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ECONOMICS OF CAT FISH PRODUCTION IN OSUN STATE, NIGERIA

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Abstract

The economics of catfish production in Osun State was explored in this study. To choose 80 cat fish producers for the study, a multi-stage sampling technique was used. Descriptive statistics, farm budgeting approaches, and the OLS regression model were used to examine the data. The average age was 40 years, the average years of experience was 6, and the average household size was four people. Personal income (4.50) is the most important source of finance for the respondents' fish farming business, and money lenders (1.45) is the least important source of finance for the respondents' fish farming business. The results also revealed that disease and poor preventive measures (4.20) are the most significant constraints impacting catfish production, while a lack of fingerling supply (2.48) is the least significant constraint. Farmers incurred an average total cost of N 1,677,699.00, with a returning gross margin of N905,668 and net returns/profit of N 206,341. The findings also revealed that the farmers' benefit cost ratio (1.1229) is larger than one, and their gross ratio is 0.8905. The profitability of cat fish production was strongly influenced by pond building cost, startup capital, labor cost, feed cost, and the number of fishes, according to the ordinary least squares regression estimations. The findings show that the catfish farming business is profitable and viable. Cat fish production, on the other hand, would be more profitable if the expenditures of feeding, pond construction, and labor could be reduced. As a result, governments should encourage more people to engage in the industry by subsidizing the inputs available to producers. In addition, farm hygiene and security measures should be recommended to address the issue of ineffective preventive measures as well as the problem of predators and poaching.

Key words**:** *profitability, cat fish, production, Osun State*

INTRODUCTION

Fish is a valuable and inexpensive source of animal protein that has no religious or cultural stigma attached to it. Fish accounts for roughly 40% of an average Nigerian's animal protein consumption [5; 6; 7], which has helped to alleviate anemia, kwashiorkor, and other malnutrition-related illnesses [13]. It also acts as a source of raw materials for industry and is a key component of animal feed [4].

Fish production generates almost one-third of Nigeria's Gross Domestic Product (GDP) [2], in addition to its consumption and nutritional benefits. Furthermore, it provides full-time employment to a large number of people, as the nation's active population earns a living both directly and indirectly through fisheries-related activities [13]. Despite these enormous potentials and opportunities, domestic fish production, at 0.62 million metric tons, falls short of demand, which is 2.66 million metric tons [7].

To meet Nigeria's ever-increasing demand for fish, a supply of 2.04 million metric tons is necessary, which is currently met through importation [9]. Nigeria imports around ₦288 billion worth of fish every year [3]. These figures reveal a significant discrepancy between supply and demand. As a result, Nigerians should increase their fish production through aquaculture [1].

Currently, many fish farmers work on a small scale, with ponds ranging from homestead concrete ponds (25–40 meters) to small earthen ponds (0.02–0.2 hectares), and the most commonly cultured fish species are catfish, tilapia, and carp [13], though the majority of fish farmers in Nigeria focus on catfish. This can be attributed to a variety of characteristics of cat fish.

Cat fish, for example, adapt to their surroundings, can be easily retailed live at a premium market price, are appropriate for

stocking in ponds, handle low dissolved oxygen better, are a rich source of high-quality protein, and are widely accepted as food in Nigeria [12].

Despite these positive features, catfish production remains low. This has been attributed to the fact that the profitability of the catfish business has received little attention [15]. For the long-term survival of the business, a thorough and complete review of the profitability of catfish production is required. For example, if you want to start catfish farming, you must first understand the costs and prospective profits so that you can make the required preparations. Many people enter the catfish business with little economic knowledge of the industry's opportunities and limitations. As a result, due to a lack of sufficient knowledge about the profitability of the agriculture they are embarking into, some make a loss or go out of business after a few years of operation.

Catfish production entails not only the control of biological processes, but also the financial aspects of the business [10]. As a result, the absence of economic data on catfish production makes it difficult to promote its commercialization and persuade investors that it is a viable business [8; 14].

