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The Influence of Socio-Economic Factors on Adoption of Fish Production Technologies among Community-Based Farmers in Cross River State, Nigeria

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Abstract

The poor performance of fishery subsector is most clearly evidenced by low adoption of fishery production technologies by farmers. The purpose of this research was analyzing influence of socio-economic factors on the adoption of fish production technologies by community-based farmers in Cross River State, Nigeria. A Multistage random sampling technique was used in selecting 60 community-based farmers. Data for the study were analyzed with descriptive statistics and probit regression model. The result showed that the farmers adopted catfish technology packages such as; pond construction, stocking rate, fertilization of pond, feeding, test cropping, fingerlings production and harvesting and processing. The probit regression estimates of the determinants of farmer's adoption showed that coefficients of education, farm income and extension contacts were positive and significant at 1%. Policies aimed at encouraging farmers' access to extension education and information on fish production technologies through extension were advocated for increased fish production and poverty alleviation.

1. Introduction

In Nigeria, fish production is from both internal and external sources. Among the internal sources, aquaculture is the second most important after artisanal fisheries and supplied between 5-13.5% of total domestic fish production between 2000 and 2007 (Federal Development of Fisheries, 2007). Aquaculture or fish farming has the potential of revising the trend of fish importation. This requires capitalizing on adoption of aquaculture technologies to strengthen production to increase fish food security and economic growth at individual and national levels (Aphunu and Agwu, 2014). Nigeria has natural endowment for aquaculture production through virtually uninterrupted year round environmental condition. Catfish, particularly *Heterobranchus spp* is the specie of choice generally accepted and grown in monoculture by fish farmers in the State (Nwosu *et al*., 2001). Fish farming as a branch of aquaculture is defined as the raising of fish for immediate family consumption or as commercial ventures (FAO, 2006). In the past, rural farming in Africa concentrated especially in tilapia because production of tilapia is cheaper, but returns from tilapia farming are not as much as catfish which is growing fast (Olukunle, 2004). The most common cultivated species in Africa include catfish (*clarias garienpinus*) and imported *clarias lazora* and *heterobranchus spp*. The African catfish is orderly distributed throughout Africa (Viveen *et al.*, 1990). Fisheries offer a key entry point to reach millions of poor people of the world including Nigeria. It assists in increasing people's income, improving the nutrition and health of families and acts as active agent of economic development and social change (Ifejika *et al*., 2008). The contributions of fish to the existence of man cannot be over emphasized being a good source of animal protein. It plays a vital role in the nutritional diet of man serving as source of employment and income (FAO, 2001). However, fish consumption is gaining wide prominence particularly in developing countries where 40% or more of their protein comes from fish. This is because fish is more affordable, palatable and readily available than other sources of animal protein, less tough, more digestible and its

acceptability cut across religion, ethnics and cultural boundaries (Ekeocha *et al*., 2010).

However, it's obvious that fish supply from marine and freshwater capture fisheries cannot meet the growing global demand for aquatic production. The quantity supplied is consistently lower than the increasing demand, thus an importation of about 800,000 tons (valued at $900 million) in 2009,that later increased to about one million tons before early 2011 was made to augment the shortage (Marcela and Uche, 2010). To revamp this sub sector government has introduced and implemented numerous policies and programmes aimed at empowering the small scale fish farmers to get out of quagmire. Notably, efforts made were in dissemination of improved catfish production technologies to including; adequate pond construction, water management, adequate stocking rate, use of nutritious and floating feed, fertilization of pond, feeding rate, test cropping, fingerlings production and harvesting and processing (Ike *et al*., 2009 and Nwaobiala, 2013). Akinbile and Alabi (2010) stated that the enhancement of local fish production can be brought about by improving capacity in terms of enhancing access to and utilization of information. In the same vein, it requires that the technical knowledge and capabilities of fish famers be regularly updated through enhanced information seeking behaviour. Aquaculture, as in other areas or sub-sectors of agriculture has certain complexities. For example, the provision of fingerlings to stock ponds, pond fertilization and food provision require considerable sophistication (Ajieh, 2004).

