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Adoption of Improved Processing Technologies by Fish Farmers in Akure North and South Local Government Areas, Ondo State, Nigeria

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Abstract

The study was conducted to determine the adoption of improved processing technologies by fish farmers in Akure North and South LGAs, Ondo state, Nigeria. A two stage sampling technique was employed to select 150 fish farmers interviewed for the study, data were analyzed by using descriptive statistics and Tobit regression model. Results showed that majority of the farmers (68.0%) were males with mean age of 38.5 years old. Majority (80.7%) of respondents were married while (90%) had various degree of formal education, oil drum, smoking kiln and mud oven were the improved fish processing technologies available in the study area. Furthermore, cooperatives (92.7%) was ranked 1st as the most preferred source of information by the farmers, majority of respondents (94.7%) were aware of oil drum. The mean levels of adoption was 2.50, values below and above the mean were regarded as low and high respectively, the use of oil drum (2.58), smoking kiln (1.47) and mud oven (1.33) were the adoption scores of the respondents in the study area. Moreover, age (4.201), education level (2.105), household size (1.791), income (3.021), gender (1.781), pond size (2.511) and other income generating activities (2.256) were factors that were statistically significant thus affecting the rate of adoption of improved fish processing technologies. The study concludes that respondents were aware of some of the improved technologies but low adoption, the study therefore recommends the need for capacity building and advisory services by extension agents and other stakeholders for fish processors.

Keywords: Fish, processing, technology, processor, Tobit regression model.

1. Introduction

Fish is an important source of protein to large population of Nigeria, fish provides 40% of the dietary intake of animal protein of the average Nigerian. According to [1] fish and fish products constitute more than 60% of the total protein intake in adults especially in rural areas. The importance of fish in human Nutrition is enumerated as follows [4]: Food fish has a nutrient profile superior to all terrestrial meats (beef, pork and chicken, etc) being an excellent source of high quality animal protein and highly digestible energy, fish is a good source of sulphur and essential amino acids such as lysine, leucine, valine and arginine. It is therefore suitable for supplementing diets of high carbohydrates contents, fish is also a good source of thiamine as well as an extremely rich source of Omega-3 polysaturated fatty acids, fat soluble vitamins (A, D and E) and water soluble vitamins (B complex) and minerals (Calcium, Phosphorus, Iron, Iodine and Selenium). It has a high content of Polyunsaturated Omega III fatty acids, which are important in lowering blood cholesterol level and high blood pressure. It is able to mitigate and alleviate platelet of cholesterol aggregation and various arteriosclerosis conditions in adult populations.

However, it reduces the risk of sudden death from heart attacks and reduces rheumatoid arthritis, Omega-3 fatty acids also lower the risk of age related muscular degeneration and vision impairment, it decreases the risk of bowel cancer, and reduces insulin resistance in skeletal muscles [6]. Total global fish production including both wild capture fish and aquaculture reached an all-time high of 154 million tons in 2011 and aquaculture is set to top 60 percent of production by 2020, according to new research conducted by the World watch institute based in the

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United States. Although Africa is only the fourth largest producer of fish in the world, its water resources are highly sought after by larger, more-competitive fishing trawlers. The human consumption figure has increased to 14.4 percent over the last five years and consumption of farmed fish has risen to ten fold since 1970, at an annual average of 6.6 percent per year, Asia consumes two thirds of the fish caught or grown for consumption. The fish sector is a source of income and sustenance for millions of people worldwide.

Therefore, the specific drive of this study is to ascertain socio-economic characteristics of the fish farmers, identify the improved processing technologies and determine the factors affecting adoption of improved processing technologies by fish farmers in Akure North and South LGAs, Ondo State, Nigeria.

2. Materials and Methods

Primary data were used for this study which were collected through direct personal interview and structured questionnaire to obtain pertinent information for the study. A two- stage sampling technique was used to select respondents. It was commenced by purposively sampling five fish farming communities from each local government area while seventeen fish farmers were randomly selected from each community making a total sample size of 170 respondents but 150 were valid and employed for the study.

