Original Research Article
ISSN: **3041-5357**
Journal homepage: https://diversity.researchfloor.org/

Journal of Diversity Studies

Information and Communication Technology Tools for Efficient Horticultural Production and Market Access in Imo State, Nigeria

Emma-Okafor,L.C*[1]., **Nnebue, O.M[1].,** **Uba, C.P[1].,** **Okezie, C[1].,** **Nwokeji, E.M[1].,** **Bar-Anyam, M.N[2].,** **Ibeabuchi, C.B[1].,** **and Chikaire, J.U[3]**

[1]*Department of Crop Science and Technology, Owerri, Imo State, Nigeria*
[2]*Department of Agronomy, Federal University of Lafia, Nasarawa State, Nigeria*
[3]*Department of Agricultural Extension, Federal University of Technology, Owerri, Imo State, Nigeria*

ABSTRACT

This study explored how Information and Communication Technology (ICT) is used in horticulture to improve production efficiency and market access in Imo State, Nigeria. Its objectives included identifying the ICT tools used by horticultural farmers, assessing the extent of ICT adoption, evaluating its effects on productivity and market connectivity, highlighting barriers to usage, and suggesting ways to enhance ICT integration. A descriptive survey approach was used, focusing on horticultural farmers across the state's three agricultural zones: Owerri, Orlu, and Okigwe. The purposive sampling method was applied to select 230 participants. Data were gathered through structured questionnaires administered by trained field assistants and analyzed using descriptive statistics, including frequencies, percentages, mean scores, and rankings.Results indicated that mobile phones, radio, television, internet services, and social media platforms were the primary ICT tools adopted by farmers. The use of these technologies was found to improve access to farming information, strengthen communication between producers and buyers, boost output, minimize post-harvest losses, expand market opportunities, and increase farmer incomes. However, several obstacles hindered broader ICT adoption, such as weak network signals, unreliable power supply, expensive internet, limited digital skills, and insufficient government support. To address these issues, the study recommended greater public investment in rural ICT infrastructure, subsidies for internet access, regular digital literacy training for farmers, stronger extension services, and better access to ICT devices in rural areas.The study concluded that effective ICT use significantly enhances horticultural productivity and market access in Imo State. Promoting wider adoption among farmers could therefore play a vital role in advancing sustainable agriculture, ensuring food security, and stimulating rural economic development, in the state and across Nigeria.

Keywords: *ICT, horticulture, agriculture, market, foods, adoption.*

Citation: Emma-Okafor,L.C., Nnebue, O.M., Uba, C.P., Okezie, C., Nwokeji, E.M., Bar-Anyam, M.N., Ibeabuchi, C.B., and Chikaire, J.U [2026]. Information and Communication Technology Tools for Efficient Horticultural Production and Market Access in Imo State, Nigeria. *Journal of Diversity Studies.* **DOI: https://doi.org/10.51470/JOD.2026.5.1.332**

Corresponding Author: *Emma-Okafor,L.C*

E-mail Address: *akjamin2010@gmail.com*

Article History: *Received 16 March 2026 | Revised 14 April 2026 | Accepted 13 May 2026 | Available Online June 17, 2026*

Introduction

Agriculture continues to form the foundation of Nigeria's rural economy, supporting the livelihoods of most of the rural population and making a substantial contribution to non-oil GDP. Within this sector, horticulture—covering the cultivation of high-value crops such as fruits, vegetables, and ornamental plants—offers significant opportunities for improving incomes, enhancing nutrition, and reducing poverty [1]. Given its potential for quick production cycles and high returns per unit of land, horticulture is increasingly seen as a key driver of economic transformation, particularly for small-scale farmers and young agricultural entrepreneurs [2]. In Imo State, located in the humid rainforest region of southeastern Nigeria, favorable ecological conditions support the growth of various horticultural crops, including fluted pumpkin (Telfairia occidentalis), tomatoes, peppers, citrus, and leafy greens [3].

