**West African Journal of Open & Flexible Learning**
Volume 7, Number 1, July 2018

# Adaptability Friendliness Status of Information and Communication Technologies (ICTs) in Fish Farming in Lagos State, Nigeria

# La Capacite D'adaptation Aux Technologies De L'information Et De La Communication (TIC) Dans La Pisciculture A L'état De Lagos

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## Abstract

*This study investigated the adaptability friendliness status of Information and Communication Technologies (ICTs) in fish farming in Lagos State. Data were collected with structured questionnaires and distributed to 180 respondents randomly selected through two stage random sampling procedure. Data collected were analyzed using simple percentages. Result showed that majority of fish fisher were male (57.8%) with an average age group of 41 – 50 years (54%) and fishing experience farmers of 11 – 15 years (41.7%). The study revealed that ICT tools such as mobile phone (37.2%) and newspaper print and media (26.7%) are currently the most readily available ICT tools use for updating knowledge on Aquaculture practices. Furthermore, majority of fish farmers (51.1%) strongly agreed that ICT tools ensure fast communication among fish farmers. Market information (29.4%) and provision of early warning systems about diseases outbreak (26.6%) are the most relevant ICT services adaptable to fish farmers. Computer illiteracy (84.5%) hinders fish farmers' effective use of ICT in the study area. The study recommended computer training and the use of ICT in Aquaculture by encouraging computer extension officers to disseminate information and knowledge through ICT media.*

**Résumé**

*Cette étude s'est penchée sur la capacité d'adaptation des technologies de l'information et de la communication (TIC) dans la pisciculture de l'État de Lagos. Les données ont été recueillies par la moyen de questionnaires structurés et distribuées à 180 répondants choisis au hasard selon une procédure d'échantillonnage aléatoire en deux étapes. Les données recueillies ont été analysées à l'aide de pourcentages simples. Les résultats montrent que la majorité des pêcheurs (57,8 %) ; 54% étaient des hommes avec un groupe d'âge moyen de 41 à 50 ans, tandis que (41,7 %) étaient des agriculteurs ayant de 11 à 15 ans d'expérience de pêche. L'étude a révélé que les outils TIC tels que le téléphone cellulaire (37,2 %) et les journaux et les diffusions médiatiques (26,7%) sont actuellement les outils TIC les plus facilement disponibles pour actualiser les connaissances sur les pratiques aquacoles. En outre, la majorité des aquaculteurs (51,1 %) sont tout à fait d'accord pour dire que les outils TIC assurent une communication rapide entre les aquaculteurs. L'information commerciale (29,4 %) et la mise en place de systèmes d'alerte rapide en cas d'épidémie (26,6 %) sont les services TIC les plus pertinents et adaptables aux pisciculteurs. L'analphabétisme informatique (84,5%) entrave l'utilisation efficace des TIC par les pisciculteurs dans la zone d'étude. L'étude recommandait la formation informatique et l'utilisation des TIC en aquaculture en encourageant les agents de vulgarisation informatique à diffuser l'information et les connaissances par le biais des TIC.*

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**Keywords:** *Information communication technology, Adaptability Friendliness, Fish farmers*

## Introduction

The advent and recent advances in information and communication technologies (ICTs) have had profound impacts on all walks of life and aquaculture is no exception. ICT has increasingly challenged old ways of delivering important services to citizens and transformed traditional societies into knowledge societies in the third world countries (Shana, *et al*., 2015). ICT tools unlike the traditional agricultural information dissemination methods, have the benefit of offering a cheaper way of communicating and sharing innovative knowledge to fish farmers in the fastest way; delivering training and quality education to farmers; and improving farmers' access to markets and aquaculture credit (Barguma and Ndaghu, 2014).

