Determinants of Catfish Production in Akwa Ibom State, Nigeria

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Abstract: The study ascertained the determinants of catfish production in Akwa Ibom State, Nigeria having ascertained from literature that greater improvement in catfish production can be achieved with a proper analysis that will lead to knowledge of the profitability of catfish production in the country. Ascertaining the factors influencing catfish production in Akwa Ibom State of Nigeria was done based on this line of thinking. Data obtained from one hundred and twenty catfish farmers in Akwa Ibom State using multi-stage sampling procedure were analysed using descriptive statistics, budgeting technique and multiple regression. Findings reveal that 79.17% of the respondents were males, with an average age of 41 years; and 80% of them having formal education. The average monthly income of the respondents was ₦32, 500.50 and their average year of fishing experience was four years. Results show that catfish production was profitable in the study area yielding a net income of ₦ 18,539,760.00. The costs of fingerlings, pond construction, feed/chemicals, as well as fishing experience and amount spent on salary/labour were the significant factors influencing catfish production in the study area. It is recommended, among others, that catfish farmers in the study area be encouraged to form co-operatives to enhance their ability to access necessary inputs such as feed/chemicals at a subsidized rate. This will lead to an increase in the total revenue earned from catfish production.

Keywords: *Clarias gariepinus*, farming, profitability, Akwa Ibom, Nigeria.

INTRODUCTION

Fish is one of the most diverse groups of animals known to man with more than 20, 500 species in existence [1]. It plays a vital role in feeding the world's population and has been contributing significantly to the dietary intake of billions of the populace [2]. Fish is the most important animal protein food available in the Tropics [3]. In Nigeria, fish and fish products, according to [4], constitute more than 60% of the total intake of adults, especially in the rural areas. The Food and Agriculture Organization (FAO) of the United Nations noted that fish is readily digestible and utilized by the human body which makes it suitable and complementary for regions of the world with high carbohydrate diet like Africa [5].

Fish is a good source of sulphur and essential amino acids such as lysine, leucine, valine and arginine [6]. It is therefore suitable for supplementing diets of high carbohydrates contents. Apart from its high availability and relatively cheap cost, there is hardly any religious taboo, and any known limitations affecting the consumption of fish unlike pork and beef meat [1]. Nevertheless, the world's natural stocks of fish - though renewable - have finite production limits which cannot be exceeded under the best management regimes [7]. The maximum sustainable fishing limit for most lakes, rivers and oceans in the world has been exceeded [8]. Fish production will therefore depend on aquaculture to bridge the gap of fish supply [9].

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Aquaculture was introduced to Nigeria in the early 1950s and fish production through aquaculture has risen steadily from a few hundred kilograms to over 45,000 metric tonnes in 2004 [5]. Fish farming, as a sub-set of aquaculture, focuses on rearing of fish under controlled or semi-controlled conditions for economic and social benefits [10]. The story of aquaculture in Nigeria is essentially the story of catfish culture [11]. The favoured catfish species include *Clarias gariepinus*, *Heterobranchus bidorsalis* and *Heteroclarias claridae.* The major reasons fish farmers in Nigeria focus on catfish are: they adapt well to culture environment; they can be retailed live; and they attract premium price [12]. Catfish are suitable for stocking in ponds and they tolerate low dissolved oxygen better than other common species in the country. [13] reported that catfish has a fast growth rate; are able to survive both natural and artificial food environments; and can be cross-bred to enhance certain favourable traits. Again, catfish production requires less space, time, money and energy and has a high feed conservation rate [14]. Catfish is highly nourishing and contains lysine as well as vitamin A that are necessary for healthy growth [11]. Catfish allows for higher protein nutrition because it has a high biological value in terms of high protein retention in the body, higher protein assimilation as compared to other protein sources, low cholesterol content and is considered one of the safest sources of animal protein [15]. Catfish production, also, serves as a source of income in Nigeria; reduces the rate of unemployment in the country; and increases the country's Gross Domestic Product. However, the current fish production in Nigeria has not met up with demand for fish and fish

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products [16]. Out of the 35 grams of animal protein per day per person recommended by FAO, less than 7 grams is averagely consumed per person in Nigeria. This is an indication that Nigeria has not been able to meet the per capita animal protein requirement of her people.