Despite these advantages, horticultural production in Imo State falls short of its potential. The sector faces persistent challenges stemming from outdated farming methods, weak institutional support, and an unstable marketing environment. Horticultural produce is highly perishable, requiring precise management practices such as timely planting, careful water control, early disease identification, and efficient post-harvest handling [4]. Yet, many smallholder farmers in the region continue to depend on traditional knowledge and informal communication channels. This limits their access to modern agricultural techniques and climate-adaptive strategies, leading to poor crop placement, inefficient use of inputs, and low productivity [5].

The challenges extend beyond the farm into market systems. Because fruits and vegetables deteriorate quickly after harvest, effective coordination between producers and urban markets is essential to minimize losses [4].

However, the marketing framework for horticultural goods in southeastern Nigeria suffers from severe information imbalances. Farmers often lack reliable data on urban demand trends, consumer preferences, and daily price changes [6]. This lack of transparency forces them to rely on local middlemen who exploit the situation by offering unfairly low prices at the farm gate or leaving farmers with spoiled produce due to insufficient storage and poor transport logistics [4].

The growing availability of Information and Communication Technology (ICT) presents a viable solution to these systemic issues. A range of digital tools—such as mobile phones, internet-based applications, social media, digital soil mapping, Geographic Information Systems (GIS), and weather forecasting platforms—can enhance data sharing and decision-making in agriculture [6, 7,8]. Across sub-Saharan Africa, integrating such technologies has helped bridge geographical and institutional gaps, enabling farmers to shift from experience-based practices to more precise, data-informed, and market-responsive farming [3,1].

In Imo State, however, the adoption and effective use of these tools remain uneven and largely unstructured. While basic ICT devices like mobile phones and radios are widely available in rural households, they are mostly used for personal communication rather than for agricultural planning or market engagement [3]. More advanced digital resources—such as Computer-Aided Design (CAD) for landscape planning, plant health monitoring apps, and centralized agricultural databases—are either underused or out of reach for most small-scale producers [1]. Therefore, assessing how these technologies are currently applied, their operational capacity, and their socioeconomic effects on horticultural productivity and market access is an urgent research need. This study aims to provide empirical insights to support and accelerate the digital transformation of agriculture in the region.

The horticultural sector in Imo State faces significant challenges due to two primary issues: an ineffective production model and a fragmented market infrastructure. At the agricultural level, farmers struggle with substantial yield risks caused by worsening climate change, unpredictable rainfall patterns, and persistent threats from localized pests and plant diseases [9,10]. Horticultural crops have a very low tolerance for moisture deficits or nutrient imbalances, and the lack of timely agronomic data means that small-scale farmers are unable to manage soil health effectively, optimize their irrigation schedules, or implement preventative pest and disease controls [4]. Furthermore, the public extension system in Imo State is significantly understaffed and lacks adequate funding, which hampers its ability to fill these informational voids or provide timely guidance to the dispersed rural farming population [11].

At the same time, the economic viability of horticultural smallholders is severely undermined by fundamental inefficiencies within the downstream supply chain. The high perishability of fruits and vegetables often results in post-harvest losses across sub-Saharan Africa that can range from 30% to 70% of total agricultural output [4]. In Imo State, these physical losses are exacerbated by financial detriments stemming from a lack of access to real-time market pricing, particularly in major urban centers such as Owerri, Orlu, and Okigwe. This absence leads smallholders to operate in ignorance during sales [3,6]. As a result, they often become dependent on unscrupulous middlemen who exploit this information gap to diminish the prices they receive.

While ICT tools like mobile phones and local radio broadcasting are prevalent in agrarian communities in Imo State, their role in enhancing market integration and farm management remains largely untapped [3]. Rural farmers encounter significant obstacles to adopting these technologies, such as unstable electricity supply, high costs associated with hardware and data plans, limited digital literacy, and a general absence of agricultural applications that are tailored to their local languages [12, 1]. In the absence of empirical, localized data that examines how horticultural producers utilize technology, the specific barriers they encounter, and the measurable effects on their socio-economic wellbeing, digital solutions will likely miss their targets. There is a pressing need to explore effective ways to leverage ICT tools to enhance both horticultural productivity and market access in Imo State.

