

Digital Communication, Information Asymmetry, and Agricultural Productivity in Imo State, Nigeria: A Conceptual Approach

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Abstract: *Smallholder farming dominates the agricultural landscape of Imo State, Nigeria, yet persistent information gaps continue to limit output and household earnings. This study investigates how digital communication tools, including mobile phones, internet platforms, and broadcast media, shape the flow of agricultural information and, by extension, farm-level productivity. Evidence drawn from farm-level surveys indicates that while basic technologies such as mobile phones and radio have reached nearly all farming households, more sophisticated digital platforms remain beyond the reach of most producers. The study identifies three critical areas where information asymmetry undermines performance: input procurement, produce marketing, and agronomic knowledge transfer. Findings suggest that farmers who actively use digital channels report better yields, lower post-harvest waste, and stronger negotiating positions against middlemen. Nevertheless, poor rural connectivity, high device costs, weak extension support, and low digital literacy prevent widespread adoption of transformative technologies. The study presents a conceptual model (Figure 1) tracing how digital tools compress information gaps and boost productivity through three efficiency channels: allocative, technical, and market-power efficiency. A second diagram (Figure 2) maps the tiered structure of technology uptake among Imo State farmers. Hence, the study recommends concentration on rural broadband investment, subsidized smart devices, extension-system digitization, and locally relevant content development.*

Keywords: *Information asymmetry, digital communication, agricultural productivity, smallholder farmers, ICT adoption.*

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1.0 Introduction

Agriculture remains an important contributor to employment, food security, and rural livelihoods in Nigeria. Its contribution to national economic development underscores the need to address the structural and informational constraints that limit the productivity of smallholder farmers (Lagos Chamber of Commerce and Industry, 2025; National Bureau of Statistics, 2024).

In Imo State, located in Nigeria's South-East geopolitical zone, crop production, particularly cassava, yam, vegetables, and other horticultural crops, constitutes an important component of rural livelihoods and household income (Food and Agriculture Organization of the United Nations, 2026). The productivity of these farming activities depends not only on land, labour, and other production inputs but also on farmers' ability to obtain reliable information about input quality, prevailing market prices, weather conditions, and improved agronomic practices.

Despite the sector's centrality to local employment and food supply, productivity levels remain disappointing. One major reason is that smallholders operate with far less market information than the traders, input dealers, and processors with whom they transact. Information asymmetry refers to a situation in which one party in a transaction possesses more accurate, complete, or timely information

than another, potentially resulting in unequal bargaining power, inefficient resource allocation, and unfavourable market outcomes. Information and communication technologies (ICTs) can help address these challenges by enabling farmers to access timely information on weather conditions, soil moisture, rainfall, solar radiation, pest outbreaks, input availability, and agricultural market prices. Such information can support better production planning, more efficient input utilisation, and improved marketing decisions ((Ifeoma *et al.*, 2023; Nwankwo *et al.*, 2023).

The theoretical foundation of this study is informed by the economics of information asymmetry, as developed in the works of Akerlof (1970), Spence (1973), and Stiglitz (1974). These contributions explain how unequal access to information can influence transaction outcomes, market participation, and resource allocation. In smallholder agriculture, information asymmetry may occur when farmers cannot independently verify the quality of seeds and fertilisers, access reliable market-price information, assess alternative buyers, or obtain timely agronomic advice. These disadvantages may increase transaction costs, weaken farmers' bargaining positions, and limit their capacity to make productivity-enhancing decisions.

In Imo State's agricultural economy, this imbalance appears whenever a farmer cannot verify seed quality, does not know the prevailing market price before harvest, or misses early warnings about pest outbreaks. Left unaddressed, these gaps depress yields, shrink incomes, and trap households in cycles of low investment and subsistence production. The expansion of mobile telephone and internet services in Nigeria has created opportunities to improve agricultural information exchange and communication between farmers, extension personnel, input suppliers, and produce buyers. Mobile phones, radio, short-message services,

and social media can facilitate the dissemination of weather forecasts, agricultural advisories, and market information (Okoronkwo *et al.*, 2025). However, access to communication technologies does not necessarily translate into their effective use for agricultural decision-making. The extent to which farmers benefit from digital communication may depend on device affordability, network availability, digital literacy, the relevance of available information, and the responsiveness of agricultural extension services (Research Floor, 2026).

However, ownership of a phone does not automatically translate into better farming decisions. Many growers use their devices only for family calls rather than for price checking, pest diagnosis, or digital record-keeping (Research Floor, 2026). Advanced tools such as smartphone applications for fertilizer calculation, e-commerce platforms for direct sales, or geographic information systems for soil mapping are still rare among small-scale producers.

