Assessment of Internet And Mobile Phone Usage in Enhancing Fish Farming in Makurdi Local Government Area of Benue State, Nigeria

Attah, A. J., Otene, V.A. And Waya, D.T.

Department Of Agricultural Extension And Communication, Federal University Of Agriculture, Makurdi, Nigeria

Abstract: **This study assessed the use of internet and mobile phones in enhancing fish farming in Makurdi Local Government Area Benue State, Nigeria. Fish farmers formed the population of the study. Simple random sampling technique was used to select one hundred and sixteen respondents. Primary data were used, and collected using a structured questionnaire. The collected data were analyzed using descriptive and inferential statistics. Findings revealed that the mean age of the farmers was about 44years, 50.0% of respondents were married, and 87.1% had formal education. The mean household size was about 8 persons with mean annual income of ₦120,107.75. Mean pond size was 43.92m^2, and mean farming experience was 7.42 years. Research revealed that majority of the respondents had high level of access to internet and mobile phones, as the mean value of their access to the internet and mobile phones were above the medium scale. The level of use of internet and mobile phones by the respondents was remarkably high, as the mean value of their level of use was also above the medium scale. The result of factor analysis revealed that two categories of factors militated against the use of internet and mobile phones; infrastructural and socioeconomic factors. Possession of formal education (W=19.173), household size (W=3.080) and marital status (W=4.236) significantly affected respondents' level of use of internet and mobile phones. It was therefore recommended that government put in place relevant infrastructure to curb the various factors and challenges faced in the use of internet and mobile phones, and the facilities not accessible by the respondents be made more accessible to fish farmers by government and extension agencies so as to enhance their usage.**

Key words: **Assessment, Internet, Mobile phone, Enhance, Fish farming**

I.INTRODUCTION

Fish farming offer a key entry point to reach millions of poor people of Africa, including Nigeria to assist in increasing people's income, improving the nutrition and health of families and becoming active agents of economic development and social change (Bene and Hecks, 2005).Fish is the most cultured of all aquatic organisms, and in many rural areas, small-scale fish farming is of special importance to villagers and farmers (Kumar, 1992). Fish is a vital source of animal protein and healthy long-chain omega-3 fats, while also supplying other nutrients such as iodine, vitamin D and calcium. With the world population expected to reach nine billion by 2050, the aquaculture sector will play a key role in ensuring food and nutrition security as the increased demand will challenge fish production over coming decades (FAO, 2017)

In Nigeria, most fish farmers operate small-scale farms ranging from homestead concrete ponds (25-40 metres) to small earthen ponds (0.02-0.2 hectares). Small scale fish farming supplies the greatest percentage of the Nigerian's annual fish production output (Federal Department of Fisheries (FDF), 1997). One of the needs of fish farmers is information, which should be accurate and timely. While agricultural extension agents have been doing their best to disseminate agricultural information to fish farmers, the overwhelming number of fish farmers makes it difficult for extension agents to effectively reach all the farmers. The adoption of faster and more efficient communication channels will benefit the fish farmers.

The internet mobile phonesis an alternative to the traditional information dissemination by extension agents. These are communication tools that, if integrated into agricultural extension delivery, would ease the flow of information to fish farmers (Chhachhar and Hassan, 2013). The volume of information contained on the internet cannot be quantified, while the use of mobile phones have made communication easier and faster.

While these communication tools have been employed in many sectors with desirable results, the use of internet and mobile phones by fish farmers in Makurdi Local Government Area of Benue State will grant them better access to agricultural information, and enhance their production capabilities. It is necessary for the fish farmers to have access to the internet and mobile phones, and also make use of them. Identification of the factors affecting the usage of the internet and mobile phones will also enhance the usage of the communication tools. These forms the basis for this research.

Objectives of the Study

The broad objective of this study is to assess the use of internet and mobile phones in enhancing fish farming in Makurdi Local Government Area of Benue state, Nigeria. The specific objectives of the study are to:

i. describe the socioeconomic characteristics of the respondents in the study area;
ii. determine the level of access of the respondents to internet and mobile phones;
iii. measure the level of use of internet and mobile phones by the respondents; and
iv. identify the factors affecting the use of internet and mobile phones by the respondents.

Hypothesis

Based on the specific objectives, the following hypothesis was stated and tested:

The socioeconomic characteristics of the fish farmers do not have any significant effect on their level of use of the internet and mobile phones.

II. RESEARCH METHODOLOGY

Area of Study

The study was carried out in Makurdi Local Government Area (LGA) in Benue State, one of the North-Central States in Nigeria. Benue State was created on the 3rd of February, 1976. The State derives its name from the River Benue, which is the second largest river in the country and the most outstanding geographic location in the state.

