

PROFITABILITY ANALYSIS OF AQUACULTURE IN EKITI STATE, NIGERIA

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ABSTRACT

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The study utilized primary data collected from 80 respondents selected via multistage sampling procedure to analyzed the cost and return of aquaculture production in Ekiti State, Nigeria A predictive multiple regression model was estimated to determine the influence of cost of inputs on the farmer's revenue. Profitability parameters such as Gross margin, Benefit-Cost Ratio (BCR), Return on Investment (ROI) and Percentage Profitability (PP) were used to estimate the profitability of aquaculture. The result revealed personal savings (42.50%) as the major source of working capital and about 91.60 % of the production cost is incurred on feed, fingerlings and labour. Also, about 69% of the variation in net revenue in aquaculture production was accounted for by the costs of water, feed, fuel, labour, fingerlings and other cost. The values of the Gross Margin (N390, 942.80), Benefit-Cost Ratio (1.74), Return on Investment (0.74) and Percentage Profitability (74.38) indicated that aquaculture is profitable in the study area. The result further revealed that 40.00 % of the respondents made a profit within the range of ₦ 201,000 to ₦ 300,000. Based on the findings, it is recommended that aquaculturists should learn how to formulate quality feeds from locally available ingredients to complement their usual supply Aquaculturists should also endeavor to organize themselves into cooperatives to facilitate their access to credit facilities. Public awareness is needed to further arouse the interest of individuals, especially youth to consider fish farming as wealth creation venture in the state.

Key words: Aquaculture, Benefit Cost Ratio, Cost, returns, Profitability

INTRODUCTION

Fin and shellfish are important part of the Nigerian economy. According to (FAO) 2008, the per capital consumption of aquatic products has increased dramatically in the last ten years. Capture fisheries are not able to meet the demand for these products, thus there is a clear growing market for aquaculture products. The reason why, fishing has not kept pace with consumption in Nigeria are complex but are closely related to increased demand, overfishing of natural stocks, and the cost of operating a fish fleet. Nigeria imported about 618, 062 MT of fish valued over \$400 million in 2010 (FAO, 2010). Equally, the fish demand of Ekiti State is about 26, 825 metric tons per annum (FDF, 2010). While production from artisanal fisheries stands at 79.50 metric tons per annum, aquaculture production stands at 108 .67 metric tons, making a total of 188.17 metric tons and a short fall of 26,636.83 tons per annum (EKDFS, 2009). Secondly, the State is landlocked i.e. enclosed by land with neither sea nor ocean surrounding for fishing purposes, therefore there is need to intensify more aquacultural practices so as to bridge the gap between fish demand and supply in Ekiti State. Aquaculture is the only means by which more uniform products are produced on a stable basis (Landau, 1992), thereby increasing the marketability of fish and shellfish. To make an impact on the economy, the culture of fresh or marine organisms must be competitive with other type of food-producing industry, including farming and fishing.

A critical mistake of people in the past was to become lured into aquaculture by the promise of substantial financial reward based on small scale biological pilot studies without due economic consideration (Kudi *et al.*, 2008). However, with careful planning, an entrepreneur can invest in aquaculture and reap financial reward from the fish or shell fish venture. A full realization of the potential for aquaculture depends only on information on the cost-returns and profitability analysis of aquaculture production so as to evolve strategies for increased fish production. The objectives considered for this study were to determine the influence of production cost on the net income of aquaculturists as well as evaluate the cost returns and profitability of aquaculture production in the study area.

RESEARCH METHODOLOGY

The study was conducted in Ekiti State, Nigeria. The study area is in the rainfall zone with climatic and aquatic conditions that favour fish farming. Primary data used were collected with the aid of well structured questionnaires aimed toward realizing the objectives of the study. A multistage sampling technique was used for the selection of the respondents. The first stage was done by purposively selecting eight out of the sixteen Local Government Areas (LGAs). The LGAs were Ado, Ekiti East, Ikere, Ikole, Ise-Orun, Ilejemeje, Irepodun/Ifelodun and Moba. The choice of the LGAs was based on information assessed from the Ekiti State Agricultural

Development Programme (EKADP) which revealed that fish farming was more prominent in the selected LGAs than other LGAs. In the second stage, ten aquaculturists were thereafter randomly selected from each of the LGAs based on the list collected from EKADP. The sample size was 80 respondents which were interviewed between September and November, 2011.

