Socioeconomic Determinants to the Output of Catfish Farmers in Ayamelum Local Government Area of Anambra State, Nigeria.

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Abstract
Socio-economic determinant to the output of catfish farmers in Ayamelum Local Government Area of Anambra state, Nigeria was studied. The objectives of the study are to describe the socioeconomic characteristics of the catfish farmers, analyze the effect of the farmers' socioeconomic characteristics on their outputs, determine the profitability of catfish production and to identify the constraints to catfish production in the study area. Sixty (60) respondents were randomly selected using multi- stage random sampling technique. A structured questionnaire and oral interview were used to elicit information from the respondents for addressing the objectives of the study. Percentage responses, multiple regression analysis, gross margin and profit analysis were used to address the objectives of the study. The result of the socioeconomic characteristics shows that majority of the catfish farmers were male, youthful and literate. The socioeconomic determinants to catfish farmers' output were educational level, membership of cooperative and farming experience. Catfish production was profitable in the study area with gross margin of ₦323,600 and profit of ₦155,100. However, the major constraints to catfish production in the study area were poor access to credit, high cost of feed and cannibalism. The need to enhance farmers' access to improved catfish fingerlings, adult education and credit from microfinance and commercial banks were recommended

Keyword; *Socioeconomic, Determinants, Output, Catfish, Farmer*

Introduction

The important of fish for adequate health and body developments of man are well documented (Eyo, 2007, Ogundari, *et al* 2006; Ume, *et al*; 2013).Fish contains n -3 (DHA; EPA) and n – 6(AA) unsaturated fatty acid as major antidote for people with high blood pressure, diabetic and obesity patients, (Anyanwu, e*t al* 2009) It is rich in vitamins A, D and E for curing sight problem, rickets disease and sterility respectively(FAO, 2011). Furthermore, fish contains minerals(iodine and selenium)which is used for healing goiter disease (Nwosu, *et al*2003; Oladejo, 2010). Apart from nutritious essence, fishing and fisheries-related activities according to Food Agriculture Organization (FAO), (2012)are important sources of employment and job opportunities. For instance, Nigeria is ranked first in Africa with two million people employed in fisheries and aquaculture followed by Morocco with almost 1.4 million people and Uganda with 1 million (CBN, 2013). However, in terms of fishers, Morocco is ranked first with 870,000 fishers, followed by Nigeria with 790,000 and Uganda; 470,000 and Mali; 350,000 fishers in that order (FAO, 2007). Nigeria has the most processors with over one million people employed in fisheries processing, followed by Morocco with slightly over 500,000, then Uganda 420,000 and Ghana 385,000 followed suite (FGN, 2011).The other important of fish are source of foreign exchange, tool for rural development, source of raw materials to drug manufacturers and use as livestock feeds (Ogundari, *et al* 2006). In Africa, over 2.7 million metric tons (Mt) of fishes consumed come from the wild capture fisheries, of which inland fisheries is predominant (FAO, 2012). In this continent in 2012, Uganda had largest inland fisheries producer catch (408,000 mt) (Emekario, *et al*.2015), followed by Nigeria (312,000 mt) (Eyo, 2007).Others were Egypt; 240,000 mt and Democratic Republic of the Congo; 214,000 mt (Karrem and Williams, 2007). However, with growth in population and expansions of other industrial uses of fish and fishery products, the fisheries from marine and fresh water capture fisheries cannot be able to meet the growing world demand (Adewumi and Olaleye, 2012) .In effect, studies had advocated on the need for aquaculture development as panacea to shortage of fish and fish products that are witnessed globally, Nigeria inclusive (FAO, 2007, Olaejo,2010).

Aquaculture refers to cultivation of aquatic organisms under controlled or semi-controlled conditions for economic and social benefits (Adewusi and Olaleeye, (2011). Literature revealed that aquaculture has the potentials of satisfying mankind quest for fish and fish products. For instance, Amao,et al.(2006) reported that aquaculture is capable of supplying the world with about 53 million tons of fish each year and over 7 percent of the animal protein for man consumption. In Nigeria, fisheries sector contributed about1.31% of total GDP in 2012 and this rose to 1.38% at the end

of the third quarter of 2013. Catfish farming is a subset of aquaculture with Clarias. gariepinus and . Heterobranchus bidorsalisis are very popular catfish reared by farmers in Nigeria (Nwosu, et al; 2003; Ume and Ochiaka; 2015) The reasons for such preference included; grows fast and thrives on assorted agricultural by-products, very resilient and can stand severe temperature, easy to produce in confinement with high yearly production, good feed converter and easily marketable at high prices (Anyanwu, *et al;*2008, Emokaro, *et al*.2010).

