COMPARATIVE ANALYSIS OF ADOPTION OF AQUACULTURE TECHNOLOGIES BY FISH FARMERS IN IMO STATE, NIGERIA

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Abstract

This study investigated the comparative analysis of adoption of aquaculture technologies by male and female fish farmers in Imo State. Despite that male and female fish farmers adopt aquaculture technologies in Imo State, fish production remains very low while the demand continues to increase, this calls for comparative analysis of adoption of aquaculture by male and female fish farmers, in Imo State.

Specific objectives included; identifying the socio-economic characteristics of male and female fish farmers that adopt aquaculture technologies in the area, identify the sources of information available to male and female fish farmers, analyze the factors that influence adoption of aquaculture technologies by male and female fish farmers in Imo State. (30) thirty male fish farmers and (30) female fish farmers were interviewed using structured questionnaire. The analysis involved use of descriptive statistics and inferential statistics. The result of the findings indicate that the socio –economic variables (such as age educational level, marital status, household size and extension contact visa –viz, affect aquaculture technology adoption. Result also indicated mean educational level of 8.5 for male and 9.5 for female fish farmers. Result showed that majority of the fish farmers identified that their major information sources available to them were their fellow farmers for both sexes. The findings showed mean value differences of 8, 6, 5.3, 6.4, 3.8, 2.8, N197, 100, N124, 252 socio economic characteristics between male and female fish farmers respectively. The result showed the socio –economic variables negatively affect adoption of aquaculture technologies by male and female fish farmers in Imo State. The F - statistics showed significance of regression which is significant and greater than the F- tabulated value (3.06). this implies that the socio-economic characteristics significantly affect the adoption of aquaculture technologies by male and female fish farmers in Imo State. The study recommended that fish farmers should use a combination of information sources, and the extension service should increase the number of farm visits.

Introduction

Aquaculture involves the deliberate rearing and cultivation of fish, which serves as food (Njoku, 2000). Aquaculture includes the propagation, cultivation and marketing of aquatic animals such as catfish, tilapia, ornamental fish and plant for food (Obinna, 2004).FAO, (1990) describes aquaculture as the farming of aquatic organisms including fish molluscs, crustaceans and plants.

Nigeria aquaculture Produces about 25,000 tons of fish per annum and currently generates less than 3% of fish production but with appropriate adoption of aquaculture technologies, it would match capture fisheries output to enhance increase production,(Ayinla, 2000). Kusemiju and Kusemiju (2003) reported that the total fish production (1985-1994) ranged between 242,525 and 362,752 metric tonnes while production from aquaculture during this period ranged between 14,881 and 25,000 metric tonnes accounting for only 3.5%, respectively of the total local fish production .

Aquaculture technologies can be in form of pre-harvest and post harvest technologies . Aquaculture systems and comprise of all component required for production of a set one more fishes (Obinna, 2004).

In this presentation, a total of ten (10) aquaculture technologies by fish farmers in Imo State were selected . These technologies selected for adoption include, improved fish species, fish pond

construction, affordable home stead, water recirculatory system, filament nets, galvanized plate oven, use of modern smoking kiln and sun drying.

Adoption of aquaculture technologies by fish farmers has been a public issue among stakeholders in aquaculture industry (Njoku, 2000). The purpose of this increasing concern among stakeholders on the adoption of aquaculture technology is because of the importance of fish as free from cultural and religious taboos, coupled with the relative low prices of fish compared with other sources of animal protein and its medicinal content(Philip,2004).

Both male and female fish farmers are engaged in a range of productive aquaculture activities essential to household welfare, (Akereolu, 2003). Women contribution continues to be marginalized while male contributions remain the sole focus of attention (FAO, 1997). Aquaculture extension was designed to serve both male and female farmers, but women appears not to be receiving much of the desired aquaculture information (Afolami , 1993)

Despite the fact that both male and female fish farmers adopt aquaculture technologies in Imo State, their levels of adoption were not yet known from available empirical evidence (FAO 2005). Worse still, it is not wise to presume that male fish farmers adopt aquaculture technologies more than female fish farmers without empirical evidence(FAO 2005) . It was against this background that this study focused on the comparative analysis of adoption of aquaculture technologies by male and female fish farmers in Imo State.

The Specific Objectives were to:

- Analyze the socio-economic characteristics of male and female fish farmers that influence adoption of aquaculture technologies in Imo State.
- Identify the sources of information available to fish farmers on adoption of aquaculture technologies.
- Analyze the factors that influence adoption of aquaculture technologies in the area.

The study assumed that there is no significant relationship between the factors that influence adoption of aquaculture technologies by male and female fish farmers and their socio –economic characteristics in Imo State.

