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# Digital Platforms and Mobile Technology in Aquaculture Communication Among Fish Farmers in Kogi State, Nigeria

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**ABSTRACT**
The study examined how fish farmers in Kogi State, Nigeria, utilized communication channels. Two hundred fish farmers were chosen using stratified and simple random sampling techniques. One hundred and eighty-seven valid questionnaires were collected and analyzed using descriptive statistics. The findings showed that 77.1% of fish farmers received information on aquacultural innovations through the Train-and-Visit system. Most respondents (63.6%) preferred this system because of its accessibility (56.5%), ease of understanding (24.0%), and cost-effectiveness (6.9%). However, challenges such as irregular visits of extension agents, insufficient training, inconsistent information, and delayed communication were reported. For radio and television, limitations included the lack of direct interaction with extension agents, language barriers, high equipment costs, and network service issues. Additionally, 63.6% of respondents reported the unavailability of printed materials in their localities, while 31.6% were illiterate, and 4.8% faced language barriers in understanding English. The study recommends distributing extension guides in local languages and equipping extension agents with improved communication tools like mobile platforms to better meet the needs of fish farmers.

**Keywords:** Channels, Communication, Fish Farmers, Extension Agents, Information

## INTRODUCTION

Fisheries and aquaculture have become increasingly important in Nigeria's quest for food security and rural development, given the country's heavy reliance on aquatic resources. As demand for fish continues to rise, aquaculture is seen as a vital means to meet this demand while alleviating pressure on wild fish stocks. However, despite its growing significance, many fish farmers in Nigeria face challenges in adopting new technologies and innovations that could boost production and ensure sustainability. Effective communication through fisheries extension services plays a critical role in bridging this gap.

Fish farmers, particularly in rural areas, rely heavily on aquaculture extension services to acquire knowledge on best practices, including disease management, feed optimization, and market information. As a form of non-formal education, agricultural extension (which includes fisheries) serves as a pivotal mechanism for disseminating innovations aimed at improving the livelihoods of rural communities. According to Iweke (2020), many fish farmers in rural Nigeria lack access to relevant information and depend on personal interactions with extension agents for the dissemination of critical aquaculture

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technologies. Similarly, Osuji (2017) emphasizes that the success of fish farming practices largely depends on the effectiveness of information transfer through appropriate communication channels.

Nduka (2018) highlights the role of extension services in aiding fish farmers to adopt innovations that improve productivity and sustainability. However, one of the key challenges in Nigeria's aquaculture sector is the limited infrastructure for information dissemination, particularly in rural areas. Many fish farmers face low literacy levels, which hinders their access to written materials or digital content without assistance from extension agents. This situation is further complicated by the irregular visits of extension workers and the inadequacy of traditional communication channels such as radio and television, which often lack the interactivity required to address specific challenges fish farmers face.

Tegene *et al*. (2023) argue that modern aquaculture requires more than just access to information; it demands timely and effective dissemination through channels that are accessible and understandable to farmers. As the Nigerian government continues to invest in the aquaculture sector through initiatives such as the Kogi State Agricultural Development Project (KSADP), selecting the appropriate communication channels becomes even more crucial. The growing use of digital platforms and mobile technology offers potential solutions to some of the challenges faced by fish farmers, particularly in terms of information dissemination speed and efficiency. The application of the Diffusion of Innovations theory, as proposed by Rogers, is relevant in this context as it provides a framework for understanding how fish farmers adopt new technologies based on the information they receive through both interpersonal and media-based channels.

While much research exists on agricultural extension, studies specifically focused on aquaculture extension in Nigeria are limited. Existing studies such as Iweke (2020), Osuji (2017), and Nduka (2018) provide general insights into agricultural extension services without fully addressing the unique challenges fish farmers encounter when adopting innovations. Furthermore, although scholars such as Eze *et al*. (2020), Abiodun *et al*. (2021), and Adeoye *et al*. (2022) have highlighted the growing importance of digital platforms, few empirical studies have examined their direct impact on fish farmers' productivity. This study bridges this gap by investigating the primary communication channels used by fish farmers in Kogi State, their preferences, and the constraints they face in accessing extension services. By focusing on aquaculture, this research aims to enhance the effectiveness of fisheries extension services and improve fish production outcomes.