Despite the growing interest in digital agriculture, important questions remain concerning how digital communication can address the different forms of information asymmetry experienced by smallholder farmers in Imo State. Information gaps in agricultural input procurement, produce marketing, and agronomic knowledge transfer are interconnected, yet their relationships with digital technology adoption and farm-level productivity require further integrated examination. Furthermore, access to basic communication technologies may not guarantee the effective use of advanced digital platforms, particularly where infrastructure, affordability, digital skills, and extension support are limited. An integrated analysis of these issues is therefore necessary to clarify the potential contribution of digital communication to agricultural productivity in the state.



The aim of this study is to examine the relationship between digital communication, information asymmetry, and agricultural productivity among smallholder farmers in Imo State, Nigeria, with particular attention to technology-adoption patterns, information gaps in agricultural markets and knowledge systems, and the constraints limiting the productive use of digital tools.

To achieve this aim, the study pursues the following specific objectives:

- i. To examine the patterns of digital communication technology adoption among smallholder farmers in Imo State.
- ii. To analyse how information asymmetry manifests in agricultural input procurement, produce marketing, and agronomic knowledge transfer.
- iii. To identify the infrastructural, economic, digital-literacy, and institutional constraints that limit the effective use of digital communication for improving agricultural productivity.

The significance of this study lies in its examination of digital communication as a potential mechanism for reducing information asymmetry and improving smallholder agricultural decision-making. The study may contribute to research on agricultural communication by bringing together information access, technology adoption, market participation, and productivity within a common analytical perspective. Its findings may also inform policymakers, agricultural extension agencies, telecommunications providers, and digital-platform developers in designing interventions that address the information needs and adoption constraints of farmers in Imo State. In practical terms, the study highlights the importance of combining digital infrastructure with affordable devices, relevant agricultural content, digital-literacy development, and effective extension support. The extent to which these measures improve

yields and incomes, however, requires appropriate empirical evaluation.

1.1 Literature Review

1.1.1 Information Asymmetry and Agricultural Market Failure

Information asymmetry provides a useful theoretical lens for understanding the market and knowledge constraints faced by smallholder farmers. Akerlof (1970) demonstrated how uncertainty about product quality can lead to adverse selection, while Spence (1973) explained how credible signals can reduce information uncertainty. Stiglitz (1974) further examined the implications of information problems for contractual arrangements and resource allocation. Applied to agriculture, these perspectives suggest that limited access to reliable information about input quality, produce prices, and production techniques can disadvantage farmers in their transactions and investment decisions. Digital traceability, electronic price information, and online agricultural advisory services may help address some of these challenges by improving information availability and transparency (Nobel Prize Outreach, 2001)

In Imo State specifically, information asymmetry operates in three distinct markets, namely,

- i. Input markets are characterized by opacity regarding seed viability, fertilizer composition, and appropriate agrochemical dosages.
- ii. Output markets suffer from spatial fragmentation and perishability, conditions that empower intermediaries to withhold price information and pay farmers below competitive rates (Research Floor, 2026).
- iii. Knowledge markets are weakened by an overstretched public extension system; nationally, the ratio of extension agents to farmers is estimated



at 1:7,500, far below what is needed for effective technology transfer (Chekene & Shehu, 2025).

1.1.2 Digital Tools and Rural Agricultural Development

Empirical research across sub-Saharan Africa has documented the developmental promise of ICTs in agriculture. Aker (2010) estimated that the expansion of mobile-phone coverage reduced grain price dispersion across Niger from 16 to 10 percent, with the greatest benefits accruing to remote markets previously isolated from price information. In a similar vein, Jensen (2007) found that mobile-phone adoption among South Indian fishermen cut waste and raised profits by improving coordination between boats and wholesale buyers.

Within Nigeria, smartphone ownership correlates positively with the adoption of modern inputs and intensified farming practices (Raji *et al.*, 2026). Digital extension channels including SMS alerts, WhatsApp farmer groups, and mobile banking can overcome the physical and staffing constraints of conventional extension by enabling mass, customized, two-way communication (Onyemekihian, 2021). These tools are particularly valuable in settings where face-to-face visits are infrequent and transportation costs are high.

Taken together, these studies indicate that digital communication can improve information exchange, reduce selected transaction costs, and strengthen coordination between agricultural producers and market participants. Nevertheless, the benefits reported in different geographical and sectoral contexts cannot automatically be assumed to apply equally to smallholder farmers in Imo State. Differences in network coverage, affordability, literacy, agricultural information needs, and extension-service capacity may

influence the extent of adoption and the outcomes achieved. Consequently, the local context must be considered when assessing whether access to digital communication translates into more efficient production, reduced post-harvest losses, and improved farm incomes.

