EVALUATION OF THE SOCIOECONOMIC FACTORS INFLUENCING ADOPTION OF CATFISH PRODUCTION TECHNOLOGIES IN ANAMBRA STATE, NIGERIA

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Abstract
The study examined the determinants of the adoption of catfish production technologies in Anambra State of Nigeria. A multistage random sampling technique was used to select 120 catfish farmers. Data, which comprised information on the socioeconomic characteristics and other quantitative variables relevant to the study were collected using a structured questionnaire and interview schedule. The socioeconomic characteristics and constraints to catfish production were analysed using descriptive statistics such as percentage response and frequencies; gross margin was used to capture cost and returns in fish production and Tobit model was used to analyse determinants of adoption of catfish production technology. Result shows that the following variables were positive and significant at different probability level to adoption of technology: age of the farmer (1%), *level of farmers' education (1%), farming* experience (1%), extension visit (1%) and family size (5%). The coefficient of gender, labour and fertilizer use were negative and significant at 5%, 5% and 10% respectively. The cost and return analysis revealed that an average total cost of catfish production was ₦197,050 per 1000 fish with cost of feed constituting the highest (46.7%) of the total cost of production. A net farm income of ₦411,950 per 1000 was realized, indicating that catfish production is profitable. Major problems encountered by the farmers were inadequate supply of fish seed and feed at economic prices and poor access to credit. There is need to implement policy options that will *increase farmers' access to credit through* microfinance and commercial banks. Experienced farmers should be encouraged to remain in fish production through increasing their access to inputs at subsidized prices.

Keywords: Socioeconomic, Adoption, Catfish Farmer, Technologies.

Introduction

Fish is one of the cheapest sources of animal protein and accounts for 22% of the protein in sub-Sahara Africa and 40% of animal protein consumption in Nigeria (FAO, 2006). In Nigeria, fish demand as estimated by Ruma, (2008) was 2.1 million metric tons at 11.5kg per capita consumption with domestic production from the wild estimated at 5% leaving a gap of 41%. Nevertheless, such yearly occurring deficits have been offset through enormous imports by various governments. The negative effects of these imports on the nation's foreign reserve have been variously acknowledged (FAO, 2002; FAO, 2006).

However, it's obvious that fish supply from marine and freshwater capture fisheries cannot meet the growing global demand for aquatic production. This together with national efforts aimed at generating foreign currency and higher standard of living have focused the attention of many countries on the development and strengthening aquaculture (Rana, et al, 1999).

Nigeria has natural endowment for aquaculture production through virtually uninterrupted year round environmental condition. Anambra State is crisscrossed by numerous rivers, swamps, abundant rainfall, effective harvesting and storage surface water, run off undoubtedly favour fish farming (Egwu, 2001). Catfish, particularly Heterobranchus sarus is the specie of choice generally accepted and grown in monoculture by fish farmers in Anambra State (Nwosu, et al, 2001).

Notwithstanding, the natural endowment of the state, low production and productivity have characterized this sub sector, thereby limiting its ability to form the traditional role of economic development. The poor performance of fishery sub sector of agriculture is most clearly evidenced by low standard of living of the small scale rural fish farmers (FAO, 2006). 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 poverty trap. Notably, is dissemination of improved catfish production technologies to including; adequate pond construction, water management, adequate stocking rate, use of nutritious and floating feed, and improved fish feed to the farmers (Ike, et al, 2009).

The effects of the programme on the farmers output was outstanding, as aquaculture production of 15,000 metric tons/annum which was second to Egypt in Africa was attained (Anadu and Eze 2006). This study intends to find out the factors determining the adoption of catfish production technologies in the study area. The broad objective of the study was to investigate the determinant factors to adoption of technologies by farmers in Anambra State. Specifically, the objectives were to, determine farmers'

socioeconomic characteristics, analyse the determinants to the adoption of catfish production technologies, determine the profitability and constraints to the adoption of the technologies.

Materials and Methods

The study was carried out in Anambra State of Nigeria. Anambra State is located in latitude $5^0 38' - 6^0 47'$E of equator and longitude $6^0 36' - 7^0 21'$N of Greenwich meridian. The state is bounded in the south by Imo sate, in the east by Enugu state, in the north by Kogi state and in the west by River Niger and Delta States. Anambra state has 21 local government areas with Awka as capital. It has population figure of 4.184 million people (NPC, 2007). Anambra state is divided into four agricultural zones; Awka, Anambra, Onitsha and Aguata.

Multi-stage sampling Technique was employed for the purpose of this study. Three agricultural zones; Onitsha, Akwa and Aguata were purposively selected because of the intensity of fish farming. Two fish farming local governments areas were selected from each zone, giving a total of six local governments. Awka North and Aniocha from Awka zone, Idemili south and Nnewi local government were selected from Onitsha zone, while Aguata and Ihiala from Aguata zone. Twenty respondents were randomly selected from each of the local government areas, giving a total of one hundred and twenty respondents. A structured questionnaire and interview schedule were used to collect data.