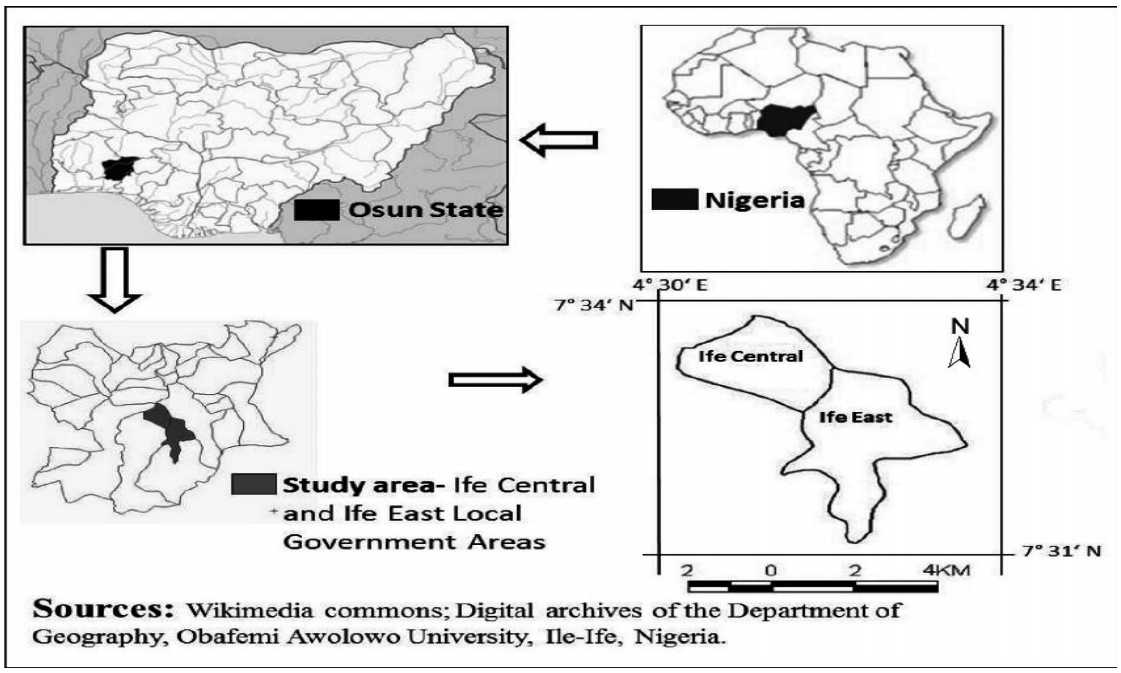
A realistic analysis that offers information on the profitability of catfish farming and the limits to its production, which is the focus of this study, would result in a significant increase in catfish output.

Consequently, the study investigated the economics of cat fish production in Osun State, Nigeria. Specifically, the study describes the socio-economic characteristics of cat fish producers; identifies the main sources of financing for cat fish production; identifies the constraints affecting cat fish production; analyzes the cost and returns to cat fish production; and determines the factors affecting profitability of cat fish production.

MATERIALS AND METHODS

The study area

The study was carried out in Osun state, particularly Ife zone which is an ancient Yoruba city in South-western Nigeria. Osun state lies within latitudes 6° and 9° N of the equator and approximately between longitudes 2° and 7° E of the Greenwich meridian (Map 1).



Map 1. Map of Nigeria, the position of Osun State and Ife Central and East Local Government areas
Source: Wikimedia commons: Digital archives of the Department of Geography, Obafemi Awolowo University, Ile-Ife, Nigeria.

Osun state is divided into six (6) zones: Iwo, Ikirun, Ilesha, Oshogbo, Ede, and Ile-Ife. Ile-Ife also known as Ife zone is made up of four local government area namely Ife central local government, Ife north local government, Ife south local government and Ife east local government (Map 1).

Ife is about 218 kilometers Northeast of Lagos with a population of 755,260 inhabitants. It is located between longitudes 4°, 30 East and 4°, 34 East and latitudes 7°28 North and 7°45 North of the Equator.

The area is recognized for two distinct seasons: the dry season and the rainy season.

The wet season runs from March to October, and the dry season runs from November to late March.

Ife's residents are largely food crop farmers who are well-known for their palm wine, palm oil, and other agricultural products. Aside from that, they engage in fish farming as a farming activity.

Data and sampling procedure

A multistage sampling procedure was used to select respondents for the study. The first stage involved purposive selection of Ile-Ife zone out of the six zones present in Osun State based on the predominance of cat fish production in the LGAs. The second stage also involved purposive selection of four local governments under Ile-Ife zone based on the predominance of cat fish production in the areas. The local government area selected includes: Ife Central, Ife North, Ife South and Ife East local government. The third stage involved selecting 20 respondents from each of the four local governments using simple random technique. In all, 80 cat fish farmers were selected for the study.

Analytical techniques

Descriptive statistics, farm budgetary technique and ordinary least squares regression model were used to analyze the data collected.

