



## DETERMINANTS OF ADOPTION OF FISH FARMING PRODUCTION PRACTICES IN RIVERS STATE OF NIGERIA

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### ABSTRACT

This study analyzed the adoption of fish farming production practices in Rivers State. Multi-stage sampling technique was used for the selection of sample with structured questionnaire administered to generate data from the respondents. A total of 186 farmers were randomly selected for the study. The data were analyzed using descriptive statistics. The study revealed that, age of the respondents were between 31-40 years, majorly male (60.2%), married (57%), Muslims (50.5%) by faith, had 6-10 number of children in a household (47.8%) with secondary education (54%), and members of social organization (64.5%), had between 6-10 years farming experience (51.6%) and 54.3% of them were visited by the extension agents. Most of the respondents were aware and used the fish farming production practices to improve their farms. The level of adoption was generally high with mean score of 2.24. Most of the socio-economic characteristics of farmers determined the adoption of fish farming production practices with an  $R^2$  value of 74%. It was concluded that, fish farmers in the study area were aware and used the production practices with high level of adoption. There is need therefore, that extension agents should continue to visits farmers and further educate them about fish farming production practices in order to sustain level of adoption.

**Keywords:** Determinants, Fish farming, Practices, Rivers State

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### INTRODUCTION

The role of fish farming in Nigeria to achieve household food security and decrease level cannot be over emphasized. Fish farming is a profitable venture and it will rapidly be expanding continuously if the management and planning are well taken care of as stated by Areola, [1]. Fish is very nutritious, providing a good source of high-quality protein and other essential nutrients which are especially important for mothers and growing children [1]. Fish farming is practiced both in large and small scales, providing additional income for farmers and boosting the domestic production in Nigeria [2].

Oluwasola, and Ajayi [3] reported that the development of fish farming in agriculture can be enhanced through introduction of improved technologies. Due to the roles fish played in economic development, one would expect that importance is accorded to it in the nation's development programme. Rather, available evidence suggests that fish farmers' access to resources such as improved technologies remains severely limited [4]. Consequently, they are faced with problems of under production and inadequate means of transportation of its products. Although, significant breakthroughs have been achieved worldwide in the area of improved fish farming practices, but most farmers still rely on traditional methods of fishing [5]. Traditional methods of fish farming are so laborious that considerable and concerted efforts were made by the government and non-governmental organizations at various levels in Rivers

state to improve fish farming using improved practices such as pond construction and management, breed selection, stocking, feeding style, water management, spawning, sorting, storage and record keeping to reduce the drudgery of traditional methods. Thus, this study analyzed the adoption of fish farming production practices in Rivers State by addressing the following objectives:

- i. describe the socio-economic characteristics of fish farmers in the study area;
- ii. ascertain the farmers' awareness of fish farming production practices in the study area;
- iii. identify the fish farming production practices used by farmers in the study area;
- iv. determine the level of adoption of fish farming production practices in the study area, and
- v. determine factors influencing adoption of fish farming technologies in the area.

### MATERIALS AND METHODS

#### The study area

This study was carried out in Rivers State and analyzed the adoption of fish farming technologies. Rivers State is one of the thirty-six (36) States of Nigeria with its capital in Port Harcourt. According to the census data released in 2006, the State had a population of five million, one hundred and eighty-five thousand, four hundred (5,185,400) with a projected population of thirteen million, nine hundred and ninety-six thousand, two hundred (13,996,200) in 2023, making it the sixth-most populous State in the country [6]. Major cash crops

produced are Oil palm products, rubber, coconut, raffia palm and jute. Other crops grown for food include vegetable, melon, pineapple, mango, pepper, banana and plantain. The fish industry is an important sector in Rivers State. Also, the State provides valuable sea foods such as crabs, oysters, shrimps and sea snails among others.

