

Digital Market Information and Smallholder Fish Supply-Chain Performance: An Empirical Synthesis from Lagos State, Nigeria

Samuel Awolumaté

Received: 10 July 2026/Accepted: 21 August 2026/Published: 12 September 2026

Abstract: Timely market information is central to the performance of smallholder fish supply chains because fish is highly perishable, prices vary across locations and time, and producers and marketers often transact under unequal access to information. This paper examines the role of digital market information in fish-supply-chain performance in Lagos State by synthesizing published empirical evidence from the author's research trajectory. The evidence base includes a 2018 Lagos survey of 180 fish farmers on ICT use, a 2022 Lagos study of 135 smoked and dried fish marketers, a 2024 Kogi State communication study with 187 valid responses, and the author's 2026 Lagos fish-supply-chain market-information study. The synthesis shows a consistent transition from basic mobile access toward market-oriented digital communication, but also demonstrates that access alone is insufficient. In the 2018 Lagos dataset, mobile phones were the most accessible ICT tool for updating aquaculture knowledge (37.2%), 88.9% of respondents agreed or strongly agreed that ICT enables fast communication, and 84.5% identified computer literacy as a major constraint. The 2024 study similarly found strong dependence on established extension communication channels: 77.1% received aquaculture innovation information through the Train-and-Visit system, while network, training, language and information-material constraints remained important. The 2022 Lagos marketing study, based on 135 respondents, showed that smoked and dried fish marketing was commercially significant but exposed to operational and market constraints. Taken together, the evidence supports a supply-chain interpretation in which digital information

improves commercial decision-making when it is timely, trusted and actionable, but its effect is conditioned by digital literacy, infrastructure, logistics, market organization and the ability to act on price and buyer information. The paper recommends verified multi-channel market-information systems linked to cooperatives, extension, buyer directories, price reporting, digital payments and logistics support.

Keywords: digital market information; fish supply chain; aquaculture; mobile communication; market access; price discovery; profitability; Lagos State; Nigeria

Samuel Awolumaté

Department of Animal and Fisheries,
Faculty of Agriculture,
National Open University of Nigeria

Email: awolumaté@noun.edu.ng

<https://orcid.org/0000-0002-8128-4214>

1.0 Introduction

Fish supply chains comprise interconnected activities involving production, processing, aggregation, wholesaling, retailing and consumption. These activities depend not only on the physical movement of fish but also on the timely exchange of accurate and relevant information among supply-chain actors. In Lagos State, where fish is supplied to a large and diverse urban market, producers and marketers must make frequent decisions concerning production, harvesting, pricing, buyer selection, transportation, preservation, storage, product form and payment. Access to appropriate market information is therefore important for improving market coordination and enabling smallholder actors to respond

effectively to changing market conditions. Information asymmetry constitutes an important challenge within smallholder fish supply chains because producers and marketers may have unequal access to information on prevailing prices, consumer demand, alternative buyers, product requirements and market opportunities. When intermediaries or other market participants possess more timely and reliable information, less-informed actors may experience higher search costs, weaker bargaining positions and greater dependence on established market relationships. These conditions can limit the ability of smallholders to identify profitable outlets and negotiate favourable transactions.

The increasing availability of mobile phones and digital communication technologies provides opportunities to reduce some of these information constraints. Digital platforms can facilitate rapid communication between producers, traders and buyers, disseminate price and demand information, and expand access to geographically dispersed markets. However, access to digital technology does not necessarily result in effective use of market information. The availability, affordability, reliability, relevance and timeliness of information, together with users' digital literacy and capacity to act on the information received, determine whether digital communication can produce meaningful improvements in supply-chain performance. The author's earlier research provides an empirical basis for understanding this transition. Awolunate (2018a), in a study involving 180 fish farmers in Lagos State, found that mobile phones were the most accessible ICT tool for obtaining and updating aquaculture information. Market-information databases were also identified as an important modern ICT application adaptable to fish farming. Nevertheless, digital literacy and cost constituted important constraints to effective ICT utilization. These findings indicate that the

presence of communication technology alone is insufficient to guarantee effective access to or use of market information.

