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Economic Viability of Cat Fish Production in Oyo State, Nigeria

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ABSTRACT The study was conducted in Ibadan metropolis, Oyo State. Sixty farmers were selected using simple random techniques drawn from five local government purposively selected from the study area. Structured questionnaire was used to collect information from the respondents; statistical analysis was accomplished by means of frequency distribution, percentages, gross margin analysis, profitability ratio and multiple regression technique. The result of the analysis showed that the average total cost per kilogram of fish was ₦204.00 and the average total revenue per kg of fish was ₦ 308.00k. This gives a gross margin of ₦194.60 per kilogram of fish produced. The result also revealed that there is a significant relationship between total revenue and cost of feed, years of farming experience, size of pond and labour. The study also showed that the sum total of elasticities of variables was less than unity (i.e. 0.801), which indicates that fish production in the study area is in stage II, which is the rational stage of production. Due to expensive nature of flow-through and re-circulatory ponds, earthen ponds were mostly preferred by majority (46.7%) of the fish farmers in the study area.

INTRODUCTION

Fishing like other hunting activities has been a major source of food for human race and has put an end to the unsavoury outbreak of anemia, Kwashiorkor and so on. It accounts for about one fifth of world total supply of animal protein and this has risen five folds over the last forty years from 20 million metric tons to 98million metric tones in 1993 and projected to exceed 150 million metric tons by the year 2010 (F.A.O, 1991).

Fish farming activity in Nigeria started about 50 years ago, with the establishment of a small experimental station at Onikan Lagos and an industrial farm about 20ha at Panyam in Plateau State by Federal Government. This generated a lot of interest in fish farming with the involvement of other levels of government and some private establishment (Longhurst, 1961).

Fish allows for protein improved nutrition in that it has a high biological value in terms of high protein retention in the body (Anthonio and Akinwumi, 1991), higher protein assimilation as compared to other animal protein sources, low cholesterol content and one of the safest sources of animal protein (Slang, 1973).

Fish farming generates employment directly and indirectly in terms of people employed in the production of fishing output and other allied business, it also generates income for all categories of people involved in fish farming and thus contributes to the national income. When compared with livestock, it requires less space, time, money and has a higher feed conserving rate.

Out of 35grams of animal protein per day per person recommended by F.A.O, less than 7 grams is consumed on the average (F.A.O., 1991). As a result of this, many Nigerians suffer from protein deficiency due to low protein intake.

Nigeria has become one of the largest importers of fish in the developing world, importing some 600,000 metric tons annually. To solve the country's high demand for fish, Nigerians must turn to their under-utilized inland water for improved fish production and aquaculture. Aquaculture expansion, moreover, has been a slow process, as private sector fish farmers have faced major constraints, including lack of seed and quality feed.

As in much of Africa, the most commonly cultured species include catfish (*Clarias gariepinus*, the imported *C. lazera* and *Heterobrachus sp*), tilapia and carp. Many fish farms focus on catfish, as they can have a market value of two to three times that of tilapia (F.A.O Agriculture Newsletter).

The major constraints to fish farming were identified to be those of environmental impacts of aquaculture operations that is water pollution (Spaulding and Blasco,1997) inadequate supply of fingerlings, inadequate information and feeds supply (Assiah, 1997).

In spite of the ever-increasing growth being witnessed by other major sources of animal protein such as livestock and poultry industries,

this problem of protein deficiency has continued unabated. The need therefore arose, to explore aquaculture as a means of curbing this menace. It is against this background that this article is embarked upon with a view to producing answers to research questions that could be faced by practicing and prospective catfish farmers, which bring about the following specific objectives to be addressed.

i. To identify the socio-economic characteristics of catfish farmers
ii. To determine the factors that affect the catfish production and
iii. To examine cost and return relationship of catfish farming.

METHODOLOGY

The study was conducted in the metropolis of Ibadan city, the capital of Oyo state, which comprises of eleven (11) Local Government Areas. The city is an important commercial center in Nigeria and comprises of different sets of people with diversified socio-cultural characteristics. Five local government areas were purposively selected because of the prevalence of the fish farmers in the study area. This was arrived at from the record of the Catfish Farmers Association of Nigeria, Oyo State branch.