In many part of Nigeria, Ayamelum Local Government Area inclusive are endowed with aquaculture practices through possession of the following attributes, including many rivers, streams, swamps, abundant rainfall, effective harvest and ability to store surface water runoff (Eyo, 2007; Olasunkanmi, 2012).In Nigeria and other developing countries, aquaculture development is limited by among other factors according to literatures high mortality, water scarcity, high cost of feed, poor marketability of fish and poor management practices, thus affecting the production and profitability (Kareem and William, 2011; FAO, 2011). However, with enormous programmes, policies and budgetary allocation to the sector by Nigeria government, the aforementioned obstacles to the development of aquaculture in Nigeria have significantly curtailed (FGN, 2011; CBN, 2013). Yet, the potentials of aquaculture development have not been fully tapped in the country. For instance, Nigeria is still lagging behind Egypt as highest producer of aquaculture in Africa, poorly contributing to the country's Gross Domestic Product (GDP) and impoverished living standard of catfish farmers' households (Ezike and Adedeiji, 2010, FAO, 2011).

Therefore, there is need to examine the socioeconomic factors dimensions which have scholastically proven to affect production and productivity of enterprises (Olagunju, *et al;* 2009).This could help in policy formulation and implementation of catfish project and interventions towards achieving food security.. It is based on this premise that this work was designed. The objectives of this study are to describe the socioeconomic characteristics of the catfish farmers, analyze the effects of the farmers' socioeconomic factors on their outputs, determine the profitability of catfish production and to identify the constraints to catfish production in the study area.

Materials and Methods

The study was conducted in Ayamelum Local Government Area of Anambra State. Ayamelum L.G.A is made up of 6 towns namely; Anaku, Omo, Ifite Ogwari, Igbankwu, Umumbo, and Omasi. It has a land mass of 428 square kilometers (Km^2) and population of 22,860 people (NPC, 2006). Ayamelum L.G.A lies between latitude 5˚36′ and 6˚18′ North of equator and longitude 7˚24′ and 8˚27′ East of Greenwich meridian. It shared common boundaries to the North with Uzo-Uwani Local Government Area in Enugu State, in the South by Anambra East, in the West and South by Ezeagu Local Government Area in Enugu State and Igbola Local Government Area of Benue State respectively. The Local Government Area has favourable warm climate for the growth of cash and food crops and rearing of animals.

Multistage random sampling was used to select towns, villages and respondents. Firstly, four (4) towns were randomly selected out of five (6). In the second stage, five villages out of eight (8)villages were randomly selected from each of the towns. This brings to a total of twenty (20) villages. Thirdly, three (3) farmers were randomly selected from each villages. This gave a total ofsixty catfish farmers for detailed study.

Well structured questionnaire was administered to each of the sixty farmers to collect information on input and output quantities used and their unit prices, farmers' socioeconomic characteristics and other essential information as related to the study. Secondary data were obtained from journals, internets, seminar and other periodicals. Percentage response was used to determine the catfish farmers' socioeconomic characteristics and their constraints to catfish production. Double Log regression method was used to analyze the effect of farmers' socioeconomic characteristics on their output. **Model Specification**

Multiple Regression model is implicitly stated as:

$$Y = f(X_1\ X_2\ X_3\ X_4\ X_5\ X_6 + e) \text{ ----------(1)}$$

Where; Y = quantity of catfish produced (kg),

X_1 = gender (dummy);

X_2 = age (yrs),

X_3 = educational level (yrs),

X_4 = pond size (m^2),

X_5 = membership of cooperative (dummy)

X_6 = extension contact (Number),

x_7 = farming experience (years)

e = error term.

Four functional forms (linear, double log, semi double log and exponential functions) of production function were tried and explicitly represented as

Linear function:

$Y = b_0 + b_1 x_1 b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + ei$ …… (2)

Double log function (Cobb Douglas):

$\ln(y) = \ln b_0 + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + b_5 \ln x_5 + ei$ …… (3)

Semi double log function:

$Y = \ln b_0 + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + b_5 \ln x_5 + ei$ …… (4)

Exponential function:

$\ln Y = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + ei$ …… (5)

The choice of the best functional form was based on the magnitude of the R^2 value, the high number of significance, size and signs of the regression coefficients as they conform to *a priori expectation*.

The profitability ratio and gross margin analysis models were specified as follows: The profitability ratio and gross margin analysis models were specified as follows:

Benefit Cost Ratio = TR/TC---------- (6)

Gross Ration = DFC/TR---------- (7)

Expenses Structure Ration (ESR) = FC/VC---------- (8)

Gross Margin = TR – TVC---------- (9)

Profit (π) = GM – TFC. ---------- (10)

where: GM = gross margin, TR = total revenue, TVC = total variable cost, TFC = total fixed cost, (Ezike, and Adedeji, 2010).