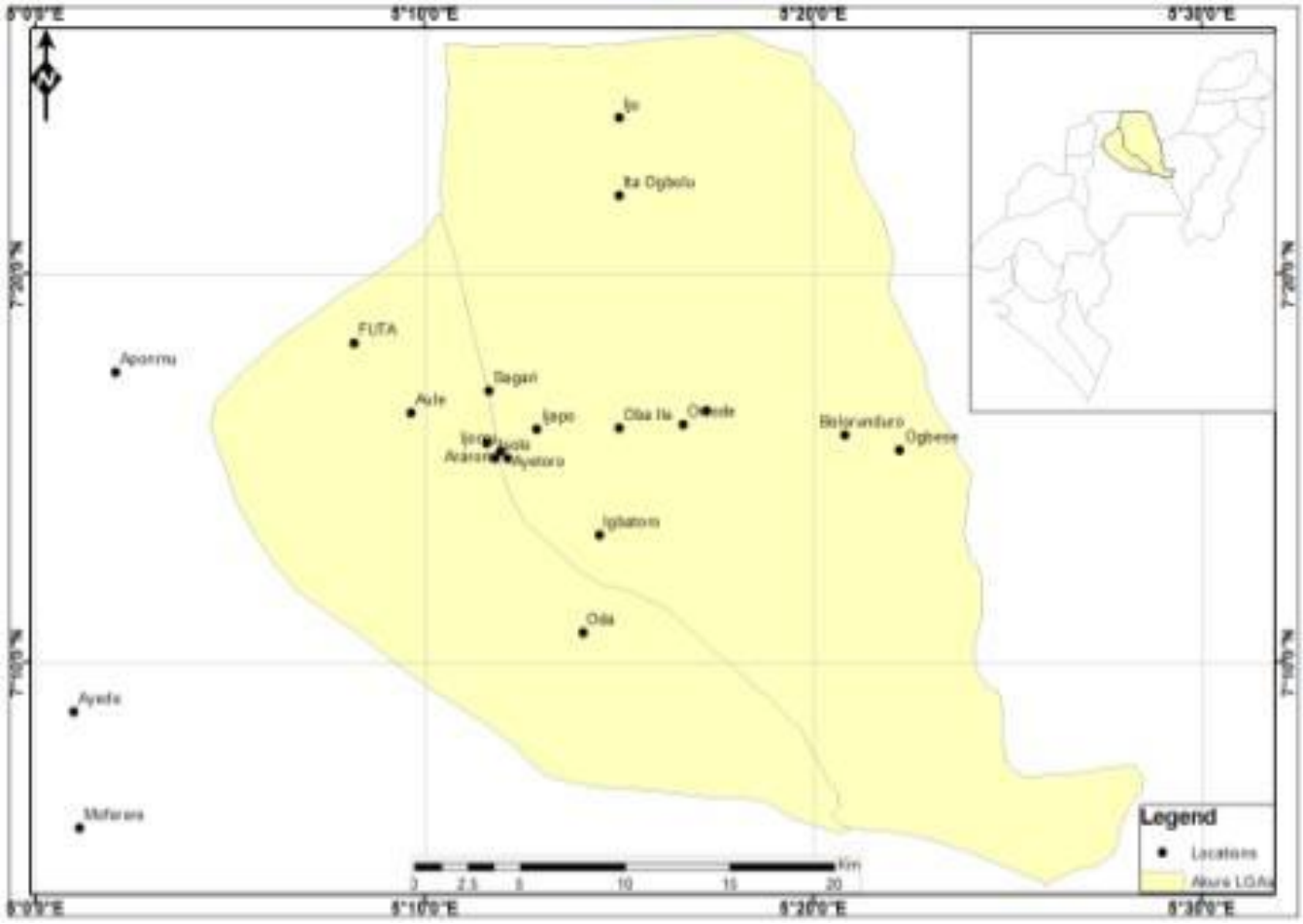

Figure 1. The map of the study area

2.1. Analytical Procedure

The data collected were analyzed using descriptive statistics such as frequencies, percentages to examine the socio-economic characteristics and adoption of improved processing technologies by the respondents.

The Tobit regression model was used to determine how the explanatory variables influence the rate of adoption of improved fish processing technologies.

The censored regression model is expressed below following [7]

$$Y_i = \begin{cases} Y_i^* = X_i + e_i & if\ Y_i^* > 0 \\ 0 = X_i + e_i & if\ Y_i^* < 0 \end{cases}$$

Where: ith is the number of respondents (150)

Y_i is the limited dependent variable, it is discrete if farmers do not adopt (it assumes zero value in this case) and continuous if adopt i.e. equal to Y_i^*

Y_i^* = is the level of adoption and it is defined as "a/A" - where "a" is the number of improved fish processing technologies that is adopted by the farmer in the study area and "A" is the total number of technologies available for adoption.

$Y_i^* > 0$ implies that Y_i^* is observed

$Y_i^* < 0$ implies that Y_i^* is not observed.

