Adoption of Fish Farming Techniques by Farmers in Akwa, Ibom State of Nigeria

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ABSTRACT

The purpose of the study was to investigate the adoption of fish farming techniques by farmers in Akwa Ibom State of Nigeria. The population for the study consisted of all the 229 fish farmers in Akwa Ibom State. A multistage random sampling technique was adopted to select 118 fish farmers from the study area. The instrument, titled "Adoption of Fish Farming Technologies by Farmers Questionnaire (AFFTFQ)" was used to collect data for the study. Frequency, percentage and means were used to analyze the data obtained. Three hypotheses were tested. One, using Pearson Product Moment Correlation while two hypotheses were tested using Chi-square statistics. The results of the study reveal that gender, marital status, age, level of education and income level which are components of fish farmers' socioeconomic characteristics are significantly related to adoption of fish farming techniques. The study also reveals that there is a significant relationship between level of awareness and extent of adoption of fish farming technique by fish farmers in Akwa Ibom State. Moreover, the relationship between the sources of fish farming technique information and extent of adoption by farmers in Akwa Ibom State is significant. The study recommends among others that input like starting stocks should be subsidized so that the poor rural farmers will easily adopt the techniques by affording to buy the inputs.

Keywords: *Adoption; Fish farming; Techniques;*

Aquaculture is now the fastest growing food production sector in many countries and global fish production from aquaculture has shown tremendous growth in recent years (*Leung and Sharma, 2001*). This is in recognition of aquaculture's potential for contributing to food security and the capacity to enhance income and employment in rural and riverine communities as well as generating foreign exchange earnings. Thus, many developing countries have now given higher priorities to aquaculture development in their development plans. Meanwhile, the rapid expansion of the industry has caused numerous national, regional and international agencies to engage in developing appropriate strategies to improve economic viability and environmental sustainability of aquaculture activities, hence innovations in fish pond designs as well as non-technical aspects of fish farming development (*Akpan, 2011*). However, the success of these systems will depend on its wide acceptability and utilization by fish farmers and this is possible through efficient extension modules.

According to *Leeuwis (2006),* agricultural extension is a series of embedded communicative interventions that are meant, among other things, to develop and/or induce innovations which supposedly help to resolve (usually multi-actor) problematic situations. Agricultural extension is a process by which rural people are persuaded to adopt improved farming methods and improved way of life. Moreover, *Obiora (2013)* reported that extension is the primary means through which farmers learn about change, the reason for it and its value, the result it can achieve, the process by which it is achieved and also uncertainties inherent in it.

Adoption is a decision made by an individual or

group to use an innovation in a continuous manner (*Akubuilo, Umebali, Mgbada, Ugwu, Egwu and Awoke, 2007*). Adoption is viewed as a decision to make full use of an innovation or technique as the best course of action available and adoption of innovation is the decision of an individual or group to use or apply an innovation (*Orisakwe and Agomuo, 2011*).

According to *Asiabaka and Owens (2002),* farmers routinely make complex decisions, especially when it comes to adoption of new techniques. When adoption and non-adoption are discrete, that is, mutually exclusive, farmers would choose to adopt a new technique if the expected profit from such technique is likely to exceed the expected profit without the technology. Farmers also have made complex decision about allocation of scarce resources taking into account the inter-linkages between different enterprises. For farmers of different agricultural zones to adopt a new agricultural technology, they must be aware of the technology, have valid and up-to-date information of the technology, the applicability of the technology to their farming system and receive the technical assistance necessary to adopt the technology (*Asiabaka, Morse, and Kenyon, 2001*).

The characteristics of farm information sources such as availability, credibility, interest, usefulness and socio-economic characteristics of the farmer and extension agent have interacting influences in the frequency of use of information (*Bel-Molokwu, 1997*). According to *Asiabaka and Owens (2002),* adoption decisions are dependent upon the degree of exposure to a piece of information and the more interest shown by a farmer on a topical issue the more his or her propensity to move through the mental stages that lead to adoption of the information. Obviously farmers of all socioeconomic backgrounds are more likely to use agricultural information if they perceive the information to be useful to them.

The credibility of the information source will sometimes depend on the perceived intelligence, reliability and/or expertise of the communicator and sometimes the gender of the communicator. According to *Asiabaka and Owens (2002),* the attributes of a technology also play an important part on farmer's adoption behaviour. They added that farmers will adopt a technology if it is simple, has comparative advantage, is compatible with existing planting practices, are available and are affordable.