The farmer therefore needs competency in knowledge, skills and techniques involved in the efficient management of fish to maximize production. Farmers' competences in aquaculture could be enhanced through persuasion to adopt agricultural innovations, by transferring technology and knowledge from scientists to farmers to trigger development (Agbamu, 2006). Nwaobiala (2014), assert that farmer decision to adopt innovations are determined by age, farm size, extension contact, level of formal education and farm income. Many improved fish technology packages has been developed and disseminated to farmers in the study area, the socio-economic factors of farmers influencing the adopting of these packages seem not to be ascertained. Based on the stated facts, this study was designed to determine factors influencing the adoption of fish production technologies by IFAD in Cross River State, Nigeria. The specific objectives are to: Describe socio-economic characteristics of community-based catfish farmers in the study area. Ascertain the levels of adoption of fish technology packages by fish farmers in the study area. Determine the factors that influence the adoption of these technology packages by homestead catfish farmers in the study area

2. Materials and Methods

2.1 Study Area Description

The study was conducted in Cross River State, Nigeria. The State lies between Latitude $5^0 5^1$ and $6^0 40^1$ North of the Equator and Longitude $8^0 10^1$ and $8^0 5^1$ East of the Greenwich Meridian. The State is bounded on the North by Benue State, on the South by Akwa Ibom State, on the East by Cameroon Republic and the West by Ebonyi State. The State is located within the forest belt of Nigeria and temperature ranges between 20^oC and 30^oC with relative humidity between 70% and 90%. Most people in the rural areas engage in artisanal fishing due to the rivers, streams, lakes and flood plains characterized in the area, the state is embowered with artisanal fishing practices, thereby making it as a revenue earner for the state (CRSPC, 2006). Purposive and multistage random sampling techniques were used in the research. Purposively, Cross River state was selected, because it is among the pilot states of the programme. Three (3) LGAs of the State were chosen namely Yala, Yakuur and Obubra were randomly selected. From selected LGAs two (2) participating communities each were randomly selected to give a total of six communities (Yala – Okpoma and Okuku / Itega Okpudu, Yakurr – Asiga and Ekori, Obubra–Nyamoyong and Apiapum). Finally ten fish farmers were randomly selected from the selected communities to give a sample size of sixty (60) participating fish farmers. A structured questionnaire was used in soliciting information from the farmers. Objective one was realized with descriptive statistics such as frequency counts, percentages and mean scores, objective two was derived with adoption scale analysis, the hypothesis was tested using probit regression model.

2.2 Model Specifications

The adoption of recommended fish technology packages by fish farmers were determined using adoption score analysis. It was achieved using 6 - point Likert type scale of unaware (0), aware (1), interest (2), evaluation (3), trial (4), accept (5). Farmers with adoption score of 3.0 and above were regarded as having reached average score of technology, that is, they are at evaluation stage, while farmers with adoption score of less than 3.0 where either at unaware, aware and interest stages. The factors that influence the adoption of fish technology packages by homestead catfish farmers were determined using probit regression analysis. This is represented thus; (Y) represents a limited dependent variable, which simultaneously measures the decision

to adopt the technologies. $(I)^*$ is an underlying latent variable that indexes adoption. (T) is an observed threshold level. (X) is the vector of independent variables affecting adoption. (βi) is a vector of parameters to be estimated. (ei) = error term.

If the non variable T, becomes a continuous function of the independent variables and O otherwise for the generated case, the value of log likelihood function is given as, empirical model are presented below;

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8 + ei)$

Y = level of adoption of technologies (adopted = 1, non adopted = 0)

X_1 = farmers age (in years)

X_2 = educational status (measured by the number of years of farmer spent in school)

X_3 = household size (number person living and feeding from one pot)

X_4 = number of fish ponds

X_5 = fish pond size (m^2)

X_6 = years of farming experience

X_7 = farm income (table amount in Nigerian Naira a farmer realized from his farm)

X_8 = contact with extension officers (daily, weekly and monthly)

ei = Error term

3. Results and discussion

3.1 Socio –economic Characteristics of Community-Based Farmers

The socio-economic characteristics of respondents are shown in Table 1. The result reveals that majority (64.17%) of community-based farmers were males, while 35.8% of them were females. Also, the respondents had a mean age of 37.80 years, which implied that the farmers were in their productive ages. Furthermore, 41.67% of the farmers acquired secondary education with mean annual farm income ₦175, 500.00. Education enhances one's ability to appreciate and adopt innovations faster (Akinbile and Alabi, 2010). The farmers had medium sized ponds (57.50%) and mean of 5.5 visits from extension in a month.

Table 1. Percentage and Mean Distribution of Selected Socio-economic Characteristics.