1.1.3 Productivity Trends in Nigeria and Imo State

Nigeria ranks as the world's leading cassava producer, with yearly output surpassing 63 million metric tons, yet smallholder yields have stagnated or declined in many areas (International Institute of Tropical Agriculture, 2021). Cross-country micro-data reveal that Nigerian smallholder productivity fell by an estimated 4.8 percent per year between 2008 and 2019 after controlling for weather, plot characteristics, and input use (Wollburg *et al.*, 2024). This decline is especially troubling because younger Nigerian farmers already achieve markedly higher yields per hectare (10,195 kg/ha) than older ones (7,898 kg/ha), implying that knowledge and technology access not land quality or biology are the binding constraints (Ifeanyi-obi & Iferobia, 2024).

At the state level, cassava cultivation in Imo remains profitable, generating an average net income of ₦288,503 per season and returning ₦3.55 for every naira invested (Food and Agriculture Organization of the United Nations, 2026). Nevertheless, growers consistently cite capital shortages (98.9%) and land scarcity (88.9%) as top barriers, suggesting that productivity gains from better information could be substantial if farmers could leverage digital tools to optimize input use and market timing (Food and Agriculture Organization of the United Nations, 2026). Yam output in the state has also proven volatile, fluctuating between 564,050 and 819,870 metric tons during 2006–2010, a pattern tied in part to erratic weather and poor



market access (International Institute of Tropical Agriculture, 2021).

The evidence on agricultural productivity indicates that smallholder performance is influenced by multiple interacting constraints, including access to productive resources, production knowledge, and markets. Digital communication may help farmers respond to some of these constraints by improving the timing and quality of information available for production and marketing decisions. However, the potential productivity benefits depend on whether farmers can access, understand, and apply the information provided. This reinforces the need to examine digital technology adoption alongside the specific information barriers and institutional conditions affecting smallholder agriculture in Imo State.

1.3 Conceptual Framework

The conceptual framework positions digital communication as a potential intermediary between information access and agricultural productivity. It proposes that mobile phones, radio, internet platforms, and other digital channels may reduce information gaps in agricultural input procurement, produce marketing, and agronomic knowledge transfer. Improved information access may support allocative efficiency by helping farmers select appropriate inputs, technical efficiency by facilitating the adoption of improved production practices, and market-related efficiency by enabling farmers to compare prices and identify alternative buyers. These mechanisms are expected to contribute to improved yields, reduced post-harvest losses, and higher farm incomes, subject to the influence of infrastructure, affordability, digital literacy, and institutional support. The framework therefore represents proposed relationships that require empirical assessment rather than proof of causality in themselves.

- i. Allocative efficiency rises because inputs are purchased in optimal combinations and quantities.
- ii. Technical efficiency improves because best practices such as correct planting dates, pest thresholds, and harvest timing are adopted more widely.
- iii. Market power increases because growers can compare buyer prices, bypass exploitative intermediaries, and time sales to coincide with peak demand.

Together, these efficiency gains translate into higher yields, reduced losses, and stronger farm incomes.

Fig. 1 presents the proposed relationships among information asymmetry, digital communication, and agricultural productivity in Imo State. It identifies information constraints in input procurement, produce marketing, and agronomic knowledge transfer, and illustrates how digital communication may help address these constraints.

The blue central panel positions digital communication technologies as the mediating force. Penetration rates drawn from farm surveys are embedded in this panel, showing a steep drop-off from basic voice tools (100%) to advanced applications (37%).

The green outcome panel lists the productivity dividends: higher cassava and horticultural yields, lower waste, and improved incomes.

The orange mechanism panel at the bottom specifies the three efficiency channels allocative, technical, and market-power through which information access becomes productivity gain.

The framework draws on the theoretical contributions of Akerlof (1970) and the empirical literature cited in the manuscript, including Okoronkwo et al. (2025) and Research Floor (2026).



