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ANALYSIS OF THE USE OF INFORMATION COMMUNICATION TECHNOLOGIES IN FISH FARMING IN KWARA STATE, NIGERIA

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Abstract. The potentials of ICTs in fish farming has not been fully harnessed by farmers in Nigeria. This study assessed farmers' awareness of the use of ICTs in fish farming, determined level of use, identified the determinants of use, and the constraints to the use of ICTs in fish farming. A two-stage random sampling technique was applied to select 133 respondents on whom a questionnaire was administered. Data were analysed using descriptive statistics, Multiple Regression Analysis and the Pearson's Product Moment Correlation. Respondents' level of awareness of the use of ICTs in fish farming was high (71.4%), but use was low (48.3%). The major constraint to the use of ICTs was the high cost of internet subscription (M = 3.53). At $p < 0.001$, number of ponds ($\beta = 0.095$), cosmopoliteness ($\beta = 0.271$), household size ($\beta = 0.159$) and frequency of extension contact ($\beta = 0.078$) determined the use of ICTs. Also, awareness of ICTs had a significant relationship with its use ($r = 0.339$, $p < 0.01$). The study concluded that the level of use of ICTs in fish farming in the state was low in spite of a high level of awareness. It recommends among others, the regulation of the activities of ICT service providers in the country for quality service at reduced prices.

Keywords: awareness, communication, internet, networking, pisciculture

INTRODUCTION

Pisciculture is an aspect of agriculture that involves the controlled keeping and raising of fish commercially in natural or artificial ponds. It is the source of livelihood of millions of small-scale operators in Nigeria. Fish species commonly cultured in the country include *Clarias gariepinus*, *Heterobranchus bodorsalis*, *Tilapia spp.*, *Mugie spp.*, *Chrysichthys nigrodigitatus*, *Ophiocephalus obscure*, *Cyprinus carpio*, *Heterotis niloticus* and *Megalo spp*. Fish farming contributes to ensuring nutrition security and good health of families (Bene and Heck, 2005; Aphunu and Atoma, 2011). It also provides raw materials for industries in the food value chain. The rapid increase in population of the country and the renewed awareness of the nutritional advantage of fish consumption over meat has continued to raise the demand for fish. Jiriko et al. (2015) also blamed the wide gap between the local production and consumption of fish in the country on the poor technological know-how of fish farmers, therefore, raising the need for improved fish farming technologies for better fish production, processing, and marketing.

The role of information in fish farming cannot be overemphasised as farmers need to be updated with various fish farming technologies necessary for high productivity (Benard et al., 2018). Ijatuyi et al. (2016) posited that information is pertinent in fish farming for increasing production, improved marketing and distribution strategies for fish products. It has been argued that unlike the traditional agricultural information dissemination methods, ICTs have the advantage of

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presenting a cheaper and faster way of communicating and sharing knowledge and information (Barguma and Ndaghu, 2014; Okello et al., 2014).

Information Communication Technologies (ICTs) are tools that help in capturing, storing, processing, transmitting and display of information by electronic means. The strength of traditional technologies is accompanied by the recent evolution of new media technologies such as computers, internet and mobile phones (Akinbile and Alabi, 2011). Studies have revealed that applying proven technologies will increase the production of small-scale operators that constitute 80 percent of global fish farmers (Aphunu and Atoma, 2011). The search for an effective, efficient and lasting strategy for agricultural development; fish farming inclusive, calls for adequate utilization and application of ICTs, especially computers, microcomputer applications and the Internet, which are considered the principal drivers of information flow for economic growth and development worldwide (Abubakar and Abdullahi, 2009; Aphunu and Atoma, 2011).

Though there is wide use of information technology in social communication and network in Nigeria, there seems to be limited access and utilisation of these technologies for agricultural development in terms of production, processing, and marketing. Encouragement to use ICTs in agriculture is important as many rural communities still rely on traditional means such as family, neighbours and other farmers for information on agriculture. The level of awareness of innovation has been reported to influence its adoption. Also, socio-economic characteristics often determine farmers' attitude and by extension, use of innovation. Finally, it is possible that certain factors impede the farmers' use of ICTs.