Investigating the relationship between ICT tools and horticultural systems in Imo State is justified on multiple fronts, including development, academic inquiry, and policy formation. From a developmental and economic angle, horticulture plays a vital role in poverty alleviation and rural job creation due to its potential for high-value output [2]. By exploring how digital tools can enhance production and reduce post-harvest losses, this study offers practical recommendations for boosting smallholder incomes and promoting food and nutritional security [4]. Improving market access through ICT empowers marginalized farming communities, with a particular focus on rural youth and women, who constitute a significant portion of the horticultural labor force and supply chain participants [2,6,7]. On the policy and institutional front, the insights gained from this research provide a data-driven basis for the Imo State Ministry of Agriculture, the Imo State Agricultural Development Programme (IADP), and various non-governmental organizations dedicated to development. As public extension services face challenges due to inadequate staffing, grasping the potential and limitations of mobile networks, radio communication, and digital databases can assist policy makers in devising decentralized and cost-effective digital extension frameworks [5]. Additionally, pinpointing specific structural challenges—like power shortages and high data costs—can guide state-level investments in infrastructure and target support for rural digital tool initiatives (Orewere, 2022). Ultimately, this research makes a valuable academic contribution by enhancing the discourse surrounding digital agricultural advancements in the Global South. While much existing literature tends to concentrate on broad assessments of ICT in grain production, this investigation zeroes in on the particular technical requirements of the vulnerable horticultural supply chain in the humid rainforest region of southeastern Nigeria. The empirical findings regarding barriers to adoption and efficiency improvements will create a reliable reference point for future scholars, agricultural economists, and software developers working towards localized, user-friendly agritech solutions for smallholder farmers. The general objective is to examine the use of ICT in horticulture for efficient production and improved market access in Imo State.

Specific Objectives:

1. To identify the types of ICT tools used by horticultural farmers in Imo State.
2. To assess the level of ICT adoption among horticultural farmers.
3. To evaluate the impact of ICT use on horticultural production efficiency.

4. To examine the role of ICT in improving market access for horticultural produce.
5. To identify the challenges affecting ICT utilization in horticulture.
6. To recommend strategies for enhancing ICT adoption among horticultural farmers.

Methodology

The research was conducted in Imo State, situated in Nigeria's South-East geopolitical zone. The state has a largely agricultural economy, with many rural households involved in crop farming, particularly horticulture—including vegetable and fruit production, ornamental plants, and spice cultivation. Its tropical climate, marked by sufficient rainfall and moderate temperatures, supports year-round horticultural activities. Farming, trading, and small-scale agribusiness are the primary livelihoods for most rural residents. In recent years, improved access to mobile phones, radio, internet services, and digital agricultural platforms has opened up new possibilities for integrating information and communication technologies (ICT) into farming practices across the state and the broader South-East region [13]. The study population consisted of all 2,300 registered horticultural farmers across the three agricultural zones of Imo State: Owerri, Orlu, and Okigwe. These farmers were engaged in various aspects of horticulture, including vegetable growing, fruit farming, nursery operations, and ornamental plant cultivation. A descriptive survey design was employed to assess how ICT is used to enhance production efficiency and market access in the sector. This approach was chosen because it allows for the systematic collection of data on farmers' ICT usage levels, the specific tools they employ, perceived benefits, challenges faced, and potential strategies to improve adoption. It also supports quantitative analysis and broader interpretation of results from a sizable sample. Previous studies on ICT use among Nigerian farmers have similarly applied descriptive surveys and multistage sampling methods with success [14,15].Respondents were selected using purposive random sampling from the list of registered farmers. A sample of 230 farmers was deemed sufficient, aligning with earlier agricultural ICT studies in Nigeria that used sample sizes ranging from 120 to 240 within similar research frameworks [13, 14, 16]. Data were collected through a structured instrument titled Use of ICT in Horticulture for Efficient Production and Market Access Questionnaire (UIHEPMAQ), administered directly by the researcher and trained field assistants to ensure clarity and accurate responses. This method of data collection mirrors approaches used in other studies evaluating ICT integration among farmers in Nigeria [15]. The collected data were analyzed using descriptive statistics, specifically frequency counts and percentages, to summarize key findings.