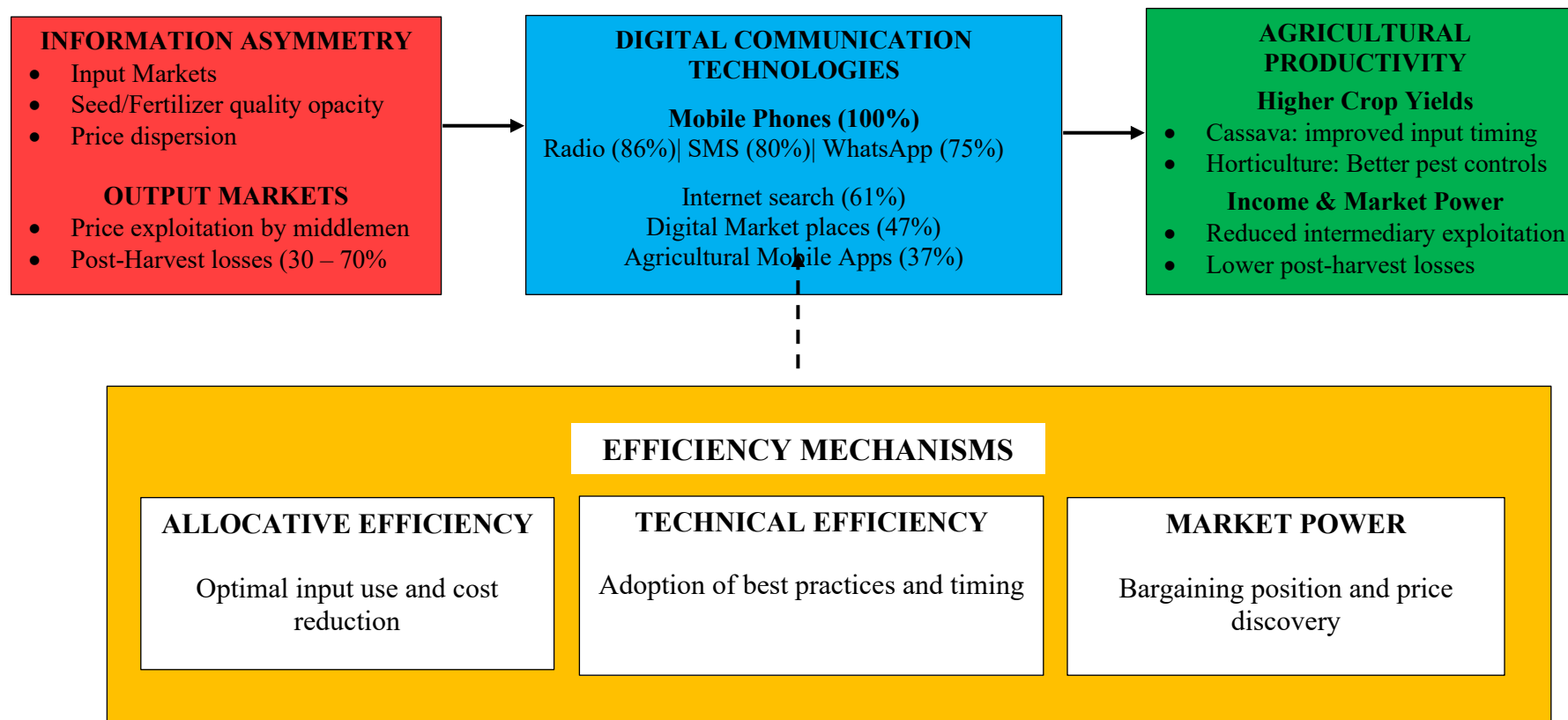


Fig. 1: Conceptual Framework: Digital Communication, Information Asymmetry, and Agricultural Productivity in Imo State, Nigeria (Source: Akerlof (1970); Okoronkwo et al. (2025) and Research Floor (2026))



The relationships represented in the diagram should be interpreted as proposed mechanisms whose effectiveness depends on farmers' access to, and productive use of, digital communication technologies.

2.0 Digital Communication Adoption in Imo State

2.1 Current Patterns of Technology Use

Digital communication adoption among farmers in Imo State varies according to the accessibility, affordability, technical requirements, and perceived usefulness of available technologies. Basic communication channels, such as mobile phones and radio, appear to be more widely used than specialised digital agricultural platforms that require smartphones, reliable internet connectivity, and specific digital skills. Understanding these differences is important for assessing farmers' ability to obtain and apply information relating to agricultural inputs, production practices, weather conditions, and produce markets.

Table 1 presents the reported use of different communication technologies for agricultural purposes among farmers in Imo State. Mobile phones recorded the highest reported adoption level (100.0%), followed by radio (86.1%), SMS messaging (80.4%), WhatsApp (74.8%), and television (71.7%). Internet search engines were reported by 60.9% of farmers, while Facebook and extension helplines recorded 51.3% and 47.8%, respectively. Lower reported adoption levels were observed for digital marketplaces (41.7%), agricultural mobile applications (37.0%), computers and laptops (31.3%), and email (23.5%).

These figures suggest that communication technologies with relatively low entry requirements are more widely used than some

specialised digital platforms. Mobile phones can facilitate communication with input suppliers, buyers, extension personnel, and other farmers, while radio and television can provide agricultural information through broadcasts. SMS messaging and WhatsApp may support the exchange of market information, production advice, and farm-related experiences. However, the extent to which these technologies are used regularly for agricultural decision-making cannot be established from adoption percentages alone. The comparatively lower reported use of agricultural applications, digital marketplaces, computers, and email suggests that access to specialised digital services may be less widespread. Possible constraints include the cost of devices and data, unreliable connectivity and electricity, limited digital skills, and the availability of locally relevant content. These factors should be interpreted in relation to the evidence provided by the original studies rather than assumed to explain the adoption differences conclusively.