Materials and Methods

Study Area

The study was carried out in Imo state, which is located in the South eastern part of Nigeria. It is bounded in the east by Abia State, North West by Anambra State, South west by Rivers State. The state lies between latitude 5^0 45' N and 6^0 35' E of Green Wich Meridian (ISMLSUP, 1990).

The state has average annual temperature of 28^0 C and annual relative humidity of 80%, annual rainfall of 1800mm to 2500mm and an altitude of about 100m above sea level (Imo ADP, 1990) .

It has total area of 5,530 km^2 with a population density of 710 persons per square kilometer (National population Commission, 2007), and it has a population of 3, 934899 (NPC, 2007). Imo State is endowed with mineral resources such as petroleum, kaolin, limestone etc (Microsoft, 2012) . The state experience two major seasons, dry and rainy seasons and a short dry spell in August. The is divided into three agricultural zones namely Owerri with (20) twenty extension blocks, Okigwe with 8 extension blocks and Orlu with 10 extension blocks. Imo State consists of acidic soils with pH range of 5.0 to 5.5 (ISMANR, 1986) Imo state is an inland state blessed with many rivers, streams , flood plain and body sites of waters . Major body sites are Imo River, Urashi River, Oguta Lake and Itu water site Amumara and life water site, all in Mbaise (Igwe H.O and Orji R. 2003). Most farm households keep small ruminants , fishes poultry and arable crops.

Sample Size and Data Collection

The research was conducted in the three agricultural zones of Imo State namely, Owerri, Okigwe and Orlu . A list of fish farmers were collected from Agricultural Development Programme (ADP) which formed the sampling frame. A multistage stratified purposive and random sampling was used in the selection of agricultural extension blocks, circles and fish farmers. Two local government areas were selected, from each agricultural zones making total of six (6) local government areas out of the (27) twenty seven council areas that made up Imo State.

This is because most of fish farmers are resident in these areas . In Owerri agricultural zone, Ezinihitte Mbaise and Owerri west were selected. In Orlu agricultural zone, Ideato south and Oru west were selected while Isiala Mbano and Onuimo local government areas were selected in Okigwe agricultural zone. In these areas majority of the fish farmers live in Imo State. In each of these local government areas, a total of (10) ten fish farmers were selected in the ratio of 1.1 or 50.50, that is, (5) five male and (5) five female fish farmers in each local government area, giving a sample size of (30) thirty males and (30) females fish farmers , which sums up (60) sixty farmers . Primary data were collected using a structured questionnaire.

The researchers personally supervised the administration of the questionnaire. Data were collected on socio-economic variables as age, educational level, and household size, farming experience, extension contacted, income and output, among others. The data collected were achieved using descriptive statistics, such as mean and simple percentages. Objectives i and ii were analyzed using descriptive statistics while the assumed study was achieved using multinomial regression analysis.

The implicit model of the regression is as follows:

$Y = f(x_1,x_2,x_3,x_4,x_5,x_6,x_7,x_8,x_9,x_{10},x_{11} + E)$
The explicit model expression as
$Y = ao + a1x + a_2X_2$…….. a,, x,,
Where ao= variable ao, a,x,…….. ax, variables

$Y1 = bo + b_1 x_2 + b_2x_2$…….. b,,x,, +e
Where Y= number of technologies adopted
f= is the functional relationship
X_1= farmers age (years)
X_2= farmers educational level (years)
X_3= Household size of farmers (persons)
X_4= farming experience of farmers (years)
X_5= farm size of farmers (pondsize)
X_6= farm income (N)
X_7= farmers access to credit (yes =1 No=0)
X_8= farmer extension contact (number of time)
X_9= tenancy status attribute (Dummy variables)
X_{10}= technology attribute (Dummy variable) simple =1, complex=0)
X_{11}= output of fish (Kg)
E= error term .

Results and Discussion

Socio-economic characteristics of male and female fish farmers in Imo State Nigeria .

Result in Table 1, shows that selected socio-economic characteristics of male and female fish farmers in the study area. The table revealed that 50 percent male and 50 percent female of the respondents were male and female respondents. This result shows gender equity and comparative analysis of male and female fish farmers in equal proportion. The Table 1, revealed mean average age of 48 years for male and 40 years for female respectively.

This means that younger female fish farmers adopted the aquaculture technologies more than older ones. Result indicated means 8.5 years for male and 9.5 years for female of educational level respectively. It also showed that 8 persons household size for males and females respectively. The finding showed 5.3 years farming experience for male and 6.4 years of farming experience for female fish farmers. The result showed mean value for male fish farmers output of fish of 260.5 kg and that of females was 228.2 kg. In extension agents while female fish farmers hardly had 1 or 2 times contact with extension agent. The Table also showed the mean value of 2.6 and 2.89 technology attribute for male and female fish farmers, respectively were simple technologies compliance terms of income it was notice that the mean values of N197, 100 and N124, 282 the socio–economic variables favoured influence male fish farmers more than female fish farmers.