Despite the general acceptance of fish farming as an income generating activity, its contribution to total domestic fish production in the country is still below expectation (Jiriko et al., 2015). The reason for this could be traced to lack of information on technological know-how among fish farmers and prospective entrepreneurs (Aphunu and Atoma, 2011). Information is power and power is information, without information there cannot be growth. Sadat et al. (2006) opined that encouragement to utilize ICT is important due to the fact that much of agriculture community in developing countries like Nigeria still rely on traditional means such as family, neighbours and other farmers in order to be informed on agricultural happenings. Despite the numerous importance and advantages of ICT in agricultural development, fish industry is still backward in its use to expand the industry. The industry has failed to tap into the various opportunities made available by ICT in fish value chain. It is, however, important to study fish farmers' level of use of ICT in fish farming. The specific objectives were to: describe the socio-economic characteristics of fish farmers in the study area; assess the awareness of fish farmers on ICTs use in fish farming; determine the level of its use; and identify the constraints to its use among fish farmers in the study area.

Hypotheses of the study

The hypotheses of the study were stated in the null form as follows:

$H0_1$: Socio-economic characteristics of fish farmers do not influence their level of use of ICTs in fish farming.

$H0_2$: There is no significant relationship between fish farmers' level of awareness of the use of ICTs in fish farming and their level of its use.

MATERIALS AND METHODS

The study area

The study was carried out in Kwara State, Nigeria. The state has a total landmass of 32,500 km^2 and a multicultural and diverse population of 3,192,900 people (National Population Commission, 2016). It lies between latitudes 7°45'N and 9°30'N and longitudes 2°30'E and 6°25'E. The state has sixteen (16) Local Government Areas (LGAs). Though crop farming is the mainstay of the economy of the state, fish farming is an important economic activity that provides a means of livelihood

Fig. 1. Map of the world showing Nigeria

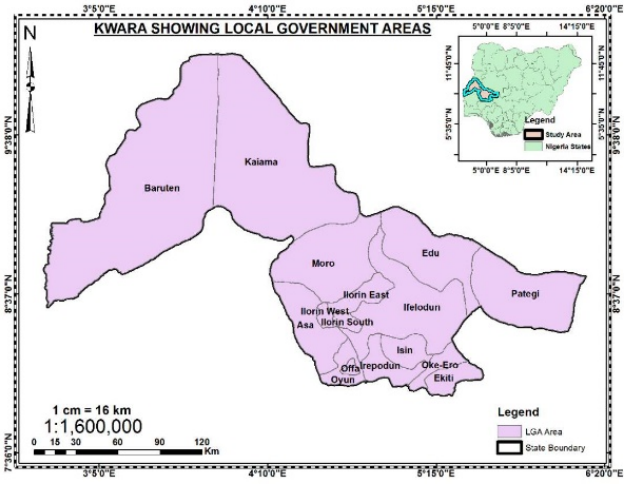

Fig. 2. Map of Kwara State showing Local Government Areas

for many families. Fish farmers in the state also engage in value addition activities along the fish value chain.

Sampling procedure and sample size

The population of the study consisted of all fish farmers in Kwara State, Nigeria. The list of members of registered Catfish Farmers' Associations obtained from the Kwara State Ministry of Agriculture in the state was the sampling frame for the study. A two-stage random sampling procedure was used. The first stage was the random selection of 50 percent of the 16 Local Governments Areas in Kwara State by dip hat method to give a total of 8 LGAs. The second stage involved the random selection of 25 percent of catfish farmers in each of the Local Government Areas selected. A total sample size of 133 was used for the study.