Nigeria's domestic fish output of 0.62 million metric tonnes of fish falls short of the demand of 2.66 million metric tonnes [17]. This large deficit between demand and supply of fish in the country is augmented by massive importation of frozen fish, making Nigeria one of the largest impoters of fish in the developing world [18]. However, Nigeria can substitute fish importation with domestic fish production and in the process ease the balance of payment deficits [19, 20]. Small-scale catfish production can lead to an increase in the supply of catfish in Nigeria which will directly increase protein supply to an average Nigerian family [11]. In fact, small-scale and home-use catfish farming are significantly more sustainable than intensive production because the cost of inputs is minimized/substantially reduced in small-scale practices [21]. Greater improvement in catfish production in Nigeria can be achieved with a proper analysis that will lead to knowledge of the profitability of catfish production [22]. This study therefore aimed at undertaking such analysis by ascertaining the determinants of catfish production in Akwa Ibom State. The major theory that underpinned this research is the theory of production. The production theory involves the economic process of converting inputs into outputs, and is fundamentally microeconomic in character [23]. It deals with physically identifiable inputs and outputs. The inputs or resources used in the production process are called factors of production. The specific objectives of the study were to:

i) examine the socio-economic characteristics of catfish farmers in Akwa Ibom State,

ii) determine the profitability of catfish production in the State, and

iii) ascertain the factors influencing catfish production in the State.

METHODOLOGY

The study was conducted in Akwa Ibom State, Nigeria. The State lies in latitude 4°31" and 5°31" North and longitude 7°35" and 8°35" East; occupies a total land area of 7, 245, 935km^2 with a population density of 587 persons per square meter and has an estimated population of 3, 920,208 [24]. Akwa Ibom State is characterized by two major seasons-the dry season and the rainy season. A multi-stage sampling procedure was used to select the sample for the study. The first stage was the random selection of four zones out of the six Agricultural Development Project (ADP) zones in Akwa Ibom State. The second stage involved the random selection of three villages in each of the selected ADP zone. The third, and last, stage was the purposive selection of ten catfish farmers from each of the ten selected villages thereby resulting in a total sample size of 120. Purposive sampling employed in the last stage of the multi-stage sampling procedure was to ensure that only catfish farmers duly registered with Akwa Ibom State Agricultural Development Project (AKADEP) are used for the study.

Data for the study were obtained through the use of a validated questionnaire from November, 2010 to April, 2011 - a period of active fishing and fish marketing activities among the respondents. Analysis of the data was done using descriptive statistics such as frequencies, percentages, means and ranks; the budgeting techniques; and multiple regression. The budgeting technique employed to ascertain the profitability of catfish farming was the net farm income. The difference between the Gross Revenue (GR) and the Total Cost (TC) gives the Net Revenue (NR). Net farm income is expressed as: NFI = GR - TC

Where:

NFI = Net farm income

TC = (TVC+TFC) = Px.X

GR = Gross Revenue = Py.Y

Py = Unit price of output

Px = Unit price of input

X = Quantity/Quality of input

TC = Total Cost (₦)

TFC = Total Fixed Cost (₦)

TVC = Total Variable Cost (₦)

In order to ascertain the factors influencing catfish production in Akwa Ibom State, multiple regression analysis was employed. The regression model is expressed as follows:

Y = Total revenue (in Naira)

X_1 = Age (in years)

X_2 = Educational status (years of formal schooling)

X_3 = Access to extension services (Yes = 1; 0 if otherwise)

X_4 = Cost of pond construction (in Naira)

X_5 = Cost of fingerlings (in Naira)

X_6 = Fishing experience (in years)

X_7 = Cost of feed/chemicals (in Naira)

X_8 = Amount spent on salary/labour (in Naira)

RESULTS AND DISCUSSION

Socio-Economic Characteristics of Catfish Farmers in Akwa Ibom State

Table **1** shows the socio-economic characteristics of catfish farmers in Akwa Ibom State. About 79.17% of the catfish farmers were males with the mean age of 41years. The result agrees with [25] which reported that fish farming in Akwa Ibom State is dominated by males/youths. Again, [26] reported that fish production in Akwa Ibom State is dominated by males. Majority of the respondents (85.83%) were married while 14.17% were single. Marriage is a highly cherished value among people in Akwa Ibom State [27]. About 37.5% of the respondents had secondary education, 25.0% had

Table 1: Socio Economic Characteristics of Catfish Farmers in Akwa Ibom State (n=120)