Note: Multiple responses were permitted. Percentages therefore do not sum to 100%. The figures should be interpreted as reported estimates of technology use, subject to verification of the original sources, sample characteristics, and definitions of use.

The distribution presented in Table 1 can be illustrated as a hierarchical pattern of technology adoption. Figure 2 should be used to distinguish technologies with higher reported adoption from those with lower reported adoption, rather than to imply that every technology within a category has the same adoption rate.



Table 1: ICT Tools Used by Farmers in Imo State

ICT Tool	Share of Farmers (%)	Main Agricultural Purpose	Analytical Note
Mobile phones (basic/feature)	100.0	Voice calls to coordinate sales and input orders	The universal entry point; affordability and portability explain saturation.
Radio	86.1	Weather bulletins, agricultural broadcasts, market reports	Dominant mass medium in low-literacy settings; complements mobile phones.
SMS text messaging	80.4	Extension reminders, price alerts, input schedules	Scalable without internet; high potential for one-to-many advisory delivery.
WhatsApp	74.8	Group discussions, photo-sharing of pests, buyer networking	Requires smartphones and data; visual interactivity supports rapid problem-solving.
Television	71.7	Demonstration videos, policy announcements	Constrained by erratic electricity and fixed broadcast schedules.
Internet search engines	60.9	General research, input price comparisons	Information demand exists, but cost and literacy barriers limit regular use.
Facebook	51.3	Community networking, informal buyer-seller linkages	Social and commercial functions overlap; not yet a primary business platform.
Extension helplines	47.8	Direct queries to agricultural officers	Low uptake reflects limited awareness and weak trust in public services.
Digital marketplaces	41.7	Online produce listings, buyer discovery	Nascent e-commerce activity; signals future potential for disintermediation.
Agricultural mobile apps	37.0	Pest identification, fertilizer calculators, record keeping	Large gap due to device incompatibility, complexity, and lack of local-language content.
Computers/laptops	31.3	Record management, document preparation	High cost and power needs make these irrelevant for most field operations.



Email	23.5	Formal correspondence, grant applications	Superseded by mobile-first, synchronous platforms in rural settings.
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Percentages synthesized from Okoronkwo *et al.*, (2025) and Research Floor (2026), based on samples of 230–370 farmers across Owerri, Orlu, and Okigwe zones.

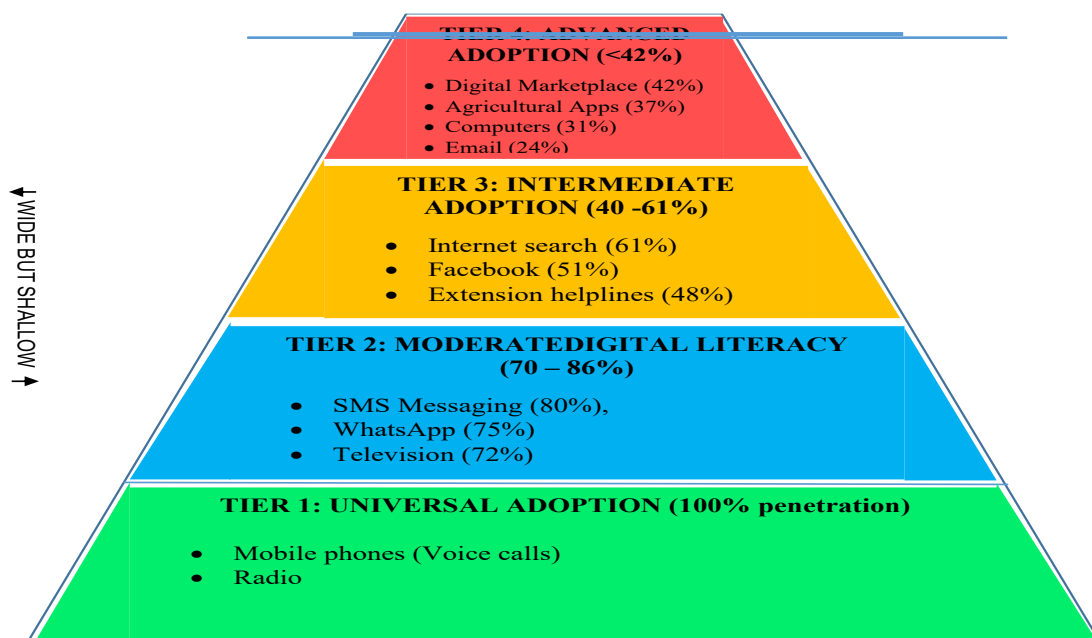


Fig. 2.: Hierarchical Model of ICT Adoption among Farmers in Imo State, Nigeria
(Note: Digital agriculture in Imo State is “wide but shallow” Universal access to basic tools, but <42% penetration of advanced platforms that drive strategic farm management and market integration)