Data collection and analysis

Data collection was done with the aid of a structured questionnaire. Descriptive statistics including frequency distribution, percentages, mean score, standard deviation were used to present the findings from the objectives of the study. The Multiple Regression Analysis (Ordinary Least Square, OLS) was used to identify the determinants of the use of ICTs in fish farming. The equation for the model was specified as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_6 X_{6+} \beta_7 D_1 + \beta_8 D_2 + e$$

Where:

β_0 – intercept, β_1–β_8 – coefficients

Y – use of ICTs in fish farming. This was measured using a 4-point Likert scale. Various Information and communication Technologies were listed, and respondents were required to indicate their level of use on a scale of 1–4. The scale was graduated as follows: never used = 1, rarely used = 2, often used = 3, always used = 4. Scores were aggregated and converted to means for individual respondents. The means score was adopted as a measure of the respondents' use of ICT in fish farming. For ease of discussion, a benchmark was introduced to categorise the respondents' level of ICTs use as follows: <2.00 = low, 2.00–3.00 = average, and >3.00 = high

X_1 – age (in years), X_2 – highest level of education (number of years of schooling), X_3 – average annual income (amount in ₦), X_4 – fish farming experience (years), X_5 – farm size (number of ponds), X_6 – frequency of extension contact (number of contact in the immediate past 6 months period of the study), X_7 – household size (number of people feeding from the same pot), X_8 – cosmopoliteness (farthest distance travelled),

D_1 – sex (1 = male, 0 = otherwise), D_2 – primary occupation (1 = fish farming, 0 = otherwise)

e – error term.

The relationship between the awareness of the use of ICTs and the level of use of ICTs was determined by the Pearson's Product Moment Correlation (PPMC).

Awareness of ICTs use in fish farming – Various Information Communication Technologies were listed, and respondents were required to indicate whether or not they were aware of their use in fish farming. The scale was graduated as follows; Not Aware = 0, Aware =1. Percentages were calculated for each of the listed ICTs. The average score on all items on the presented ICTs list was taken as a measure of respondents' level of awareness of ICTs.

Constraints to the use of ICTs – A four-point Likert-type scale was used to assess the level of severity of the constraints to the use of ICT in fish farming. A list of possible constraints was drawn, and respondents were required to rate the level of severity of the constraints on a scale of one to four. The scale was graduated as follows; Not a constraint = 1, Not severe = 2, Severe = 3,

Very severe = 4. Scores were aggregated and converted to means for each of the listed possible constraints. The means scores were adopted for ranking of the constraints in order of severity.

RESULTS AND DISCUSSION

Socio-economic Characteristics of Fish Farmers

Table 1 shows that the mean age of the respondents was 39.82 years and the modal age bracket (36–45 years) was within the economically active and productive age range. This result implies a commendable level of youth involvement in commercial fish farming in the study area. A similar report was made by Olowosegun et al. (2004). Only 15 percent were females. All the respondents had formal education with 70.7 percent having tertiary education. The high level of education is an advantage in the adoption of technology (Aphunu and Atoma, 2011; Omotesho et al., 2016). The majority (85%) of the respondents were married, which could confer family responsibilities that need financial commitments on them. This finding is in agreement with Ifejika et al. (2008) who reported the same among fish farmers in Nigeria. Most (70.7%) of the respondents were full-time fish farmers. The result contradicts that of Ifejika and Ayanda (2005) who reported that most fish farmers engaged in fish farming as secondary occupation. The average annual income was ₦1,169,714.3. ($3,249.21) while the average number of years of fish farming experience was 7.08years. This result corroborates the findings of Akinrotimi et al. (2010). It is worth noting that majority (71.4%) of farmers had no contact with extension within the immediate past six (6) months period and this could be as a result of the array of challenges combating extension services in Kwara State (Omotesho et al., 2016).