Descriptive statistics

Descriptive statistics such as mean and percentage were used to describe socio-economic characteristics of the cat fish farmers, identify the main sources of financing for cat fish production and the constraints affecting cat fish production

Farm budgetary technique

The cost and returns of catfish production were studied using a farm budgeting technique. Cost and revenue components are included in the farm budgeting technique. The revenue component represents the monetary value derived from total production sales. Mathematically, it is expressed as follows:

$$TR = P \times Q \quad \ldots(1)$$

where:

P is the price of output per unit, and Q is the quantity of output.

The total cost of production refers to the total expenditure or expenses incurred by the firm on a specific enterprise during a given period. These expenses include land rent, pond construction costs, fingerling costs, feed costs, and so on. Fixed costs, which do not vary with the production process, and variable costs, which do vary with the production process, were among the cost components. The straight-line method was used to calculate depreciation, which is the cost of fixed assets consumed over time. It is expressed as follows:

$$D_T = (P - L) \div N \quad \ldots(2)$$

where:

D_T =depreciation; P= cost of assets; L= salvage value; N= no of economic life.

Profitability model was expressed as follows:

$$TR = P \times Q \quad \ldots. \quad (3)$$

$$TC = TVC + TFC \quad \ldots \quad (4)$$

$$GM = TR - TVC \quad \ldots \quad (5)$$

$$\Pi = TR - TC \text{ or } GM - TFC \quad \text{(Depreciated value)} \quad \ldots \quad (6)$$

$$BCR = TR \div TC \quad \ldots \quad (7)$$

$$GR = TC \div TR \quad \ldots \quad (8)$$

where:

TR= Total Revenue or Total Income; Q= Quantity; P=Price; TC=Total Cost; TVC=Total Variable Cost; TFC= Total Fixed Cost; GM= Gross Margin; Π= Profit; BCR= Benefit Cost Ratio; GR= Gross Ratio.

Ordinary least squares regression (OLS) model

The parameters that affect the profitability of catfish production were determined using an OLS regression model. The OLS regression model was used because it models the exogenous relationship between socioeconomic circumstances and the profitability of the catfish business decisions made by the producers. The model was chosen based on the premise that the error term (ei) is normally distributed, and as a result, its estimator is normally distributed, linear, and unbiased.

The model for the regression was specified thus:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 \ldots\ldots \beta_8 X_8 \quad \ldots \quad (9)$$

= Profitability of cat fish producers(₦)

The explanatory variables are:
X_1 = Pond Construction (₦);
X_2 = Startup capital (₦);
X_3 = Cost of lime (₦);
X_4 = Fingerling's cost (₦);
X_5 = Labour cost (₦);
X_6 = Feed cost (₦);
X_7 = Number of fishes
X_8 = Years of experience.

RESULTS AND DISCUSSIONS

Socio-economics characteristics of the cat fish producers

Table 1 shows the socio-economic characteristics of catfish producers. The participants' average age is around 40 years old. This shows that the catfish industry employs young and active people. Males make up the majority of the respondents (72.2%). Males are more involved in catfish production than females, according to the findings. The majority of the respondents (74.4%) are married. The findings reveal that married people engage in the catfish business. Also, majority of the respondents had formal education (83%). The findings reveal that educated people work in the catfish industry.

The respondents' average family size is roughly four, with an average dependence size of two. This demonstrates that cat fish farmers do not have enough family members to help them with their business. Farmers' cooperatives are only represented by a small percentage of the respondents (23.8%). The findings suggest that the vast majority of respondents do not belong to a farmers' association, as only a small fraction do. The respondent has an average of 6 years of experience. This demonstrates that the catfish producer has a limited level of experience. This means that the majority of catfish farmers in the study area are amateurs.

Table 1. Socio-economic Characteristics of cat fish Farmers

Variables	Cat fish farmers
Male (%)	72.2
Age (years)	40.46(±7.93)
Married (%)	74.4
Household size (#)	3.78 (±1.35)
Formal education (%)	82.6
Years of farming experience	6.34(±2.82)
Dependency (#)	2.28(±1.84)
Cooperative (%)	69.2

Source: Field survey, 2020.

Main sources of financing for cat fish production

Main sources of financing for cat fish production is presented in Table 2. Six major sources were identified and studied. Personal income ($\bar{x}$=4.50) is the most important source of finance for the respondents' fish farming business as it ranked the highest, followed by family and friends (2.63), cooperative societies ($\bar{x}$ =1.85), bank loan ($\bar{x}$ =1.73). Agricultural corporation ($\bar{x}$ =1.48) is the second to the least financial source for the respondents' fish farming business. However, money lenders ($\bar{x}$=1.45) is the least financial source for the respondents' fish farming business.