#### Sampling procedure and sample size

Rivers State comprised of twenty (23) Local Government Areas which are grouped into three (3) major agricultural zones such as zone I, zone II and zone III. Based on a reconnaissance survey carried out in the study area, multistage sampling procedure was used in selecting the sample. In the first stage, one (1) LGA each was purposively selected from each of the three agricultural zones. Those were Obioakpo LGA from zone I, Degema LGA from Zone II and Ikwere LGA from Zone III. The criteria used for the purposive selection was based on intensity of fish production in the areas and data given by Rivers State Agricultural Development Project (RADP). In the second stage, two communities were randomly selected from each of the three (3) LGAs. Hence, a total of three LGAs, and six (6) communities were chosen for the study. The third stage involved a compilation of a list of fish farmers in these communities. At the final stage, 12% of sample frame was randomly selected for the study. The sample frame was the list of fish farmers compiled during the reconnaissance survey (Table 1). There sample size of 186 out of 1,550 sample frame was used to collect data for analysis. Descriptive statistics, frequency distribution and percentage were used to achieve objectives i, ii, iii and iv of the study. Objective iv was

further subjected to Likert 3-points rating scale which was used to ask respondents to indicate the level of adoption of fish production practices. It ranges from highly adopted, moderately adopted and not adopted with weights of 3, 2 and 1. The mean adoption level of fish production practices was obtained by adding together 3+2+1=6 which was divided by 3 to get a mean score of 2. Scores equal to or greater than ( $\geq$ ) 2.0 were regarded as “high” while, those less than 2.0 were regarded as “low” respectively. Multiple regression is an extension of simple linear regression. It is used to predict the value of a variable based on the values of two or more variables. The variable to be predicted is called the dependent variable while variables used to predict the value of the dependent variable are called the independent variables. It was used to achieve objective v. The implicit regression equation is given as:

$$Y_i = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, U) \dots\dots\dots 1$$

Where;

Y = Dependent variable (number of fish farming production practices adopted).

X<sub>1</sub> = Age (in years)

X<sub>2</sub> = Sex (male 1, female 2)

X<sub>3</sub> = Marital status (single =1, married =2, widowed =3, divorce 4, separated =5)

X<sub>4</sub> = Household size (no of people in a household)

X<sub>5</sub> = Educational level (primary = 1, secondary =2 and tertiary = 3)

X<sub>6</sub> = Membership of association (years spent)

X<sub>7</sub> = Extension visits (no. of visits)

X<sub>8</sub> = Fish farming experience (in years)

X<sub>9</sub> = Number of ponds

U = error term

**Table 1:** Sampling procedure and sample size

ZONES	Names of LGAs/ Communities	Registered Fish Farmers (Sample Frame)	12% Sample Size
<b>I</b>	Obioakpo LGA		
	i. Rumuodumaya	283	34
	ii. Rukpoku	259	31
<b>II</b>	Degema LGA		
	i. Asarama	261	31
	ii. Agbalama	247	30
<b>III</b>	Ikwere LGA		
	i. Isiokpo	244	29
	ii. Igwuruta	256	31
<b>TOTAL</b>		<b>1550</b>	<b>186</b>

Source: Reconnaissance survey, 2018

## RESULTS AND DISCUSSION

### Socio-economic characteristics of fish farmers in the study area

The result of age revealed that most (45.7%) of the respondents were between 31-40years of age with an average of 35years. Result also revealed that most (60.2%) of the respondents were males and about 57% of them were married. It was shown also that 50.5% were Muslims by faith. It was revealed that majority (47.8%) had 6-10 members in their households with an average number of 8 members. The result also revealed that about 54% had secondary education. This implies that, the respondents were literate enough to read and understand fish farming practices. Literacy is believed to have a positive implication on efficient adoption of production practices. The level of farmers' education is believed to influence the use of improved technologies in agriculture. Also, the level of education determines

the level of opportunities available to improve livelihood strategies, enhance food security and reduce the level of poverty. It also affects the level of exposure to new ideas. Majority (64.5%) of the fish farmers were members of social organization. This implies that, the farmers had opportunities of interacting with one another on the need to adopt the fish farming practices in the study area. The result further shows that 51.6% of fish farmers had between 6-10years farming experience. The mean years of experience of farmers was 8years. This implies that the farmers' experience in fish farming is long enough to be able to make sound decisions as regards the adoption of fish farming practices in their farms. The study revealed that majority (54.3%) of the respondents were visited by the extension agents. This however implies that the performance of the extension agents in the study area was positive. Majority (72.1%) of farmers had between 10-20ponds with an average of 15ponds owned by respondents.