Result and Discussions

ICT Tools Used by Horticultural Farmers in Imo State

Table 1 presents how horticultural farmers in Imo State use various ICT tools. All 230 respondents (100.0%) reported using mobile phones in their farming activities, highlighting their widespread adoption due to affordability, portability, and ease of communication. Mobile phones emerged as the most common ICT tool among these farmers.Radio was used by 198 respondents (86.1%), and SMS messaging by 185 (80.4%), indicating that both remain key means of delivering agricultural updates, weather reports, and market information, especially in rural areas.Additionally, 172 farmers (74.8%) used WhatsApp, and 165 (71.7%) relied on television for agricultural knowledge and communication. This shows that social media platforms and televised programs contribute significantly to improving access to extension services, market data, and modern farming techniques.Internet search engines like Google were used by 140 respondents (60.9%), while 118 (51.3%) engaged with Facebook, reflecting a moderate level of internet and social media use within this farming community.A total of 110 respondents (47.8%) accessed extension service helplines, and 96 (41.7%) used digital marketplaces to trade horticultural products. These figures suggest a growing, though still limited, shift toward digital tools for marketing and advisory support.Only 85 farmers (37.0%) used agricultural mobile applications, and 72 (31.3%) used computers or laptops, pointing to low uptake of more advanced technologies—likely due to limited digital skills, insufficient infrastructure, and the high cost of equipment.Email was the least adopted tool, with just 54 respondents (23.5%) reporting its use. Its minimal usage may stem from a lack of technical proficiency and a stronger preference for more user-friendly platforms like mobile phones and WhatsApp.Overall, horticultural farmers in Imo State primarily depend on basic, easily accessible ICT tools such as mobile phones, radio, SMS, and WhatsApp. In contrast, the use of more complex digital technologies remains limited.

Table 1: ICT Tools Used by Horticultural Farmers in Imo State

S/N	ICT Tools Used	Frequency	Percentage
1	Mobile phones	230	100.0
2	Radio	198	86.1
3	Television	165	71.7
4	WhatsApp	172	74.8
5	Internet/Google search	140	60.9
6	Facebook	118	51.3
7	Agricultural mobile applications	85	37.0
8	Computer/Laptop	72	31.3
9	Email services	54	23.5
10	Digital market platforms	96	41.7
11	Extension service helplines	110	47.8
12	SMS text messaging	185	80.4

Level of ICT Adoption among Horticultural Farmers in Imo State

Table 2 outlines the extent of ICT adoption among horticultural farmers in Imo State, based on responses from 230 participants. The data show that 225 farmers (97.8%) used mobile phones for farming-related communication, reflecting widespread use of basic digital tools in this sector. This highlights the central role mobile phones play in coordinating farm operations, obtaining agricultural information, and connecting with buyers and extension officers. Additionally, 190 respondents (82.6%) accessed market information via ICT, and 182 (79.1%) received extension services through SMS, indicating that many farmers depend on these technologies for timely advice, pricing data, and productivity-enhancing knowledge.Further, 176 farmers (76.5%) obtained weather forecasts using ICT tools, and 172 (74.8%) incorporated such tools into their everyday farming routines, underscoring their significance in planning planting and harvesting activities. The results also reveal that 168 respondents (73.0%) used social media to gather agricultural information, while 156 (67.8%) employed internet or mobile banking for financial transactions related to their farms, suggesting growing integration of digital communication and financial platforms into farming practices.