The observed pattern suggests a distinction between access to communication technologies and their effective application to agricultural management. Farmers may use mobile phones and messaging platforms to communicate with buyers or obtain advice without necessarily using specialised applications for farm planning, crop monitoring, or record-keeping. Consequently, widespread access to basic communication tools does not automatically demonstrate that farmers can use digital information to improve productivity or profitability. The practical value of digital communication depends on the relevance and reliability of the information received, farmers'

ability to interpret it, and the availability of resources needed to act on it.

2.2 The Extension System's Digital Shortfall

Agricultural extension services can help farmers interpret and apply information about improved production practices, pest and disease management, weather conditions, input selection, and market opportunities. Digital communication provides additional channels through which extension personnel can distribute agricultural advisories, respond to farmers' enquiries, and maintain contact with farming communities. Mobile phones, messaging applications, and other digital platforms may therefore complement



conventional extension activities and improve the timeliness of information delivery.

However, the effectiveness of digital extension depends on more than the availability of communication technologies. Extension personnel require appropriate training, reliable connectivity, suitable devices, and access to relevant agricultural information. Farmers also need opportunities to ask questions, receive explanations, and obtain practical guidance when implementing recommendations. Where extension services face inadequate resources, limited personnel, transportation difficulties, or weak coordination, the benefits of digital communication may remain limited (Umunakwe, 2025; Chekene & Shehu, 2025).

The reported adoption pattern in Table 1 indicates that extension helplines were used by 47.8% of farmers, a lower proportion than those reporting mobile phone, radio, and SMS use. This difference may indicate an opportunity to strengthen the integration of digital communication into agricultural advisory services. Nevertheless, the adoption percentage alone does not establish whether limited use results from poor awareness, inadequate extension capacity, connectivity problems, or farmers' preferences for other information sources. These possible explanations require confirmation from the underlying studies.

Strengthening digital extension in Imo State would therefore require a coordinated approach that combines accessible communication technologies with trained extension personnel and locally relevant agricultural content. Practical training, farmer-focused messaging, and the use of appropriate local languages could help improve the usefulness of digital advisory services. Digital platforms should complement rather than automatically replace face-to-face extension, particularly where farmers need demonstrations, individualised

advice, or assistance in evaluating the reliability of agricultural information.

Overall, digital communication adoption in Imo State should be understood in terms of both technology use and the institutional arrangements that support productive application. Although the reported figures suggest that basic communication channels are more widely used than specialised digital agricultural tools, the extent to which these channels reduce information asymmetry and improve farm outcomes requires further empirical assessment.

3.0 How Information Asymmetry Undermines Productivity

3.1 Input Markets

When farmers cannot verify the genetic purity of seeds or the nutrient content of fertilizers, they routinely apply substandard inputs that depress germination rates and soil fertility. Without digital traceability or QR-code verification systems, counterfeit agrochemicals circulate freely in Imo State's supply chains. Farmers who depend on word-of-mouth recommendations from neighbors or local traders lack the comparative benchmarks needed to select inputs best suited to their soils and crops (Research Floor, 2026).

3.2 Output Markets

Imo State's horticulture sector suffers acutely from output-market information gaps. Because fruits and vegetables are highly perishable, post-harvest losses across sub-Saharan Africa range from 30 to 70 percent of total output (Research Floor, 2026). In Owerri, Orlu, and Okigwe markets, growers often arrive with truckloads of produce unaware of current retail prices. Middlemen exploit this blindness by offering prices well below market levels, capturing value that should belong to producers. Farmers equipped with real-time price data via SMS, WhatsApp groups, or digital marketplaces can negotiate harder,



reject low bids, or redirect sales to more favorable buyers (Aker, 2010).

3.3 Knowledge Markets and Yield Penalties

Perhaps the most damaging asymmetry is in agronomic knowledge. A timely warning about an approaching pest infestation or an impending dry spell can save an entire season's

investment. Yet, the public extension system is too thinly staffed to reach most farmers, and private advisory services are unaffordable for smallholders (Umunakwe, 2025). The resulting knowledge vacuum leaves growers dependent on tradition and intuition rather than on evidence-based practices.