Subsequent research expanded the focus from ICT accessibility to communication practices and fish marketing. Mundi, Awolunate, and Ambassador-Brikins (2024) demonstrated the continuing importance of established extension communication channels alongside mobile and digital technologies. Their findings showed that fish farmers continued to depend substantially on the Train-and-Visit extension system, while inadequate training, irregular extension contact, inconsistent information, language barriers and network-service limitations constrained communication effectiveness. This suggests that digital market-information systems may achieve greater practical value when integrated with trusted extension and institutional communication channels.

The economic dimension of the information problem is also evident in fish marketing. Awolunate et al. (2022) examined smoked and dried fish marketers in Lagos State and documented a commercially active marketing system alongside significant operational and market constraints. Their findings highlight the fact that information can generate economic value only when market actors have the capacity to respond to it. For example, information about a higher price in another market may have limited value when transportation costs are excessive, storage facilities are inadequate, or working capital is insufficient. This interaction between information and physical market capacity is particularly important in fish supply chains because fish products are perishable. The author's 2026 study on market-information access and fish-supply-chain performance in Lagos State provides a further link between communication, market information and supply-chain outcomes. Building on the earlier studies, the present work considers digital



market information as a multidimensional resource involving accessibility, timeliness, reliability, relevance and actionability. This perspective moves beyond the question of whether fish farmers and marketers possess mobile phones or use digital platforms and instead considers whether the information obtained through such technologies can support improved price discovery, buyer access, market coordination, transaction efficiency and commercial performance.

Despite the growing relevance of digital communication, an important gap remains in understanding how digital market information translates into actual performance within smallholder fish supply chains. Digital access may create opportunities for improved information exchange, but its benefits can be constrained by digital literacy, network infrastructure, affordability, transportation, storage, finance, institutional support and the organization of buyer relationships. Consequently, digital market information should be examined not as an isolated technological intervention but as one component of a wider supply-chain system.

The significance of this study lies in its integration of evidence from ICT use, extension communication, fish marketing and market-information research to provide a broader understanding of digital information within smallholder fish supply chains. The study is relevant to fish farmers and marketers because improved access to timely and reliable information can support better marketing decisions and market opportunities. It is also relevant to extension organizations and policymakers because the findings can help identify the technological, human and institutional conditions required for effective digital market-information delivery. For cooperatives, buyers and other supply-chain actors, the study provides a basis for developing communication mechanisms that improve coordination and market connectivity.

More broadly, the study contributes to understanding how digital information can be combined with transportation, storage, finance and institutional support to improve the effectiveness of smallholder fish supply chains in Lagos State.

Against this background, the present study examines the role of digital market information in the performance of smallholder fish supply chains in Lagos State, with particular attention to access, usefulness, constraints, market coordination and the capacity of supply-chain actors to convert information into improved market outcomes.

The aim of the study is to assess the role of digital market information in improving the performance of smallholder fish supply chains in Lagos State, Nigeria, using an empirical synthesis of evidence from studies on ICT utilization, communication, fish marketing and market-information access.

The study specifically seeks to:

- (i) examine the empirical evidence linking ICT access, digital communication and fish-market performance;
- (ii) assess the accessibility and perceived usefulness of mobile and digital information channels among fish farmers and fish-market actors
- (iii) identify the digital-literacy, connectivity, cost and institutional constraints limiting the effective use of digital market information
- (iv) examine the relationship between market-information access, market coordination, fish-marketing profitability and supply-chain performance; and
- (v) develop evidence-based recommendations for an integrated and verified digital market-information system for fish-supply-chain actors in Lagos State.

The study seeks to answer the following research questions:

- (i) What information and communication channels are most accessible to fish farmers and other fish-market actors?



(ii) To what extent do fish farmers perceive ICT and digital communication as improving the speed and availability of relevant information?

(iii) What digital-literacy, network, cost and institutional constraints limit the effective use of digital market information?

(iv) How does access to market information relate to market coordination, price discovery, buyer access and the commercial performance of fish marketers?

(v) What features should an effective digital market-information system possess to improve fish-supply-chain performance rather than merely increase communication volume?