Awareness of use of ICTs in fish farming

Table 2 reveals that all of the respondents were aware of the use of mobile phones in fish farming. They were also highly aware of the use of radio and television in fish farming. Similarly, Adejo and Haruna (2009) stated that these classes of ICTs facilities are ideal for rural areas, cheap to set up, and easy to use. Very few of the respondent (12.8%) were aware of the use of CD-ROM in fish farming. The result also indicated that the average level of awareness of fish farmers on ICTs use in

Table 1. Distribution of respondents according to their socio-economic characteristics

Variables	Frequency	Percentage	Mean	SD
Age (years)				
≤25	5	3.80		
26–35	39	29.30	39.82	9.03
36–45	53	39.80		
≥46	36	27.10		
Sex				
male	113	85.00		
female	20	15.00		
Marital status				
married	113	85.00		
otherwise	20	15.00		
Level of education				
primary education	2	1.60		
secondary education	37	27.70		
tertiary education	94	70.70		
Primary occupation				
fish farming	94	70.70		
otherwise	39	29.30		
Annual farm income				
≤100,000	7	5.30	1,169,714.30	
100,001–600,000	39	29.30		
600,001–1,100,000	37	27.80		
≥1,100,001	50	37.60		
Fish farming experience				
≤5	42	31.60		
6–10	79	59.40	7.08	3.70
≥10	12	9.00		
Number of ponds owned				
≤5	79	59.40		
6–15	53	39.80	5.48	5.20
≥16	1	0.80		
Household size				
1–5	97	72.90	4.90	2.90
6–10	35	26.30		
≥16	1	0.80		
Frequency of extension contact				
0	95	71.40		
1–5	33	24.80	0.80	2.60
≥6	5	3.80		

Source: own elaboration based on research ($1=N 360).

Table 2. Distribution of respondents based on their awareness of ICTS use in fish farming

Uses*	Aware F (%)	Not Aware F (%)	Rank
Mobile phones	133(100)	0(0)	1st
Television	130(97.7)	3(2.3)	2nd
Radio	126(94.7)	7(5.3)	3rd
Social media (Whatsapp and Facebook etc.)	126(94.7)	7(5.3)	3rd
Internet search engines (Google etc.)	123(92.5)	10(7.5)	4th
Video	118(88.7)	15(11.3)	5th
Electronic journals	118(88.7)	15(11.3)	5th
Computer	115(86.5)	18(13.5)	6th
Personal e-mail	109(82)	24(18)	7th
Personal website	96(72.2)	37(27.8)	8th
Blogs	42(31.6)	91(68.4)	9th
Digital wallet (e-wallet)	22(16.5)	111(83.5)	10th
Cinema	19(14.3)	114(85.7)	11th
CD-ROM	17(12.8)	116(87.2)	12th

Source: own elaboration based on research.
* Multiple responses. Average level of awareness of the use of ICTs = 71.4%.

fish farming was high (71.4%). FAO (2007) and Gangadhar (2011) also reported high level of awareness of the use of digital and other information and communication technologies in developing economies.

Use of ICTs in fish farming

Table 3 reveals that mobile phones were the most used ICT in fish farming (M.S = 3.91). This could be explained by fact that mobile phones are easily accessible, available and cheap. This finding is in agreement with those of Chavula (2014) which also asserted that mobile phones were the most used ICT tools. The high use of social media (M.S = 2.86) which includes the use of Facebook, WhatsApp, Instagram etc. is a reflection of youth engagement in fish farming in the study area. The least used ICT was Cinema with (M.S = 1.06). This agrees with Otitolaye (2006) who reported that accessibility and cost of use were important factors to consider in the use of communication channels.