According to Aphunu and Atoma (2011), optimal fish farming production depends on having an edge on information related to the market, efficient allocation of available resources and use of new or innovative farming practices. As such, sustainable development of aquaculture requires fish farmers have access to ICTs infrastructure that is vital to increasing the flow of information. This information is meant to serve as a means of empowering fish farmers to face the challenges of carrying out fish breeding and rearing effectively. The increasing importance of aquaculture as an alternative source of protein has further emphasized the need to adapt and develop advanced ICT for the better management of aquaculture facilities as well as aquaculture development. Hence, appropriate deployment and use of information and communication technologies (ICT) is pivotal to increasing fish farming production and improving the marketing and distribution strategies of fish products (Ijatuyi *et al*., 2016).

World Bank (2011) stated that the proliferation of adaptable and more affordable technologies and devices has also increased ICT's relevance to smallholder agriculture. Innovation has steadily reduced the purchase price of phones, laptops, scientific instruments, and specialized software. ICT devices like radio, television, cellular phones, computers, tablets and networking, hardware and software, satellite systems facilitate farming activities (Pande and Deshmukh 2015). According to Bhalekar *et al*., (2015), ICT plays an important role in enhancing the impact and performance of agricultural

production and by extension, directly alleviate poverty through credit and financial services. Yimer (2015) similarly indicates that ICT furnish up-to-date knowledge and information on agricultural technologies, best practices, markets, price trends, and weather conditions. In the light of this, fish farmers' perception on ICTs as it applies to different aspects is necessary consideration to explore the potential contributions of ICT to the livelihoods fish farmers' communities.

Studies (Ramli *et al*., 2015; Kale *et al*., 2015; Pande and Deshmukh, 2015; Singh *et al*., 2015) have shown that there is a positive relationship between telecommunication infrastructure development and economic growth. Mobile phones can have an impact on rural livelihoods and thereby on poverty in rural communities in developing countries (Lustig and Stern, 2000). Soyemi and Haliso (2015) highlighted the potentials of information use in aquaculture to include; awareness on various improved fish farming technologies; awareness on improved fish breeds, fish feeds and fish feeding; and increased productivity.

Aquaculture is one of the fastest growing food-producing sectors and an important contributor to national economic development, global food supply and food security (Tveterås *et al*., 2012). The need to disseminate scientific research and indigenous knowledge to user as a means of supporting the innovation process for aquaculture development is critical to improving and promoting fish yield. ICT can effectively play this vital role in facilitating rapid, efficient, and cost effective knowledge management. It can also help fish farmers improve their productivity by giving them access to basic financial services, new aquaculture techniques, and new markets. McNamara *et al*. 2012 observed that farmers have benefited from the ICT revolution, and the latest innovations in ICT have enhanced the development of the agriculture sector. Information and Communication Technology power in disseminating Aquaculture information to the farmers is vital to improving and promoting fish yield. However, the full potential of the aquaculture sector to contribute to human development and social empowerment is yet to be realized, and the sector may require new

approaches that are adaptable and friendly to realize its goals beyond 2020.

The potential contribution of Aquaculture to local food security and livelihoods can be very significant, especially in remote and resource-poor areas where improved communication technologies are available. Improved communication and information access are directly related to social and economic development (McNamara *et al*., 2012). To attain its full potential to contribute to human development and social empowerment, the aquaculture sector may require new approaches.

Omofunmi *et al*., 2017 studied the assessment of catfish effluents management in Lagos State. However, adaptability friendliness status of Information and Communication (ICT) in fish farming in Lagos State is not known, Dulle, *et al*. (2017) reported that despite the strong belief in the role of ICTs for social economic development, clear evidence on how ICTs can be used to achieve this purpose in the Nigeria aquaculture context is still lacking. In pursuant of the goal of assessing the fish farmers use of ICTs in Lagos State, Nigeria, the following specific objectives were raised to: determine the socio–economic characteristics of the fish farmers, identify ICT tools currently in use for updating knowledge among fish farmers, examine modern ICT trends adaptable to fish farming, determine the perceived effects of ICT on fish farming and identify the constraints of fish farmers in using ICT in Lagos State.