1.1 Hypotheses

The following null hypotheses are proposed for empirical testing:

H₀₁: Access to mobile and digital information has no significant relationship with the availability of market information among smallholder fish-supply-chain actors.

H₀₂: Timeliness and trustworthiness of digital communication have no significant relationship with market coordination and price discovery.

H₀₃: Digital literacy, connectivity and information-related costs have no significant relationship with the effective utilization of digital market information.

H₀₄: The relationship between digital market information and commercial performance does not significantly differ according to the availability of transportation, storage, finance and organized buyer linkages.

1.2 Literature Review

1.2.1 Market Information and Fish Supply-Chain Performance

Market information encompasses knowledge about prevailing and expected prices, quantities demanded, buyer locations, product-quality requirements, transportation conditions, input availability, payment arrangements and market rules. For

smallholder fish producers and marketers, such information can influence decisions concerning when to harvest, where to sell, which buyers to contact, how to negotiate and whether to accept particular offers. Market information is therefore an important resource for coordinating activities throughout the fish supply chain.

Information asymmetry provides a useful basis for understanding differences in bargaining power and value capture within markets. When one participant possesses more timely or reliable information than another, the less-informed participant may incur greater search costs, have weaker negotiating capacity and become dependent on a limited number of intermediaries. In smallholder fish supply chains, these conditions may affect the prices received by producers, marketing margins and access to alternative markets.

The importance of timely information is heightened by the perishability of fish. Producers and traders often have limited opportunities to delay sales while searching for better markets. Consequently, information that is accurate but received too late may have less practical value than information that is available when production, pricing and marketing decisions are being made.

1.2.2 Digital Communication and Market Access

Mobile communication can reduce information-search costs by enabling producers and traders to communicate rapidly with buyers and compare market opportunities. Aker (2010) demonstrated the broader agricultural-market value of mobile information, while Jensen (2007) showed that improved information technology can influence price dispersion and market performance in fisheries. These studies demonstrate the potential for communication technologies to influence the way market participants obtain and respond to information.



However, technology availability does not necessarily translate into effective utilization. Awolumate (2018a) found that mobile phones were already prominent among fish farmers in Lagos State, but computer literacy, cost and accessibility continued to influence effective ICT use. The implication is that digital technology should be regarded as an enabling mechanism whose benefits depend on users' ability to access, understand and apply the information obtained.

Digital market-information systems should therefore be designed around the actual communication needs and capabilities of their intended users. Simple, accessible and affordable platforms may be more useful to smallholders than technically complex systems that require advanced digital skills or costly equipment. The relevance of the information provided is equally important because information that does not address farmers' and marketers' immediate decisions may have limited practical value.

1.2.3 Constraints to the Use of Digital Market Information

The effectiveness of digital information is influenced by technological, human, institutional and economic constraints. Mundi, Awolumate, and Ambassador-Brikins (2024) found that fish farmers continued to depend substantially on the Train-and-Visit extension system despite the availability of mobile and digital communication. Although respondents valued accessibility and ease of understanding, inadequate training, irregular extension contact, inconsistent information, language barriers and network-service limitations remained important constraints.

These findings suggest that digital systems should complement rather than necessarily replace established communication and extension structures. Extension institutions can contribute to information verification, interpretation and technical support, while

digital platforms can improve the speed and geographical reach of information dissemination. Such integration can potentially strengthen users' confidence in digital information and improve its practical application.

Other constraints arise from the physical and financial environment in which market transactions occur. Awolumate et al. (2022), in their study of smoked and dried fish marketers in Lagos State, documented an active commercial marketing system alongside significant operational and market challenges. Information about a better price or alternative buyer may have limited value if transportation costs are high, storage facilities are inadequate or working capital is unavailable. Thus, digital market information cannot be considered independently of the physical capacity of supply-chain actors to respond to market opportunities.

1.4.4 Digital Market Information and Smallholder Fish Supply Chains

The author's 2026 study, *Market Information Access and Performance of the Fish Supply Chain in Lagos State*, provides a direct connection between earlier research on ICT and communication and the broader issue of supply-chain performance. The present study extends this research trajectory by conceptualizing digital market information as a multidimensional resource involving access, frequency, timeliness, reliability, relevance and actionability.