**Table 2:** Distribution of socio-economic characteristics of respondents

Variable	Frequency	Percentage	Mean
<b>Age (years)</b>			
20-30	35	18.8	<b>35</b>
31-40	85	45.7	
41-50	55	29.6	
51-60	11	05.9	
<b>Sex</b>			
Male	112	60.2	
Female	74	39.8	
<b>Marital status</b>			
Married	105	56.5	
Single	81	43.5	
<b>Household size</b>			
1-5	57	30.6	<b>8</b>
6-10	89	47.8	
11-15	40	21.5	
<b>Level of Education</b>			
No formal education	07	03.8	
Primary	67	36.0	
Secondary	101	54.3	
Tertiary	11	05.9	
<b>Membership of association</b>			
Member	120	64.5	
Non-member	66	35.5	
<b>Extension visits</b>			
Visited	101	54.3	
Not-visited	85	45.7	
<b>Fish farming experience</b>			
1-5	48	25.8	<b>8</b>
6-10	96	51.6	
11-20	42	22.9	
<b>Number of ponds</b>			
10-20	134	72..1	<b>15</b>
21-30	52	28.0	

Total	186	100
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### Farmers' awareness of fish farming practices in the study area

Awareness is the first stage of adoption process and it involves the farmers' knowledge of the existence of an innovation. Adeokun *et al.* [7] affirmed that awareness is the first step in adoption process and starts when farmers first hear about the existence of an innovation. According to them, the place of awareness is imperative as farmers need to hear about the existence of a technology before taking a decision to adopt or not. To determine the farmers' awareness of improved fish production practices, there was need to know if the farmers were aware or not. The findings further show

that all the respondents were aware of the fish pond netting (100%) mainly for pest control. In the same vein, majority (99.6%) were aware of hybrid culture, feeding fish with maggot (99.5%), artificial production of fry/fingerlings (98.9%), fish feed formulation (97.8%) and stock management (98.4%). Others include water quality management (94.6%), application of lime (93.5%) and fertilizer application (80.6%). This result is in agreement with the findings of Adeokun *et al.* [7] that, there was increasing awareness of fertilizer application among farmers. The least fish production practices that farmers were aware of are post-harvest technology (54.8%) and Tilapia sex reversal (53.3%).

**Table 3:** Distribution of respondents based on their awareness of fish farming production practices

Fish farming production practices	*Aware	
	Frequency	Percentage
Fish pond netting for pest control	186	100
Application of lime	174	93.5
Fertilizer application	150	80.6
Fish feed formulation	182	97.8
Feeding fish with maggot	185	99.5
Water quality management	176	94.6
Artificial production of fry/fingerlings	184	98.9
Highbred Culture	185	99.6
Stock management	183	98.4
Post-harvest technology	102	54.8
Tilapia sex reversal	99	53.2

\*Multiple response

Source: Field survey, 2018

### Fish farming production practices being used by farmers

The promoted fish farming production practices by farmers are presented in Table 4 below. The result revealed that 97.8% of the farmers used the maggot as feeds for fish, stock management (96.8%), fish pond netting (88.7%) and water quality management (87.6%). Others include, application of lime (86.0%), fertilizer application (79.5%), highbrid culture (83.9%), fish feed formulation (80.6%), tilapia sex reversal (52.2%), artificial production of fry/fingerlings (69.9%) and post-harvest technology (53.7%). The reason why the farmers mostly used the recommended fish pond netting practice was to protect the fish against birds and rodents. Also, the result of awareness of fish farming production

practices in Table 4 below, indicated that some of the farmers were aware of some practices but, did not use them. For instance, among the respondents who were aware of fish pond netting did not later use it. This implies that, the awareness of a practice by farmers does not automatically make them use it except if they further developed interest for the usage of the practice. Although, it is commonly known that farmers use improved agricultural practices when they have knowledge of its existence. That is, the more awareness creation of the practices, the more the practices would be attracted to the users. However, the analysis of fish farmers' use of production practices in Rivers State shows that, most farmers who were aware of the practices also made use of them.