Results and Discussion

Table 1 showed that 83.3% of the fish farmers were male, while 16.7%, female.

Table 1: Socioeconomics Characteristics of Fish Farmers

Variables	Frequency	(%)
Gender		
Male	51	83.3
Female	9	16.7
Age (yrs)		
Less than 21	-	
21-30	5	8.3
31-40	10	16.7
41-51	15	25
51 and above	30	50
Level of Education		
No formal Education	5	8.3
Primary Education	25	41.7
Secondary Education	20	33.3
Tertiary Education	10	16.7
Pond size		
$5m^2$	30	50
5m x 7m	15	25
10 x 10m	8	13.3
10 x 15m	7	11.7
Membership of Cooperative		
Non-member	15	25
Member	45	75
Extension Contact		
Yes	20	33.3
No	40	66.7
Farming experience (years)		
Less than 10	20	33.3
11-21	30	50%
Above 22	10	16.7

Source: Field Survey, 2017

The implication is that males dominated catfish production in the study area. This could be because of the fact that catfish production is capital intensive and mostly men have the financial muscle to execute the project(Ume and Okoronkwo, 2013). In addition, most of the farmers were aged (75%). The domination of the aged in the enterprise production could be perhaps, due to catfish production is less labour intensive compare to cropping investment (Ezike, and Adedeji, 2010; Ume, *et al* 2016). As well, 91.7% of the sampled farmers were educated. Educated farmers as asserted by Eyo, (2007) are often receptive to innovation adoption and resource utilization. Furthermore, 50% of the catfish farmers operated on a pond size of $5m^2$, indicating that the sampled farmers operated in small scale. Ochiaka and Ume,(2015) opined that farm size played an important role in farm success because it reflects the availability of capital, access to credit and even good management ability. Also, 75% of the respondents did not belong to cooperative organization, while only 30% were members. This implies that farmers who belong to organization through interaction could acquire information that could help them to improve their productivity (Ezike, and Adedeji, 2010). More so, 66.7% of the catfish farmers interviewed had no access to extension services, while 30% had access. Extension services help in disseminating innovations and inculcating technical skills into farmers in order to enhance their productivity (Asiabaka, 2003). Moreover, most (50%) of the respondents had farming experience of 11-21 years, while the lease, 16 .7%; above 22 years. This implies that most of the respondents had been in catfish production for a long period of time. Farmers with long period of farming experience as reported by Oladiejo, (2010) is capable of setting realistic goals for the success of their businesses.

The result of multiple regression determing the effect of farmers' socioeconomic characteristics on their output is shown in Table 2.

Table 2: Multiple Regression Results

Variable	Linear	+Double Log	Expon.	Semi Log
Constant	0.014	1.001	4.047	0.791
	(4.016)***	(7.021)***	(6.913)***	(3.071)***
Age	1.007	0.777	1.766	0.001
	(0.2007)	(0.009)	(0.988)	(0.939)
Educational Level	0.327	1.404	1.003	3.082
	(2.75)**	(4.707)***	(0.437)	(2.44)**
Farming experience	1.051	1.710	2.001	0.725
	(0.331)	(2.005)**	(0.217)	(0.231)
Member of Cooperative	1.244	2.041	4.001	0.289
	(2.301)**	(2.491)**	(0.473)	(0.2001)
Pond Size	0.792	0.299	0.217	1.275
	(0.549)	(-2.331)*	(2.881)**	(0.550)
R^2	0.376	0.686	0.417	0.551
F ratio	0.524	0.621	0.337	0.451

Source: Field Survey, 2017

Double - log functional form was chosen as lead equation because it had highest R^2 of 0.886 and high number of significant variables. The R^2, 0.686 indicated that 68.6% variation in the output of catfish farmers were explained by the independent variables included in the model, while, the remaining 31.4% were due to error term. The coefficient of educational attainment was positive and significant at 1% probability level. Education helps in facilitating farmers' use of written information sources and in increasing their knowledge and comprehension of new farm practices to improve the production and productivity (Olasunkanmi, (2012).

In addition, the coefficient of farming experience was positive and significant at 5% alpha level This finding is synonymous with Amao, et al (2006), who opined that the number of years a farmer had spent in the fishery business may give an indication of the practical knowledge he/she had acquired on how he/she can overcome certain inherent fishery farm problems. The aftermath of wealth of farming experience as noted by Onyenweaku, et al (2010) is to enhance the farmer's capacity of maximizing the output and profit at minimum cost.