Analytical techniques

Multiple regression was used to determine the influence of the cost factors on the net farm income tested at 5 % significant level. The explicit function of the multiple linear regression is given as:

$$\ln Y = b_0 + b_1 \ln C_W + b_2 \ln CF_1 + b_3 \ln CF_2 + b_4 \ln CL + b_5 \ln CF_3 + b_6 \ln C_O + e \dots\dots\dots 1$$

Where: Y = Net farm income in Naira/per annum; C_W = Cost of Water in Naira/per annum; CF₁ = Cost of Feed in Naira/per annum; CF₂ = Cost of Fuel in Naira/per annum; C_L = Cost of Labour in Naira/per annum; CF₃ = Cost of Fingerlings/per annum; C_O = Other Cost in Naira/per annum

Ln = Natural Log; b -b₆ = Parameters to be estimated; and e = Error term

Profitability analysis

This was evaluated using budgeting analysis which includes:

Gross margin

This was determined by the difference in the Total Revenue (TR) accrued from fish sales and the total variable cost (TVC) expressed as: GM = TR - TVC.....2

Where: GM = Gross Margin; TR = Total Revenue in Naira/per annum; and TVC = Total Variable Cost in Naira/per annum

Benefit-Cost Ratio

Benefit-Cost Ratio (BCR) was determined by the ratio of total revenue (TR) to total cost (TC), expressed as: BCR

$$= \frac{TR}{TC} \dots\dots\dots 3$$

Where: BCR = Benefit-Cost Ratio; TR = Total Revenue (Naira) /per annum; and TC = Total Cost (Naira) /per annum

Return on Investment

The Return on Investment (ROI) was determined by the ratio of the Net Return (NR) to Total Cost (TC), expressed as: ROI = $\frac{NR}{TC}$ 4

Where: ROI = Return on Investment; NR = Net Revenue (Naira) /per annum; and TC = Total Cost (Naira) /per annum

Percentage profitability

Percentage profitability (PP) was determined by the ratio of net profit to total cost multiplied by 100, expressed as: PP = $\frac{NP}{TC} \times 100$5

Where: PP = Percentage profitability; NP = Net Profit (Naira) /per annum; and TC = Total Cost (Naira) /per annum

RESULTS AND DISCUSSION

Socio-economic statistics of respondents

The result indicated that, on the average, a typical aquaculturist was 50.69 years, attained 13.81 years of schooling (i.e., secondary education) and gained about 5.63 years of experience in aquaculture enterprising. The mean household size, pond holdings, stock population and stock mortality were 6, 42.59 m², 2050 fingerlings and 6.49 % respectively.

Table 1: Average statistics of the farmers (n = 80)

Variables	Mean Value
Age	50.69 Years
Education	13.81 Years
Experience	5.63 Years
Household size	6
Pond Holdings	42.59 m ²
Stock population	2050 Fingerlings
Stock Mortality	6.49 %

Source: Field Survey, 2011. Sources of Working Capital

Respondents' sources of working capital available for aquaculture production are presented in Table 2. It shows that majority of respondents (42.50 %) sourced capital from personal savings, 13.75 % sourced from cooperative services while 8.75 % sourced from both personal Savings and Government loan. The descriptive analysis revealed that personal savings was the largest form of working capital available to aquaculturists in the study area. This is similar to Ekanem *et al.*, (2012) and Adewuyi *et al.*, (2010) who said majority of fish farmers in Cross River and Ogun State sourced capital from personal savings. The inability of Aquaculturists to assess bank and Government loans might be connected to its high rate of interest, stringent conditions and inability to provide collateral. Research findings equally showed that some aquaculturists got working capital from combined sources with personal savings and government loan been the highest in that category.