Random sampling technique was used to select 60 respondents and data were collected through the use of structured questionnaires.

Gross margin analysis and profitability ratio were used to examine the cost and returns of fish farming in the study area while production function was employed to determine the productivity of the farm.

Gross margin analysis is given by equation (1)

$$GM = TR - TVC \quad \ldots\ldots (1)$$

Where

GM = Gross Margin (₦)
TR = Total Revenue (₦)
TVC = Total Variable Cost (₦)

The performance and economic worth of the respondents can be determined by the use of the following Profitability ratios:

1. Benefit Cost Ratio BCR = TR/TC
2. Expense Structure Ratio ESR = FC/VC
3. Rate of Return ROR = NR/TC
4. Gross ratio GR = TC/TR

The production function postulated for fish farmers in the study area is implicitly presented by equation (2)

$$Q = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, U_i) \quad \ldots\ldots (2)$$

Where

Q = Total Revenue (₦)
X_1 = Age of farmers (years)
X_2 = Sex of the respondents/farmers. Dummy male=1, female=2
X_3 = Cost of Feed (₦)
X_4 = Educational Level (years)
X_5 = Years of Experience (years)
X_6 = Farm size (Kg of fish raised)
X_7 = Size of pond (square meter)
X_8 = Labour (Mandays)
U_i = Error term assume to have a zero mean and constant variance.

The linear, Semilog, Cobb-Douglas production functions were evaluated using ordinary least square method.

RESULTS AND DISCUSSIONS

Gross Margin and Net Returns Analysis

The average total cost per kilogram of fish produced was ₦204.00 while the average total revenue per kilogram of fish raised was ₦308.00k.

This gives a gross margin of ₦194.60 per kilogram, of fish. According to Adeyeye and Dittoh (1982) Gross margin is a good measure of profitability. Table 1 therefore shows that the fish production is highly profitable in the study area.

Table 1: Gross margin and net return analysis of fish production

L.G.A	TVC (₦/kg)	FC (₦/kg)	TC (₦/kg)	TR (₦/kg)	GM (₦/kg)	NR (₦/kg)
A	110	100	210	320	210	110
B	115	105	220	320	205	100
C	120	80	200	300	180	100
D	110	90	200	320	210	120
E	112	68	190	250	168	90
Total	113.4	88.6	204	308	194.6	104

Source: Field Survey, 2004.

The fish farmers from local government E had the highest gross margin of N210. This implies that they had minimum variable cost of production coupled with low fixed cost. Hence gave the highest net return per kilogram of fish production in the area.

Profitability Estimates

Benefit cost ratio (BCR) was 1.50. This ratio is

one of the concepts of discount method of project evaluation. As a rule of thumb, project with benefit cost ratio greater than one, equal to one or less than one indicate profit, break-even or loss respectively. Since the ratio is greater than one, it shows profit and indicates that the enterprise is profitable even with little capital invested into it. It is therefore possible to have higher value of BCR with increased capitals and skilled labour.

(i) Gross Ratio (GR): This ratio 0.662 implies that from every ₦1.00 returns to the enterprise, ₦66.20k is being spent.

(ii) Rate of Return (ROR): The rate of returns in fish production in the study area is 51%. This shows that for every ₦1.00 invested, 51kobo is gained by the respondent.

(iii) Expense Structure Ratio (ESR): The value of the ratio is 0.43 which implies that about 43% of the total cost of production is made up of fixed cost component. This make the business worthwhile since increase in the production with variable cost will increase the total revenue leaving the fixed cost unchanged.

Estimated Production Function

In determining the factors affecting fish production, a structural relationship was specified. Total revenue was regressed on the demographic characteristics of the farmers, socio-economic characteristics and other independent variables as cost of feeds, type of ponds.

Though three functional models (linear, semi-log and double log) were used, the linear was chosen. The choice of the production function is predicated on its conformation to *a priori* expectation in terms of signs and magnitude of the coefficient, the number of significant variables and the coefficient of multiple determinations (Olayemi and Olayide, 1981).