Makurdi doubles as a Local Government Area in Benue State and also as the State capital. Its coordinates are 7°, 43′50″ North and 8°,32′10″ East and defined by a 26km radius with the Benue river and its tributaries covering a substantial area of the town. A population of 292,642 at the 2006 census makes it the biggest city in Benue. Makurdi experiences an annual average rainfall of 1090mm.There are two distinct seasons, the rainy season and the dry season; the former lasts from April to October and the latter from November to March. Makurdi has a temperature range between a minimum of 27.8°C to 28.2°C and a maximum of 30.1°C to 34.1°C (Benue State, 2019).

The local government has people of diverse cultural backgrounds with the indigenous and dominant the Tiv, Idoma, Igede and the Etulo and about a good number of the populations are involved in subsistence farming. Among the arable crops grown in Makurdi are yam, cassava, sweet potatoes, cocoyam, groundnut, beniseed, rice, maize, millet, sorghum and pigeon pea while tree crops include oil palm, citrus, mango, cashew, plantain, banana, guava. They also raise livestock such as chicken, goats, sheep, pigs and cattle and also engage in fish farming. The postal code of the area is 970001 (Wikipedia, 2017). A map of the study area is presented in Figure 1.

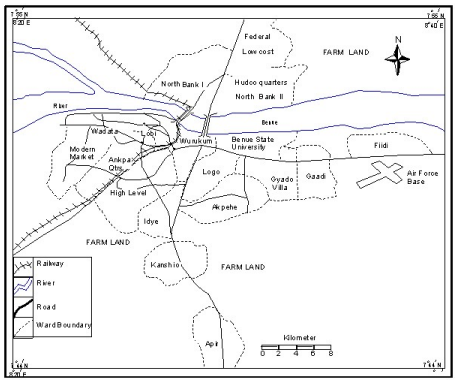

Figure1: Map of Makurdi Local Government Area of Benue State, Nigeria.

Population and Sampling Techniques

The population for this study comprised fish farmers in Makurdi LGA. Six out of the eleven council wards in the study area were purposively selected for the study, owing to the large number of fish farmers in the council wards. One hundred and sixteen (116) respondents were selected as sample size from the council wards, corresponding to 5 % of the sampling frame.

III. METHODS OF DATA COLLECTION AND ANALYSIS

Primary data were used for this study, and collected using a well-structured questionnaire. The data collected were analyzed using descriptive and inferential statistics. Objectives 1-3were achieved using descriptive statistics such as percentages, mean, and Likert-type scale, while objective 4was achieved using factor analysis. The null hypothesis will be tested using the chi square value of logistic regression.

Model specification

The logit regression is of the form

$$Y = \frac{e^{a+\beta_1 X_1 + \ldots + \beta_7 X_7}}{1 + e^{a+\beta_1 X_1 + \ldots + \beta_7 X_7}}$$

Where

Y = Probability of level of use of internet and mobile phone (1=high, 0=low)

β_0= constant term

β (1……7) vector of the parameter to be estimated

X_1 = Age of respondents (years)

X_2 = Years of formal education

X_3= Household size (Persons)

X_4 = Pond size (M^2)

X_5 = Income (Naira)

X_6 = Fish farmingexperience (years)

X_7 = Marital status (1= Married, 0= Single)

IV. RESULT AND DISCUSSION

4.1 Socioeconomic Characteristics of the Respondents

The result of the analysis of the socioeconomic characteristics of the respondents is presented in Table 1.Research revealed that most of the respondents (27.6%) were within the age range of 51 and 60 years. Smaller proportion (0.9%) were in the age range of above 60 years, and the mean age was found to be about 44 years. Fish farmers in the study area are therefore generally in their economically active age and youthful, an age group characterized by more frequent use of mobile phones and the internet. This result is corroborated by Tsue *et al*. (2012),who opined that able bodied young men in Benue State were the ones largely and actively involved in fish farming.

Research findings also revealed that there were more males (56.8%) involved in fish farming than females (41.4%). As suggested out by Okonji and Bekerederemo (2011), this is due to the tedious nature of some aspect of fish farming such as culturing which a lot of females may not be able to cope with. This agrees with Ufuoku *et al*. (2006),who reported that males were more involved in fish farming than females.