Aquaculture extension services are essential for transferring knowledge and innovations that can improve productivity and sustainability in fish farming. Although several studies have explored the effectiveness of different communication channels in facilitating this knowledge transfer, adoption challenges persist, especially in rural areas where access to technology and consistent extension support is limited. This review examines the effectiveness of different communication channels in transferring new fish farming technologies, identifying critical gaps that this study seeks to address.

Extension services are fundamental to enhancing fish farming productivity. Osuji (2017) underscores the crucial role these services play in equipping fish farmers with knowledge on disease management, feed optimization, and market information. However, Abiodun *et al*. (2021) found that despite the availability of extension services, fish farmers' adoption rates remain low due to ineffective communication channels and a lack of continuous support from extension agents. Ajibade *et al*. (2019) further suggested that resource constraints in rural Nigeria reduce the frequency of extension visits, diminishing agents' capacity to provide timely and relevant information.

Communication channels are the backbone of delivering extension services, enabling fish farmers to access essential information. Eze *et al*. (2020) emphasize that the Train-and-Visit (T&V) system, mobile platforms, and group-based methods are critical in improving fish farmers' knowledge of innovative practices. Afolabi and Adebayo (2019) stress the importance of adopting diverse communication strategies to effectively reach fish farmers, especially in areas with varying literacy levels and access to technology.

Digital platforms and mobile technology have gained increasing recognition as effective tools in fisheries extension. Adeoye *et al*. (2022) found that mobile applications and SMS services ly improved the dissemination of aquaculture information, especially in remote areas. Ifeanyi *et al*. (2019) pointed out that social media platforms such as WhatsApp and Facebook create interactive networks among fish farmers, extension agents, and researchers, facilitating the timely sharing of information. However, Ogunbameru and Abolade (2018) noted that many rural fish farmers struggle to fully utilize these platforms due to a lack of training and internet access.

The Diffusion of Innovations theory by Everett Rogers provides a widely accepted framework for understanding how innovations are adopted in aquaculture. Rogers' theory posits that the adoption of innovations depends on factors such as communication channels, social systems, and time. In the context of aquaculture, Adebayo and Akintola (2020) found that early adopters of fish farming innovations are often influenced by peer farmers and extension agents, reinforcing the importance of interpersonal communication and opinion leaders. Anaeto *et al*. (2008) and Ajayi and Popoola (2020) highlight the significance of both traditional media (radio, television) and newer digital channels in diffusing innovations. However, Kareem *et al*. (2019) points out that the effectiveness of diffusion is contingent on the regularity of extension services, which are often inconsistent in rural Nigeria due to logistical challenges.

The Train-and-Visit (T&V) system remains one of the most effective methods for delivering aquaculture extension services. Egbetokun *et al*. (2021) found that personal interactions with extension agents allowed fish farmers to receive customized advice and immediate feedback. However, Okeke *et al*. (2020) note that this method is resource-intensive and limited by the scarcity of extension workers in rural Nigeria. Group methods, such as cooperative meetings, farmer field schools, and demonstration ponds, have also been found to be effective. Amusat and Ogunjimi (2019) showed that demonstration ponds ly increased the adoption of new fish farming techniques among farmers who participated in group training sessions. According to Adewale *et al*. (2018), group-based extension approaches are more cost-effective than individual methods, enabling extension agents to reach a larger number of farmers.

Mass media remains an important tool for disseminating aquaculture-related information. Nweke and Emeka (2020) report that radio programs focused on aquaculture innovations have helped raise awareness among rural fish farmers. However, Yahaya and Oladapo (2019) argue that mass media lacks the interactivity needed to address specific challenges, and its effectiveness is limited by language barriers and the lack of access to electronic devices in rural areas. Printed materials, such as newsletters and instructional booklets, are useful for literate farmers who prefer accessing information at their own pace. Ifeanyi *et al*. (2019) point out that low literacy levels in rural fish farming communities limit the effectiveness of printed materials, especially when they are not available in local languages. Ajayi and Popoola (2020) recommend complementing printed materials with other communication methods in areas with low literacy rates.

Digital platforms have opened new possibilities for improving aquaculture extension services in rural Nigeria. Adesina *et al*. (2022) found that mobile technology is particularly useful for providing real-time

updates on market prices, weather conditions, and disease outbreaks. In their study, Adeoye *et al*. (2022) report that fish farmers who received regular SMS updates from extension agents were more likely to adopt new practices. Nonetheless, Amobi and Nnadi (2021) caution that the digital divide, including limited internet connectivity and high mobile data costs, hinders the widespread use of these platforms in rural communities.