**Methodology**

The study was carried out in the three (3) Agricultural Development Programme (ADP) zones in Lagos State, comprising of, Western zone (Badagry, Ojo, Ikeja Apa, Ibeshe and Ikoga), Eastern zone (Ikorodu, Igbogbo and Imota, odoguniyan) and Far-eastern zone (Epe, Eti-Osa, Eredo , Ibeju-lekki and lagos island) Two stage sampling technique was used to select respondents for the study. The first stage involved purposive selection of 3 extension blocks from ADP zones namely Badagry, Ojo and Ikeja (Western Zone); Epe, Eti-Osa and Eredo (Far-eastern zone) and Ikorodu, Igbogbo and Imota (Eastern zone). Simple random technique was used at the second stage to select twenty respondents (fish farmers) from each extension blocks. A total of one

hundred and eighty (180) respondents were selected from April to September 2017. A well-structured questionnaire was used to elicit information from the respondents. Data were mainly obtained from primary source. The primary source of data was collected on fish farmer's socio-economic characteristics, access to extension services, information on fish farming and profitability of fish farming. The analytical tools employed in the study were descriptive statistics, which includes percentage and frequency distribution**.**

## Results and Discussion

### A. Socio-Economic Characteristics of Fish Farmers Using Information Communication Technologies

The socio-economic characteristics of fish farmers as presented in Table 1 revealed that male and female composition of fisher folks under sex was 57.8 % and 42.2%, respectively. This implies that both the males and the females are involved in fish farming in the area but the greater percentage of the male could be attributed to the dominance of the male folks ownership production resources in Aquaculture. This result is in conformity with Luomba, (2013) assertion that aquaculture sector is often considered a male domain because of the high levels of investments and nature of work. Fregene *et al*. (2011) also reported the dominance of men in fish production. Women's role and participation has often been ignored partly due to socio-cultural taboo against them. Ayanboye *et al.* (2014) further attributed this trend to gender inequalities. That is, male fish farmers had better access to land and as well to credit facilities, which are very important in fish farming. delete this This calls for special attention for more women to be involved in training meetings where they can fully increase their understanding on fish farming as greater benefits can be gained by having more women extension agents. This would help to overcome and eliminate some of the barriers inhibiting many women from taking up fish farming (FAO, 2012).

Age group 41 - 50 years dominated the study area with 54 % of fisher folk's population. Age group of less than 30 years (8.3 %) was the least in the population. This implies that youth's involvement (8.3%) in fish farming is low. Youth constitute about 60 percent of the more than 180 million people of Nigeria (NBS, 2014). Fish farming remains an

integral part of Nigeria's agriculture sector, Nigeria however still have a deficit of 2.1 million metric tonnes of our national demand for fish which is 3.2 million metric tonnes. Considering the enormity of this challenge, the low percentage of youth in this sector will continue to pose a threat to the supply of fish food in the future. It is in light of this, participation of the youth in aquaculture will not only help the sector to reach its full potential but also contribute to the reduction of unemployment among the youth, as there are opportunities in the sector waiting to be tapped.

Marital status in Table 1 also shows that majority of fisher folks (83.9 %) were married. Unmarried fisher folks (divorced, widowed, single parent) constituted 16.1% of the population. This indicates that most of the farmers were married, a trend which implies that most of them have family responsibilities that need financial commitments. This result agrees with the result of Akinpelu *et al*., (2013) where majority of the fish farmers (85.6%) in Ibadan Metropolis, were married.

Fish farmers' experience in Table 1, shows that majority of fisher folks (41.7%) had 11 – 15 years' experience in fish farming. 12.8% % of the farmers' population had less than 5years of experience. This implies that respondents have good experienced in fish farming, hence have lower likelihood of risk associated with aquaculture and high potential to develop innovation for the increase of production.