The regression result is presented as:

$$Q = \underset{(4.681)}{13.083} + \underset{(0.250)}{0.011X_1} - \underset{(-1.023)}{0.068X_2} - \underset{(-2.032)}{0.138X_3^{*}} + \underset{(-0.652)}{0.075X_4} + \underset{(2.018)}{0.134X_5^{*}} + \underset{(0.462)}{0.058X_6} + \underset{(2.132)}{0.581X_7^{*}} + \underset{(3.60)}{0.264X_8^{**}}$$

$R^2 = 0.708$ $R^{-2} = 0.658$ $F = 17.153$

* = Significant at 5%;** = Significant at 1%

The value in parenthesis under regression coefficients are the t-values.

The R^2 for the estimated regression showed that about 71% of variation in total revenue of fish's farmers in the study area was explained by the explanatory variables with the remaining 29% unexplained; this is due to random variable (U_i).

Five of the estimated coefficients (that is, age (X_1), educational level (X_4), farming experience (X_5), size of pond (X_7) and labour (X_8) have positive signs which indicated that an increase in any of the five variables would increase the level of total revenue of the respondents *Ceteris Paribus*. The coefficients of sex (X_7); cost of feed (X_3); farm size (X_6) had negative signs, which indicated that an increase in any of these variables would decrease the total revenue of the respondents *Ceteris Paribus*.

Cost of feed; farming experience and the size of pond used were significant at 5% level while the labour per manday was significant at 1%.

Elasticity of Production and Return to Scale

The total sum of elasticities of production of the variables as shown in table 2 was less than unity that is 0.801 indicating decreasing returns to scale. This suggests that fish production in the study area had a decreasing positive return to scale. Each additional unit results in a smaller increase in product than the preceding unit. Fish production in the study area fall within the rational stage (Stage II) of the production function. The implication of this is that the more input one puts in, the higher the profit even through at a declining rate.

Table 2: Elasticity of production and return to scale of fish farmers in Oyo State.

Independent Variables	*Elasticity of Production*
X_1	0.011
X_2	- 0.068
X_3	- 0.138
X_4	0.075
X_5	0.134
X_6	- 0.058
X_7	0.0581
X_8	0.264
Return to scale	0.801

Source: Data Analysis, 2004.

Socio-economic Characteristics of the Farmers

The analysis in table 3 shows that majority (80%) of the fish farmers are male and fall within the age of 40-60 years. The mean age is 49years. From the data, it could be deducted that there is

Table 3: Socio-economic characteristic of the fish farmers

Socio-economic variables	*Frequency (No= 60)*	*Percentage (%)*
Sex		
Male	48	80.0
Female	12	20.0
Age		
20-30years	5	8.3
31-40years	13	21.7
41-50years	14	23.3
51-60years	19	31.7
>60	9	15.0
Level of Education		
Primary	8	13.3
Secondary	14	23.3
Tertiary	38	63.3
Household Size		
0-5	23	38.3
5-10	32	53.3
>10	5	8.3
Years of Experience		
1-5	38	63.3
6-10	16	26.7
Above 10	6	10.0
Distribution by Pond Size		
1-400sqm	34	56.6
401-800sqm	16	26.7
801-1200sqm	10	16.7
Distribution by No. of Ponds		
1-2	32	53.3
3-4	21	35.0
5-6	7	11.7
Type of Pond		
Earthen	28	46.7
Flow-Through	12	20.0
Re-Circulatory	20	33.3

Source: Data Analysis, 2004.

no age discrepancy among cat fish farmers in the study area, meaning that any body could practice cat fish farming regardless of their age.

The educational attainment of the beneficiaries reveals that 63.3% had tertiary education. The high level of education might be due to the metropolitan nature of the study area and its implication is that the respondents will be very receptive to new innovations in their methods of production.

The analysis shows that majority (46.7%) of the respondents make use of earthen pond while 20% and 33% made use of flow-through and re-circulatory pond respectively.

Flow through and re-circulatory ponds are more expensive to construct and maintain than the earthen type, and this explain the relatively smaller number of farmers using them.

CONCLUSION AND RECOMMENDATION

In conclusion, production of cat fish is highly profitable and it is related to size of the enterprise. Other variables that contributed to the profitability include age, educational status and the number of labour used.

It is therefore recommended that more people should be encouraged to participate in the business so as to increase their income.

Also, the Association of Cat fish Farmers should organize training, workshops and seminars for their members so that they could have access to improved methods and technologies of cat fish production.

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