While previous studies highlight the importance of both traditional and digital communication channels, a critical gap remains in understanding how a combined, multi-modal approach can overcome persistent challenges, such as low adoption rates and inconsistent access to extension services. Despite the rise of digital platforms, technological barriers persist in rural fish farming communities (Ogunbameru and Abolade, 2018; Amobi and Nnadi, 2021). Moreover, traditional methods like the Train-and-Visit system, although effective, are resource-intensive and difficult to scale (Egbetokun *et al*., 2021; Okeke *et al*., 2020). This study addresses these gaps by evaluating the effectiveness of an integrated communication approach that combines digital platforms, group methods, and traditional media in improving the adoption of new fish farming techniques in rural Nigeria. This approach aims to offer a comprehensive strategy tailored to the unique challenges faced by fish farmers in these communities.

## MATERIALS AND METHODS

### Study Area

Kogi State, located in the North-Central region of Nigeria, is a hub for fish farming (Oyewole & Adeoye, 2018). With an estimated 500 to 700 fish farms spanning approximately 2,500 to 3,500 hectares, the state is home to around 1,500 to 2,000 fish farmers (Abubakar and Isah, 2020). The selected Local Government Areas (LGAs) of Bassa, Dekina, Ankpa, Olamaboro, Okene, Adavi, Okehi, and Ogori-Mangogo are representative of the state's fish farming industry. The main fish species cultivated in the state are Tilapia, and *Clarias* species, with an average annual production of 10,000 to 15,000 metric tons (FDF, 2020). The tropical climate with two distinct seasons, coupled with the presence of major rivers like the Niger, Benue, and Osse, provides suitable water temperature and quality for fish farming (Kogi State Government, 2019).

### Population and Sampling Techniques

The target population for this study comprised fish farmers in Kogi State, Nigeria. Stratified and simple random sampling techniques were employed to select the fish farmers for the study. The twenty-one (21) Local Government Areas (LGAs) in the state were stratified into three agricultural zones: the Eastern, Central, and Western Agricultural zones of Kogi State. From these, two zones and eight (8) LGAs were randomly selected; specifically, four LGAs were chosen from each zone. The selected LGAs were Bassa, Dekina, Ankpa, and Olamaboro from Kogi East and Okene, Adavi, Okehi, and Ogori-Mangogo from Kogi Central. Five villages were randomly selected from each LGA, and from each village, five fish farmers were randomly chosen, resulting in a total of forty (40) fish farmers per local government area. This brought the total number of fish farmers (respondents) to 200. However, 187 (93.5%) fish farmers completed the questionnaire correctly, and these were ultimately used for data analysis.

### Sources and Instruments for Data Collection

The necessary information for this study was obtained from both primary and secondary sources. Primary data were collected directly from fish farmers using a questionnaire designed to meet the research objectives. The questionnaire was developed, pre-tested, and subjected to a reliability test before being administered. Secondary data were gathered from textbooks, journals, monographs, the internet, and other related sources.

**Statistical Analysis**
Data obtained were subjected to descriptive statistics, such as percentages. Frequency distributions were used to organize, and present data on communication channels among fish farmers in the study area.

## RESULTS AND DISCUSSION

### Channels of Communication to Fish Farmers

Table 1 presents the distribution of fish farmers based on the channels of communication. The communication channels considered include the Train-and-Visit (T&V) system, radio, television, and printed materials. The majority (77.1%) of fish farmers (respondents) obtained information on fish farming/aquaculture innovations primarily through T&V system contact. This method involved various sources, including agricultural extension agents (EAs), members of farmers' associations, relatives, and friends, making it the most popular channel among fish farmers. This finding aligns closely with that of Rambo (2018), who reported that 87% of change agents utilized the T&V system as their primary communication method with fish farmers. This study's result, showing T&V system interaction as the main source of information (77.1%) for fish farmers, contrasts with previous studies by Yakubu (2018) and Voh (2021), where radio was found to be the primary medium for communicating information to fish farmers. Similarly, Kwagbe and Ikwe (2016) identified radio as the most frequent channel of farm information in their study of farmers in the Akure zone of Ondo State.