Moreover, 121 farmers (52.6%) leveraged digital platforms to market their produce, and 104 (45.2%) engaged in online agricultural training, pointing to a moderate uptake of more advanced ICT applications. However, adoption rates were lower for certain technologies: only 88 respondents (38.3%) used mobile farming apps, and 70 (30.4%) relied on computers or laptops for farm management. These lower figures may stem from challenges such as limited digital skills, unreliable power supply, high device costs, and poor internet connectivity in rural communities. Finally, email usage was the lowest, with just 48 respondents (20.9%) employing it for agricultural communication, likely due to limited technical familiarity and a preference for more user-friendly platforms like mobile calls, text messages, and messaging apps. Overall, the findings suggest that while horticultural farmers in Imo State widely adopt simple, accessible technologies, the use of more complex digital tools remains limited.

Impact of ICT use on horticultural production efficiency.

The table outlines the effects of ICT use on horticultural production efficiency based on responses from 230 participants in the study area. Because multiple responses were permitted, the total number of responses surpasses the sample size. The most commonly reported impact was better access to agricultural information, cited by 210 respondents (91.3%), indicating that tools like mobile phones, internet services, radio, and farming apps enabled farmers to obtain up-to-date knowledge on cultivation techniques, inputs, and market prospects. A large share of respondents—198 (86.1%)—also noted higher crop yields due to ICT use, pointing to improved productivity through access to current farming knowledge and more effective communication. Additionally, 185 respondents (80.4%) found that ICT enhanced communication with buyers and suppliers, leading to quicker transactions and more efficient marketing. About 176 respondents (76.5%) credited ICT with better pest and disease control, likely due to easier access to expert advice and online agricultural updates. The data also show that 170 respondents (73.9%) experienced improved weather forecasting and farm planning, while 168 (73.0%) observed fewer post-harvest losses, suggesting ICT helped farmers make more timely decisions about harvesting, storage, and transport.

Further, 165 respondents (71.7%) reported expanded market access, and 160 (69.6%) said ICT improved record keeping on their farms. Some 158 respondents (68.7%) indicated that ICT supported better decision-making in daily farm operations by providing reliable and timely agricultural information. Around 150 respondents (65.2%) believed ICT contributed to more efficient time and labor use, while 148 (64.3%) linked it to higher income and profitability, driven by gains in production and marketing. Moreover, 145 respondents (63.0%) said ICT made extension services more accessible, and 138 (60.0%) noted lower production costs due to improved resource management and reduced waste. Finally, 132 respondents (57.4%) observed improvements in produce quality, and 128 (55.7%) said ICT encouraged the adoption of modern farming methods. Overall, the results highlight that ICT significantly enhances horticultural efficiency by improving access to information, boosting output, strengthening communication, expanding market reach, and supporting better farm management practices.

Table 2: Impact of ICT Use on Horticultural Production Efficiency

	Impact of ICT Use on Horticultural Production Efficiency	Frequency	Percentage
1	Improved access to agricultural information	210	91.3
2	Increased crop yield	198	86.1
3	Faster communication with buyers and suppliers	185	80.4
4	Improved pest and disease management	176	76.5
5	Better weather forecasting and planning	170	73.9
6	Reduction in post-harvest losses	168	73.0
7	Increased market access	165	71.7
8	Improved farm record keeping	160	69.6
9	Enhanced decision-making on farm operations	158	68.7
10	Improved time management and labour efficiency	150	65.2
11	Increased income and profitability	148	64.3
12	Easier access to extension services	145	63.0
13	Reduced cost of production	138	60.0
14	Improved quality of horticultural produce	132	57.4
15	Greater adoption of modern farming practices	128	55.7

Roles of ICT in Improving Market Access for Horticultural Produce

The table examined the roles of ICT in improving market access for horticultural produce among 230 respondents using multiple responses. The findings revealed that ICT played significant roles in enhancing market accessibility, communication, sales, and profitability among horticultural farmers. The highest proportion of respondents, 214 (93.0%), indicated that ICT provides timely market price information. This suggests that ICT tools such as mobile phones, internet platforms, and social media enabled farmers to access current price information, thereby helping them make informed marketing decisions. Also, 208 respondents (90.4%) reported that ICT enhances communication between farmers and buyers. This implies that ICT improved interaction and facilitated easier exchange of information between producers, traders, and consumers. Similarly, 205 respondents (89.1%) stated that ICT facilitates access to wider markets, while 201 respondents (87.4%) noted that ICT improves access to market demand information. These findings indicate that ICT helped farmers expand beyond local markets and better understand consumer preferences and market trends.