More so, the coefficient of membership of organization was positive and significant at 5% probability level. This concurred with the findings of Ume, et al (2016), who noted that farmers' group plays a crucial role in empowering farmers with farming techniques, knowledge and management skills hence reduces the transaction costs and benefit from collective actions. Furthermore, against apriori expectations, the coefficient of pond size was negative and significant at 10% alpha level. This implies that the size of pond may not be the only major criterion in catfish output optimization for profit maximization to made. However, other factors such as prudent fish management and the quality of fish seed stocked could also effect the output of the farmers (FAO, 2012)

Finally, the coefficient of extension contact was negative and significant at 10% alpha level. The sign identity of the variable could be related to the bottlenecks involved in the dissemination of innovations to the farmers by the extension agents (Ume, et al (2016). Extension services as opined by Ezike and Adedeji, (2010) range from the effective transfer of technology to the building up of strong rural organisations which can exert influence over future research and policy agendas, and also take and enforce collective decisions over natural resource management.

Table 3 shows that the average total variable cost for rearing 1,000 fish of about 950kg for 8-12 months was ₦247,400, while the total fixed cost was ₦119,500.

Table 3: Gross margin and profit analysis of farmers

TVC (₦) (Total variable cost)	TFC (₦) (Total fixed cost)	TC (₦) (Total cost)	TR (₦) (Total revenue)	GM (Gross margin)	Profit	Benefit cost ratio
267,400	119,500	386,900	540,000	247,400	153,100	2.01

Source: Field Survey, 2017.

The total cost amounted to ₦386,900. The average total revenue earned from the sales at N600 per kg of 950kg of *Heterobranchus bidoscarus* (catfish) was ₦570,000. The gross margin as shown in Table 3 was ₦322,600 and profit of ₦153,100. Profitability estimate result showed that benefit cost ratio (BCR) was 1:40 and as rule of thumb, project with BCR greater than one (>1), indicates profit. Expense structure ratio (RSR) was 0.48, which implied that 48% of the total cost of production was made up of fixed cost component. The lower in the fixed cost will increase the variable input used which will in turn increase total revenue. The Gross Ratio (GR) was 0.2123, which implies that from every ₦1.00 returns to the enterprises, ₦21.23k is spent.

The major constraint to catfish production as shown in Table 4 was poor access to credit (90%).

Table 4: Constraints to Catfish Production

Item	Frequency	%
Poor access to credit	54	90
High cost of feeds	44	73.3
Poor breed and scarcity of fish fingerlings	8	13.3
Cannibalism	36	60
High cost of pond construction	2	3.3
Total	**60**	**100**

Source: Field Survey, 2017

Farmers' poor access to credit could be linked to ignorance of existence of loan facility to location of most lending agencies in urban area (Ume, *et al*.2015). This was followed by high cost of fish feed (73.3%). Anyanwu, et al (2009) reported that the effect of high cost of feed is that farmers stop feeding their fish and resumes only when they can afford the cost or use poultry mash which is not only nutritious but causes water pollution to the detriments of fish productivity. As well, 60% of the respondents complained about cannibalism . The cannibalism could be as result of development of shooters among catfish which prey on young ones, resulting in high losses and poor fish yield (Eyo, 2007)

Conclusion and Recommendation

The major conclusions deduced from the study were; most of catfish farmers were aged educated and had reasonable years of farming experiences. In addition, education, membership of organization and farming experience were the major determinants to catfish farmers' output. As well, catfish production is a profitable venture with high Net farm income. Finally, major constraints to catfish production in the study were poor access to credit, high cost of industrial feed and cannibalism.

Based on the results, the following recommendations were proffered;

(1)There is need to improved farmers' access to credit in order to procure the necessary inputs needed to enhance their productivity through commercial and microfinance banks.

(ii)There is need to enance farmers access to education through universal basic, adult and nomadic educations, workshops and seminars. Furthermore, policies aimed at improving farmer's access to education through aggressive awareness campaign, mass mobilization, agricultural shows and competitions could be enacted in order to improving their productivity.

(iii) More so, the extension agents should be motivated in disseminating catfish innovations to the famers through provision of adequate incentives such as payment their salaries and provision of all the necessary logistics.

(iv) On the problem of high cost of feed, farmers were encouraged to learn the skill of commercial feed formulation in order to maximize their profits.

(v)Policies aimed at encouraging farmers to form cooperative/association should be advocated. Cooperation helps in capacity building, acquisition of credit, training and provision of production inputs to the members at reduced cost.

(vi)There is need to encourage experienced and inexperienced farmers to remain in business through provision of inputs by the concerned government agencies at subsidized prices

(vi) On the problem of fish cannibalism, farmers are advised to sort the fingerlings at the appropriate time.

(vii)The catfish seed industry also needs to be standardized and regulated. Government needs to establish an agency to certify the quality of catfish seeds. This will go a long way in helping newly established hatcheries to secure market for their products as potential customers will have little fear in certified fingerlings.

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