Economic analysis of catfish (*Clarias gariepinus*) production in Ibadan metropolis

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Abstract

This study examined the economic analysis of catfish production in Ibadan metropolis from which, two local government areas were selected. The data collected was analyzed by descriptive statistics such as frequency, counts and percentage and regression. Multi stage sampling technique was used to select 90 respondents. The socio-economic characteristics of the respondents were identified, the problems facing catfish production and possible solutions were also identified. The study revealed that most of the catfish farmers were in their active ages of 30 – 49 years, which accounts for 71.1% of the total frequency and a mean value of 42.66 and it was also revealed that majority of the respondents are male (83.3%). Benefit-cost analysis showed that snail farming was profitable with a BCR of 1.62. Regression analysis showed that there is significant relationship between the socio-economic characteristics of the catfish farmers and the total revenue. Variables that were significant are cost of land, quantity harvested and number of pond unit.

Keywords: Catfish, productivity, metropolis, profitability.

INTRODUCTION

Fish farming is the sub-set of aquaculture that focuses on rearing of fish under controlled or semi controlled conditions for economic and social benefits (Anthonio and Akinwumi, 2002). The African Catfish is a species of catfish of the family Clariidae and its scientific name is *Clarias gariepinus* which was named by Burchell in 1822. The story of aquaculture in Nigeria is essentially the story of catfish culture and the hope of fish supply in Nigeria hangs on its development and culture.

Food and Agriculture Organization (2002), made a statement that fisheries products represented a major source of export revenue for developing countries, amounting to over US $ 20 billion per annum in late 1990s. This exceeded the values obtained from the exports of meat, dairy, cereals, vegetables, fruit, sugar, coffee, tobacco and oilseeds in 1997 from developing countries (International Trade Centre, 2002). However, F.A.O (2007), estimated that Nigeria imports about 560,000 tonnes of fish estimated at about $400 million annually while annual domestic fish supply in Nigeria stands at about 400,000 tonnes. This makes Nigeria one of the largest importers of fish in the developing world.

Catfish production is important to the Nigerian economy. It serves as a source of income, reduces the rate of unemployment in the economy and increases the Gross Domestic Product (GDP). In most countries it fetches a higher price than tilapia as it can be sold live at the market as they have a market value two to three times that of tilapia (Emokaro, 2010). According to Olagunju, *et al*., (2007), it requires less space, time, money and has a higher feed conserving rate.

The importance of catfish itself cannot be overemphasized. According to Anoop *et al*., (2009), it provides food for the populace, it allows for improved protein nutrition because it has a high biological value in terms high protein retention in the body, higher protein assimilation as compared to other protein sources, low cholesterol content and one of the safest sources of animal protein.

Many species of fish are farm produced all over the world, but Catfish is taking the lead because of its uniqueness.
The demand for Catfish in Nigeria is unprecedented so much so that no matter the quantity supplied into the market, it would be consumed by ready buyers. This is so because of its low caloric value, low carbohydrate content, high in protein, low in fat, it is quick and easy to prepare and above all, it tastes great. (Vanguard, 2009). It is against this background that the study sought to analyze the economics of catfish farming in the study area.

Objectives of the study

The general objective is to analyze the economics of catfish farming in the study area. Specifically, it is designed to:
1. Identify the socio-economic characteristics of catfish farmers in the study area.
2. Investigate the inputs employed in catfish farming in the study area.
3. Describe the catfish farming practices in the area.
4. Identify the problems militating against catfish production in the study area.
5. Analyze the cost and returns relationship of catfish farming in the study area.

Hypothesis: There is no significant relationship between the socio-economic characteristics of the catfish farmers and the total revenue.

METHODOLOGY

The study was carried out in Ibadan metropolis, Oyo State. It has a land area of 3,123.30 km square with population figure of about 2,550,593 as at 2006, giving a population density of 816.63 person/km square. Tropical rain forest is the vegetation of Ibadan metropolis which makes it suitable for catfish farming.