Furthermore, 196 respondents (85.2%) agreed that ICT reduces exploitation by middlemen. This may be because farmers could directly access buyers and market prices without depending heavily on intermediaries. In addition, 192 respondents (83.5%) revealed that ICT enables online advertising of produce, thereby increasing product visibility and attracting more buyers. The table further showed that 188 respondents (81.7%) believed ICT supports mobile banking and digital payments, while 184 respondents (80.0%) indicated that ICT improves transportation and logistics coordination. This demonstrates that ICT contributed to smoother financial transactions and efficient movement of horticultural produce to markets. Moreover, 181 respondents (78.7%) stated that ICT helps farmers identify profitable markets, and 177 respondents (77.0%) observed that ICT enhances linkage with extension agents and marketers. This implies that ICT improved networking opportunities and market-oriented production.

In the same vein, 174 respondents (75.7%) noted that ICT facilitates direct sales to consumers, whereas 171 respondents (74.3%) agreed that ICT reduces post-harvest losses through faster sales. These responses indicate that ICT promoted quick marketing and minimized spoilage of perishable horticultural products.

The study also found that 167 respondents (72.6%) believed ICT promotes market transparency, while 164 respondents (71.3%) indicated that ICT assists farmers in negotiating better prices. This suggests that ICT empowered farmers with the information needed for fair pricing and improved bargaining power. Additionally, 160 respondents (69.6%) reported that ICT increases farmers' income through improved sales, and 156 respondents (67.8%) stated that ICT provides weather and market forecast updates. This indicates that ICT contributed to better planning and increased profitability. Furthermore, 151 respondents (65.7%) agreed that ICT encourages participation in agribusiness networks, while 147 respondents (63.9%) believed ICT improves customer feedback and satisfaction. This implies that ICT strengthened relationships among market actors and enhanced service delivery. Lastly, 142 respondents (61.7%) indicated that ICT enhances access to export market opportunities, while 138 respondents (60.0%) reported that ICT promotes branding and packaging awareness. Although these had comparatively lower percentages, they still demonstrate that ICT contributed meaningfully to improving competitiveness and market standards among horticultural farmers. Overall, the findings revealed that ICT plays a substantial role in improving market access for horticultural produce through enhanced communication, market information dissemination, digital transactions, wider market reach, and improved profitability among farmers.

Table 3: Roles of ICT in Improving Market Access for Horticultural Produce

	ICT Roles in Improving Market Access for Horticultural Produce	Frequency*	Percentage
1	Provides timely market price information	214	93.0
2	Enhances communication between farmers and buyers	208	90.4
3	Facilitates access to wider markets	205	89.1
4	Improves access to market demand information	201	87.4
5	Reduces exploitation by middlemen	196	85.2
6	Enables online advertising of produce	192	83.5
7	Supports mobile banking and digital payments	188	81.7
8	Improves transportation and logistics coordination	184	80.0
9	Helps farmers identify profitable markets	181	78.7
10	Enhances linkage with extension agents and marketers	177	77.0
11	Facilitates direct sales to consumers	174	75.7
12	Reduces post-harvest losses through faster sales	171	74.3
13	Promotes market transparency	167	72.6
14	Assists farmers in negotiating better prices	164	71.3
15	Increases farmers' income through improved sales	160	69.6
16	Provides weather and market forecast updates	156	67.8
17	Encourages participation in agribusiness networks	151	65.7
18	Improves customer feedback and satisfaction	147	63.9
19	Enhances access to export market opportunities	142	61.7
20	Promotes branding and packaging awareness	138	60.0