Research and experience have shown that fisheries product from Akwa Ibom State are some of the best in terms of taste and quality in Nigeria and the entire gulf of Guinea and much sought after in Europe and America (*Ministry of Agriculture and Natursal Resources, 2013*). This is so because the expanded shoreline, vast swamps, upland and water resources available in the state provide veritable opportunities for sustainable and profitable aquaculture development and investment. However, the need for improved breeds and all –year-round supply has urged farmers across the six agricultural zones within the state of Akwa Ibom to engage in fish farming at the subsistence level. These farmers have in the past years been berated with diverged innovations ranging from pond type, pond design, materials for construction of pond, hatchery method, transportation, feeding regime, water management methods, culture type, breeding duration and frequency among others. These innovations are primarily communicated to the fish farmers through extension agents under Akwa Ibom State Agricultural Development Programme (AKADEP).

With government's efforts to enhance fish production in the State, fish farm capacities and yields for the farmers differ one from another owing to many reasons of which the level of adopting the innovation is among the principal. Increased agricultural productivity will involve a judicious use of a package of complementary input recommendations that include (1) biological farm inputs (2) mechanical farm inputs (farm implements, equipment and machinery), (3) improved management practices and (4) extension advisory technical services. Productivity will not be optimum where the farmers have no access to the recommendations and information as it concerns the appropriate use of the available inputs. At this point it is pertinent to ask the following questions.

What are the socioeconomic characteristics of farmers involved in fish farming? What is the level of awareness of fish farmers on farming techniques disseminated in the areas? From what sources do farmers receive fish farming techniques information? What is the extent of adoption of fish farming techniques in the area? What are the factors affecting the adoption

of fish farming techniques by farmers in the study area? These questions form the thrust which this study is based in order to provide information on the adoption of fish farming techniques by farmers in Akwa Ibom State of Nigeria. The following null hypotheses were stated and tested in the study:

i. There is no significant relationship between farmers' socio-economic characteristics and adoption of fish farming techniques.
ii. There is no significant relationship between farmers' awareness level and extent of adoption of fish farming techniques.
iii. There is no significant relationship between the sources of fish farming technique information and extent of adoption by farmers.

METHODOLOGY

Akwa Ibom State is one the South-Southern States in Nigeria. The State was created on September 23, 1987. It is densely populated with 3,930,208 persons (*National Population Census, 2006*). The state has a total land area of about 8412km2 with a total arable land of 7,500,00ha and underground and surface water of about 12,000cubic million. It has a shore line of 129 km, rivers and streams. Contributions by the agricultural sector to the state GDP stands at about 40 per cent with 70 per cent agricultural workforce.

The population for this study consisted of all the 229 fish farmers in Akwa Ibom State. This statistics cover all the fish farmers who are enlisted in the records of AKADEP as at the time of this study. A simple random sampling technique was adopted. Firstly, the six agricultural zones were selected. In each agricultural zone, 20 fish farmers were randomly selected except in one zone that all the fish farmers took part in the study (Table 1). This sample size represents 51.5 per cent of the study population.

Table 1. Sampling frame for distribution of fish farmers in Akwa Ibom State

Agricultural Zone	Population	Sampled
Abak	41	20
Eket	37	20
Etinan	36	20
Ikot Ekpene	37	20
Oron	18	18
Uyo	60	20
Total	229	118

An instrument, titled "Adoption of Fish Farming Technologies by Farmers Questionnaire (AFFTFQ)" was developed and used for the collection of data for the study. Face and content validation were used on the research instrument. Test retest reliability was used to determine the interval consistency of the study instrument. The instrument was administered to 15 fish farmers who were not part of the main study at two weeks interval. Data were collected and analyzed using Pearson Product Moment Correlation. A Correlation coefficient of 0.77 was obtained and was high enough to consider the instrument as being statistically reliable.

Data collected from the field were analyzed using descriptive statistics such as frequency, percentage, means and standard deviation. The hypotheses were tested using *Chi-square statistics* and *Pearson Product Moment Correlation* (PPMC). The significance of all three hypotheses was tested at .05 alpha level of significance. All analysis was made using the Statistical Package for Social Science Students and Microsoft Excel.