Level of Use of ICTs in fish farming

Table 4 reveals that the level of use of ICTs in fish farming was low among 54.1 percent of the respondents. Very few (3.8%) of the respondents had a high level of

Table 3. Distribution of respondents based on the use of ICTS in fish farming

ICTs	Always Used F(%)	Often Used F(%)	Rarely Used F(%)	Never Used F(%)	Score	MS	Rank
Mobile phones	127(95.5)	3(2.3)	0(0)	3(2.3)	520	3.91	1st
Social media	70(52.6)	15(11.3)	8(6)	40(30.1)	381	2.86	2nd
Internet search engines (Google etc.)	44(33.1)	33(24.8)	24(18)	32(24.1)	355	2.67	3rd
Radio	16(12)	36(27.1)	14(10.5)	67(50.4)	267	2.01	4th
Computer	20(15)	34(25.6)	6(4.5)	73(54.9)	267	2.01	4th
Television	15(11.3)	38(28.6)	9(6.8)	71(53.4)	263	1.98	5th
Video	14(10.5)	32(24.1)	14(10.5)	73(54.9)	253	1.90	6th
Electronic journals	9(6.8)	37(27.8)	10(7.5)	77(57.9)	244	1.83	7th
Personal e-mail	14(10.5)	16(12)	28(21.1)	75(56.4)	235	1.77	8th
Personal website	9(6.8)	7(5.3)	20(15)	97(72.9)	194	1.46	9th
Blog	4(3)	11(8.3)	16(12)	102(76.7)	183	1.38	10th
Digital wallet (e-wallet)	2(1.5)	2(1.5)	8(6)	121(91)	151	1.14	11th
CD-ROM	2(1.5)	1(0.8)	9(6.8)	121(91)	150	1.13	12th
Cinema	2(1.5)	0(0)	2(1.5)	129(97)	141	1.06	13th

Source: own elaboration based on research.

Table 4. Distribution of respondents based on their level of use of ICTS in fish farming

Level of use	Frequency	Percentage	Mean
Low (<2)	72	54.1	
Average (2.00–3.00)	56	42.1	1.93
High (>3.00)	5	3.8	

Source: own elaboration based on research.

use of ICTs in fish farming. With a mean level of use score of 1.93 out of 4, the result implies a poor use of Information Communication Technologies in fish farming in Kwara State, Nigeria. The finding is corroborated by the study of Akpabio et al. (2007).

Constraints to the use of ICTs among fish farmers

Table 5 shows that the most severe constraint to the use of ICTs was the high cost of internet subscription (M.S = 3.53). Erratic power supply (M.S = 3.50), poor connectivity/network problem (M.S = 3.49), the high cost of ICT facilities (M.S = 3.39) were rated 2nd, 3rd and 4th respectively in terms of severity.

The results of tested hypotheses

$H0_1$: Socio-economic characteristics of fish farmers do not influence their level of use of ICT.

As revealed in Table 6, the multiple regression model with nine predictors produced $R^2 = 0.444$, $p < 0.00$. Four of the nine variables included in the analysis were significant in predicting fish farmers' level of use of ICTs in fish farming, and they accounted for 44.4% of total variations in the level of ICTs use among fish farmers. These variables were cosmopoliteness, household size, number of ponds owned and frequency of extension contact. The positive coefficient of the variables implies that the use of ICTs increased with an increase in each of the variables. Therefore, as the numbers of extension contact increases, the level of use of ICTs will also increase. This may be as a result of the fact that regular extension agents visit to farmers would result in better awareness and exposure to ICTs. Also, at $p < 0.01$, the size of the household also positively influenced ICTs use. Cosmopoliteness ($p < 0.05$) also positively affected