Access determines whether information can be obtained, while frequency reflects how regularly market actors receive updates. Timeliness determines whether information is received when decisions must be made, and reliability affects the extent to which users can trust it. Relevance concerns the extent to which information addresses actual market needs, while actionability refers to the ability of users to convert information into practical production and marketing decisions. These



dimensions are important because digital adoption alone does not necessarily result in improved market outcomes.

The evidence from the author's research suggests that conversational digital platforms, including WhatsApp and Facebook, may be more accessible to fish farmers than more complex digital systems. This reinforces the importance of designing market-information systems that are compatible with existing communication practices and digital capabilities. Taken together, the literature supports a pathway in which digital access creates opportunities to obtain market information; information quality influences trust and utilization; improved information can facilitate price discovery, buyer search and market coordination; and commercial benefits depend on whether users have the resources and institutional support required to act on that information. Digital literacy, network infrastructure, cooperative participation, transportation, storage and finance may therefore influence the extent to which digital information contributes to improved supply-chain performance.

The literature consequently provides a basis for examining digital market information as an enabling resource within smallholder fish supply chains rather than as a stand-alone technological solution. The present study builds on the existing evidence by integrating ICT access, communication, marketing and market-information perspectives to assess how digital information can contribute to improved market coordination and supply-chain performance in Lagos State.

2.0 Methodology

2.1 Research Design

The study adopted a structured secondary empirical synthesis design to integrate evidence from the author's previous research on ICT utilization, communication, fish marketing and market-information access. The design was selected because the source studies

differ in geographical coverage, study population, sample size, study period and questionnaire design. Consequently, the individual respondents from the different studies were not pooled or treated as a single sample. Instead, reported aggregate findings were extracted, organized and compared within a common evidence framework.

The synthesis focused on four interconnected dimensions: information access, communication quality, constraints to information utilization, and fish-market performance. This approach permits evidence from different studies to be examined collectively while preserving the original characteristics and context of each dataset. It also prevents heterogeneous samples from being presented as though they originated from a single primary survey.

2.2 Evidence Base and Dataset Construction

The evidence base consisted of published empirical findings from four studies that collectively address different aspects of digital information and fish-supply-chain performance. The 2018 Lagos study provided evidence on ICT accessibility, perceived usefulness and constraints among fish farmers. The 2022 Lagos study provided information on the socioeconomic and commercial characteristics of smoked and dried fish marketers. The 2024 Kogi State study contributed evidence on aquaculture communication channels, preferences and communication constraints, while the 2026 Lagos study provided the most recent evidence linking market-information access with fish-supply-chain performance.

A structured evidence matrix was developed in which each entry represented a reported statistic or finding from the corresponding source study. Only findings that could be identified and verified from the available publication records were incorporated. The



studies and their respective contributions to the present synthesis are summarized in Table 1.

As shown in Table 1, the studies contribute complementary rather than identical forms of evidence. The Lagos studies provide direct

evidence relevant to the target geographical context, while the Kogi study is used primarily to illuminate communication behaviour and constraints. The latter is therefore not interpreted as a direct estimate of conditions among fish actors in Lagos State.

Table 1. Empirical Evidence Base Used in the Study

Study and location	Sample	Empirical role in the present study	Key reported evidence
Awolumate (2018a), Lagos State	180 fish farmers	ICT access, adaptability and constraints	Mobile phones accounted for 37.2% of accessible ICT tools; 88.9% agreed/strongly agreed that ICT enables fast communication; 84.5% identified computer literacy as a major challenge.
Awolumate et al. (2022), Lagos State	135 smoked and dried fish marketers	Marketing performance and operational constraints	Females constituted 65.93%; mean age was 43.59 years; mean household size was 6 persons; mean marketing experience was 3.5 years; fish marketing was reported as highly profitable but subject to operational and market constraints.
Mundi, Awolumate, and Ambassador-Brikins (2024), Kogi State	200 selected; 187 valid responses	Communication channels and usability constraints	77.1% received aquaculture-innovation information through the Train-and-Visit system; 63.6% preferred the system; network, training, language and information-material constraints were reported.
Awolumate and Obodo (2026), Lagos State	Published empirical supply-chain study	Market-information access and fish-supply-chain performance	Published in <i>Dutse Journal of Pure and Applied Sciences</i> , 12(2c), 10–17; used as the most recent market-performance evidence. Respondent-level microdata were not supplied with the present manuscript.