RESULTS AND DISCUSSION

Socioeconomic characteristics of farmers involved in fish farming : The socioeconomic characteristics of the respondents viz: gender, marital status, age, level of education and family income level were analyzed and presented in Table 2. The table shows the frequency of distribution and the corresponding percentage.

The socioeconomic characteristics show that most of the fish farmers are male and married. The farmers were mostly of age bracket 31 to 40 years. Most of the fish farmers are holders of secondary school certificates. Fish farming was seen to be a lucrative agro-business as evidenced by the bulk of the farmers earning above the basic minimum wage. The fish farmers were operating a small scale fish farm with less then a thousand fishes per stock. Catfish was reared more than every other species of fish. The fish farmers were found to basically operate concrete pond which ages into a range of 1-5 years.

The result of this study has shown that gender, marital status, age, level of education, income level, pond capacity, pond type, fish type and age of pond which are components of fish farmers' socio-economic characteristics are significantly related with adoption of fish farming techniques. The study is in agreement

with the findings of *Jatto et al (2013)* that years of education, labour, farm size, income, participation in cooperative society are the significant factors contributing to catfish farmers' interest in fish production. Also, this is in consonance with the findings of *Asiabaka and Owens (2002)* that farmer's personal characteristic, the source of agricultural information and technology attributes were significant determinants of farmer's adoption behaviour.

Table 2. Socioeconomic characteristics of fish farmers

Variable	Item	No.	%
Gender	Male	75	63.6
	Female	43	36.4
Marital Status	Single	42	35.6
	Married	76	64.4
Age (years)	20-25	14	11.9
	26-30	20	16.9
	31-40	55	46.6
	40-45	29	24.6
Level of education	Primary	01	0.8
	Secondary	69	58.5
	Vocational	07	5.9
	Tertiary	41	34.7
Family Income level ((N)	0-5,000	06	5.1
	5,000-10,000	16	13.6
	10,000-20,000	27	22.9
	20,000-50,000	69	58.5

Also, farmers' awareness level has been seen to be an effective determinant of adoption of fish farming techniques by fish farmers. This can be seen to be a function of the sources of information of innovative fish farming technique. Similarly, the result of the study is in consonance with the findings of *Orisakwe and Agomuo (2011)* that the main determinants of the adoption were farmers' age, educational level, farm size, income, access to credit and extension contact. Moreover, *Jatto et at (2013)* estimated the factors influencing catfish farmers' interest in fish production to include years of education, labour, farm size, income and participation in cooperative society.

Level of awareness of fish farming techniques by fish farmers : The level of awareness of fish farming technique by fish farmers was analyzed as presented in Table 3 shows the mean and standard deviation of scores from the categories of fish farmers based on their level of awareness of fish farming techniques. The mean score of the fish farmers with high level of awareness (25.5) of fish farming technique was higher than their counterparts with low level of awareness (14.33) out of a total obtainable score of 28. Moreover, the fish farmers with high level of awareness were more than others with low level of awareness.

Table 3. Fish farmers' level of awareness of fish farming techniques

Variable	Category	No.	Mean	SD
Level of Awareness	High	115	25.50	3.02
	Low	3	14.33	2.52

Sources of information on fish farming techniques available to farmers : Table 4 presents the sources of information on fish farming techniques available to farmers. The result in Table 4 shows that most of the fish farmers receive information on fish farming techniques from extension agents (40.8%) and from Akwa Ibom Agricultural Development Programme (AKADEP) (37.3%), Television/radio (6.8%), Print media and friends ranked as the least source of information on fish farming techniques.

Table 4. Fish farming techniques information sources

Source of information	No.	%
Extension Agents	48	40.8
AKADEP	44	31.4
TV/Radio	8	6.8
Workshop	7	5.9
Online	5	4.2
Print Media	3	2.5
Friends	3	2.5

Table 5. Adoption of fish farming techniques by fish farmers

Statement	Most Readily	Often	Rarely	Never	MS
Feeding for fish	46	53	12	7	3.17
Fish breads	43	39	21	15	2.93
Pond type	32	53	22	11	2.90
Equipment	8	82	24	4	2.80
Pond water management	15	62	35	6	2.73
Handing capacity	15	54	43	6	2.66
Feed mixing method	7	37	51	23	2.24
Digital technology	0	25	75	18	2.06
Pond design	0	22	71	25	1.97
Processing of fish products	0	0	73	39	1.72

Extent of adoption of fish farming techniques: The extent of adoption of fish farming techniques by farmers was analyzed as presented in Table 5. The frequencies of respondents' responses and their corresponding means score are as presented. The result shows that technique of feeding regime for fish (mean socre = 3.17) was mostly adopted by the fish farmers. This was followed by fish breeds (mean score = 2.93) and pond type (mean score = 2.90). However, techniques on the processing of fish products was least adopted with the mean score of 1.72.