The population of the study consists of all catfish farmers in the study area. A multi stage sampling procedure was used to select 90 respondents. The first stage involved selection of an association of catfish farmers in Ibadan metropolis being the umbrella body of catfish farmers. This followed by purposive selection of two (2) local government areas notable for high production of catfish which are Ibadan South West and Ibadan South East local government areas. The third stage involved random selection of forty five (45) catfish farmers selected from each local government to make a total of ninety catfish farmers. In the research work, primary data was used. Structured Questionnaires were used to obtain primary data from the selected respondents. Both dependent and independent variables were used for the study. The dependent variable was the total revenue while the independent variables included the socio economic characteristics (age, marital status, educational experience, cost of land, cost of labour, quantity harvested, cost of construction and number of pond unit).

Descriptive Statistical Analysis: This was used to analyse the socio-economic characteristics of the respondents. It involves the use of frequency tables, percentage and mean.

Cost and returns analysis: This was used to determine the profitability of catfish production. The profitability analyses that were employed were Fixed cost (FC), Variable cost (VC), Total cost (TC), Total revenue (TR), Gross margin (GM) and profit.

\[ TC = TVC + TFC \]
\[ TR = P \times Q \text{ (P = Price and Q = Total output (kg))} \]
\[ GM = TR - TVC \]
\[ Profit = GM - TFC \text{ OR } Profit = TR - TC \]

In addition to the above illustrations, the profitability can also be determined with the use of ratio analysis such as:

\[ \text{Expense Structure ratio} = \frac{\text{Fixed cost}}{\text{Total cost}} \]
\[ \text{Benefit cost ratio (BCR)} = \frac{\text{Total revenue}}{\text{Total cost}} \]
\[ \text{Gross ratio} = \frac{\text{Total Cost}}{\text{Total revenue}} \]
\[ \text{Rate of Return} = \frac{\text{Net return}}{\text{Total cost}} \]

Regression analysis: This was used to identify the factors that influence catfish production. All the functional forms were tested before choosing the double log which was best fit. The production function was expressed as a function of
the explanatory variables. It showed relationship between dependent variable (Y) and independent variables (X_1, X_2, ..., X_9).

Given a hypothetical Cobb-Douglas functional form

\[
\ln Y = b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + b_8 \ln X_8 + b_9 \ln X_9 + E
\]

- \( Y \) = Dependent variable
- \( X_3 \) = Educational level
- \( X_4 \) = Cost of land
- \( X_5 \) = Cost of fingerling
- \( b_1 \) = Parameters that were estimated
- \( E \) = Error term
- \( X_6 \) = Quantity harvested
- \( X_7 \) = Cost of construction
- \( X_8 \) = Cost of drug
- \( X_9 \) = Number of pond unit

**RESULTS AND DISCUSSION**

Socio-economic characteristics of the respondents

Table 1 shows that majority of the catfish farmers were within the ages of 30-49 which represents about 71.1% of the total respondents in the study area with mean age of 42.66. According to Sikiru, *et al.* (2009), this age bracket is a productive age which predicts better future for catfish production.

Table 1 also shows that the household size of those that ranged between 4-6 had the highest percentage of 60 with a mean of 4.84. This shows that there were enough hands (family labour) engaged to carry out fish farming operations. This result agrees with Adebayo (2012), this family size can serve as source of free and cheap labour.

Table 1 shows that 54.4% of the respondents have 1-5 years of experience with a mean value of 5.97. This shows that the catfish farmers are relatively new in the enterprise. This agrees with Williams *et al.*, (2012), that the ability to manage fish pond efficiently depends on the years of experience and this is directly related to the total productivity of the farm.

The respondents with 1-5 units of pond have the highest percentage of 77.8. This might probably be due to lack of capital or shortage of land to expand the existing project.

Catfish farming Practices

From Table 2, it is observed that the common catfish farming practices are earthen pond, concrete pond, flow-through water supply, intensive feeding, semi intensive feeding and stagnant water supply. It also reveals that most respondents in the study area prefer earthen pond due to the fact that the cost of construction and its maintenance is less expensive than other types.