Descriptive statistics such as percentage response and Tobit model were used for data analysis. The Tobit analysis is stated as:

Tobit analysis is used to determine the extent of adoption of technology. The Tobit model, (Tobin, 1957) is

$$Y^* = x\beta + e \quad - \quad - \quad - \quad - \quad (1)$$

Where β is a vector unknown coefficient, x is a vector of independent variables, e is an error term that is assumed to be independently distributed with mean zero and a variance of σ^2, Y is a latent variable that is unobservable.

The variable used in the analysis are presented below

$Y = X_1\ X_2\ X_3\ X_4\ X_5\ X_6\ X_7\ X_8\ X_9\ X_{10}\ X_{11}\ X_{12}\ X_{13}\ X_{14}\ X_{15}\ X_7$ fei

X_1 = age of the farmer (yrs); X_2 = level of education (yrs)

X_3 = farming experience (yrs); X_4 = extension visit (no)

X_5 = household size (no); X_6 gender (male = 1, female = 0)

X_7 = fertilizer use;

X_8 = member of organisation (member = 1, non member = 0

X_9 = credit access (₦); X_{10} = pond size (m^2); X_{11} = non farm income (₦)

X_{12} = labour (manday); X_{13} = tenancy status (tenant 1, landlord = 2)

Er = error term.

Result and Discussion

The data on Table 1 shows the average statistics of catfish farmers in Anambra state.

On the average, a typical catfish farmer was 44.16 years with 9.22 years at education, 16 years at farming experience, average household size at 6 with pond size at $8m^2$. The mean credit access was ₦45,000, an average extension visits of 5.26 with ₦64.012 non farm home. The mean of labour was 74.21 manday with the average number of catfish production technologies used by farmers of 7.25.

Table 2 shows the estimated result of Tobit model. The x^2 was highly significant at 1% level of probability, indicating goodness of fit. The coefficient of level of the farmers' education, farming experience, age of the farmers, extension visits, and credit access were positive and highly significant at 1% level of probability, while credit access and family size were positive and significant at 5%. This infers that the increase in these variables will lead to increase in adoption and intensity of use of catfish production technologies. The level of farmers' education had profound effect on the technology adoption. The effect could be related to the fact that educated farmers are more responsive to positive changes in farming trends and risk averse (Ewuziem, et al 2010). This finding is in consonance with Dung, et al (2010), who opined that education increases productivity and enhances the farmers' ability to understand and evaluate new production techniques. The effect of farming experience had been variously found to be positive (Nwaru, 2004; Ume, et al 2009; Iheke, 2010, Onyenweaku, et al 2010). Experience farmers are generally better able to access the relevance of new technologies through interaction with their neighbours and the outside world (Langgintuo and Mekura, 2005).

Age of farmer was positive and agrees with findings of Lanyyintuo and Mekura (2005) who reported that older farmers have higher accumulated capital, more contacts with extension workers, better preferred by credit institutions and larger family size, all of which may make them more prepared to adopt technology more than younger ones. This finding contradicts Ume, et al (2009), who opined that older farmers are less amendable to change and hence reluctant to

change the status quo i.e. old way of doing things which have negative impact on adoption.

Extension is the major medium for agricultural innovations dissemination to farmers from the research. This finding is in line with Rogers, (2003) but contradicts Eze and Akpa, (2010), who cited that inadequate transfer of information to farmers by extension agent due to bottle necks such as negative attitude of the extension agents to their works and inadequate motivation by appropriate quarter, affect technology transfer and consequent adoption.

Credit was positive and significant at 1% probability level. This assertion agrees with Okoye and Onyenweaku (2007) but not in conformity with Amaefula, et al (2010) who pointed out that many farmers divert this credit into non agricultural uses.

Family size had a positive relationship with technology adoption, as large family size is a potential source of labour and ease labour availability, thereby reducing labour cost in executing catfish production activities. The positive sign of non farm income is inconsistent with Onyenweuaku, et al (2010), opined that farmers that generate off farm income, usually uses such money to augment their meager resources in procuring improved production inputs which would facilitate the intensity of technology adoption. The coefficients of gender, labour and fertilizer use were negative and significant at 5%, 5% and 10% respectively. This implies that there is indirect relationship between these variables and use and intensity of adoption of catfish production technologies. The negative value on the gender coefficient could mean that female has more likelihood to adopt the catfish production technologies than the male counterpart. The negative sign on the pond size particularly large pond, implies high human capital, credit requirement, labour requirement, labour cost and risk perspective (Obubuenyi, et al, 1999).

The co-efficient of labour was signed negative. This could be related to the fact that catfish production requires low labour but high capital intensive. The coefficient of fertilizer use and tenancy were positive but not significant.