The explicit function is expressed as:

$Y_i^* = \beta_o + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + e_i$

Where: X_i is a vector of explanatory variables

β is a vector of unknown coefficients and

e_i is an independently distributed error term.

The explanatory variables specified as determinants of adoption are defined as follows:

X_1 = Age of the respondent (years)

X_2 = Education (years)

X3 = Gender (Dummy =1 if male; 0, if otherwise)

X4 = Marital status (Dummy =1 if married; 0, if otherwise)

X5 = Household size (numbers)

X6 = Pond size (ha)

X7 = Land acquisition

X8= Social participation

2.2 Dependent variable

1.The dependent variable of this study was adoption of improved processing technologies by fish farmers. It was measured by asking the respondents to indicate on a scale of Yes or No to the use of the available improved processing technologies. The respondents were also instructed to indicate their level of adoption of the improved processing technologies using a 3-point likert scale of Always used [3], occasionally used [2], rarely used [1]. A breakdown of adoption scores in each segment was determined thus:

$$\frac{3 + 2 + 1}{3} = 2$$

2 ± 0.5

3.0	2.1	High
2.0	1.1	Moderate
1.0	0.0	Low

3. Results and Discussion

Socio-economic Characteristics of the Respondents

The socioeconomic characteristics of the respondents that were analyzed included age, gender, level of education, marital status, pond size, social participation, household size and income.

The result of the distribution of respondents' socioeconomic characteristics is presented above, as revealed in Table 1, majority of the farmers (68.0%) were males while 32.0% were females this suggests that both male and females were involved in fish production in the study area. This negates a similar study by [3] who stated in his report that majority of fish processors are women and that the dominance of women is attributed to the fact that women bear primary responsibilities for household sustenance and wellbeing.

Moreover, results in Table 1 showed that the modal age of the respondents to be 46-55years while the mean age is 38.5. This implied that the respondents are young and active to cope with the stress of fish processing, majority of the farmers (80.7%) were married which implies that most of the respondents were mature and responsible to cater for their households. Results indicated that (34%) of the respondents had tertiary education, (25.3%) with Diploma certificate while (26.7%) had secondary education and (10%) had no formal education. [8] and [2] stated that educational level is one of the factors that influence adoption of new technology by farmers. Educational level of the respondent is an important factor to be considered in adoption of innovation, it was also revealed that majority of the farmers have household size of 1-5 (58.7%).

Table 1. Distribution of respondents according to Socio economic characteristics

Characteristics	Frequency	Percentage (%)
Sex		
Male	102	68.0
Female	48	32.0
Age		
26-35	32	21.3
36-45	52	34.7
46-55	58	38.7
56-65	8	5.3
Marital status		
Single	15	10.0
Married	121	80.7
Divorced	11	7.3
Widowed	3	2.0
Educational level		
No formal education	15	10.0
Primary education	6	4.0
Secondary education	40	26.7
OND/NCE	38	25.3
Tertiary education	51	34.0
Household size		
1-5	88	58.7
6-10	52	34.7
>11	10	6.7
Other income generating activities		
None	-	-
Civil service	85	56.7
Trading	23	15.3
Farming	42	28.0

Source: Field survey, 2014

3.1. Distribution of Respondents according to use of improved Processing technologies

The result of the distribution of respondents according to use of improved processing technologies is presented in Table 2 below. Results showed that oil drum was the most used improved processing technologies by the respondents (91.3%) while smoking kiln(6.0%) and Mud oven(2.7%). Table 2 further revealed that respondents were using the improved processing technologies because of its color (40.7%), longer shelf life (43.3%), texture (34.7%) and flavor (30.0%). The findings are in line with [3] on adoption of smoking chokor by fish processors in Kwara state, Nigeria.

Table 2. Available Improved Processing Technologies Used by Respondents

Improved Processing technologies	Frequency	Percentage (%)
Oil drum	137	91.3
Smoking Kiln	9	6.0
Mud oven	4	2.7
Reasons for using Improved Processing technologies		
Texture	52	34.7
Color	61	40.7
Flavor	45	30.0
Longer shelf life	65	43.3

Source: Field survey, 2014

Multiple responses allowed

Sources of information preferred by the Respondents

This section reveals the findings relating to the sources of information preferred by the respondents in accessing information on fish processing. Out of the sources of information presented to the respondents four of these sources were prominently preferred. By using the mean scores to rank the information sources according to their order of preference as indicated by the fish processors, cooperatives was ranked 1st with MS = 1.55, friends and neighbors was 2nd with MS = 2.78, ADPs was 3rd with MS=1.18 and Radio was ranked 4th with MS= 0.90

This shows that these information sources were adequate, effective and also accessible that the farmers would prefer to use in disseminating information as regards fish processing technologies.

