most reported challenge, especially in remote villages. Low literacy and ICT skills (58%) further hinder adoption, particularly for applications requiring reading or digital navigation. High costs of smartphones and data (45%) add financial constraints, limiting access to more advanced or internet-based platforms. Despite these barriers, respondents acknowledged several benefits of ICT in farming. These included timely access to information, which helps with better planning and marketing; reduced post-harvest losses due to improved logistics; and better decision-making informed by market and environmental data. These perceived benefits affirm the transformative potential of ICT in smallholder agriculture, particularly when barriers are effectively addressed (World Bank, 2024).

Objective 2: To Identify the Types of ICT Tools Used and Their Purposes in Yam Farming Activities

The study revealed that the most commonly used ICT tools among small-scale yam farmers in Southern Taraba include:

i. Mobile Phones (95%): Mobile phones are the most widely used ICT tool due to their affordability, portability, and multifunctionality. Farmers use them for voice calls, SMS, and increasingly, for internet-based applications like WhatsApp.
ii. Radio (60%): Radios are popular in rural areas because they are cheap, easy to operate, and do not require literacy. Local agricultural programs provide weather forecasts, farming tips, and market information.
iii. WhatsApp Groups (30%): Some farmers who own smartphones participate in community or cooperative WhatsApp groups to share market trends, input availability, or updates from extension officers.
iv. Television (15%) (less common): Television is occasionally used to watch agricultural programs, though its usage is limited due to erratic power supply and cost of ownership.
v. Internet via Smartphones (20%): A growing number of digitally inclined farmers access the

internet for agricultural blogs, YouTube videos, and e-extension services.

V. PURPOSES OF ICT USE IN YAM FARMING

Purpose	Description
Market Information Access	Farmers use ICT tools to check current prices of yam and inputs in nearby markets.
Communication with Buyers	Farmers directly negotiate prices and logistics with buyers using phone calls or messaging apps.
Weather Forecasts	Information on rainfall patterns and dry spells helps farmers plan planting and harvesting.
Extension Services	ICT enables remote access to agricultural advice, disease control tips, and new practices.
Input Sourcing	Farmers use phones to locate suppliers of fertilizer, herbicides, and improved yam seedlings.
Financial Services	Some farmers access mobile banking or mobile money platforms for transactions and savings.

- Discussion

The predominance of mobile phones reflects their versatility in both basic and internet-enabled functions. Voice calls remain the most common mode of communication due to low literacy, while smartphones are gaining traction among younger farmers. Radios remain essential for reaching illiterate or semi-literate farmers, especially for disseminating weather and extension information.

However, usage is primarily market- and communication-oriented, with less emphasis on technical agronomic support or digital recordkeeping. The findings highlight the need to integrate more localized digital content and train farmers on how to use these tools beyond communication, including decision-making, pest monitoring, and accessing government support programs.

Objective 3: To Evaluate the Perceived Benefits and Limitations of ICT Adoption Among Small-Scale Yam Farmers in Southern Taraba

- Perceived Benefits of ICT Adoption

Table 6: The study identified several key benefits that small-scale yam farmers associate with the use of ICT tools:

Benefit	Description
Timely Access to Market Information	Farmers use mobile phones and radio to obtain current yam prices and market demand trends, helping them sell at competitive rates.
Improved Communication	ICT tools facilitate direct contact with buyers, suppliers, extension agents, and fellow farmers, enhancing coordination.
Weather Forecasting	Access to weather updates via radio or SMS allows farmers to plan planting and harvesting activities more accurately.
Reduction in Post-Harvest Losses	Improved communication and market access reduce delays in distribution, helping farmers minimize spoilage.
Increased Productivity	Access to information on modern farming practices, input application, and pest control leads to better crop yield.
Faster Access to Extension Services	In some cases, farmers receive remote advisory services, reducing reliance on in-person visits.
Cost Savings	By using ICT, farmers reduce transportation costs and time spent searching for market or farming information.

These benefits align with prior research which shows that ICT can improve rural livelihoods by enhancing

access to knowledge and strengthening market linkages (World Bank, 2024; Aker, 2025).

- Perceived Limitations of ICT Adoption

Table 7: Despite the benefits, farmers also reported significant challenges limiting effective ICT use:

Limitation	Description
Poor Network Coverage (65%)	Weak or inconsistent signal in rural areas makes communication unreliable.
Low Literacy and ICT Skills (58%)	Many farmers struggle to use smartphones or interpret text-based information.
High Cost of Devices and Data (45%)	Smartphones and mobile data plans are considered unaffordable for many.
Language Barriers	Many ICT platforms are not available in local languages, reducing accessibility.
Limited Access to Electricity	Inconsistent power supply hampers regular use of ICT tools, especially phones.
Inadequate Digital Agricultural Content	Lack of crop-specific, location-based content limits the practical usefulness of available platforms.

These limitations suggest that while ICT tools are available and valuable, their full potential is not being realized due to socio-economic and infrastructural constraints

- Discussion

The evaluation reveals that small-scale yam farmers in Southern Taraba recognize ICT as a transformative tool, especially for market access, communication, and productivity enhancement. However, the benefits are often offset by real-world barriers including poor infrastructure, limited education, and cost constraints—that prevent widespread and effective adoption.