Variables	Farmers
Male (%)	64.17
Female (%)	35.83
Mean Age (years)	37.80
Secondary Education (%)	41.67
Mean Annual farm income* (₦)	175,500
Medium Pond Size ($9m^2 – 175m^2$) (%)	57.50
Extension Contact (number/ month)	5.5

*1 $ = 198.89 ₦

3.2 Levels of Adoption of Fish Technology Packages among Community-Based Farmers in Cross River State, Nigeria

The results in Table 2 show that Cross River State participating farmers adopted all the fisheries technology packages. The packages include pond construction ($\bar{x}$= 3.4), stocking rate ($\bar{x}$=3.4), fertilization of pond ($\bar{x}$=3.3), feeding ($\bar{x}$=3.5), test cropping ($\bar{x}$=3.0), fingerlings production ($\bar{x}$=3.0) and harvesting and processing ($\bar{x}$=3.5) with total mean score of 3.3. The high rate of adoption of fisheries technology packages is not surprising because the technology is location specific. Farmers in the Niger Delta Regions of Nigeria especially in Cross River State are known to be fish farmers. This result agrees with the research findings of Onu and Unaeze, (2009) and Ezenwa *et al*., (2006) where they identified fish farming or growing of culture fisheries as the major occupation of rural people in the core Niger Delta Regions of Nigeria.

Table 2. Levels of Adoption of Fisheries Technology Packages among.

Technology Packages	Mean adoption score
Pond construction	3.4
Stocking Rate	3.4
Fertilization of pond/water management	3.3
Feeding/Feeding Rate	3.5
Test cropping	3.0
Fingerlings production	3.0
Harvesting and processing	3.5
Total Mean Adoption Score	23.1
Mean Adoption Score	3.3

3.3 Determination of the Effect of Socio-Economic Factors on the Adoption of Fish Production Technologies

The result in Table 3 shows the probit model estimates for the determinants of the level of adoption of fisheries technology in Cross River State. The Chi^2 was significant at 5.0% level of probability with Pseudo R^2 of 30.63% indicating goodness of fit.

The coefficient for education (0.5349) was positively signed and highly significant at 1.0% level of probability. This implies that any increase in level of education will lead to increase in adoption of fishery technology packages of the programme. This finding agrees with that of Onumadu *et al.,* (2008) who asserted that higher literacy level increases the chances of adoption of a technology.

The coefficient of pond size (-2.0444) was negatively signed and significant at 5.0% level of probability. This implies that any increase in pond

size will lead to a decrease in adoption of fisheries technologies in the study area. This is against a priori expectation. With small farms it has been argued that large fixed cost becomes a constraint to technology adoption (Abana and Singh, 1993; Okoronkwo and Umeh, 2013)

The coefficient of farm income (0.0361) was positive and highly significant at 1.0% level of probability. This implies that increase in farm income will lead to increase in adoption of fishery technologies. This result is in consonance with the findings of Unamma, (2004) and Chinaka *et al.*, (2007) where they found a positive relationship between farm income and adoption.

The coefficient for extension contact (0.0456) was also positively signed and highly significant at 1.0% level of probability. This implies that any increase in extension contact will lead to increase in adoption of fishery technologies in the study area. Frequency of extension contact has proved to be a viable means of adoption of innovations. This result is in tandem with the findings of Nwaobiala (2014) obtained a similar result from homestead catfish farmers in Ebonyi State Nigeria.

Table 3: Probit Regression Estimates of the Determinants of Community-Based Farmers Adoption of Fisheries Technology in Cross River State, Nigeria.

Variables	Parameters	Coefficients	T- ratio
Constant	X_0	26.425	9.08***
Age	X_1	0.0197	0.20
Household size	X_2	-0.0841	-0.44
Education	X_3	0.5349	5.14***
Pond size	X_4	-2.0444	- 1.94**
Fish farming experience	X_5	-0.0987	0.77
Farm income	X_6	0.0361	9.78***
Extension contact	X_7	0.0456	5. 01***
LR Chi^2	X^2		4.49***
Prod Chi^2			0.061
Pseudo R^2			0.3063

, and * is significant at 5% and 1% respectively.

4. Conclusion and recommendations

The study revealed that community-Based farmers adopted all the technology packages (pond construction, adequate stocking rate, fertilization of pond/water management, feeding rate, test cropping, fingerlings production and harvesting and processing) the programme promoted. Education, pond size, farm income and extension contacts were the identified as factors that influenced farmers' adoption of fishery production technologies in the study area. From the results obtained the following recommendations were proffered;

1. Farmers need access to information on fish farming technologies packages. This is informed by farmers to get informed on the latest technology.
2. Since education has positive significant to fish adoption, there is need to enhance the acceptance of any technology package transferred.
3. Youths should be encouraged to engage in fish production as a poverty alleviation strategy and entrepreneurial activity.
4. Encourage farmers to participating in extension education and access to information on fish production technologies through extension for increased fish production and poverty alleviation.

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