2.3 Variables and Analytical Framework

The principal explanatory construct was digital market-information access, represented by the availability and use of mobile phones, digital platforms and related information channels. The principal constraints examined included digital literacy, device and service costs, network availability, training limitations, language barriers and accessibility of communication channels. Supply-chain performance was interpreted using indicators related to market coordination, buyer reach, price discovery, transaction efficiency, marketing margins and profitability.

Physical and institutional conditions, including transportation, storage, finance, extension support and organized buyer relationships, may further condition this relationship.

2.4 Data Analysis

Because the evidence was obtained from separate studies with different samples, locations and measurement instruments, the analysis was descriptive and triangulative rather than based on pooled econometric estimation. Reported frequencies, percentages and sample characteristics were compared to identify recurring patterns across the studies.

The hypotheses were consequently treated as evidence-supported propositions rather than subjected to formal statistical tests using a common respondent-level dataset. The synthesis therefore identifies the extent to which the available empirical evidence is consistent with each proposition while avoiding unsupported causal claims.

2.5 Data Integrity and Limitations

The original unit of analysis, sample size and study year were retained for each source. Missing observations were not reconstructed, and unpublished respondent-level data were not inferred from aggregate results. Percentages from different studies were not averaged because the underlying samples and measurement procedures were not equivalent.

The Kogi State communication findings were used to explain communication behaviour and constraints and were not generalized as Lagos State estimates. Similarly, the 2022 study involved smoked and dried fish marketers and therefore was not treated as representative of all fish farmers, processors, traders or consumers in Lagos State. These distinctions are important for maintaining the validity of the cross-study synthesis.

3.0 Results

3.1 ICT Access and the Transition toward Mobile Information

The 2018 Lagos study provides the principal baseline for understanding ICT accessibility among fish farmers. The findings indicate that mobile phones were the most accessible ICT tool for obtaining and updating aquaculture information, accounting for 37.2% of reported access. Newspapers and other print formats accounted for 26.7%, digital libraries for 19.4%, and television or other tele-centres for 16.7%. These findings indicate that mobile communication had already emerged as an important information channel among the sampled fish farmers.

The distribution of the reported ICT tools is presented in Table 2.

As shown in Table 2, mobile phones constituted the largest single category of accessible ICT tools, with 67 respondents (37.2%). This finding provides an important basis for considering mobile communication as an entry point for digital market-information services among smallholder fish farmers.

3.2 Perceived Benefits of ICT Communication

Beyond simple access to ICT tools, respondents reported substantial perceived benefits from digital communication. In the Lagos 2018 dataset, 51.1% strongly agreed and 37.8% agreed that ICT tools ensured fast communication among fish farmers, producing a combined positive response of 88.9%.



Similarly, 85.0% either agreed or strongly agreed that fish farmers could obtain current and relevant information from online resources, while 81.1% agreed or strongly

agreed that most farmers possessed an ICT tool. These findings are summarized in Table 3.

Table 2. Accessible ICT Tools for Updating Aquaculture Information among Fish Farmers in Lagos State, 2018

ICT tool	Frequency	Percentage (%)
Mobile phone	67	37.2
Newspapers/other print formats	48	26.7
Digital libraries	35	19.4
Television/other tele-centres	30	16.7
Total	180	100.0

Table 3. Perceived Benefits and Accessibility of ICT among Fish Farmers in Lagos State, 2018

Perception item	Strongly agree (%)	Agree (%)	Combined positive response (%)
ICT tools ensure fast communication	51.1	37.8	88.9
Access to current/relevant online information	25.6	59.4	85.0
Most farmers possess an ICT tool	28.3	52.8	81.1
ICT has triggered private involvement in fish farming	48.9	48.3	97.2

The results in Table 3 indicate a generally positive perception of ICT among the respondents. The 88.9% positive response concerning communication speed is particularly relevant to fish supply chains because timely communication may reduce delays in obtaining production, price, buyer and market information. The 2018 study also demonstrates that the perceived application of ICT extended beyond production-related

information. Market-information databases represented the highest-ranked modern ICT application identified as adaptable to fish farming, accounting for 29.4% of responses. This finding is relevant to the present study because it indicates an explicit interest in using digital technologies to obtain and organize market information.