The result is in consonance with a similar study by [8] who reported that most Agricultural extension programmes in Nigeria are tilted towards food crop and livestock production. The result confirmed by [5] who stated that poor agricultural extension services are serious constraint to fish production in Nigeria. These sources of information that are available if utilized are expected to be enough for acquiring sufficient information necessary for adoption of improved processing technologies.

Table 3. Farmers' Sources of information

Source(s) of information	Most Preferred	Preferred	Not preferred	Mean Score	Rank
Friends and Neighbours	131 (87.3.)	38 (25.3)	0 (0.0)	1.12	2nd
ADPs	118 (78.6)	13 (8.7)	5 (3.3)	0.90	4th
Seminars	80 (53.3)	37 (24.7)	3 (2.0)	0.80	5th
Cooperatives	139 (92.7)	91 (60.7)	3 (2.0)	1.55	1st
Radio	33 (22.0)	74 (49.3)	71 (47.3)	1.18	3rd

Source: Field survey, 2014 Mean scores derived from MP =3, P=2, NP= 1 N=150

Multiple responses allowed

Note: The values in parenthesis represent percentages while the values outside represent the frequency.

Adoption level of Improved Processing technologies

The improved processing technologies in fish farming were identified to be the most used among the farmers. The scoring of improved processing technologies in table 4 was done by using a 3- point scale to score farmers' responses.

The study indicated that Oil drum was ranked 1st , smoking kiln 2nd and Mud oven were ranked 3rd among the improved processing technologies in the study area. It was observed from the study that majority of the farmers were just getting to know about smoking kiln as an improved processing technology. A critical look at table 4 below shows that the level of adoption of the improved processing technologies was generally low except for oil drum which was just a little above the mean, the implication of this result is that the respondents were aware of these technologies but the level of adoption was low, this is also suggesting that awareness and combination of other socioeconomic factors which is germane to the appreciation of innovation by rural farmers as reported by [9] could drive respondents to adopt new technologies.

Table 4. Ranking of Improved Fish Processing technologies

Technologies	Always (3) X_2	Occasionally (2) X_1	Rarely (1) X_0	Mean	Adoption level	Ranking
Smoking kiln	21	28	101	1.47	Moderate	2nd
Oil drum	108	22	20	2.58	High	1st
Mud oven	5	27	131	1.33	Moderate	3rd

Source: Field survey, 2014

Factors affecting adoption of improved processing technologies

The Tobit regression model in table 6 shows the effect of socioeconomic characteristics on the adoption of improved processing technologies in the

study area. The likelihood ratio statistics as indicated by χ^2 statistics (55.68) are highly significant ($P < 0.0025$), suggesting the model has a strong explanatory power. Educational level, household size, pond size and farmers' income had a positive coefficient and significant relationship with adoption of these technologies. This indicates that increase in any value of these variables, will likely increase the rate of adoption. The implication of this result is that for instance, high level of education is crucial to their understandings of the value and use of improved fish processing technologies. However, age of the respondents had a negative coefficient but significant in affecting adoption of improved processing technologies. This indicates that the higher the age of the respondents, the lower the probability of adopting improved processing technologies.

Table 5. Tobit regression analysis showing factors affecting adoption of improved processing technologies

Explanatory variables	Coefficient	t-ratio	Decision
Age	-8.4123*	4.201	S
Marital status	-0.7295	0.911	NS
Household size	31.4130	1.791	S
Educational level	0.1787*	2.105	S
Income	5.06E+3*	3.021	S
Social participation	1.4206	0.314	NS
Gender	0.1375	1.781	S
Pond size	6.1781*	2.511	S
Other income generating activities	56.7983*	2.256	S
Constant	-3.956	0.815	

Source: Field survey, 2014 sig at $t \geq 2.0$
Log Likelihood = -87.35; LR chi^2 [10] = 55.68*** (prob. > chi^2 = 0.0025)
Pseudo R^2 = 0.2655,
number of observation = 150

4. Conclusions

The study concludes that socioeconomic characteristics of the respondents is very crucial to the adoption of innovation by farmers, nevertheless, extension services need to be intensified among fish farmers in order to have efficient utilization of innovation in the sector.

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