Table 2: Respondents' information on sources of working capital

Sources of Working Capital	Frequency	Percentage
Personal Savings	34	42.50
Cooperative Services	11	13.75
Government Loan	10	12.50
Bank Loan	4	5.00
Family Assistance	8	10.00
Personal Savings & Government Loan	7	8.75
Personal Savings & Family Assistance	2	2.50
Personal Savings & Bank Loan	1	1.25
Personal savings & Cooperative Services	3	3.75
Total	80	100

Source: Field Survey, 2011.

Average cost of production

Table 3 present the average cost of production in the study area. Feed purchases represent 64 percent of the production cost, labour accounted for 18.71 percent while fingerlings 14.89 percent. Other cost such as cost of vaccines, maintenance of equipment and other miscellaneous cost represent 1.36 percent of the cost of production. The study indicates that the cost of feed, labour and fingerlings accounted for the largest proportion (91.6 percent) of the variable cost of production in the study area. This is in line with Olawumi *et al.*, (2010) who discovered that labour cost, cost of fingerlings and feed constituted the lion share of aquaculture production in Ogun State. Okwu and Acheneje (2011) disclosed that the cost of feed and fingerlings accounted for over 50 percent of expenditure for fish farming in Benue State. Ekanem *et al.* (2012) however in Cross River State discovered that water accounted for 40.59% of aquaculture running cost.

Table 3: Average cost of production

Variable	Mean (₦)	Percentage
Water cost	21891.25	4.17
Feed cost	336395.30	64.00
Fuel cost	15093.75	2.87
Labour cost	103609.40	19.71
Fingerlings cost	41448.57	7.89
Other costs	7154.38	1.36
Total	525589.82	100.00

Source: Field Survey, 2011.

Determinants of respondents' revenue

The multiple regression was used to predict the impact of the cost-inputs on the value of output of the farmers. A total of 6 predictors were included in the model and the regression estimates are shown in Table 4. The results indicated that three out of the 6 variables (i.e., feed, labour and cost of fingerlings) had significant influence on net farm income. This implies that a larger percentage of the production cost is incurred on them. The regression estimates further shows that the cost of water, fuel and other cost exhibited weak impacts on net farm income, respectively. Ekanem *et al.*, (2012) in Cross Rivers State discovered that cost of water was significant in aquaculture production. Similar studies by Adewuyi *et al.*, (2010), Okwu and Acheneje (2011) and Ekanem *et al.*, (2012) discovered that the cost of fingerlings was significant on net farm production Ogun, Benue, Cross River States of Nigeria respectively. The significant of the labour cost is equally supported by Banjo *et al.*, (2009), Olagunju *et al.*, (2010) and Ekanem *et al.*, (2012). However, similar studies by Adewuyi *et al.*, (2010) revealed

that labour cost was not significant among fish farmers of Ogun State. This was however different with the findings by Olagunju *et al.*, (2007), Ugwumba (2011), Ekanem *et al.*, (2012) indicating that cost of feed was significant in Oyo, Anambra and Cross River States respectively. It is good to note in general that parameters such as feed cost, labour cost and fingerlings cost are very important in the management and sustainability of aquaculture production in the study area. The fitted model for the production function in the study area is presented in table 4. The coefficient of determination (R^2) value of 0.69 implies that about 69% of the variation in net farm income in aquaculture production was accounted for by variations in the costs of water, feed, fuel, labour, fingerlings and other cost.

Table 4: Estimates of cost function parameters

Predictor	Coef	S.E	T	P
Constant	1.683	0.418	4.026	0.000
C_w	-0.102	0.065	-1.569	0.122
CF_1	0.457	0.123	3.715*	0.000
CF_2	-0.111	0.068	-1.632	0.108
C_L	0.383	0.124	3.089*	0.003
CF_3	0.164	0.071	2.310*	0.024
C_o	-0.019	0.056	-0.339	0.727
$R^2 = 0.69$				

Source: Field survey, 2011.