The result shows that personal savings is however, the main source of financing for cat fish production.

Table 2. Main sources of financing for cat fish production

Sources	SD (%)	D (%)	U (%)	A (%)	SA (%)	MEAN	STD	RANK
Personal income	0	0	3.75	42.5	53.75	4.50	0.57	1
Family and friends	16.25	30	28.75	25	0	2.63	1.04	2
Cooperatives	48.75	27.5	13.75	10	0	1.85	1.01	3
Bank loan	46.25	40	8.75	5	0	1.73	0.83	4
Agricultural loan	57.59	37.5	5	0	0	1.48	0.59	5
Money lender	60	35	5	0	0	1.45	0.53	6

Source: Field Survey, 2020. SD: Strong disagree; D: Disagree; U=Undecided; A=Agreed; SA= Strongly agreed

Constraints affecting cat fish production

Constraints affecting cat fish production are presented in Table 3.

Twelve constraints are identified and studied. Disease and poor preventive measures ($\bar{x}$=4.20) are ranked the highest among the constraint affecting cat fish production, followed by poaching (4.19). Inadequate knowledge about fish farming ($\bar{x}$=4.05) is ranked the third highest among the production constraint, followed poor demand by consumers ($\bar{x}$=3.78), lack of market ($\bar{x}$=3.64), lack of access to credit ($\bar{x}$=3.43), lack of availability of feed ($\bar{x}$=3.33), low level of education ($\bar{x}$=3.28), shortage of water ($\bar{x}$=3.20), lack of labour ($\bar{x}$=3.13). However, inadequate supply of fingerlings ($\bar{x}$=2.48) is ranked the least among the production constraint. The result implies that disease and poor preventive measures are the main constraints affecting cat fish production.

Table 3. Constraints affecting cat fish production

Sources	SD (%)	D (%)	U (%)	A (%)	SA (%)	MEAN	STD	RANK
Diseases and poor management	1.3	5	1.3	57.5	35	4.20	0.80	1
Poaching	62.5	6.3	0	0	31.3	4.19	0.73	2
Inadequate knowledge	7.5	5	3.8	42.5	31.3	4.05	1.15	3
Poor demand by consumers	11.4	0	17.5	53.8	17.5	3.78	0.87	4
Lack of market	13.8	2.5	18.8	47.5	17.5	3.64	1.00	5
Lack of access to credit	6.3	21.3	17.5	33.8	21.3	3.43	1.22	6
Lack of feed	17.5	11.4	22.5	18.84	30	3.33	1.46	7
Low level of education	8.8	20	17.5	42.5	11.3	3.28	1.17	8
Shortage of water	7.9	15	43.8	17.5	16.3	3.20	1.12	9
Lack of labour	11.4	16.5	31.6	29.1	11.4	3.13	1.17	10
Government policy	28.9	15.8	21.1	14.5	19.7	2.8	1.497	11
Inadequate supply of fingering	30	23.8	16.3	28.8	1.3	2.48	1.232	12

Source: Field Survey, 2020 SD: Strong disagree; D: Disagree; U=Undecided; A=Agreed; SA= Strongly agreed.

Cost and return to cat fish production

Table 4 presents the costs and returns to cat fish production using average cost of both costs incurred and yield or output data generated by each of the respondents in the last season. The cost of feed accounted for the largest proportion (48.9%) of the total cost of fish farming. This is followed by the cost of labour (3.6%), cost of fingerlings, (2.1%), electricity cost (1.1%), transportation cost (0.8%) and miscellaneous (0.8%), followed by cost of fertilizer (0.6%), security cost (0.4%) and to the least cost, cost of lime (0.1%). The fixed cost consists of land cost, rent, pond construction cost, water pump, pond equipment among other. This accounts for 42% of the total cost. It is evident from the result that an average total cost of ₦ 1,677,699.00 was incurred by the farmers while a returning gross margin of ₦905,668

and the net returns/profit of ₦ 206,341 was realized. The result further revealed that the benefit cost ratio (1.1229) is greater than one for the farmers. The gross ratio for the farmer is 0.8905. This implies for every 89 kobo spent on cat production, ₦ 1.00 returns to the enterprise. These measures of performance indicate business of cat fish production is viable and profitable. This result is in line with previous studies such as [1; 4; 9; 13; 2; 11].