**Table 4:** Distribution according to fish farming production practices used by farmers in the study area

Practices	Frequency	Percentages
Fish pond netting	165	88.7
Application of lime	160	86.0
Fertilizer application	148	79.5
Fish feed formulation and production	150	80.6
Feeding fish with maggot	182	97.8

<b>Water quality management</b>	163	87.6
<b>Artificial production of fry/fingerlings</b>	130	69.9
<b>Highbred Culture</b>	156	83.9
<b>Stock management</b>	180	96.8
<b>Post-harvest technology</b>	100	53.7
<b>Tilapia sex reversal</b>	97	52.2

Field survey, 2018

#### Farmers' level of adoption of fish farming production practices in the study area

The result in Table 5a revealed the adoption level of fish farming production practices. The production practice which was majorly adopted (99.5%) by farmers was fish pond netting. The reason for the adoption was for pest control. This was followed by highbred culture (98.9%), fish feed formulation (98.4%), water quality management (96.2%) and artificial production of fry/fingerlings (95.7%). Others include feeding fish with maggot (95.2%), application of lime (93.5%), fertilizer application (92.5%) and stock management (91.9%). The least adopted level of fish production practices were tilapia sex reversal (40.3%) and post-harvest technology (35.5%) respectively. Generally, the adoption level

aligns with Abudu [8] and can also be explained by the attributes of technologies disseminated, especially since farmers have limited financial and risk-bearing capacity. Similarly, the result revealed that, the mean score (Table 5b) of adoption level of fish farming production practices was high with an average mean of 2.24. This result corresponds with Abudu [8] who reported that, cocoyam farmers' level of use of recommended improved cocoyam production practices was high with a mean score of 2.23 in South-South, Nigeria. The results of standard deviations of the mean scores of farmers' level of adoption of fish farming production practices further indicated that there was unity in the respondents' opinions.

**Table 5a:** Distribution according to level of adoption of fish farming production practices by farmers

<b>Fish farming production practices</b>	<b>Frequency</b>	<b>Percentage</b>
Fish pond netting for pest control	185	99.5
Application of lime	174	93.5
Fertilizer application	172	92.5
Fish feed formulation	183	98.4
Feeding fish with maggot	177	95.2
Water quality management	179	96.2
Artificial production of fry/fingerlings	178	95.7
Highbred Culture	184	98.9
Stock management	171	91.9
Post-harvest technology	66	35.5
Tilapia sex reversal	75	40.3

Filed survey, 2018

**Table 5b:** Distribution according to the mean level of adoption of production practices by farmers

<b>Fish farming production practices</b>	<b>MS</b>	<b>SD</b>	<b>Level of adoption</b>
Fish pond netting for pest control	2.45	0.683651	High
Application of lime	2.41	0.445791	High
Fertilizer application	2.37	0.70501	High
Fish feed formulation	2.36	0.802008	High
Feeding fish with maggot	2.62	0.837362	High
Water quality management	2.42	0.615855	High
Artificial production of fry/fingerlings	2.43	0.792463	High
Highbred Culture	2.54	0.709557	High
Stock management	2.25	0.567029	High
Post-harvest technology	1.53	0.690225	low
Tilapia sex reversal	1.23	0.576053	Low
<b>Average mean score</b>	<b>2.24</b>		<b>High</b>

Mean score= MS and Standard deviation= SD.

### Determinant factors influencing adoption of fish farming production practices in the area

Multiple regression analysis was used to analyze determinants of adoption of fish farming practices. The signs, number of significant variables and magnitude of  $R^2$ , were used to select double log equation as basis of discussion. Table 6 shows that, level of education positively influenced the adoption of fish farming practices with a t-value of 1.925 at 5% level of probability. This implies that, farmers with higher education adopted fish farming practices than those with lower education. This is so because, education helps to create a favourable mental attitude for the adoption of new technologies. Also, this result agrees with Ani *et al.* [9], who reported that educational level had significant relationship at 5% level of confidence with adoption of farm technologies.

This finding equally agrees with Amaza and Olayemi [10], who also reported that education had a positive and significant impact on farmers' production efficiency. Similarly, household size had positive influence on the adoption of fish farming practices at 1% level of probability. This result implies that, the more the number of people in a household, the more farmers adopt fish farming technologies in order to improve farm productivity. This finding agrees with Akpoko [11] who reported that large household size positively influenced the adoption of recommended soil management practices in Kaduna state. Also, Tokula *et al.* [12] found that, household size had positive influence on technology acceptance of rice varieties, implying that, the more the household size, the higher the probability of accepting improved rice varieties.