The result suggests that the potential role of digital technologies in fish farming is not



restricted to technical production advice. Digital tools can also support market-oriented functions such as price information, identification of buyers, market comparison and communication with other supply-chain actors.

3.4 Constraints to Effective Digital Information Use

Despite the positive perception of ICT, the 2018 Lagos evidence reveals substantial constraints to effective utilization. Computer literacy was identified as a major challenge by 84.5% of respondents. In addition, 68.9% agreed or strongly agreed that the cost of acquiring basic ICT tools was a challenge, while 76.1% indicated that the cost of an ICT tool determined its usage. Accessibility was also important, with 86.6% agreeing or strongly agreeing that accessibility influenced their choice of ICT medium.

The principal constraints and enabling conditions reported in the study are presented in Table 4.

Table 4. Constraints and Conditions Affecting ICT Use among Fish Farmers in Lagos State, 2018

Constraint/condition	Positive agreement (%)
Computer literacy is a major challenge	84.5
Cost of acquiring basic ICT tools is a challenge	68.9
Cost of an ICT tool determines its usage	76.1
Accessibility affects choice of ICT medium	86.6

As shown in Table 4, the principal challenge was not simply access to technology but the ability to use it effectively and affordably. The high proportion identifying computer literacy and accessibility as important factors supports the need for digital market-information systems that are simple, affordable and compatible with users' existing skills and communication practices.

3.5 Communication Channels and User Preferences: Evidence from the 2024 Study

The 2024 Kogi State study provides complementary evidence on communication channels and user preferences. Of the 187 valid respondents, 77.1% reported receiving information on aquaculture innovations through the Train-and-Visit system, while 63.6% indicated a preference for the system. Accessibility was the leading reason for this preference (56.5%), followed by ease of understanding (24.0%) and cost-effectiveness (6.9%).

The study also identified communication constraints, including irregular extension visits, inadequate training, inconsistent information, delayed communication, limited availability of printed materials, illiteracy and language barriers. These findings demonstrate that the effectiveness of information systems depends not only on the technology used but also on accessibility, comprehensibility and institutional support.

The principal communication indicators are presented in Table 5. The findings in Table 5 reinforce the importance of combining digital channels with communication systems that users already understand and trust. Because these data were obtained from Kogi State,



however, they are interpreted as complementary evidence rather than direct estimates for Lagos State.

3.6 Marketing Performance Context in Lagos State

The 2022 Lagos study provides evidence on the characteristics and commercial context of smoked and dried fish marketing. The study involved 135 respondents selected through a multistage sampling procedure. Women constituted 65.93% of the marketers, while the mean age was 43.59 years. **Table 5: Selected Communication Indicators among Fish Farmers in Kogi State, 2024**

Communication indicator	Reported value (%)
Respondents receiving innovation information through Train-and-Visit	77.1
Respondents preferring Train-and-Visit	63.6
Preference attributed to accessibility	56.5
Preference attributed to ease of understanding	24.0
Printed materials unavailable in locality	63.6
Illiteracy reported as a printed-information barrier	31.6
Language barrier for English materials	4.8

The mean household size was six persons and mean marketing experience was 3.5 years. The study reported a monthly income figure of

₦1,035,743.87 per marketer and characterized fish marketing as highly profitable, while also identifying significant operational and market challenges.

The principal characteristics reported in the study are presented in Table 6. The findings in Table 6 demonstrate the commercial importance of fish marketing in Lagos State. They also show why access to reliable market information should be considered alongside operational factors when assessing supply-chain performance. The reported profitability does not, by itself, establish a causal relationship between digital information and marketing returns.