Variable	Categories	Frequency	Percentage
Sex	Male	95	79.17
	Female	25	20.83
Age	21 – 30 years	14	11.67
	31 – 40 years	43	35.83
	41 – 50 years	44	36.67
	51 – 60 years	18	15.00
	61 – 70 years	1	0.83
Marital status	Single	17	14.17
	Married	103	85.83
Educational status	No formal education	24	20.00
	Primary education	30	25.00
	Secondary education	45	37.50
	Tertiary education	21	17.50
Monthly income (in Naira)	1 – 50, 000	107	89.17
	50, 001 – 100, 000	9	7.50
	100, 001 – 150, 000	3	2.50
	150, 001 – 200, 000	1	0.83
Household size	1 – 3 person(s)	28	23.33
	4 – 6 persons	54	45.00
	7 – 9 persons	35	29.17
	10 – 12 persons	3	2.50
Fishing experience	1 – 3 year(s)	67	55.83
	4 – 6 years	38	31.67
	7 – 9 years	8	6.67
	10 – 12 years	7	5.83
Management system	Earthern pond	30	25.00
	Concrete pond	77	64.17
	Both earthern and concrete ponds	13	10.83
Access to extension services	Yes	102	85.00
	No	18	15.00

Source: Field Survey, 2011.

primary education, 20.0% has no formal education and 17.5% had tertiary education. The findings reveal that a very high percentage (80.0%) of the respondents were functionally literate. The average monthly income of the respondents was ₦32,500.50 and their average household size comprised of five persons. This relatively low household size of the respondents could be attributed to the high level of education among the respondents which have constrained them to have only the number of children they can cater for. The average years of fishing experience among the respondents was four years. This could be due to the fact that commercial catfish production is relatively a new idea in the study area.

About 64.17% of the respondents used concrete ponds as their management system while 10.83% used both earthern ponds and concrete ponds as their management system [25] reported that majority of fish farmers in Akwa Ibom State use concrete ponds for fish production. The findings agree with this. Even though all the respondents were AKADEP-registered catfish farmers, about 15% of them stated that they had no access to extension services relevant to their catfish

Table 2: Costs and Returns of Catfish Production in Akwa Ibom State

Item	Total cost for the production period (₦)	Average cost (₦)	Percentage
A. Fixed cost			
Land (ha)*	2, 907, 000. 00	24, 225.00	11.75
Water	1, 054, 050.00	8, 783.75	4.26
Concrete pond construction	6, 924, 000.00	57, 700. 00	27.99
Earthern pond construction	4, 121, 300.00	34, 344.16	16.66
Insurance/tax	1, 265, 650.00	10, 547.08	5.12
Facilities	1, 719, 000.00	14, 325.00	6.95
Wheel barrow	1, 857, 900.00	15, 482.50	7.51
Buildings/structures	4, 892, 000.00	40, 766.67	19.77
Total Fixed Cost (TFC)	24, 740, 900.00	206, 174.17	100
B. Variable Cost			
Labour (mandays)	205, 900.00	1, 715.83	1.57
Transportation	665, 900.00	5, 549.17	5.08
Feed (kg)	3, 224, 100.00	26, 867.50	24.60
Fingerlings (kg)	2, 098, 200.00	17, 485.00	16.01
Cost of water	708, 200.00	5, 901.67	5.40
Management/staff salaries	3, 291, 500.00	27, 429.17	25.12
Storage	1, 126, 000.00	9, 383.33	8.59
Medication	1, 254, 300.00	10, 452.50	9.57
Maintenance	530, 240.00	4, 418.67	4.05
Total Variable Cost (TVC)	13, 104, 340.00	109, 202.83	100
Total Cost = TFC + TVC	37, 845, 240.00	315, 377.00	
C. Total Revenue (TR)			
Sales of catfish	56, 385, 000.00	469, 875.00	
D. Net farm income (NFI)			
NFI = TR – (TFC + TVC)	18, 539, 760.00	154, 498.00	

Note: * = Cost of land is not depreciated as it is leased for only one production period; Naira (₦) is the Nigerian currency and 1.00 US Dollar is equal to 174.641 Nigerian Naira as at November, 2014.

production needs. This could be due to the fact that most of these AKADEP-registered catfish farmers have just recently been engaged in catfish production on a commercial basis, and their expectations of extension messages from AKADEP specifically targeted at commercial catfish production are yet to be met.