Challenges Affecting ICT Utilization in Horticulture

Table 4 outlines the key challenges impacting the use of information and communication technologies (ICT) in horticulture, based on responses from 230 participants who could select multiple issues. The results indicate that a range of infrastructural, economic, educational, and institutional barriers restrict farmers' effective use of ICT. The most commonly cited obstacle was insufficient ICT infrastructure, particularly poor internet connectivity, mentioned by 205 respondents (89.1%), highlighting how unreliable network access limits farmers' ability to obtain digital agricultural information and engage with online markets. A closely related concern was the high cost of ICT devices and data, reported by 198 respondents (86.1%), reflecting the limited affordability of smartphones, computers, and ongoing internet subscriptions.

Lack of consistent electricity supply was noted by 194 respondents (84.3%), underscoring how power instability in rural horticultural areas disrupts the use of digital tools. Digital skills gaps were also significant: 189 respondents (82.2%) pointed to low ICT literacy among farmers, while 185 (80.4%) emphasized the absence of training opportunities, both of which hinder meaningful engagement with technology. Limited ownership of smartphones and computers was raised by 181 respondents (78.7%), suggesting many farmers still lack essential devices for accessing digital services.

Weak support from agricultural extension services was reported by 176 respondents (76.5%), indicating that field officers may not be effectively incorporating ICT into their advisory roles. Language barriers were identified by 170 respondents (73.9%), as many digital platforms are not adapted to local languages or the literacy levels of rural users. Concerns about cybersecurity and fraud were expressed by 165 respondents (71.7%), revealing that fears of scams and data misuse deter some farmers from using digital systems.

Additionally, 160 respondents (69.6%) noted a shortage of agriculture-specific digital content, suggesting that existing platforms often fail to meet the practical needs of horticultural producers. Inadequate government policies and support were highlighted by 155 respondents (67.4%), pointing to insufficient investment and strategic direction for ICT integration in farming. Poor technical maintenance and repair services were reported by 149 respondents (64.8%), meaning that even when technology is available, breakdowns can render it unusable. Finally, 144 respondents (62.6%) observed resistance to adopting new technologies among certain farmers, likely due to cultural preferences, fear of change, or trust in traditional practices.

Overall, the data show that ICT use in horticulture is held back by interconnected challenges—including inadequate infrastructure, financial constraints, limited digital skills, insufficient institutional backing, and socio-cultural factors. Tackling these issues could greatly improve ICT adoption and, in turn, enhance productivity in the horticultural sector.

Table 4: Challenges Affecting ICT Utilization in Horticulture

S/N	Challenges Affecting ICT Utilization in Horticulture	Frequency*	Percentage (%)
1	Inadequate ICT infrastructure (network coverage)	205	89.1
2	High cost of ICT devices and internet data	198	86.1
3	Poor electricity supply	194	84.3
4	Low level of ICT literacy among farmers	189	82.2
5	Lack of training on ICT use	185	80.4
6	Limited access to smartphones/computers	181	78.7
7	Poor extension support services	176	76.5
8	Language barrier in ICT platforms	170	73.9
9	Cybersecurity and fraud concerns	165	71.7
10	Lack of relevant agricultural digital content	160	69.6
11	Weak government support policies	155	67.4
12	Poor maintenance and technical support services	149	64.8
13	Resistance to technology adoption by some farmers	144	62.6

Strategies for Enhancing ICT Adoption Among Horticultural Farmers

Table 5 outlines strategies to boost ICT adoption among horticultural farmers, based on input from 230 respondents analyzed through multiple response methods.