**Table 1. Distribution of Socio-Economic Characteristics of Fish Farmers**

| Socio-Economic Characteristics | Frequency (%) |
|---|---|
| **Sex** | |
| Male | 104 (57.8) |
| Female | 76 (42.2) |
| **Age (years)** | |
| 21 – 30 | 15 (8.3) |
| 31 – 40 | 32 (17.8) |
| 41 – 50 | 100 (55.6) |
| Above 50 | 33 (18.3) |
| **Marital Status** | |
| Single | 29 (16.1) |
| Married | 151 (83.9) |
| **Work Experience** | |
| 0-5 years | 23 (12.8) |
| 6-10 years | 36 (20.0) |
| 11-15 years | 75 (41.7) |
| > 15 years | 46 (25.6) |

**B. Information Communication Technologies Tools Currently in Use for Updating Knowledge among Fish Farmers.**

Table 2 shows that majority (37.2%) of fish farmers attested that mobile phones were currently the most accessible ICT tools use for updating knowledge on Aquaculture practices in the area. This implies that technological information and innovation dissemination are more easily accessed through mobile phones in the study area. This result conform with Aker and Mbiti (2010), Nakasone, et al., (2013) which studies affirmed that mobile phone technology has achieved high

penetration very rapidly in much of the developing world. Mobile phones could potentially offer the opportunity to deliver personalized agricultural information to farmers at low cost and in a way that is tailored to their context and time to coincide with the relevant part of the agricultural season. in the same vain, Salia *et al*., (2011) study of the effects of mobile phone use on artisanal fishing market efficiency and livelihoods in Ghana also confirmed that phones were used to coordinate between fishermen and markets, which led to increased market efficiency, less price dispersion, less waste, and benefits for all in Ghana.

About 27% of the fish farmers indicated newspapers and other print formats are readily accessible for use, since agricultural information can be sourced from it but most often information are least included. This corroborate the assertion of Flyvbjerg, 2012 that Mass media plays a key role in structuring and dominating the public sphere and is one of the most used and preferred information sources as well as being characterized as the “watch dog” or the “fourth power” of government. Digital Libraries and TV & Tele-centers for updating their knowledge were 19.4% and 16.7% respectively. These also indicate that information can be sourced through them, but they are not readily available but to some extent, still serve as means of getting information. This could be due to level of education, socioeconomic background, high cost of subscription or poor network coverage. World bank, 2011 explained that integrating ICT into national programs, creating a policy environment conducive for ICT investment, and designing digital systems that are compatible and common can help improve access for users.

**Table 2. Distribution of ICT Tools Currently in Use for Updating Knowledge Among Fish Farmers**

| ICT Tools | Frequency (%) |
|---|---|
| TV & Other Tele-centers | 30 (16.7) |
| Digital Libraries | 35 (19.4) |
| Newspapers & other print format | 48 (26.7) |
| Mobile phone | 67 (37.2) |
| Total | 180(100.0) |

**C. Modern ICT Trends Adaptable to Fish farming in Lagos State**

Market information database (29.4%) in Table 3 with ranked the highest modern ICT trends adaptable extension system indicating that market information including daily updates on the prices of agricultural commodities in the markets of the surrounding villages and cities enables farmers to sell at those markets where their goods would command the best prices. Recent studies have shown that ICT-based market information service interventions do facilitate smallholder farmers' access to market information and hence enhance linkage to input and output markets (Katengeza *et al*, 2011a; Katengeza *et al* 2011b; De Silva, 2010). The contribution of information and knowledge in bringing about social and economic development has been well recognized globally. Availability of markets and market information gives farmers the potential to bargain and improve their incomes, to seize market opportunities through the adjustment of production plans and better allocation of production factors, and also to use the information to make choices about marketing.

Furthermore, results revealed that provision of early warning about diseases / pests problem, representing 20.6 % revealed that modern ICT trends are adaptable to extension system in the study area. This implies that such will enable farmers systematically implement relevant measures to reduce damage from pests and diseases, increase fish production and give the desired success. A similar study of Soham *et al*., 2017 which stated that timely information remains essential for managing risk, and information and communication technology (ICT) has provided highly cost-effective instruments for collecting, storing,

processing, and disseminating information about risk. Information services using mobile phones and radios can direct early warnings of inclement weather, market movements, and pest and disease outbreaks to farmers.