In another study, Nsabimana and Masobo [13] also found that large household size imposes pressure on the output of the farm and as such, affects the use of technology. Similarly, farmers' farming experience had positive coefficient of 1.972 and significantly influenced adoption of fish farming practices at 5% level of probability. This finding agrees with Atala [14] who found that, farming experience positively contributed to

the adoption of agricultural technologies. Furthermore, farmers' membership of social association had a coefficient of 0.056 that positively influenced adoption of fish farming production practices. This result is consistent with Deji [15], who observed that membership of cooperative societies positively influenced adoption of agricultural innovation. Also, Arene *et al.* [16] found that membership of social organizations influenced acceptance of yam minisett technology among women farmers in Abia State. Marital status (0.283) and sex (0.185) had positive coefficients but were not significant. This implies that, these variables though contributed to the influence of farmers' adoption of fish farming practices, but their contributions were not significant. The result on the influence of marital status was at variance with Ani *et al.* [9] who reported that marital status had positive relationship with adoption of insecticides. Also, extension contacts (2.867) had positive significant coefficient. This implies that, the adoption of fish farming practices in the study area was dependent upon the number of visits of extension agents to farmers. The result agrees with Agbamu and Orhorhoro [17] who reported that, there was significant relationship between extension contact and adoption of improved cocoyam varieties by farmers in Oyo State. The number of ponds own by farmers had positive coefficient (1.774) and hence, influenced fish farmers' adoption of farming practices. This implies that, the more the number of farmers' ponds, the more they were interested in adopting fish farming technologies.

Generally, from the findings in Table 6, the study shows that seven (7) out of nine (9) independent variables (age, household size, educational level, membership of association, extension visits, fish farming experience and number of ponds) influenced adoption of fish farming practices. Also, the variables together explained about 74% of  $R^2$  value and F-ratio of 2.543 in the total variability of adoption of fish farming practices.

**Table 6:** Distribution of factors influencing adoption of fish farming technologies in the area

Variables	Linear function	Semi Log	Exponential function	Double	Log
Constant	-.060	-.10678	.4875	.683	
Standard error	.449	.0867870	.1095639	.816	
$R^2$	.050	.566	.052	.740	
N	186	186	186	186	
F-value	1.906	2.547	1.987	2.543	
Age ( $X_1$ )	-.007 (-741))	7.025 (-.813)	-.001 (1.573)	.848 (1.786) *	

Sex (X <sub>2</sub> )	-.012 (-.103)	2.312 (-.372)	-.005 (.740)	.185 (.556)
Marital status (X <sub>3</sub> )	-.110 (-.527)	2.953 (-.577)	-.012 (.934)	.283 (.841)
Household size (X <sub>4</sub> )	.005 (2.217)	-2.003 (2.350)	.006 (-1.256)	0.234 (3.636) *
Educational level (X <sub>5</sub> )	-.005 (-.317)	1.508 (-.223)	.000 (.940)	0.369 (1.925) **
Membership of association (X <sub>6</sub> )	-.025(-1.817)	-1.618 (-1.421)	-.002 (-1.643)	.056 (3.883) **
Extension visits (X <sub>7</sub> )	-0.57 (-.790)	-.107 (-1.166)	-.009 (-.067)	.1964 (2.867) *
Fish farming experience (X <sub>8</sub> )	-.008 (-.624)	-1.118 (-.560)	-.001 (-.975)	1.972 (2.881) *
Number of ponds (X <sub>9</sub> )	.074 (.958)	1.493 ((1.020)	-.008 (1.302)	.857 (1.774) *

\* = Significant at 1%, \*\* = Significant at 5% and R<sup>2</sup>=0.72

## CONCLUSION AND RECOMMENDATIONS

The paper analyzed the determinants of adoption of fish farming production practices in Rivers State of Nigeria. Most farmers were aware and equally used the fish farming production practices. The level of adoption of fish farming production practices was high with an average mean score of 2.24. Age, household size, educational level, membership of association, extension visits, fish farming experience and number of ponds were the determinant factors that significantly influenced adoption of fish farming production practices with about 74% of R<sup>2</sup> value and 2.543 F-ratio. There is need for extension agents to continue to visits farmers and further educate them about fish farming production practices in order to sustain level of adoption. From the findings, farmers' membership of association was useful in the adoption of fish farming production practices, there is need therefore, to register more of fish farmers into social organizations in order to enhance farmers' interactions about fish farming production practices.

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