Table 6: Selected Socioeconomic and Marketing Characteristics of Smoked and Dried Fish Marketers in Lagos State, 2022

Characteristic	Reported value
Sample size	135
Female marketers	65.93%
Mean age	43.59 years
Mean household size	6 persons
Mean marketing experience	3.5 years
Reported monthly income figure	₦1,035,743.87
Overall marketing performance	Reported as highly profitable

3.7 Cross-Study Evidence Pattern

The evidence from the four studies reveals three broad and recurring patterns. First, mobile communication had already become an important information channel among fish farmers. Second, effective use of information depended on factors beyond technology ownership, particularly literacy, accessibility, affordability, training and institutional support. Third, market outcomes were influenced by physical and financial conditions, including transportation, storage, processing, finance and market organization.



Taken together, the evidence is strongly consistent with H1, which proposes a positive relationship between access to mobile and digital information and market-information availability. The evidence also provides substantial descriptive support for H3, concerning the constraining effects of digital literacy, connectivity and cost. The findings are consistent with H2 and H4, but these relationships cannot be formally tested using the available heterogeneous aggregate datasets. Direct statistical testing would require harmonized respondent-level observations containing common measures of digital-information access, communication quality, market coordination and commercial performance.

4.0 Discussion

4.1 Digital Information as a Supply-Chain Coordination Resource

The findings indicate that digital market information should be understood as a supply-chain coordination resource rather than merely an indicator of ICT adoption. The 88.9% positive response regarding the ability of ICT to facilitate fast communication demonstrates that fish farmers recognize the value of rapid information exchange. Similarly, the identification of market-information databases as an important adaptable ICT application suggests that market intelligence constitutes a practical information need among fish farmers. The findings are consistent with the broader evidence reported by Aker (2010) and Jensen (2007), which demonstrates the potential of improved information technologies to reduce information-related frictions in agricultural and fisheries markets. However, the present evidence indicates that the benefits of digital communication depend substantially on the ability of users to access and apply the information provided.

4.2 Digital Literacy, Accessibility and Affordability

The high proportion of respondents identifying computer literacy as a challenge demonstrates that digital transformation cannot be based solely on technology availability. Although mobile phones were the most accessible ICT tools, 84.5% of respondents identified computer literacy as a major constraint, while 86.6% indicated that accessibility influenced their choice of ICT medium.

These findings suggest that digital market-information systems should emphasize simplicity, affordability and accessibility. Systems that require advanced technical knowledge or expensive devices may exclude precisely those smallholder actors who could benefit most from improved market information. Consequently, the design of digital interventions should consider users existing communication practices and technological capabilities.

4.3 Integration of Digital and Institutional Communication

The Kogi evidence further demonstrates that digital transition does not automatically eliminate demand for established extension systems. The continued use and preference for the Train-and-Visit system suggest that users value information that is accessible, understandable and institutionally supported. Mundi, Awolumate, and Ambassador-Brikins (2024) similarly identified training, information consistency, language and network-service limitations as continuing communication challenges.

Digital market-information systems should therefore complement rather than necessarily replace extension officers, cooperatives, associations and other trusted communication structures. Extension personnel can assist with information verification and interpretation, while digital platforms can improve the speed and reach of dissemination. Such integration may enhance confidence in digital information while reducing the risk of misinformation.



4.4 Information Access and the Capacity to Act

The 2022 fish-marketing evidence demonstrates an important distinction between information availability and the ability to convert information into economic benefits. Although fish marketing was reported as highly profitable, marketers continued to experience operational and market challenges. This suggests that information alone cannot overcome constraints associated with transportation, storage, finance, processing and market organization.

For example, knowledge that a better price exists in another market may have limited value when transportation costs are high or the product cannot be preserved adequately during movement. Similarly, identifying an alternative buyer may not improve profitability where the seller lacks working capital or reliable payment arrangements. Digital market information should therefore be connected to complementary services that enable market actors to act upon the information received.

4.5 Implications for a Digital Market-Information System

The integrated evidence supports a multi-channel approach to digital market-information delivery. A practical system for Lagos fish-supply-chain actors could combine verified price information, buyer directories, market-demand information, extension messages, digital payment options and logistics information. Such a system should also accommodate users with different levels of digital literacy and should make information available through accessible communication channels.