Table 1: Distribution of Fish Farmers Based on Channels of Communication in Kogi State

| Communication Channels | Frequency | Percentage (%) |
|---|---|---|
| Train-and-Visit (T&V) system | 144.0 | 77.1 |
| Radio | 33.0 | 17.6 |
| Television | 3.0 | 1.6 |
| Printed Materials | 7.0 | 3.7 |
| **Total** | **187.0** | **100.0** |

Source: Field Survey, 2023.

### Preferred Channels of Communication by Fish Farmers

Table 2 revealed that 63.6% of the fish farmers identified the T&V system as their most preferred communication channel. This suggests a strong preference for interpersonal communication in the study area, as it far surpasses other communication channels in terms of popularity. Radio followed with 19.8%, while television ranked third with 12.3%. The preference for the T&V system could be attributed to the proximity and availability of extension agents, farmers' associations, relatives, and friends, who serve as both sources and channels of information. This is consistent with Ekelekume (2019), who found that agricultural research workers in Makurdi, Benue State, frequently utilized formal agricultural information sources.

Table 2: Distribution of Fish Farmers Based on Their Most Preferred Channels of Communication in Kogi State

| Communication Channels | Frequency | Percentage (%) | Level of Preference |
|---|---|---|---|
| Train-and-Visit (T&V) system | 119.0 | 63.6 | Most Preferred |
| Radio | 37.0 | 19.8 | Preferred |
| Television | 23.0 | 12.3 | Less Preferred |
| Printed Materials | 8.0 | 4.3 | Least Preferred |
| **Total** | **187.0** | **100.0** | |

Source: Field Survey, 2023.

**Reasons for Channel Preference**

The analysis of Table 3 reveals critical insights into fish farmers' communication channel preferences, highlighting the key factors influencing their choices. Accessibility emerges as the most important factor, with 56.6% of fish farmers prioritizing ease of access to communication channels. This indicates that fish farmers are inclined toward channels that are readily available and easy to use, underscoring the necessity of providing communication platforms that facilitate seamless information sharing. This finding is supported by Oyewole and Adeoye (2018), who also identified accessibility as a fundamental component of effective agricultural communication. However, it contrasts with Voh (2021), who argued that accessibility may not always be the foremost consideration in farmers' communication preferences, depending on the local context and technological infrastructure.

Effective message comprehension, accounting for 24.0% of the farmers' preferences, is the second most important factor. Farmers place a strong emphasis on the clarity and conciseness of information received. This underlines the need for communication channels that not only deliver content but also ensure that the messages are understandable and actionable. This result aligns with the findings of Yakubu (2018), who noted the importance of clear communication in enhancing farmers' knowledge and decision-making. However, Abubakar and Isah (2020) present a differing perspective, suggesting that in some cases, farmers may prioritize the source's credibility over message clarity.

Convenience is another notable factor, with 13.4% of the farmers considering it an essential aspect of their communication channel choice. Farmers prefer channels that allow them to manage their time effectively, indicating that communication systems need to be flexible and adapt to the busy schedules of fish farmers. This finding supports Abubakar and Isah (2020), who also observed that convenience plays a key role in the adoption of communication technologies among farmers. Nevertheless, Oyewole and Adeoye (2018) reported that convenience might not be as crucial in some farming communities, where other factors such as social networks or peer influence carry more weight.

Table 3: Distribution of Fish farmers Based on Their Reasons for Preference of Communication Channels

| Reasons for Preference of Channel | Frequency (No) | Percentage (%) |
|---|---|---|
| Easiest for contact | 104.0 | 56.6 |
| Messages are understood best | 45.0 | 24.0 |
| Cheaper | 13.0 | 6.9 |
| Can be read at your convenience | 25.0 | 13.4 |
| **Total** | **187.0** | **100.0** |

Source: Field Survey, 2023.

Interestingly, cost-effectiveness is the least factor, with only 6.9% of the farmers prioritizing it. This suggests that fish farmers are willing to invest in communication channels that meet their needs, even if they are not the most affordable. This finding contradicts Yakubu (2018), who argued that cost considerations often take precedence in farmers' technology adoption decisions. On the other hand, it aligns with Voh (2021), who found that farmers may prioritize other factors such as accessibility and reliability over cost, especially when the communication channels deliver value to their farming practices.