Factors militating against catfish production

The factors were categorized into “not a constraint”, “mild constraint” and “severe constraint”. Inadequate finance was indicted by the respondents as the most serious constraint to catfish production with mean score of 1.68 and was ranked first. Catfish farming is capital intensive and thus requires big capital investment for reasonable profit to be made. Also, Sikiru *et al.* (2010) identified inadequate finance as a serious problem in catfish production. The second serious constraint was lack of encouragement from the government with a mean scale of 1.47 and it was ranked second which corroborates with FAO (2001) findings. High cost of feeds was ranked third and was indicted by the respondents as a constraint to catfish production with mean scale of 1.40. The importation of most commercial feeds into the country and problems associated with importation and distribution could be the main reasons for the hike in feed prices. These commercial feeds possess floating and high protein qualities and are therefore preferred by fish farmers. This result is in consonance with the records of Ocmer (2006). Ugwumba and Nnabuife (2008) also identified high cost of feed as very serious draw back to profits realizable from catfish farming. Other constraints and their mean values include inadequate electric power supply (44.4), water pollution (0.88), predators (0.86), inappropriate research on aquaculture (0.83), poor experiences of past attempts at developing aquaculture (0.76), theft (0.73), flood problems (0.70), inadequate storage facilities for feeds and drugs (0.64), inconvenient source of drugs and chemicals (0.58), limited market sales (0.57) and inadequate harvesting and transportation equipment (0.52) and they were ranked fourth, fifth, sixth, seventh, eighth, ninth, tenth, eleventh, twelfth, thirteenth and fourteenth respectively (Table 3).
Table 1. Socio–economic characteristics of the catfish farmers

<table>
<thead>
<tr>
<th>Socio-economic variables</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-29</td>
<td>7</td>
<td>7.8</td>
</tr>
<tr>
<td>30-39</td>
<td>26</td>
<td>28.9</td>
</tr>
<tr>
<td>40-49</td>
<td>38</td>
<td>42.2</td>
</tr>
<tr>
<td>≥ 50</td>
<td>19</td>
<td>21.1</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>75</td>
<td>83.3</td>
</tr>
<tr>
<td>Female</td>
<td>15</td>
<td>16.7</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>11</td>
<td>12.2</td>
</tr>
<tr>
<td>Married</td>
<td>77</td>
<td>85.6</td>
</tr>
<tr>
<td>Divorced</td>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td>Widowed</td>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td><strong>Household size</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3</td>
<td>26</td>
<td>28.9</td>
</tr>
<tr>
<td>4-6</td>
<td>54</td>
<td>60.0</td>
</tr>
<tr>
<td>7 and above</td>
<td>10</td>
<td>11.1</td>
</tr>
<tr>
<td><strong>Years of experience</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-5</td>
<td>49</td>
<td>54.4</td>
</tr>
<tr>
<td>6-10</td>
<td>31</td>
<td>34.5</td>
</tr>
<tr>
<td>11-15</td>
<td>8</td>
<td>8.9</td>
</tr>
<tr>
<td>16-20</td>
<td>2</td>
<td>2.2</td>
</tr>
<tr>
<td><strong>Number of pond units</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-5</td>
<td>70</td>
<td>77.8</td>
</tr>
<tr>
<td>6-10</td>
<td>17</td>
<td>18.9</td>
</tr>
<tr>
<td>11 and above</td>
<td>3</td>
<td>3.3</td>
</tr>
</tbody>
</table>


Table 2. Distribution of respondents according to their farming practices

<table>
<thead>
<tr>
<th>Farming practises</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthen pond</td>
<td>75</td>
<td>83.3</td>
</tr>
<tr>
<td>Concrete pond</td>
<td>19</td>
<td>21.1</td>
</tr>
<tr>
<td>Flow through water supply</td>
<td>22</td>
<td>24.4</td>
</tr>
<tr>
<td>Intensive feeding</td>
<td>23</td>
<td>25.6</td>
</tr>
<tr>
<td>Semi-intensive feeding</td>
<td>2</td>
<td>2.2</td>
</tr>
<tr>
<td>Stagnant water supply</td>
<td>34</td>
<td>37.8</td>
</tr>
</tbody>
</table>