Research findings further revealed that 50.0% of the fish farmers were married, thus implying that majority of the fish farmers have family responsibilities that will require more financial commitment, and improving their fish farming will be beneficial to them. On the level of education of respondents, research finding shows that majority (87.1%) of the respondents was literate and the mean years of education was about 12 years thus suggesting that fish farming is dominated by literate persons. This high level of literacy among the respondents is expected to enhance internet and mobile phone usage. The result is in consonance with those of Raufu*et al.* (2009) and Osondu and Ijioma (2014),who reported that most of the fish farmers in Lagos and Abia State, Nigeria, respectively, were formally educated.

The mean household size of the respondents was 8 persons further confirming that respondents have relatively large families, with more responsibilities taking care of their families. This is in consonance with the findings of Olasunkanmi(2012**)**,where most of the fish farmers in Osun State, Nigeria were also married with dependents

With respect to pond size, most of the respondents (44.8%) had a pond size that is in the range of 21 and 40 square metre with a mean size of about 44square metre. This implies that the respondents are small-scale fish farmers. They will therefore, need agricultural information to obtain optimum output from their small fish farms. These findings are similar to that of Okwu and Acheneje (2011) among fish farmers in Benue State.

Research findings revealed that, most of the respondents (34.5%) earned between ₦100,001 and ₦150,000 with average annual income of ₦120,107.76 .This buttresses the assertion that fish farmers in the study area are mainly small-scale fish farmers .This finding is in consonance with the findings of Essien *etal*.(2010), who opined that small-scale farmers do not earn much from their farms. Spending money on mobile phones and internet facilities could be a challenge to the low-income earning farmers.

Most (47.4%) of the fish farmers have had 6 and 10 years fish farming experience. On the average, the fish farmers have been into fish farming for about 7 years implying that most of them had some level of experience in fish farming. As revealed by Kitojo (2001), experience is a risk management factor in fish farming, and new entrants into the aquaculture sector are at a higher risk compared to experienced fish farmers.

TABLE 1: SOCIO ECONOMIC CHARACTERISTICS OF RESPONDENTS (n= 116)

Socio-economic Characteristics	Frequency	Percentage	Mean ($\bar{x}$)
Age (Years)			44.07
21 - 30	31	26.7	
31 – 40	27	23.3	
41 – 50	25	21.6	
51 – 60	32	27.6	
> 60	1	0.9	
Sex			
Female	48	41.4	
Male	68	58.6	
Marital Status			
Married	58	50.0	
Single	34	29.3	
Divorced	13	11.2	
Widow/Widower	11	9.5	
Level of Education			
Non-formal	15	12.9	
Primary	28	24.1	
Secondary	50	43.1	
Tertiary	23	19.8	
Household Size (Persons)			≈ 8
0 – 5	19	16.4	
6 – 10	75	64.7	
11 – 15	19	16.4	
16 – 20	2	1.7	
> 20	1	0.9	
Pond Size (M^2)			43.92
0 – 20	9	7.8	
21 – 40	52	44.8	
41 – 60	32	27.6	
> 60	23	19.8	

Annual Income (₦)			120,107.76
< 50,000	14	12.1	
50,001 – 100,000	39	33.6	
100,001 – 150,000	40	34.5	
150,001 – 200,000	21	18.1	
> 200,000	2	1.8	
Fish farming experience (Years)			7.42
0 – 5	16	13.3	
6 – 10	15	12.5	
> 15	14	11.7	

4.2 Level of Access to Internet and GSM Facilities by the Respondents

The result on level of access to internet and GSM facilities is presented in Table 2. Results indicate that fish farmers had mean rating scores of between 2.01 and 2.96 for 5 out of the 9 variables (internet and GSM facilities) on the scale, which is higher than 2.00, the medium of the scale. The result therefore indicates that respondent's level of access to internet and GSM facilities was high. For instance, World Wide Web ($\bar{x}$=2.56), Social media ($\bar{x}$=2.57), E-mail ($\bar{x}$=2.01), SMS ($\bar{x}$=2.63) and Voice calls ($\bar{x}$=2.96). This implies that majority of the respondents had access to internet and GSM facilities and this might be due to the fact that the respondents were resident in the urban areas where internet and GSM facilities is more accessible. This finding corroborates that of Fadiji (2011), who opined that high access to internet and GSM facilities might be attributed to the increasing growth in the proliferation and use of cell phones in Nigeria, with its attendant ease of access and reasonable cost.

The research findings also revealed that the remaining four items had mean rating scores of between 1.30 and 1.99 which are lower than 2.00, the medium of the scale. These are Fax ($\bar{x}$=1.30), Newsgroup ($\bar{x}$=1.99), Mailing list ($\bar{x}$=1.58) and Search engines ($\bar{x}$=1.86). This implies that the respondent's level of access to the list of these items was low, and fish farmers will not have access to many useful materials found in the internet. The internet is a formidable source of information on recent developments in the field of agricultural extension(Okwu and Acheneje, 2011).