**Major Constraints with Communication Channels**

Table 4a highlights that the most constraint (58.3%) was the irregularity and inconsistency of the extension agent's visits. Despite this, the majority of fish farmers still relied on EAs as their primary source of farm information. This suggests that if EAs were more consistent in their visits, a higher rate of adoption of fish farm innovations could be achieved. The finding also reinforces the importance of interpersonal communication, as respondents indicated a preference for Train-and-Visit (T&V) system interactions

despite these challenges. The study also found that 16.0% of respondents were concerned about the lateness of information delivery, while 15.5% noted inconsistencies in the information provided by different EAs.

Table 4a: Major Constraints Associated with Various Channels of Communication

| Major Constraints | Frequency (No) | Percentage (%) |
|---|---|---|
| Irregular visits by extension agents | 109.0 | 58.3 |
| Lack of adequately trained EAs | 19.0 | 10.2 |
| Variation in information among EAs | 29.0 | 15.5 |
| Lateness in information flow | 30.0 | 16.0 |
| **Total** | **187.0** | **100.0** |

Source: Field Survey, 2023.

Table 4b the major constraints associated with radio and television as communication channels. Fifty-three (53.5) % of respondents were frustrated by the lack of opportunities for interactive discussion with experts on these platforms. Schramm (2016) emphasized that effective communication requires mutual understanding between the source and receiver, which is often lacking in mass media channels. Additionally, 10.7% of respondents did not understand the languages used in broadcasts, and 8.0% found the cost of electronic equipment prohibitive.

Table 4b: Major Constraints with Radio and Television as Communication Channels

| Major Constraints | Frequency (No) | Percentage (%) |
|---|---|---|
| Do not understand the language | 20.0 | 10.7 |
| Lack of network service | 7.0 | 3.7 |
| No room for an interactive discussion | 100.0 | 53.5 |
| Too costly | 15.0 | 8.0 |
| **Total** | **187.0** | **100.0** |

Source: Field Survey, 2023

Table 4c reveals that 63.6% of fish farmer indicated that printed materials were not readily available in their localities. This suggests that many fish farmers might be interested in Fisheries/Aquaculture extension bulletins and newsletters if they were accessible. However, 31.6% of respondents were illiterate, and 4.8% cited language barriers as their constraint with printed materials. These findings are consistent with the views of Anaeto & Solo-Anaeto (2010), who noted that illiteracy remains a hindrance to rural development.

Table 4c: Major Constraints with Printed Materials as a Communication Channel in Kogi State

| Major Constraints | Frequency (No) | Percentage (%) |
|---|---|---|
| Printed materials not available | 119.0 | 63.6 |
| Unable to read or write | 59.0 | 31.6 |
| Do not understand the language | 9.0 | 4.8 |
| **Total** | **187.0** | **100.0** |

Source: Field Survey, 2023.

**Conclusion and Recommendations**

Based on the findings of this study, it can be concluded that all the selected communication channels play roles in disseminating innovations to fish farmers in Kogi State. These channels are crucial in creating awareness, which is the first step in the adoption process. Among the various channels of communication, farmers showed a strong preference for the Train-and-Visit (T&V) system. However, it is also evident that some communication channels are more effective than others in persuading fish farmers to adopt improved fish farming practices. Despite its limitations, the T&V system communication remains the most popular

and most effective means of transferring information to fish farmers. Challenges such as irregular visits by extension agents, insufficiently trained personnel, unavailability of printed materials, illiteracy among some fish farmers, and issues with electronic media were constraints faced by fish farmers in Kogi, Nigeria.

**Recommendations**

The fish farmers in Kogi State predominantly rely on T&V system communication, emphasizing accessibility, message clarity, and convenience over cost-effectiveness. Therefore, it is crucial to enhance the frequency and consistency of the T&V system interactions, particularly through extension agents, as this remains the most effective communication channel. Strengthening this interpersonal communication approach will address the challenge of irregular visits and improve the dissemination of timely and accurate information. Additionally, while radio and television provide broad coverage, the lack of interactivity limits their effectiveness. To mitigate this, enhancing interactive programs on radio and television by incorporating live question-and-answer sessions or feedback mechanisms could foster greater engagement with fish farmers. Since a substantial number of respondents did not prefer printed materials due to illiteracy and unavailability, the recommendation for printed materials should focus on making them accessible in local languages and complemented by adult literacy programs. However, considering the low preference, their role should be secondary to more interactive and accessible channels.

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