Table 1: Percentage and mean Distribution of the selected Socio –economic characteristics of male and female fish farmers in Imo State Nigeria

Variables	Male	Female
Gender	50:	50
Age (years)	48,	40
Educational level (years)	8,	6
Household size (number)	5.3,	6.4
Farm size pond size (number)	3.8,	2.8
Farm income (N)	197,100,	124,25
Access to credit (yes=1, No=0)	3.1,	1.1
Extension contact (number of visit)	3,	21.98
Tenancy status (1 or 0)	2.6,	2.89
Output of fish (kg)	260.5,	228.7

Source Field survey data, 2010

Source of information on Aquaculture Technologies Available to male and fish farmers in Imo State, Nigeria . Results in Table 2, showed that male fish farmers and fish farmers that adopt aquaculture technologies learnt about aquaculture technologies from their fellow fish farmers and friends as reported by 86 percent of the male fish farmers and 90 percent of the fish farmers. The table indicates that 86.7 percent of male and 76.6 percent of female, first learnt of chosen technologies from farmer's cooperative. Also 13.33 percent of male fish farmers and 53.33 percent of female first learnt of chosen technologies from Radio Farmer programme, while 16.7 percent of male and 10 percent of female first learnt from television programme. This contradicts with (Sylvia, 2013) who asserted that radio is a common and effective means of communication in the rural areas for large audience.

The table concludes that the sources of information about aquaculture technologies available to fish farmers were, fellow farmers, farmers cooperative radio programmes and extension contact among others for both male and female fish farmers in Imo state

Table 2: Percentage and Frequency Distribution of Male and Female Fish Farmers According To Source of Information Available in Imo State, Nigeria.

Sources of information	Male		Female	
	Frequency	Percent	Freq.	Percent
Professional InterPersonal Extension agent	26	86.7	22	76.67
Research Institute	7	23.33	4	13.33
Agricultural shows	13	43.33	12	40.00
Non-Professional Interpersonal				
Fellow farmers friend	29	86.67	27	90.00
Village heads	9	30.00	6	20.00
Farmers cooperatives	27	90.00	26	86.70
Printed Sources				
ADP Extension New letter	5	16.70	1	3.33
Posters	7	23.33	4	13.33
Broadcast Source				
Radio Farmers Prog.	4	13.33	16	53.33
Television (Oru Ubi) prog.	5	16.70	3	10.00

Source: Field Survey Data, 2010

Determinants of the Factors Affecting the Adoption of Aquaculture Technologies and Socio-economic Characteristics of fish farmers in Imo state, Nigeria.

The result of four functional forms (linear, semi-log, double-log and exponential forms) shows that the double log function gave the best fit to the data having produced the highest values of the coefficient of multiple determination (R^2) (0.910) for female. Table 3, regression result showed that the lead function was taken as the lead function and used for further discussion. The coefficient of multiple determination (R^2) as produced by the double log function was (0.910) and (0.982) for male and female respectively, which implies that 92 % and 98 % of the variation in the dependent variable (Y) was caused by the variation in the independent variables (X_1, X_2, X_3 ……. X_{11}) for male and female respectively. This is in line with (Njoku, 2005) who found out that male artisanal fisher men adopt artisanal technologies more than female artisanal fishers.

Female fish farmers age (X_i) is negatively related to adoption of aquaculture technologies, implying that the younger female fish farmers adopted more of the aquaculture technologies than the older ones.

This is because younger fish farmers are more experimental than older farmers who are mainly laggards and reluctant to change. This relationship is significant at 1% level, as the t-calculated value (5.13) is greater than the t-tabulated value (2.750).

While male farmers educational level was negatively related to adoption of aquaculture technologies, female fish farmers educated level (X_2) was positively, this implies that the less educated male fish farmers adopted aquaculture technologies more that the more educated farmers, where as the more educated female fish farmers adopted more than the less educated ones. (Rogser and Shoemaker, 1995). This effect is significant at 1% level as the t-calculated value 2.18 and 3.088 for male and female, respectively. This is greater than the t-tabulated valued 2.042 and 2.750 for male and female fish for male fish farmers extension contact (X_3) had a negative effect on adoption of aquaculture technologies. This implies that male fish farmers with less number of contacts with extension agents adopted more of the aquaculture technologies than those with more number of contact with extension. This effect is significant at 10% level of significance as the t-calculated value (1.750) is greater than the t-tabulated value (1.697).

Male fish farmers pond size (X_4) is positively related to adoption of aquaculture technologies. This implies that male fish farmers with larger pond size adopted more of the aquaculture technologies than those with smaller pond size. This effect is significant at 10% level as the t-calculated value (1.728) is greater than the t-tabulated valued (1.697).