Only 5.0% of the fish farmers indicated online feedback mechanism, while about 19% indicated that website established by research institutes containing information available to extension workers are the least Modern ICT Trends that will be adaptable to the Agricultural extension System in the Study Area. This is because easy and affordable access to internet facilities is the main hindrance when it comes to rural ICTs because without telecom connections most ICTs do not work. This is critically importance to agricultural extension, yet most organizations involved in food security and improving rural livelihoods. This finding is similar to Ojo, *et al*., 2014 where internet services had low mean score and low feedback mechanism from the fish farmers to extension in southeastern Nigeria.

**Table 3. Distribution of Modern ICT Trends Adaptable to Fish farming in Lagos State**

| Modern ICT Tools | Frequency (%) |
|---|---|
| Creation of data bases for marketing information | 37 (29.4) |
| Provision of early warning systems about problems | 53 (20.6) |
| Website established by research institutes | 34 (18.9) |
| Creation of mobile Apps for extension purposes | 17 (9.4) |
| E-commerce | 16 (8.9) |
| Tele-education to farmers | 14 (7.8) |
| Online feedback mechanism | 09 (5.0) |

## D. Perceived Effects of Information and Communication Technology on Fish Farmers

Table 4 showed the responses of fish farmers to their perception on ICT use. It was shown that 51.1% of the fish farmers strongly agreed that "ICT tools ensure fast communication among fish farmers" while 12% and 4.4% disagreed and strongly disagreed, respectively. This implied that ICTs has the potentials for facilitating fast availability and accessibility of information to fish farmers.

This result agree with Barguma and Ndaghu (2014), Katengeza *et al*., (2013) finding which affirmed that unlike the traditional agricultural information dissemination methods, ICT tools have the benefit of offering a cheaper way of communicating and sharing knowledge and information to fish farmers in the fastest way; delivering training and education to farmers; and improving farmers' access to markets and aquaculture credit. Remove the literature review

Also, results revealed that 59.4% of fish farmer admitted that fish farmers have access to latest and relevant information from the pool of online resources implying that majority of fish farmers can easily get latest appropriate information from online resources. One of the ways to bring about enhancement in fish farming production is the provision of right information through appropriate source that is accessible to fish farmers which such information are meant for. This calls for use of ICTs in sharing information among fish farmers by agricultural extension programme in Lagos State.

Moreso, results revealed that majority of the fish farmers (81.1%) agreed that they possess at least an ICT tool in study area showing the proliferation and significance of ICT to fish farming in the study area. Several trends are working in tandem with this result which are making ICT devices and services more affordable in ways that also extend access to small-scale producers (World Bank, 2011). Wireless Intelligence (2018) reported that 2017 was a milestone year for the mobile industry: the number of people connected to mobile services surpassed 5 billion globally, with 3.7 billion in developing markets. As such, two out of three people in the world had a mobile subscription at the end of 2017. Looking out to 2025, the mobile industry will reach new major milestones across key indicators – unique subscribers, internet users and 4G/5G connections. The proliferation of adaptable and more affordable technologies and devices has also increased ICT's relevance to smallholder agriculture. Innovation has steadily reduced the purchase price of phones, laptops, scientific instruments, and specialized software (World Bank, 2011).

Majority (97.2%) of the respondents agreed that introduction of ICT has triggered private involvement in fish farming. This confirm the

finding of Kerry *et al.*, (2011) that public and private sector actors have long been on the search for effective solutions to address both the long and short-term challenges in agriculture, including how to answer the abundant information needs of farmers. ICT is one of these solutions, and has recently unleashed incredible potential to improve agriculture in developing countries specifically.