The results emphasize the need for coordinated efforts across infrastructure, education, finance, institutions, and technology. The most commonly recommended measure was making ICT devices and internet services more affordable, cited by 212 respondents (92.2%), underscoring affordability as a central factor in increasing access to smartphones, computers, and online connectivity. A closely related priority was improving rural ICT infrastructure, noted by 208 respondents (90.4%), reflecting the necessity of dependable and widespread network coverage for effective digital use in farming areas.Regular training and skill development programs were highlighted by 204 respondents (88.7%), pointing to the importance of ongoing learning opportunities to build farmers' confidence and proficiency with digital tools. Financial incentives, such as subsidies for smartphones and data plans, were supported by 198 respondents (86.1%), suggesting that economic assistance can play a significant role in lowering adoption barriers. Equally critical is access to stable electricity, identified by 194 respondents (84.3%), as a consistent power supply is fundamental for operating ICT equipment in remote agricultural settings.Integrating ICT tools into agricultural extension services was mentioned by 189 respondents (82.2%), indicating that frontline advisors are key to introducing and supporting digital practices among farmers. The creation of intuitive, easy-to-use digital platforms for agriculture was recommended by 183 respondents (79.6%), highlighting that usability must be prioritized to accommodate users with limited technical experience. Digital literacy initiatives in rural areas received backing from 179 respondents (77.8%), reinforcing the need to establish basic digital knowledge at the community level.Government involvement through supportive policies was recognized by 175 respondents (76.1%), showing that institutional frameworks are essential for long-term integration of ICT in farming. The establishment of shared ICT centers in communities was proposed by 170 respondents (73.9%), offering a practical solution for those unable to afford personal devices. Mobile-based advisory services were endorsed by 166 respondents (72.2%), affirming the mobile phone's role as a primary medium for disseminating agricultural information.Encouraging private sector engagement in agricultural ICT was suggested by 160 respondents (69.6%), indicating that collaboration with businesses could drive innovation and broaden access to digital solutions. Lastly, enhancing cybersecurity awareness and fraud prevention was raised by 155 respondents (67.4%), emphasizing that user trust and platform safety are vital for sustained engagement with digital technologies.Overall, advancing ICT use in horticulture demands a comprehensive strategy that combines cost reduction, infrastructure upgrades, education, policy development, and improved access. Together, these measures can enhance digital tool utilization, ultimately supporting greater productivity and better market connections for farmers.

Table 5: Strategies for Enhancing ICT Adoption Among Horticultural Farmers

S/N	Strategies for Enhancing ICT Adoption in Horticulture	Frequency*	Percentage
1	Provision of affordable ICT devices and internet services	212	92.2
2	Improvement of rural ICT infrastructure (network expansion)	208	90.4
3	Regular training and capacity building for farmers	204	88.7
4	Subsidy on smartphones and data bundles for farmers	198	86.1
5	Reliable electricity supply in rural areas	194	84.3
6	Strengthening agricultural extension services with ICT tools	189	82.2
7	Development of user-friendly agricultural ICT platforms	183	79.6
8	Provision of digital literacy programs in rural communities	179	77.8
9	Government support through ICT-friendly agricultural policies	175	76.1
10	Establishment of community ICT resource centers	170	73.9
11	Promotion of mobile-based agricultural advisory services	166	72.2
12	Encouraging private sector investment in agricultural ICT	160	69.6
13	Strengthening cybersecurity and fraud awareness programs	155	67.4

Conclusion

The study found that Information and Communication Technology (ICT) played a significant role in boosting horticultural productivity and expanding market access for farmers in Imo State. Tools like mobile phones, radio, internet services, social media, and television enabled farmers to obtain timely information on weather conditions, pest and disease management, better farming techniques, and current market prices. These technologies also strengthened communication among farmers, extension workers, suppliers, and buyers, helping to minimize post-harvest losses and increase earnings.However, despite these advantages, several challenges hindered effective ICT use. These included unreliable network connectivity, inconsistent electricity supply, expensive internet services, limited digital skills, and scarce access to modern ICT devices, particularly among rural farmers. To address these issues, the study suggested greater government investment in rural ICT infrastructure, expanded training programs for farmers, more affordable internet options, and enhanced agricultural extension services. These measures could promote broader ICT adoption in horticulture, supporting sustainable agricultural growth and improved market engagement in the region.

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