Table 2: Distribution of Respondents according to Level of Access to Internet and GSM facilities

Internet and GSM facilities	Level of Access			Mean
	Low	Moderate	High	
World Wide Web	14 (12.1)	23 (19.8)	79 (68.1)	2.56
Social Media	16 (13.8)	18 (15.5)	82 (70.7)	2.57
E-mail	31 (26.8)	52 (44.8)	33(28.4)	2.01
Fax	82 (70.7)	31 (26.7)	3 (2.6)	1.30
Newsgroup	30 (25.9)	57 (49.1)	29 (25.0)	1.99
Mailing list	59 (50.9)	46 (39.7)	11 (9.5)	1.58
SMS	11 (9.5)	20 (17.2)	85 (73.3)	2.63
Search engines	36 (31.1)	59 (50.9)	21 (18.1)	1.86
Voice calls	1 (0.9)	3 (2.6)	116 (100.0)	2.96

Figures in parenthesis are percentages

4.3 Level of Use of Internet and GSM Facilities by the Respondents

The result on the level of use of internet and GSM facilities by the respondents is presented in Table 3. Mean scores shows that the most frequently used internet and GSM facilities for enhancing fish farming was World Wide Web ($\bar{x}$=2.54), Social media ($\bar{x}$=2.56), E-mail ($\bar{x}$=2.18), Newsgrroup ($\bar{x}$=2.04), SMS ($\bar{x}$=2.61) and Voice calls ($\bar{x}$=2.93). This finding is also in line with the findings of Gakuru *et al*. (2009), who opined that majority of fish farmers in Africa use social media to seek for a variety of agricultural information, mostly scientific, educational and technology based, including training information, agrochemicals and technological information.

Table 3: Distribution of Respondents according to Level of Use of Internet and GSM facilities

Internet and GSM facilities	Level of Use			Mean
	Low	Moderate	High	
World Wide Web	16 (13.8)	20 (17.2)	80 (69.0)	2.54
Social Media	16 (13.8)	17 (14.7)	83 (71.6)	2.56
E-mail	21 (18.1)	51 (44.0)	44 (37.90	2.18
Fax	80 (69.0)	30 (25.9)	6 (5.2)	1.35
Newsgroup	28 (24.1)	53 (45.7)	35 (30.2)	2.04
Mailing list	58 (50.0)	49 (42.2)	9 (7.8)	1.58
SMS	13 (11.2)	19 (16.4)	84 (72.4)	2.61
Search engines	44 (37.9)	49 (42.2)	23 (19.8)	1.82
Voice calls	3 (2.6)	2 (1.7)	111(95.7)	2.93

Figures in parenthesis are percentages

4.4 Factor Analysis of the Factors Affecting the Use of Internet and GSM Facilities by the Respondents

The result of factor analysis of the factors affecting the use of internet and GSM facilities by farmers in the study area is presented in Table 4. Research reveals the result of the rotated components matrix with the extracted factors. Two constraining factors were extracted based on the response of the farmers.

According to Stevens (1992) rule of thumb, any factor that has a coefficient of 0.40 and above is said to highly loaded and therefore significant. With respect to this, the factors that were highly loaded in factor 1 werepotential

problems of GSM and internet maintenance (0.555), lack of regular power supply for charging the GSM (0.591), lack of access/unavailability of GSM services (0.411) and lack of network or poor network coverage (.461).The factors found to be significant in factor 2 category were rural poverty (-0.514), lack of skills to operate GSM and internet facilities (.651), high cost of acquiring GSM and internet facilities (0.764), lack of awareness/knowledge about importance of GSM and Internet facilities (.765), lack of training on GSM and internet facilities (.552) and lack of competence in handling internet facilities (0.534). Providing solution to the infrastructural problems and socio-economic problems that the fish farmers face would therefore enhance their use of GSM and internet to access agricultural information.