Analysis of table III shows the cost and returns of catfish farmer in the study area based on 2010 market prices of inputs and outputs. The analysis revealed that cost of feed constituted the highest (46.7%) share of the total cost of production. This could be associated with high cost of concentrates used for formulating feed. This is followed by high cost of fingerling which accounted for about 20.4% of the total cost, while the least was incurred on transportation (0.38%).

The average total cost of production was ₦197,050 per 1000 fish, while the total revenue from catfish production was ₦609,000. The net farm income was ₦411,950 which indicates that catfish production is profitable in the study area. Furthermore, the benefit and cost ratio of catfish farmers was 3.09, indicating that for everyone naira spent, about ₦3.09 was realized in return.

Constraints to Catfish Production

Majority (86%) of the respondents interviewed complained of high cost of feed. Ike et al (2003) reported that high cost and often unavailability of fish feed concentrate make fish farming unproductive. The effect is that farmers stop feeding their fish when the prices of feed is high and resumes only when they can afford the cost. Moreso, Esonu, (1991) opined that poorer resource farmer during period of high cost of feed and resorts to use of poultry mash, which is not in water but so expensive that it takes nearly 70 – 80% of the farmers production cost.

75% of the farmers encounters problem of poor fish feed breeds. Ezuike and Adedeji, (2010) revealed that the performance of this breed is, high uneconomical, as not missing the market target but waste space and finance. This affects adversely profit maximization in fish farming. Poor access to credit was complained by 70% of the farmers. Credit is vital in purchasing productive inputs and in payment of hired labour.

Conclusion

The important determinants of catfish production technologies are, farmers' educational level, farming experience, extension visit, family size, credit access and non farm income and age of the farmers. Catfish production is a profitable venture in the study area despite the constraints to its production. Scarcity of fish seed, high cost of fish feed, poor access to credit and water pollution were the major problems encountered by the sampled farmers. These result calls for policies designed to improve farmers' access to; more education, credit, improved breeds of fish seed and feeds at reduced cost. There is need to put adequate infrastructure especially boreholes to reduce water problems.

Table 1: Average statistics of catfish farmer in Anambra state of Nigeria

Variable	Mean	Standard deviation	Min.	Max
Age of the farmer (yrs)	44.6	11.04	31	63
Educational level (yrs)	9.22	4.0	6	19
Farming experience (yrs)	16	3.171	6	12
Household size (No)	6	1.647	4	12
Pond size (m^2)	8	2.302	5	36
Credit access (₦)	45,000	38,240	50,000	140,000
Extension visits (no of times)	5.26	0.547	0	8
Non farm income (₦)	64.012	10.712	45,000	154,000
Labour (Manday)	74.21	67.51	58	102
Catfish prod. tech. (No)	7.25	5.025	3	7

Source: Field Data, 2010

Table 2: Tobit model estimates of factors affecting Adoption and use of catfish production technologies Anambra state.

Variable	Parameters	Coefficient	standard error	t-ratio
Intercept	bo	0.409	0.127	3.209***
Age of the farmer (Yrs)	X_1	0.080	0.015	5.388***
Level of education (Yrs)	X_2	0.691	0.091	7.575***
Farming experience (Yrs)	X_3	0.008	0.002	3.904***
Extension visit (N0)	X_4	0.259	0.082	3.157***
Family size (N0)	X_5	- 0.146	0.030	4.892**
Gender	X_6	-0.251	0.092	-2.734**
Fertilizer use	X_7	-0.0571	0.021	2.707
Member of organisation	X_8	-0.024	0.028	0.609
Credit access (₦)	X_9	0.253	0.068	2.724**
Pond size (M^2)	X_{10}	0.0013	0.0005	2.606
Non farm income (₦)	X_{11}	0.0039	0.00006	6.039***
Labour (Manday)	X_{12}	-0.152	0.060	-2.518**
Tenancy status	X_{13}	0.006	0.028	6.539
X^2		0.01240		
Log likelihood		-720.324		
Total sample		120		

Source: Field data, 2010

*** = significant at 1% probability level

** = significant at 5% probability level

Table 3: Cost and Return Analysis of Catfish Production

Item	Cost/Returns (₦)	% Cost
Variable cost		
Transportation	750	0.38
Water	24,000	12.2
Hired labour	40,000	20.3
Fingerling	40,100	20.4
Feed	90,000	46.7
Total variable cost	194,850	
Fixed Cost		
Implement (Scooping net and harvesting net)	2,200	1.1
Total Cost (TVC + TFC)	197,050	100
Fish return	609,000	
Net farm income	411,950	
Return per Naira	2.09	
BCR (Benefit cost ratio)	3.09	

Source: Field survey, 2010

Table 4: Constraints to catfish production

Variable	Frequency	Percentage
Poor fish seed	45	75
Poor access to credit	42	70
High cost of feed	52	86
Water pollution	42	70
Marketability	15	30
Drug and medication	12	20

* multiple responses

Source: Field survey, 2010

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