* Multiple responses recorded

Gross margin analysis

Total fixed cost (TFC) = ₦408,850
Total Variable Cost (TVC) = ₦522,709.06
Total cost (TC) = ₦931,559.06
Total Revenue (TR) = ₦1,505,671.20
GM = ₦592,962.14
Profit = ₦574,112.14. This shows that catfish production is productive.
Table 3. Distribution of the respondents according to the problems militating against catfish production

<table>
<thead>
<tr>
<th>Constraints</th>
<th>Not a constraint</th>
<th>Mild constraint</th>
<th>Severe constraint</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>F (%)</td>
<td>F (%)</td>
<td>F (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inadequate finance</td>
<td>1 (1.1)</td>
<td>27 (30.0)</td>
<td>62 (68.9)</td>
<td>1.68</td>
</tr>
<tr>
<td>Lack of encouragement from the Government</td>
<td>16 (17.8)</td>
<td>16 (17.8)</td>
<td>58 (64.4)</td>
<td>1.47</td>
</tr>
<tr>
<td>High cost of feed</td>
<td>4 (4.4)</td>
<td>46 (51.1)</td>
<td>40 (44.4)</td>
<td>1.40</td>
</tr>
<tr>
<td>Inadequate electric power supply</td>
<td>27 (30.0)</td>
<td>23 (25.6)</td>
<td>40 (44.4)</td>
<td>1.14</td>
</tr>
<tr>
<td>Water pollution</td>
<td>27 (30.0)</td>
<td>47 (52.2)</td>
<td>16 (17.8)</td>
<td>0.88</td>
</tr>
<tr>
<td>Predators</td>
<td>20 (22.2)</td>
<td>63 (70.0)</td>
<td>7 (7.8)</td>
<td>0.86</td>
</tr>
<tr>
<td>Inappropriate research on aquaculture</td>
<td>34 (37.8)</td>
<td>37 (41.1)</td>
<td>19 (21.1)</td>
<td>0.83</td>
</tr>
<tr>
<td>Poor experiences of past attempts at developing aquaculture</td>
<td>37 (41.1)</td>
<td>38 (42.2)</td>
<td>15 (16.7)</td>
<td>0.76</td>
</tr>
<tr>
<td>Theft</td>
<td>41 (45.6)</td>
<td>32 (35.6)</td>
<td>17 (18.9)</td>
<td>0.73</td>
</tr>
<tr>
<td>Flood problems</td>
<td>42 (46.7)</td>
<td>33 (36.7)</td>
<td>15 (16.7)</td>
<td>0.70</td>
</tr>
<tr>
<td>Inadequate storage facilities for feeds and drugs</td>
<td>42 (46.7)</td>
<td>38 (42.2)</td>
<td>10 (11.1)</td>
<td>0.64</td>
</tr>
<tr>
<td>Inconvenient source of drugs and chemicals</td>
<td>44 (48.9)</td>
<td>40 (44.4)</td>
<td>6 (6.7)</td>
<td>0.58</td>
</tr>
<tr>
<td>Limited market sales</td>
<td>43 (47.8)</td>
<td>43 (47.8)</td>
<td>4 (4.4)</td>
<td>0.57</td>
</tr>
<tr>
<td>Inadequate harvesting and transportation equipment</td>
<td>49 (54.4)</td>
<td>35 (38.9)</td>
<td>6 (6.7)</td>
<td>0.52</td>
</tr>
</tbody>
</table>


Profitability ratios

**Expense Structure Ratio (ESR):** The ESR value is 0.439 which means that the fixed cost accounted for 43.9/o of the total cost incurred.

**Benefit Cost Ratio (BCR):** The BCR Value (1.62) shows that catfish production is profitable and worth venturing into. The value (1.62) simply means that every ₦1.00 invested in catfish enterprise will yield ₦ 1.62.