Factors affecting the adoption of fish farming techniques by farmers: The factors affecting the adoption of fish farming techniques by fish farmers in Akwa Ibom is presented in Table 6. The summarized data on the Table show the frequency percentage of farmers attesting to each of the factors. The result shows that most of the farmers (96.6%) identify lack of necessary cash as a major factor. Lack of access to infrastructure (84.7%), inadequate skilled labour (82.25%), environmental and price risk (80.5%) and property rights and poor information access (79.7%) were other factors identified to affect the adoption of innovative fish farming techniques. Lack of maintenance facilities and manpower (68.6%) was the least identified factor affecting the adoption of fish farming techniques by fish farmers in Akwa Ibom State.

Table 6. Factors affecting adoption of fish techniques by farmers

Factors	No.	%
Lack of necessary cash	114	96.6
Lack of access to infrastructure	100	84.7
Inadequate Skilled Labour	97	82.2
Environmental and price risks	95	80.5
Property rights	94	79.7
Poor information awareness	94	79.7
Complexity of innovation technology	92	78.0
Low profitability	91	77.1
Incompatibility of technology with existing agricultural practices	90	76.3
Lack of comparative advantage	87	73.7
Culture and Norms	86	72.9
Lack of maintenance facilities and manpower	81	68.6

Hypothesis One (Ho1): There is no significant relationship between farmers' socio-economic characteristics and adoption of fish farming techniques. The result in Table 7 shows that the calculated Chi-square for the relationship between farmers' socio-economic characteristics and extent of adoption by farmers were 8.678, 9.797, 33.254, 102.068, 78, 12.167, 164.203, 44.970 and 10.593 for gender, marital status, age, level of education, income level, pond capacity, pond type, fish type, and age of pond respectively. The corresponding critical Chi-square values for each independent relation were obtained as recorded in the table. The result shows that the calculated Chi-square values were greater than the critical in each case. Thus the relationship between gender and extent of adoption of fish farming technique was significant (x^2_{crit} = 3.841,df = 1). The significance of the relationship was similar for marital status (x^2_{crit} = 3.841,df = 1) age (x^2_{crit} = 7.815,df = 3), level of education (x^2_{crit} = 9.488,df = 4)., income level (x^2_{crit} = 7.815,df = 3)., pond capacity (x^2_{crit} = 11.070,df = 5), pond type (x^2_{crit} =

Table 7. Chi-square result of the relationship between farmer's socioeconomic characteristics and extent of adoption by farmers

Independent variables	Dependent variable	df	x^2_{cal}	x^2_{crit}	Contingency	Remarks
Gender		1	8.678	3.841	0.283	Reject Ho
Marital status		1	9.797	3.841	0.299	Reject Ho
Age		3	33.254	7.815	0.500	Reject Ho
Level of education		4	102.068	9.488	0.711	Reject Ho
Income level	Extent of adoption of	3	78	7.815	0.662	Reject Ho
Pond capacity	fish faming technique	5	12.167	11.070	0.329	Reject Ho
Pond type		4	164.203	9.488	0.788	Reject Ho
Fish type		2	44.970	5.991	0.557	Reject Ho
Age of pond		3	10.593	7.815	0.723	Reject Ho

Critical values at .05 alpha

9.488,df = 4), fish type reared (x^2_{crit} = 5.991,df = 2), and age of pond (x^2_{crit}= 7.815,df = 3). These imply that there is a relationship between farmers' socio-economic characteristics and the extent of adoption of fish farming techniques by farmers in Akwa Ibom State. With this observation the null Hypothesis One (H01) which assumed that: "There is no significant relationship between farmers' socio-economic characteristics and adoption of fish farming techniques" was rejected.