Table 5. Constraints to the use of ICTS in fish farming

Constraints	V.S F(%)	S F(%)	L.S F(%)	N.C F(%)	Score	MS	Rank
High cost of internet subscription	96(72.2)	17(12.8)	14(10.5)	6(4.5)	469	3.53	1st
Erratic power supply	91(68.4)	21(15.8)	18(13.5)	3(2.3)	466	3.50	2nd
Poor connectivity/network problem	88(66.2)	26(19.5)	15(11.3)	4(3)	464	3.49	3rd
High cost of ICT facilities and accessories	71(53.4)	48(36.1)	9(6.8)	5(3.8)	451	3.39	4th
Poor access to ICT device	74(55.6)	36(27.1)	16(12)	7(5.3)	443	3.33	5th
Lack of training on ICT	71(53.4)	30(22.6)	22(16.5)	10(7.5)	428	3.22	6th
Lack of awareness/knowledge of ICT	66(49.6)	32(24.1)	26(19.5)	9(6.8)	421	3.17	7th
Problems of ICT facilities maintenance	56(42.1)	44(33.1)	28(21.1)	5(3.8)	417	3.14	8th
Lack of confidence to operate ICTs	71(53.4)	23(17.3)	19(14.3)	20(15)	411	3.09	9th
Lack of skills to operate ICTs facilities	58(43.6)	37(27.8)	29(21.8)	9(6.8)	410	3.08	10th
Lack of enabling government policy	12(9)	33(24.8)	27(20.3)	61(45.9)	262	1.97	11th
Low income of fish farmers	11(8.3)	19(14.3)	38(28.6)	65(48.9)	242	1.82	12th
Low level of education	9(6.8)	16(12)	25(18.8)	83(62.4)	217	1.63	13th

Source: own elaboration based on research.

Table 6. Result of OLS regression analysis showing relationship between socio-economic characteristics of fish farmers and their level of use of ICTS in fish farming

Socio-economic characteristics	Beta	Std. Error	t-value	Sig
Constant	1.530	0.478	3.198	0.002
Age	–0.006	0.005	–1.163	0.247
Household size	0.159	0.026	6.051	0.001
Cosmopoliteness	0.271	0.101	2.673	0.009
Level of Education	0.115	0.091	1.262	0.209
Primary Occupation	0.093	0.102	0.919	0.360
Annual income from fish farming	0.001	0.000	1.880	0.062
Number of ponds owned	0.095	0.019	5.112	0.001
Fish farming experience	–0.017	0.016	–1.073	0.285
Extension contact	0.078	0.018	4.348	0.001

Source: own elaboration based on research.

ICTs use among fish farmers. Respondents' closeness to urbanisation determined their use. The positive relationship between number of ponds possessed by the respondents and ICTs use can be related to the fact that increased number of ponds is likely to translate to increased income and hence increased purchasing power with which respondents can access ICTs.

$H0_2$: There is no significant relationship between farmers' awareness of the use of ICTs in fish farming and the level of use.

Table 7 shows that awareness of the use of ICT is positively significant to the level of its use. The implication is that the more aware farmers were about the use of ICTs in fish farming, the more they used it. For farmers to use any innovation or technology, they first have to be aware of the uses of such innovation or technology. Awareness is also expected to generate interest which will eventually lead to farmers trying out a new idea. Fawole and Olajide (2012) also reported that farmers' use of ICTs increased with their awareness.

Table 7. Result of the correlation analysis between awareness of use of ICTS in fish farming and level of use

	Awareness of ICTs use	Level of ICTs use
Awareness of ICTs Use	1	0.339*
Level of ICTs use	0.339*	1

*Correlation is significant at the 0.01 level (2-tailed).
Source: own elaboration based on research.

CONCLUSION AND RECOMMENDATIONS

The study concluded that though farmers were well aware of the various uses of ICTs in fish farming, their level of use was low. The farmers' level of use of ICT in fish farming was significantly influenced by household size, number of ponds owned, farmers' cosmopolitness and frequency of extension contact. The low level of use in spite of the high awareness is explained by the level of severity of constraints such as the high cost of acquisition of ICT facilities and internet subscription, erratic power supply and poor internet access among others.

Based on the conclusion of the study, it recommended that extension service provision to fish farmers should be improved upon. The activities of ICT service providers in the country should be regulated to ensure quality service at reduced prices such that farmers can take full advantage of ICTs in driving fish production and distribution. While effort should be deployed to ensure uninterrupted electricity supply, other sources of power should also be explored. Fish farmer groups should explore the possibilities of joint acquisition of ICT facilities which individual farmers may not be able to afford.

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