Addressing these limitations will require multi-stakeholder interventions, including:

- Government investment in rural network and electricity infrastructure.
- Subsidized smartphones or data bundles.
- Local language digital content and ICT training programs.

Objective 4: To Recommend Strategies for Improving ICT Use Among Rural Farmers

Based on the findings of this study, several strategic recommendations can be made to enhance the adoption and effective use of ICT tools among small-scale yam farmers in Southern Taraba and similar rural settings:

Table 8: Recommended Strategies

Strategy	Description
1. ICT Capacity Building and Training	Organize regular digital literacy workshops and farmer-friendly training programs focusing on the use of mobile phones, SMS, and apps for farming purposes. This will empower farmers with the skills needed to navigate digital tools effectively.
2. Improve Network Infrastructure	Collaborate with telecom providers and government agencies to extend reliable mobile network coverage and internet connectivity to underserved rural communities.
3. Provision of Affordable ICT Devices	Government and NGOs should subsidize or provide low-cost smartphones, radios, and solar chargers to rural farmers to overcome the barrier of affordability.
4. Develop Local-Language ICT Content	Create and promote digital platforms, radio broadcasts, and mobile apps in local languages (e.g., Tiv) with content tailored to yam farming. This will ensure inclusivity for non-English-speaking farmers.
5. Strengthen Agricultural	Leverage mobile platforms (SMS, voice calls, WhatsApp) for real-time advisory services, pest alerts,

Strategy	Description
Extension via ICT	and weather updates delivered directly to farmers' phones.
6. Establish Farmer ICT Support Centers	Set up community-based ICT hubs or centers where farmers can receive support, access information, and use digital tools under guidance.
7. Encourage Farmer Cooperatives and Digital Groups	Promote the formation of WhatsApp groups or other online communities for farmers to share knowledge, coordinate sales, and learn from peers.
8. Promote Public-Private Partnerships (PPPs)	Involve private ICT firms, agricultural NGOs, and government in collaborative efforts to develop and deploy scalable digital agriculture solutions.
9. Provide Incentives for ICT-based Innovations	Offer grants or recognition to local startups, youth groups, and developers creating user-friendly, relevant ICT solutions for agriculture.

- Discussion

Improving ICT use among rural farmers requires a multi-dimensional approach that addresses both technical and socio-cultural barriers. Investments in infrastructure must be accompanied by training, support systems, and local content development. Digital inclusion is not just about access to devices, but about empowering farmers to use technology effectively for better productivity, income, and sustainability.

The success of these strategies depends heavily on collaborative efforts between local government, private sector players, extension services, NGOs, and the farmers themselves.

V. SUMMARY, CONCLUSION, LIMITATION, RECOMMENDATION AND FURTHER STUDIES

5.1 Summary

This study investigated the use of Information and Communication Technologies (ICT) among small-scale yam farmers in Southern Taraba, Taraba State, Nigeria. A total of 100 farmers participated through random sampling. Data were collected using questionnaires, interviews, and field observations, and analyzed using descriptive statistics and chi-square tests. Findings showed that while 70% of respondents were aware of ICT tools, actual usage was limited mostly to mobile phones and radio. ICT was primarily used for communication with buyers, accessing market information, and receiving weather updates. Barriers included poor network coverage, digital illiteracy, and high device costs. Despite these challenges, ICT contributed positively to decision-making, reduced post-harvest losses, and enhanced market access.

5.2 Conclusion

ICT holds significant potential to enhance yam farming practices among smallholder farmers in Southern Taraba by improving access to market information, weather forecasts, and agricultural support. However, its impact is currently limited by infrastructural, economic, and educational barriers. Addressing these challenges is essential to fully realize the benefits of ICT in rural agriculture and to foster sustainable digital inclusion.

5.3 Limitations

- The study was limited to Southern Taraba LGA, thus findings may not be generalizable to all yam-producing regions in Nigeria.
- Some respondents lacked digital literacy, which may have limited the depth of insight during interviews.
- The study focused primarily on farmers' reported use rather than long-term outcomes of ICT adoption (e.g., yield increases).

5.4 Recommendations

- Digital Literacy Training: Implement regular ICT training workshops for farmers, tailored to their literacy levels and languages.
- Affordable ICT Devices: Provide subsidies or grants for smartphones, radios, and solar-powered devices.
- Infrastructure Investment: Improve rural internet and mobile network access, and expand rural electrification programs.
- Localized Content Development: Create ICT content in local languages (e.g., Tiv) with a focus on yam farming techniques and market updates.
- Public-Private Partnerships: Encourage collaboration between ICT companies, government, and NGOs to develop sustainable rural ICT platforms.

5.5 Further Study

- Comparative studies across multiple yam-producing LGAs or states to assess regional differences in ICT usage.
- Impact assessment of ICT adoption on yield, income, and poverty reduction over time.
- Exploration of gender-specific barriers and opportunities in ICT access among rural farmers.

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