**Table 4: Perceived Effects of Information and Communication Technology on Fish Farming**

| Variables | Strongly Agree | Agree | Disagree | Strongly disagree |
|---|---|---|---|---|
| ICT tools ensure fast communication among fish farmers | 92 (51.1%) | 68 (37.8%) | 12 (6.7%) | 8 (4.4%) |
| Fish farmers have access to latest and relevant information from the pool of online resources | 46 (25.6%) | 107 (59.4%) | 18 (10.0%) | 9 (5.0%) |
| Most farmers possess ICT tool | 51 (28.3%) | 95 (52.8%) | 16 (8.9%) | 18 (10.0%) |
| Introduction of ICT has triggered private involvement in fish farming | 88 (48.9%) | 87 (48.3%) | 5(2.8%) | 0 (0.0%) |

## E. Constraints of fish farmer in using ICT

Table 5 revealed the constraints of fish farmers in using ICT. Majority (84.5%) of the farmers agreed that computer literacy is a major challenge to the effective use of ICT in the study area implying that fish farmers requires some level of knowledge that will make them exploit the potentials embedded in the use of ICTs. This confirmed Akinbile *et al.* 2010 finding that the use of ICTs among fish farmers in Oyo State which affirmed that fish farmers' behaviour to information is not poor but they do not have enough knowledge of ICTs, especially

the modern ones, which will make them exploit the potentials embedded in the use.

Results in Table 5 revealed that 62.1% of the respondents disagree with the assertion that most fish farmers lack basic telecommunication services that support usage of ICT meaning that ICT especially the internet with its different services has recorded a great expansion through the whole of the industrialized world.The cost of an acquiring ICT tool is a challenge to farmers and determines its usage was strongly agreed (37.2%) and agreed (38.9%) by the fish farmers, which show that fish farmers face many financial and economic problems in use of ICT. In the same vein, Munyua (2007) indicated in the African context that uncoordinated ICT initiatives have created several problems including the high cost of the technology, poor ICT connectivity, skills and lack of local contents. However, this assertion was strongly disagreed by 10.6% of fish farmers in the study area.

Table 4 revealed that 86.6% of fish farmers generally agreed that accessibility is a factor when choosing an ICT medium while only 13.3% disagreed with this claim. The result showed that affordable connectivity and bandwidth is a prerequisite to the chose of an ICT medium by fish farmers. Not Relevant. Remove

**Table 5: Constraints of fish farmers in using ICT**

| Variables | Strongly Agree | Agree | Disagree | Strongly disagree |
|---|---|---|---|---|
| Computer Literacy is a Major Challenge to the Effective Use of ICT | 64 (35.6%) | 88 (48.9%) | 24 (13.3%) | 4 (2.2%) |
| Most Farmers Lack Basic Telecommunication Services That Support Usage of ICT. | 30 (16.7%) | 59 (32.8%) | 65 (36.1%) | 14.4 (26%) |
| Cost of Acquiring Basic ICT Tools is a Challenge to farmers | 41 (22.8%) | 83 (46.1%) | 42 (23.3%) | 14 (7.8%) |
| The cost of an ICT tool determines its usage. | 67 (37.2%) | 70 (38.9%) | 24 (13.3%) | 19 (10.6%) |
| Accessibility is a factor when choosing an ICT medium | 87 (48.3%) | 69 (38.3%) | 24 (13.3%) | 0 (0.0%) |

## Conclusion and Recommendations

A high proportion of sampled fisher folks were married in their active and productive years with relatively high experience. Mobile phone and newspaper print and media are currently the most readily available ICT tools use for updating knowledge on Aquaculture practices. Majority of fish farmers strongly agreed that ICT tools ensure fast communication among fish farmers. Market information (and provision of early warning systems about diseases outbreak are the most relevant ICT services adaptable to fish farmers. Computer illiteracy hinders fish farmers' effective use of ICT in the study area. The study recommended computer training and the use of ICT in Aquaculture by encouraging computer extension officers to disseminate information and knowledge through ICT media. ICT should be integrated into national programs conducive environment created for ICT investment, and digital systems that are compatible and common should be designed to help improve access for fisher folks in the study area.

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