Table 4: Factors Affecting the Use of Internet and GSM Facilities by the Respondents

Constraints	Factor 1	Factor 2
Lack of enabling government policies	-.044	.025
Potential problems of GSM and internet maintenance	.555*	.126
Rural Poverty	-.109	-514*
Insufficient financial resources to buy recharge cards	.381	.198
Lack of skills to operate GSM and internet facilities	.191	.651*
High cost of acquiring GSM and internet facilities	. 152	. 764*
Lack of awareness/knowledge about importance of GSM and Internet facilities	-.068	.765*
Lack of regular power supply for charging the GSM	.591*	.099
Lack of training on GSM and internet facilities	.226	.552*
Limited number of GSM and internet facilities	.347	.271
Lack of access/ unavailability	. 411*	.213
Problem of theft	.262	.014
Transmission of wrong messages	-.184	.194
Lack of network or poor network coverage	.461*	.041
Poor communication network	.591*	-.011
Inappropriate content of GSM and internet messages	.186	.251
Lack of competence in handling internet facilities	.134	.534*

Factor 1: Infrastructural factor

Factor 2: Socio-economic factor

4.5 Effect of Respondents' Socioeconomic Characteristics on Level of Use of Internet and GSM Facilities

Logistic regression was used to test the effect of respondents' socioeconomic characteristics on their level of use of internet and GSM facilities, and the result obtained is presented in Table 5. Out of the eight explanatory variables in the model, only three were statistically significant; educational level, household size and marital status of the respondents.

Educational level of the respondents had a positive coefficient (0.289) and was significant (0.000) at a 1% level of probability. Possession of formal education therefore increases the likelihood that the respondents will make high use of internet and GSM facilities. This is because the respondents are knowledgeable enough and knows the benefits and potentials accrued to the use of internet and GSM facilities.

Household sizehad a negative coefficient (-0.143) and was significant (0.079) at a 10% level of probability. By implication, it means the larger the household size, the less likely they are to use internet and GSM facilities in enhancing fish farming. This is because fish farmers have dependent and are with great family responsibilities.

Marital status also had a negative coefficient (-1.374) and was significant (0.040) at a 5% level of probability. This implies that married fish farmers in the study area are less likely to use internet and GSM facilities in enhancing fish farming. This could be because majority of the fish farmers have family responsibility ties that will require more financial commitment which may constrain them from using internet and GSM facilities.

The Nagelkerke R^2 for the regression is .454, indicating that the variables tested accounted for 45.4% of the variations in the dependent variable. The chi-square value of the model was 41.450 and was significant at a 1% level of probability. This implies that respondents'socioeconomic characteristics affected their level of use of internet and GSM facilities; thus, the null hypothesis for the study which stated that the socioeconomic characteristics of the fish farmers do not have any significant effect on their level of use of the internet and GSM facilities was therefore rejected.

Table 5: Logistic Regression showing the Effect of Respondents Socio-economic Characteristics on their Level of Use of Internet and GSM Facilities

Socioeconomic characteristics	B	S.E	Wald	Sig	Exp (B)
Age	0.033	0.025	1.742	0.187	1.033
Education	0.289	0.066	19.173	0.000*	1.336
Household size	-0.143	0.082	3.080	0.079***	0.866
Pond size	0.010	0.023	0.175	0.676	1.010
Income	0.000	0.000	2.079	0.149	1.000
Experience	0.016	0.101	0.025	0.875	1.016
Marital status	-1.374	0.668	4.236	0.040**	0.253
Constant	-0.998	1.454	0.472	0.492	0.368
χ^2	41.450				
Sig	0.000				
2Log likelihood	84.431				
Nagelkerke R^2	0.454				

Note: *, ** and *** indicates significant at 1%, 5% and 10% level of probability respectively

V. CONCLUSION AND RECOMMENDATIONS

Conclusion

The results of this study reveal a population that is predominantly male, advanced in age, married, and possess formal education. They, however, have short years of fish farming experience, have small fish farms, earn low incomes, and have large families.

The level of access of fish farmers to internet and GSM facilities selected for this study was high, the level of usage of internet and GSM facilities by the respondents was remarkably high and it can further be deduced from the findings obtained that voice calls, SMS, Social media, World Wide Web, E-mail and newsgroup were the most common internet and GSM facilities used by fish farmers in the study area. Factors affecting the use of internet and GSM facilities were infrastructural and socioeconomic in nature. Possession of formal education, household size and marital status of the respondents significantly affected their level of use of internet and GSM facilities.

Recommendations

The following recommendations were made based on the findings of the study;

1. The farmers are encouraged to acquire formal education and increase their level of production so that they can earn higher incomes, as these variables affect their level of use of internet and GSM facilities.
2. The least accessible internet and GSM facilities were fax, newsgroup, mailing list and search engines. These internet and GSM facilities should be made more accessible to fish farmers by government and extension agency so as to enhance their usage.
3. Government should put in place relevant infrastructure to curb the infrastructural factors and challenges faced in the use of internet and GSM facilities.

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