Table 4. Cost and return to cat fish production

Items	Cost (₦)	TVC (%)	TC (%)
A. Variable cost			
Transportation	12,645	1.3	0.8
Fertilizer	10,000	1.0	0.6
Lime	2,173	0.2	0.1
Security	6,852	0.7	0.4
Feed	820,735	83.9	48.9
Labour	59,573	6.1	3.6
Fingerlings	34,844	3.6	2.1
Electricity	18,702	1.9	1.1
Miscellaneous	12,848	1.3	0.8
Total variable cost	978,372	100	58.3
Items	Cost ₦)	TFC (%)	TC (%)
B. Fixed cost			
Land	207,029	29.6	12.3
Pond	126,367	18.1	7.5
Water pump	135,175	19.3	8.1
Pond equipment	18,231	2.6	1.1
Rent	134,609	19.2	8.0
Total fixed cost	699,328	100	42
C. Total cost	1,677,699		
D. Total Revenue	1,884,040		
E. Gross margin	905,668		
F. Net returns	206,341		
G. Benefit cost ratio	1.123		
H. Gross ratio	0.891		

Source: Field Survey, 2020.

Factors affecting profitability of cat fish production

The factors affecting profitability of cat fish production are presented in Table 5. The R-Square was 0.630. This suggests that 63.0% of the variability in the profit of the respondents is jointly explained by variations in the independent variables specified in the model. The F-ratio (28.93) was statistically significant at 1 percent level.

Table 5. Factors affecting profitability of cat fish production

Profitability	Coefficient	Std. Err.	t	Sig
Pond Construction Cost	-1.5458**	0.610489	-2.53	0.045
Startup capital	0.0416 **	0.083893	2.50	0.028
Lime	-0.6112	0.29072	-2.1	0.156
Fingerlings cost	-0.2199	0.092248	-2.38	0.331
Labour cost	-0.7947 ***	0.184324	-4.31	0.001
Feed cost	-0.8334 ***	0.102975	-8.09	0.000
Number of fishes	0.5525***	0.195348	2.83	0.004
Years of experience	0.0924	0.128287	0.72	0.484
_cons	4.6173**	6.293728	2.73	0.006

Source: Field Survey, 2020 ***, **and * indicated variables that are significant at 1; 5 and 10 percent respectively
$R^2 = 0.63$ Adjusted $R^2 = 0.59$ F-test = 28.93

From Table 5, pond construction cost, startup capital, labour cost, feed cost and number of fishes significantly influenced profitability of cat fish production.

The coefficients of startup capital and number of fishes had positive signs. This implies that increase in any of these variables increases the profitability of cat fish production. There is positive relationship between value of fish and startup capital. This implies that increase in the initial capital investment increases profitability of cat fish business. Catfish farming doesn't require a very high initial capital investment. However, huge start-up capital ensures the success and the profitability of the business.

There is a positive relationship between value of fish and quantity of fish which indicates that increase in the number of fishes, more revenue will be realized. The reason cannot be farfetched because revenue is directly proportional to the quantity of fish produced.

However, the coefficient of pond construction cost, labour cost and feed cost had negative sign. This implies that increase in any of these variables decreases profitability of cat fish production. As a result, the more money spent on labor, pond building, and feeds, the less money is made from fish farms in the research area. This necessitates policies that ensure that fish farming inputs are available at affordable prices, making the industry more sustainable. Additionally, in order to grow their earnings from the business, cat fish farmers must be prudent in their spending

It's also worth noting that, as indicated in Table 5, the total sum of the significant variables' production elasticities is less than 1.

This indicates that catfish output in the area of study is declining. This means that a marginal increase in the unit of inputs will lead to a marginal rise in the value of fish output, but at a slower rate.

This indicates that the research area's cat fish farmers are in the second stage of production.

CONCLUSIONS

This study investigated economics of cat fish production in Osun State. A multi stage sampling procedure was employed to select 80 cat fish producers for the study. Data were analyzed using descriptive statistics, farm budgetary techniques and OLS regression model. The study concluded that majority of the cat fish producers are male and at their productive age. The business of cat fish production is profitable and viable. Pond construction cost, startup capital, labour cost, feed cost and number of fishes significantly influenced profitability of cat fish production. However, cat fish production would be more profitable, if the costs of feeding, constructing ponds and labour could be controlled. As a result, governments should encourage more individuals to participate in the business by subsidizing these inputs and recommending farm hygiene and security to address the problem of poor preventive measures as well as the problem of predation and poaching.

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