Male fish farmers output (X_{11}) is negatively related to adoption of aquaculture technologies. This indicates that male fish farmers with higher output adopted less of the aquaculture technologies than those with lower output. This effect is significant at 5% level as the t-calculated value (2.24) is greater than the t-tabulated value (2.041).

Female fish farmers house hold size (X_5) income (X_6) access to credit (X_7) contact with extension, (X_8), tenancy status (X_{10}) and output (X11) were all negatively related, and that these variables are not important determinants of adoption of aquaculture technologies.

The F-statistics which determines the overall significance of a regression is significant and greater than the F-tabulated (3.60). The assumed study was rejected and the conclusion is that fish farmers socio-economic characteristics significantly affected adoption of aquaculture technologies by fish farmers in the area.

TABLE 3: Regression results on the male and female fish farmer factors affecting adoption of innovations

Exogenous variable	double – log		exponential		semi-log		linear	
	Male	**female**	**male**	**female**	**male**	**female**	**male**	**female**
Constant	6.487	16.145	0.358	4.877	14.634	80.469	0.846	24.519
X_1	0.063	-3.173	0.036	-0.066	1.226	-14.894	1.014	24.519
	(0.957)	(-5.132)	(2.213)***	(-4.908)***	(1.034)	(-5.143)***	(1.184)	(-4.552)***
X_2	-0.248	0.340	-0.055	0.016	-1.376	1.094	-0.276	-0.291
	(-2.187)	(3.088)***	(-1.982)	(0.860)	(0.407)	(2.120)***	(-1.524)	(0.581)
X_3	-0.094	-0.148	0.016	-1.376	-1.226	-0.604	-0.011	-0.051
	(-0.751)	(-1.687)	(0.495)	(-1.095)	(-2.162)***	(-1.467)	(0.045)	(-0.773)
X_4	0.522	-0.092	0.103	-0.043	1.344	-0.510	0.190	-0.87
	(.728)	(-1.270)	(1.304)	(-1.219)	(-1.415)	(-1.505)	(0.725)	(-1.220)
X_5	-0.114	-0.095	-0.072	-0.039	-0.334	0.056	-0.177	-0.205
	(-1.039)	(-0.697)	(-2.688)***	(-1.227)	(1.458)	(0.087)	(-1.335)	(0.012)
X_6	-3.44e-007	-0.158	617e-007	1.58e-006	-0.064	-1.128	0.039	0.002
	(-0.069)	(-0.803)	(0.504)	(1.640)	(-0.725)	(-1.222)	(0.175)	(0.456)
X_7		-0.108	-0.155	0.109	-0.786	-0.067	-0.271	2.11e-006
		(-0.629)	(-2.105)***	(0.804)	(-0.081)	(-0.067)	(-1.168)	(0.884)
X_8	-0.522	-0.046	0.425	-0.091	1.258	-0.359	0.467	0.574
	(-1.750)*	(0.912)	(1.617)	(-1.791)	(-0.965)	(-1.467)	(1.766)*	(-2.580)*
X_9	0.897	0.189	0.359	0.246	2.455	-1.659	0.877	-0.632
	(0.840)	(-1.082)	(0.958)	(1.078)	(1.353)	(-2.030)	(2.693)***	(-1.250)
X_{10}	1.329	-0.197	-0.001	-0.471	-2.064	-1.141	-0.411	-1.370
	(0.874)	(-1015)	(-1.460)	(-3.006)***	(2.146)***	(-1.253)	(-1.381)	(-3.536)
X_{11}	-0.009	-0.100		0.001	0.898	-0.276		-2.656
	(-2.244)***	(-0.462)		(1.116)	(0.844)	(-0.274)		(0.802)
R^2	0.910	0.982	0.905	0.981	16.704***	0.977	0.855	0.003
R^2	0.863	0.970	0.854	0.969		0.964	0.779	0.960
F-ratio	19.269***	86.971***	18.015***	82.800***		70.616***	11.223***	0.960

Source: Field Survey Data 2010
*** Significant at 1% level
** Significant at 5% level
*Significant at 10% level.

Conclusions and Recommendations

Some reasonable conclusion has been made from the results of the study, these includes

- Small scale fish farmers dominated the fish farming in both sexes. There was low adoption by both sexes.

- Socio-economic characteristics significantly influence adoption of aquaculture technologies by fish farmers in Imo State. The finding also indicated that socio-economic characteristics significantly affected the adoption of aquaculture technologies by male and female fish farmers positively.

- The socio- economic variables of fish farmers, coupled with functional and effective institutional framework should be put in place to address the hydra headed, age long bottle necks of the extension service to make it more functional and goal oriented.

- Since extension as presently constituted has not performed creditably in assisting farmers to have access to the needed inputs, alternative sources may be explored to fill this needed gap. Aquiculture farmer should be encourage to acquire basic education as this will create an enabling environment for extension agents to communicates and transfer these innovations appropriately.

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