Hypothesis Two (Ho2): There is no significant relationship between farmers' awareness level and extent of adoption of fish farming technique. The results in Table 8 show that the calculated correlation index, r-cal for the relationship between level of awareness and extent of adoption of fish farming technique is .312 while its corresponding critical –r value at df 100 is .195. The calculated r-value, 0.312 is greater than the critical –r value of .195 in which the decision is based. This implies that the r-cal is statistically significant. That is, there is a significant relationship between level of awareness and extent of adoption of fish farming technique by fish farmers in Akwa Ibom State. With this observation null Hypothesis Two (H02) which assumed that: "There is no significant relationship between farmers' awareness level and extent of adoption of fish farming techniques" was rejected.

Table 8. Summary of PPMC Analysis of scores on relationship between level of awareness Extent of adoption of fish farming technique

Score (X):Level of Awareness	Score (Y)
Pearson Correlation	.312
Sig. (2-tailed)	.195
df	100
N	118

NS = Not significant at p <.05 alpha

Hypothesis Three (Ho3): There is no significant relationship between the sources of fish farming technique information and extent of adoption by farmers. The results in Table 9 show that the calculated Chi-square for the relationship between the sources of fish farming technique information and extent of adoption by farmers is 144.92 while its corresponding critical chi-square is statistically significant. That is, there is a relationship between the sources of fish farming technique information and extent of adoption by farmers in Akwa Ibom State. With this observation null hypothesis Three (Ho3) which assumed that: "There is no significant relationship between the sources of fish farming technique information and extent of adoption by farmers" was rejected.

Table 9. Chi-square result for the relationship between the sources of fish farming technique information and extent of adoption by farmers

Variable	df	x^2_{cal}	x^2_{crit}	Contingency
Relationship*	7	144.92	14.067	0.767

*Relationship between the sources of fish farming technique information and extent of adoption by farmersh

Remarks: Reject Ho

The findings also show that technology attributes such as complexity, cost and availability and compatibility were positive and statistically significant at both 0.05 and 0.01 levels. Contrastingly, in a similar study by *Dhaka and Chayal (2010)*, the findings show that a majority of the farmers had favourable attitude towards the Information Technology.

The purpose of this study was to investigate the adoption of fish farming techniques by farmers in Akwa Ibom State. A descriptive survey design was adopted for the study. The population for the study consisted of all the 229 fish farmers in Akwa Ibom State. A simple random sampling technique was adopted to select 118 fish farmers for the study. An instrument, titled "Adoption of Fish Farming Technologies by Farmers Questionnaire (AFFTFQ)" was used for the collection of data. Frequency, percentage and means were used to analyze the data obtained from the study. Hypotheses One and Three were analyzed using Chi-square statistics while hypothesis two was analyzed using Pearson Product Moment Correlation (PPMC). The significance of all three hypotheses was tested at .05 alpha level of significance. The results of the study reveal that gender, marital status, age, level of education, income level, pond capacity, pond type, fish type and age of pond which are components of fish farmers' socio-economic characteristics are significantly related with adoption of fish farming techniques. The study also reveals that there is a significant relationship between level of awareness and extent of adoption of fish farming technique by fish farmers in Akwa Ibom State. Moreover, the relationship between the source of fish farming technique information and extent of adoption by farmers in Akwa Ibom State was significant.

CONCLUSION

The farmers are mostly middle age married. This definitely confines them to practice fish farming as a source of income for the up keep of their families. Most of the fish farmers are aware of fish farming techniques, the knowledge gathered from several sources, mostly, from extension agents and AKADEP. Therefore, there is significance of gender, marital status, age, level of education, income level, pond capacity, pond type, fish type and age of pond on adoption of fish farming techniques. Farmers' awareness level and sources of information also relate with the adoption of fish farming techniques by farmers in Akwa Ibom State.

Recommendations :

Based on the findings of the study, the following recommendations are made.

1. Farmers should be provided with loans preferably at market interest rates to solve farmers' problem of inadequate finance. The loans should be supervised to ensure the judicious utilization of such loans by farmers.
2. Inputs like starting stocks should be subsidized so that the poor rural fish farmers will easily adopt the technique by affording to buy the inputs.
3. Farmers' socio-economic factors should be considered fundamental in designing extension intervention strategies.
4. Cooperative societies should be strengthened to encourage technical innovations and timely availability of necessary innovations and timely availability of necessary inputs that can assist the fish farmers.

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