Profitability of Catfish Production in Akwa Ibom State

The profitability of catfish production in Akwa Ibom State was ascertained using costs and returns analysis which is shown in Table **2**. The Table reveals that the fixed cost of catfish production constitutes 65.37% of the total cost of production while the variable cost constitutes 34.63% of the total cost of production. The major fixed costs incurred by the respondents during the period of study were the costs of concrete pond construction (27.99%), buildings/structures (19.77%), earthern pond construction (16.66%), and land (11.75%) while the major variable costs incurred were the costs of management/staff salaries (25.12%) and feeds (24.60%). The total quantity of catfish sold by the respondents in the production period (2010/2011) was 62,650 and the average price per catfish at market price in 2011 was ₦900.00. Table **2** also indicates that the total cost of catfish production during the production period was ₦ 37,845, 240.00 while the total revenue realized form sales of catfish during this period was ₦56,385,00 thereby resulting in a net income of ₦18,539,760.00. The costs and returns analysis showed that catfish production in Akwa Ibom State is profitable [12] corroborated this result by reporting that catfish production is profitable in Akwa Ibom State.

Factors Influencing Catfish Production in Akwa Ibom State

In determining the factors influencing catfish production in Akwa Ibom State, a multiple regression model was specified. Total revenue was regressed on the socio-economic characteristics of the catfish farmers and other independent variables such as costs of pond construction, fingerlings, feed/chemicals and mount spent on salary/labour. The multiple regression analysis result is presented in Table **3**. From the result, the multiple regression coefficients for cost of fingerlings (X_5), fishing experience (X_6) and amount spent on salary/labour (X_8) were positive and significant at 1%, 5% and 5% levels of significance respectively; the regression coefficients for cost of pond construction (X_4) and cost of feed/chemicals (X_2) were negative and significant at 10% level each, implying that these are the important factors influencing catfish production in the study area. The positive regression coefficients for cost of fingerlings, fishing experience and amount spent on salary/labour indicate that an increase in any of these variables would increase the level of total revenue of the respondents *Ceteris Paribus*. An increase in cost of fingerlings depicts increase in the stocking density of fingerlings in ponds by the respondents hence the reason the variable is directly related to the level of total revenue the respondents earned from catfish production in the study area. The negative regression coefficients for cost of pond construction and cost of feed/chemicals indicate that an increase in the costs of pond construction and feed/chemicals would decrease the

Table 3: Multiple Regression Result of Factors Influencing Catfish Production in Akwa Ibom State

Variable	Coefficients	Standard error	t	Decision
Age (X_1)	1939.83	3569.96	0.543	Not significant
Educational status (X_2)	190.20	1261.32	0.151	Not significant
Access to extension services (X_3)	-73.66	672.25	-0.110	Not significant
Cost of pond construction (X_4)	-298.45	165.87	-1.799*	Significant
Cost of fingerlings (X_5)	56.32	5.09	11.069***	Significant
Fishing experience (X_6)	1507.95	586.76	-2.570**	Significant
Cost of feed/chemicals (x_7)	-5804.81	3321.15	-1.748*	Significant
Amount spent on salary/labour (X_8)	5516.14	2726.35	2.023**	Significant
Constant	5400.79	7656.56	0.705	Not significant

Note: ***, ** and * = Significance at 1%, 5% and 10% levels respectively.
Source: SPSS Version 17.0 Computer Printout.

total revenue the respondents earn from catfish production in the study area.

On the other hand, age (X_1), educational status (X_2) and access to extension services (X_3) were not statistically significant even at 10% level, implying that they are not important determinants of catfish production in Akwa Ibom State.

CONCLUSION AND RECOMMENDATIONS

This study has shown that catfish production is profitable in the study area. Certain factors such as costs of pond construction, fingerlings and feed/chemicals; fishing experience; and amount spent on salary/labour combine in varying proportions and magnitude to influence the profitability of catfish production in Akwa Ibom State. Based on the findings of the study, the following recommendations are hereby made:

i. Catfish farmers should be encouraged by the State Government through its extension delivery services, Non-Governmental Organizations and other development agencies to increase their stocking density since increased stocking density reflected in increased cost of fingerlings led to increase in the total revenue earned from catfish production.

ii. Catfish farmers in the study area should also be encouraged to form co-operative associations to enhance their ability to access feed/chemicals for their catfish production activities at a reduced cost since cost of feed/chemicals is inversely related to total revenue earned from catfish production in the study area. Formation of co-operatives can also enhance the ability of catfish farmers to access low interest loans/credit facilities to use and expand their catfish production activities in the study area.

iii. Effort should be made by the State Government to bring down the cost of pond construction by subsidizing the cost of building materials used for pond construction by catfish farmers in the State. This will lower the cost of pond construction thereby leading to increased total revenue of catfish production in the study area.

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