Table 2: Perceived Productivity Effects of ICT Use among Horticultural Farmers in Imo State

Productivity Indicator	Farmers Reporting Improvement (%)	Interpretation
Better access to agricultural information	91.3	Nearly all ICT users recognize an information dividend, indicating strong unmet demand for digital extension.
Higher crop yields	86.1	A robust perceived link between digital access and output gains, likely driven by better input timing and pest control.
Stronger communication with buyers and suppliers	80.4	Digital coordination shortens transaction lags and supports just-in-time marketing of perishables.
Improved pest and disease management	76.5	Photo-sharing and remote diagnostics via WhatsApp enable faster, more accurate crop protection decisions.
Better weather forecasting and planning	73.9	Predictive information helps farmers synchronize planting and irrigation with climatic conditions.
Lower post-harvest losses	73.0	Market-timing advice and storage tips delivered digitally directly address the loss problem.
Expanded market access	71.7	Online platforms connect growers to distant buyers, weakening dependence on village-level brokers.
Better record keeping	69.6	Even simple SMS logs improve expense tracking and strengthen creditworthiness.
Improved daily operational decisions	68.7	Data-informed management replaces guesswork in planting, spraying, and harvesting.
Higher income and profitability	64.3	Income gains trail yield gains, suggesting that market-power asymmetries persist even when productivity rises.

Adapted from Research Floor (2026), $N = 230$ horticultural farmers.



Table 2 confirms that farmers experience digital tools as beneficial across virtually every dimension of production. The gap between yield effects (86.1%) and income effects (64.3%) is especially instructive: it shows that information alone cannot overcome structural market power imbalances. Even well-informed farmers may still face monopsonistic buyers or collusive intermediaries. Therefore, digital information interventions must be paired with measures that improve market access and competition (Jensen, 2007). The importance of ICT tools in extension services is demonstrated by the highest use of digital tools by livestock and poultry farmers, followed by mass media exposure and extension agencies (Ifeoma *et al.*, 2024).

3.4 Barriers to Productive Digital Communication

The promise of digital agriculture in Imo State is held back by a web of interconnected obstacles spanning infrastructure, economics, institutions, and culture (Okoronkwo *et al.*, 2025; Research Floor, 2026).

Table 3 presents the major constraints affecting the utilization of information and communication technologies (ICTs) among farmers in Imo State, together with the proportion of farmers reporting each constraint, its classification, and its policy implications. The table shows that ICT adoption is influenced by a combination of infrastructural, economic, human-capital, institutional, and socio-cultural barriers, indicating that access to digital technologies alone may not be sufficient to ensure their effective application in agricultural production and marketing.

3.4.1 Multiple responses.

As presented in Table 3, poor internet connectivity and weak ICT infrastructure

constitute the most frequently reported constraints, affecting 89.1% of farmers, followed by the high cost of devices and data subscriptions (86.1%) and unreliable electricity supply (84.3%). These findings indicate that inadequate digital infrastructure, affordability challenges, and unreliable power supply may substantially limit farmers' ability to access and consistently use digital agricultural services. Human-capital and institutional barriers are also prominent, with 82.2% of farmers reporting low digital literacy, 80.4% identifying a lack of training opportunities, and 76.5% reporting weak extension-service support. These results suggest that investments in connectivity and devices should be accompanied by practical digital-literacy training and stronger extension services to facilitate the productive use of ICTs. Furthermore, the reported absence of local-language content (73.9%) and fear of cyber fraud and scams (71.7%) highlight the importance of developing linguistically accessible platforms and strengthening digital safety awareness. These findings are consistent with the concerns discussed by Umunakwe (2025) regarding extension-service limitations and by Onyemekihian (2021) concerning the need for accessible, farmer-oriented digital communication. Collectively, the results support an integrated policy approach that combines rural ICT infrastructure, affordable devices and data, reliable electricity, digital-skills development, effective extension support, local-language content, and appropriate digital-security measures. However, the percentages represent reported constraints and should not be interpreted as establishing causal relationships between individual barriers and ICT utilization.



Table 3: Constraints on ICT Utilization among Farmers in Imo State

Constraint	Share of Farmers Affected (%)	Category	Policy Relevance
Poor internet connectivity / weak ICT infrastructure	89.1	Structural	Demands public and private investment in rural broadband and mobile tower densification.
High cost of devices and data subscriptions	86.1	Economic	Requires targeted subsidies, tax waivers on farm smartphones, and affordable data bundles.
Unreliable electricity supply	84.3	Structural	Solar charging stations and off-grid power solutions are needed in remote communities.
Low digital literacy	82.2	Human capital	Adult-education and farmer-field-school models should integrate basic digital skills.
Lack of training opportunities	80.4	Institutional	Extension curricula must be updated to include hands-on digital tool training.
Limited ownership of smartphones or computers	78.7	Economic	Shared community ICT hubs and device-financing schemes can lower entry barriers.
Weak support from extension services	76.5	Institutional	Extension agencies need equipment, connectivity, and incentives to champion digital adoption.
Absence of local-language content	73.9	Socio-cultural	Platforms must offer Igbo-language interfaces and voice-based (IVR/USSD) services.
Fear of cyber fraud and scams	71.7	Perceptual	Verified-platform certification and digital-safety campaigns can build user trust.