**Gross ratio (GR):** The ratio 0.619 implies that from every ₦1.00 returns to the enterprise, 62k is being spent.

**Rate of Return (ROR):** The rate of returns in fish production in the study area is 62%. This shows that for every ₦1.00 invested, 62 kobo is gained by the respondent.

Regression Analysis

Regression analysis was used to determine the relationship between the total revenue (dependent variable) and the independent variables such as age, sex, education level, cost of land, cost of fingerling, quantity harvested, cost of construction, cost of drug and number of pond unit. The choice of the functional form, that is Cobb Douglas was determined after comparing all the functional forms using different statistical criteria. Adjusted R Square which is 0.816 means that the independent variables have explained 82% variation in the dependent variable (Total revenue) while the remaining 18% is due to random error E.

The model used for this analysis is \( Y = b_0X_1^{b_1}X_2^{b_2}X_3^{b_3}X_4^{b_4}X_5^{b_5}X_6^{b_6}X_7^{b_7}X_8^{b_8}X_9^{b_9} \)

\[
\ln Y = b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + b_8 \ln X_8 + b_9 \ln X_9
\]

\[
\begin{align*}
\text{In } Y &= 7.418 + 0.131 \ln X_1 + 0.043 \ln X_2 - 0.227 \ln X_3 - 0.093 \ln X_4 + 0.070 \ln X_5 + 0.806 \ln X_6^* \\
&\quad + 0.056 \ln X_7 - 0.020 \ln X_8 + 0.181 \ln X_9^* \\
&\quad (6.606) (0.644) (0.246) (-1.566) (-2.406) (1.247) (15.650) \\
&\quad (+0.753) (-0.311) (2.605)
\end{align*}
\]

Note:
Values in parenthesis are t-values
* Significant at 1%level of significance

From the above equation, six of the coefficients (that is, age \((X_1)\), sex\((X_2)\), cost of fingerlings \((X_5)\), quantity harvested \((X_6)\), and number of pond unit \((X_9)\)) are significant at the 1% level of significance.
(X_3), cost of construction(X_7) and number of pond units (X_9)) have positive signs which means that an increase in any of the variables would increase the revenue of the respondents. The coefficients of educational level(X_3), cost of land (X_4) and cost of drugs (X_8) have negative signs which indicate a decrease in the total revenue as the variables increase. Also, cost of land (X_4), quantity harvested (X_6) and number of pond units (X_9) are significant at 1% level of significance.

**Hypothesis Result**

\[
F_{cal} = 42.787 \\
F_{tab} \left(9, 76 \right) (0.05) = 2.006 \\
\text{If } F_{cal} > F_{tab} \text{ then there is significant relationship between the socio-economic characteristics of the catfish farmers and the total revenue.}
\]

**CONCLUSION AND RECOMMENDATIONS**

In conclusion, Large and small productions of catfish can be embarked upon in rural and urban areas without infringing on the peace of neighbours, because catfish are noiseless and require little space. Production in large scale will allow for availability of catfish throughout the year at a reduced price. This will encourage more families to supplement their diet with catfish regularly in order to meet the recommended protein intake of 35 grammes per day by Food and Agriculture Organization of the United Nations. It should be noted that the excess demand of catfish in recent times has forced up the price tremendously.

Based on the findings of the study, the following recommendations are hereby made to promote increased catfish production in the study area:

(i) Government should provide facilities such as incentives, subsidies and facilitate access to credit by catfish farmers in the study area by the review of the stringent lending policies of the formal lending institutions.

(ii) Catfish farmers should come together to form co-operative unions to facilitate their access to credit and other inputs.

(iii) Adequate trainings and seminars should be held at interval to update catfish farmers’ knowledge on catfish farming so that they could have access to improved methods and technologies of catfish production.

(iv) Effort should be made to bring down the cost of feeds by exploring alternative sources of feed for catfish through well-funded researches.

**REFERENCES**


Sikiru BO., Omobolanle NM., Ayorinde BJO and Adegoke OO (2009). Improving Clarias productivity. J. Biol. Res. 3(1-