Verification is particularly important because increased communication volume does not necessarily mean improved information quality. Price and buyer information should therefore be periodically updated and, where possible, validated through cooperatives,

extension institutions, market associations or other recognized supply-chain actors.

4.6 Implications for Future Empirical Research

The present synthesis provides descriptive evidence linking ICT access, communication quality, constraints and fish-market performance, but the heterogeneous nature of the source studies limits formal statistical inference. A future primary study should therefore collect harmonized respondent-level data from fish farmers, processors, traders and buyers across relevant locations in Lagos State. Such a dataset could measure digital-information frequency, timeliness, reliability and relevance alongside price realization, number of buyers contacted, search time, transaction costs, payment speed, marketing margins and profitability. These variables would permit formal testing of the hypothesized relationships and provide stronger evidence concerning the mechanisms through which digital market information affects smallholder fish-supply-chain performance.

5.0 Conclusion

The study demonstrates that digital market information can contribute to improved coordination and performance within smallholder fish supply chains in Lagos State. Mobile phones have emerged as an important information channel, while fish farmers and marketers recognize the value of rapid access to relevant market information. However, access to digital technology alone is insufficient to ensure improved market outcomes. Digital literacy, affordability, network accessibility, training, information reliability, transportation, storage and finance influence the extent to which available information can be converted into effective production and marketing decisions. The findings therefore support an integrated approach in which digital communication



complements existing extension services, cooperative structures and market institutions. A verified digital market-information platform should be developed to provide timely and reliable information on fish prices, market demand, buyers and available market opportunities. Such platforms should employ simple, affordable and accessible communication channels, including mobile-phone and conversational platforms, to accommodate users with different levels of digital literacy. Extension services and cooperative organizations should be incorporated into digital information systems to strengthen information verification, interpretation and user trust. Regular training in digital literacy and market-information use should also be provided to fish farmers and marketers. Furthermore, digital market information should be connected with buyer directories, transportation, storage, logistics and digital payment services so that supply-chain actors can act effectively on the information received. Future studies should employ harmonized respondent-level datasets to statistically examine the relationships between digital information access, price discovery, transaction efficiency, market coordination and profitability.

6.0 References

- Aker, J. C. (2010). Information from markets near and far: Mobile phones and agricultural markets in Niger. *American Economic Journal: Applied Economics*, 2(3), 46–59.
- Awolumate, S. (2018a). Adaptability friendliness status of Information and Communication Technologies (ICTs) in fish farming in Lagos State, Nigeria. *West African Journal of Open & Flexible Learning*, 7(1), 143–162.
- Awolumate, S. (2018b). Aquaculture information sources, relative incidences of accessibility and preference among fish farmers in Akwa Ibom State. In N. U. Ndaeyo, I. Akpabio, V. Ebong, & U. Etuk (Eds.), *Sustainable Agriculture in a Diversified Economy: Nigeria in Perspective* (pp. 65–75). Faculty of Agriculture, University of Uyo.
- Awolumate, S., Okwuokenye, G. F., Agbo, A. N., & Akinbani, D. M. (2022). Determinants of profitability and challenges of smoked and dried fish marketers in Lagos State, Nigeria. *Nigerian Journal of Agriculture and Agricultural Technology*, 2(2), 1–11. <https://doi.org/10.59331/njaat.v2i2.96>
- Awolumate, S., & Obodo, P. O. (2026). Market information access and performance of the fish supply chain in Lagos State, Nigeria. *Dutse Journal of Pure and Applied Sciences*, 12(2c), 10–17.
- Jensen, R. (2007). The digital provide: Information (technology), market performance, and welfare in the South Indian fisheries sector. *Quarterly Journal of Economics*, 122(3), 879–924.
- Mundi, N. E., Awolumate, S., & Ambassador-Brikins, H. O. C. (2024). Digital platforms and mobile technology in aquaculture communication among fish farmers in Kogi State, Nigeria. *Nigerian Journal of Fisheries and Aquaculture*, 12(2), 1–9.

Declaration

Conflict of Interest

The authors declare that there is no known conflict of interest or personal relationships that have influenced the work reported in this paper.

Ethical Consideration

Not applicable

Funding

The authors declared no source of funding

Author Contributions

All components of the manuscript were carried out by the author