Source: Research Floor (2026) and Okoronkwo et al. (2025)

4.0 Discussion

The evidence leads to three main conclusions. First, digital tools have penetrated Imo State farming households broadly but superficially. Mobile phones and radios are everywhere, yet they are used mainly for social coordination rather than for strategic farm management (Okoronkwo *et al.*, 2025). Second, information asymmetry measurably erodes productivity in input, output, and knowledge markets, and

digital channels can mitigate these losses where they are deployed effectively (Research Floor, 2026). Third, structural deficits connectivity gaps, high costs, institutional frailty, and low literacy block the conversion of digital access into digital impact (Umunakwe, 2025). If policymakers can narrow even a portion of these gaps, the payoff could be substantial. Farmers already using ICT for agricultural purposes report better yields, tighter pest control, and less post-harvest waste (Research



Floor, 2026). Some of the factors challenging the willingness of farmers to invest in improved technologies are; the absence of extension officers in the study area which leave the farmers with insufficient information about some recent improved technologies that should be adopted and invested in (Ifeoma and Mbajiuka, 2024). Scaling these benefits requires moving beyond the current pyramid of adoption (Figure 2) toward an integrated digital ecosystem in which hardware, connectivity, content, and institutional support reinforce one another.

5.0 Conclusion

Digital communication technologies offer Imo State's smallholder farmers a powerful, if still largely unrealized, pathway out of information asymmetry and low productivity. Mobile phones and radio have already reached universal coverage, providing a foundation upon which more advanced services can be built. Yet the current pattern of use “wide but shallow” means that the tools most capable of transforming input procurement, output marketing, and agronomic learning remain accessible to only a minority of growers.

Information asymmetry continues to extract a heavy toll: farmers overpay for suspect inputs, underprice their harvests, and miss opportunities to adopt improved practices. Digital channels can compress these gaps by raising allocative efficiency, technical efficiency, and market power, but only if the surrounding ecosystem of infrastructure, affordability, training, and institutional support is strengthened. Policymakers must therefore resist the temptation to treat digital agriculture as a purely technical intervention. It is, at its core, a socio-technical undertaking that demands simultaneous investment in connectivity, devices, human capital, localized content, and extension reform.

Looking ahead, longitudinal impact evaluations are needed to isolate the causal

effects of specific digital interventions on yields and incomes in Imo State. Gender-disaggregated research is equally urgent, given evidence elsewhere in Nigeria that male- and female-headed households face unequal access to productive resources and market information. As Nigeria seeks to diversify its economy and secure its food supply, enabling Imo State's farmers to turn digital access into digital advantage will be essential for inclusive rural growth.

Based on this findings, the following recommendations were made:

1. Government and telecom regulators should prioritize tower construction and fiber rollout in Owerri, Orlu, and Okigwe agricultural zones. Solar-powered community ICT centers can simultaneously solve electricity and access problems.
2. Smartphones and data plans tailored for agricultural use should be subsidized or bundled with input credit. Zero-rating of agricultural websites and apps would remove a major cost barrier (Raji *et al.*, 2026).
3. The Imo State Agricultural Development Programme should embed digital proficiency into job descriptions for extension agents and provide them with tablets, connectivity, and training. Digital advisory delivery should become a core service, not an afterthought.
4. Agricultural platforms should offer Igbo-language menus, voice-based advisory lines (IVR/USSD), and image-heavy interfaces that do not depend on high literacy. Content must reflect the specific crops, pests, and seasons of Imo State.
5. Real-time, digitally disseminated price data for cassava, yam, and horticultural produce in major Imo State markets would arm farmers with bargaining power and reduce intermediary rents.



6. Platform operators and regulators should introduce user verification, escrow payments, and fraud-reporting mechanisms to address the cyber security fears that deter 71.7% of farmers (Research Floor, 2026).

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Conflict of interest statement

The authors declare that they have no conflict of interest in relation to this research, whether financial, personal, authorship or otherwise, that could affect the research and the results presented in this paper.

Compliance with Ethical Standards

Declaration

Ethical Approval

Not Applicable

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Authors' Contributions

All components of the work were carried out by the authors