Cost Returns and Profitability

An enterprise could be adjudged profitable in the short run, if the gross revenue is greater than the total variable cost (Emakoro and Ekunwe, 2009). Alternatively, the gross margin, which is the difference between the gross revenue and total variable cost, must be positive. This measurement enables investors to decide whether to invest in catfish farming business or not. Hence, such an estimate would serve as a general guide in the choice of investment opportunity in the study area. The budgeting analysis from the data collected is presented in Table 5. It revealed that the average total cost of production was ₦ 525589.82 (made up of labour cost, water cost, cost of fingerlings, feed cost, fuel and other cost). The table shows that a typical fish farmer in the study area generated ₦ 916,532.60 from fish sales of 1916.43 kg at average price of ₦ 478.25 per kg. The profitability analysis shows that a typical aquaculturist in the study area had an average positive Gross Margin (GM) of ₦ 390,942.80, a Benefit-Cost Ratio (BCR) of 1.74, Return on Investment (ROI) of 0.74 and a Percentage Profitability (PP) of 74.38. These parameters shows that aquaculture in the study area was profitable. This result is similar to the work of Okwu and Acheneje (2011) that discovered that fish farming is profitable in Benue State. It also compare favorably with Emakoro and Ekunwe (2009) that examined the efficiency of resource-use among catfish farmers in Kogi State. The profitability analysis of this study also agrees with that of Ashaolu *et al.*, (2005) that disclosed that fish farming is profitable in Abeokuta Metropolis of Ogun State; Ekanem *et al.*, (2012) also described fish farming in Cross River State as profitable. Therefore the third null hypothesis that says aquaculture production is not profitable in the study area is therefore rejected and alternative hypothesis accepted with a conclusion that aqua culture production is profitable in the study area. The distribution of respondents by profit per annum presented in Table 6 revealed that 10 % of the respondents realized a profit below ₦100, 000, 16.25 % had between ₦101, 000 and ₦200, 000, majority (40 %) had profit between ₦201,000 and ₦300,000, while 16.25 % of the respondents had profit above ₦500,000.

Conclusion and Recommendations

The cost-returns and profitability analysis of aquaculture production in Ekiti State, Nigeria revealed that cost inputs such as feed cost, labour cost and fingerlings cost had sign effect on the net income of farmers. It can also be concluded that aquaculture production was profitable in the study area considering the fact that the farmers were able to cover their operating expenses. This was apparent from the magnitude of their gross-margin, benefit-cost ratio, return on investment and percentage profitability. Prospective investors in the state should therefore capitalize on this highly viable sub-sector of economy should capitalize to increase fish production in the study area as well as increase the economic profile of the state. More emphasis should therefore be placed on resource utilization to further sustain the production of fish in the study area. The following are recommended:

Farmers in the study area should learn how to formulate quality feeds from locally available feed ingredients so as to reduce the pressure on total cost of production. Government should subsidize feed and other aquacultural inputs so as to increase fish production in the study area.

Table 5: Budgeting analysis

Parameters	Value
Labour cost	₦ 103609.40
Water cost	₦ 21891.25
Fingerlings	₦ 41448.57
Feed cost	₦ 336395.50
Fuel cost	₦ 15090.75
Other cost	₦ 7154.35
Total cost	₦ 525589.82
Weight of harvested fish (kg)	1926.76
Total Weight of fish sold (kg)	1916.43
Fish Price/kg	₦ 478.25
Revenue (Naira)	₦ 916532.60
Gross Margin (GM)	₦ 390942.80
Benefit-Cost Ratio (BCR)	1.74
Return on Investment (ROI)	0.74
Percentage Profit (PP) %	74.38

Source: Field Survey, 2011.

Table 6: Distribution of Aquaculturists by Profit per Annum

Profit (₦)	Frequency	Percentage
≤ 100,000	8	10.00
101,000 - 200,000	13	16.25
201,000 - 300,000	32	40.00
301,000 - 400,000	11	13.75
401,000 - 500,000	3	3.75
> 500,000	13	16.25
Total	80	100.00

Source: Field Survey, 2011.

With most of the fish farmers depending on personal savings for aquaculture, Government should as a matter of urgency provide capital for fish farmers in the study area in form of soft loan, as this formed the highest problem confronting the success of aquaculture in the study area. Small-scale farmers should organize themselves into fish cooperatives to facilitate their access to credit facilities, exchange of idea, control of price and technical information among members. However, Government should show more commitment to the implementation of agricultural credit scheme for efficient service delivery.

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