# EFFECT OF COST ACCUMULATION METHODS ON THE PROFITABILITY OF FISH FARMING BUSINESS IN CALABAR METROPOLIS, NIGERIA

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**Abstract:**
The investigation focused on effect of cost accumulation methods on the profitability of fish farming business. The main objective of this study was to investigate the effect of cost accumulation methods on the profitability of fish farming business in Calabar Metropolis. The research design adopted for this study was the ex-post facto research design. The result revealed that the two methods for estimating production cost have considerable effect on the profitability of fish farming which significantly proved that cost estimation and record keeping in fish farming business is a critical factor that will assist fish farmers in the measurement of profit. This is evidenced as the regression result of both fixed and variable cost showed the existence of substantial relationship between cost accumulation and profitability of fish farming in Cross River State, Nigeria. From the findings, the study recommended that fish farmers should develop better cost-effective techniques that minimize feed and equipment related costs to enhance future returns.

**JEL**: Q10; Q22; D20

**Keywords:** accumulation, cost, farming, fish, profitability

## 1. Introduction

The Nigerian fishing industry is believed to consist of three major subsectors, which are artisanal, industrial and aquaculture. Each of these sub-sectors is seen as important facet of fish production as they contribute to bridging income gap and creation of jobs in several ways. As fisheries sector provides source of livelihood to many homes, it also serves as a source of protein to the body. Hence, its contribution to Nigeria GDP is overwhelming (Onoja, 2005; Asuquo, Akum, Asuquo & Fumbui, 2018). Many African

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countries have identified great potentials in fish raring an; are resolute to encouraging private sector investments in this sector, due to its economic importance on human body. There is need to boost domestic production and reduce importation of fish into the country so as to facilitate growth. From biological viewpoint, African catfish is said to be one of the best aquaculture species in the world because it survives in different environments. In this light, Nigeria government in her agricultural value chain initiative through the support of international organizations such as the World Bank, African Development Bank and other financial institutions has come up with several developmental projects with more focus on fish farming so as to address vigorously the issue of economic diversification and import substitution, and also, environmental friendly policies are implemented by appropriate government agencies to ensure conducive and eco-friendly habitats for the operation fish farming (Ike & Chuks-Okonta, 2014; Asuquo, Dan, Odey, Linus, Uklala & Tapang, 2021; Asuquo, Dan & Effiong, 2020; Asuquo, 2012a).

In Nigeria, fish farming is seen as one of the fastest emerging animals founded food production sectors. Corroborating this view, the low level of seizure fisheries which serve as main facets fish farming in Nigeria has also appeared to have gotten their natural bounds due largely to environmental deprivation and overfishing, with a greater effect on over utilization of several fish species from the wild sources. These fishes which were once seen to be huge and limitless, are now over caught, and categorized as not being enough in their present state. Similarly, the demand for fish in the country has been on the rise against supply and is considered as one of the reasons why government has encouraged domestic aquaculture and providing enabling environment with input support. In regard to series of fisheries administrations, Agboola (2011) in his view holds that private sector in Osun State had about 2000 rural fish ponds, 3000 farm ponds and over 50 commercial farms which consist of great number of qualified manpower, as well as research equipment for aquaculture. Cross Rive State is bounded by terrestrial oceanic surrounding for fishing purposes and the production from these will intensify the supply during high anticipated demand given its economic importance. Through the Agricultural Reform Programme in the State, Government has extended support to private individuals in the areas of training, capacity building and grant for the sole aim of improving fish production in line with the policy of food sufficiency. In spite of government effort, fish farmers are still faced with the challenges of producing below expected output. This incidence could be related to insufficient and undependable releases of funds, absence of input materials, inadequate supply of quality fish seeds and feeds, low performing extension services etc. However, government support to production of fish in the State is cardinal but the most concerned aspect is management of fish farm by fish farmers to sustain production capacity. In order to gain full insight on the prospects of fish farming, it is imperative that information on various cost-return analyses be done so as to advance strategies and financial plan processes for increased fish production and performance of fish farms towards their imperishability and continuity (Asuquo, Ejabu, Bogbo, Atu & Adeioupe, 2018; Uwah & Asuquo, 2016).

## 1.1 Objectives of the Study

The main objective of this study is to investigate the effect of cost accumulation methods on the profitability of fish farming business in Calabar Metropolis. However, this was decomposed into the following individual or specific objectives: To examine the effect of variable cost on the profitability of fish farming business in Calabar Metropolis; and to evaluate the effect of fixed cost on the profitability of fish farming Calabar Metropolis.

## 1.2 Research Questions

The following research questions were formulated to match the research objectives respectively: Does variable cost affect profitability of fish farming in Calabar Metropolis? Is there any relationship between fixed cost and profitability of fish farming in Calabar Metropolis?

## 1.3 Research Hypotheses

Two null hypotheses were equally formulated for the study: Variable cost does not significantly affect profitability of fish farming business in Calabar Metropolis; and there is no significant relationship between fixed cost and profitability of fish farming business in Calabar metropolis.

## 2. Literature Review

Ike and Chuks-Okonta (2014) examined output and profitability of aquaculture fish farming using simple random sampling techniques to obtain data from eight communities of Burutu and Warri South West Local Government area of Delta State, Nigeria. The study employed Ordinary Least Square for the data analysis. Findings showed that cost of feeds was sensitive to aquaculture business and was also found profitable. Similarly, Adewuyi, Phillip, Ayinde and Akerele (2010) used multiple regression technique to analysis profitability of fish farming in Ogun State, Nigeria. The result revealed that fish output has a positive significant relationship with variable cost such as feeds cost, fingerlings cost, cost of labour, pond size cost and cost of lime. Cost of feeds and fingerlings exerted high variable cost to profitability of the study fish farmers. Tsue, Lawal and Ayuba (2012) employed stochastic profit frontier approach to look at profit efficiency among catfish farmers in Benue State of Nigeria. The expected parameters of the independent variables shows that cost of feeds exerted inverse relationship and is capable of reducing profitability of fish farming.

Awotide and Adejobi (2006) carried out a survey in two local government areas and six villages of Oyo State of Nigeria on cost of plantain production with a purpose of understanding the practical link between cost of production and procedural efficiency. It was found that plantain production was quite lucrative within the sample frame and resources were also judiciously utilized. In a related study, Omobepade, Adebayo, Amos & Adedokum (2015) used survey method to examine the cost and return of aquaculture production in Ekiti State, Nigeria. Data for the study were obtained from 80 respondents

carefully selected through multi-stage sampling method. The result revealed that cost of feed, fingerlings and labour cost on production takes highest in the ranking, but aquaculture was seen significant to profitability.

Nandi, Gunn, Adeboye and Barnaba (2014) used survey method to measure the livelihood and poverty status of fish farmers in Delta State, Nigeria. The study used descriptive statistics to analyses the questionnaire result. It was found that farmers lived in a rented apartment and their salaries were inadequate to enhance productivity as evidenced in frequent increase in spoilage. Emokaro and Ekunwe (2009) investigated efficiency of resources-used and elasticity of production among catfish farmers in Kaduna, Nigeria. They also used survey method to elicit information from 60 catfish farmers drawn from four Local Government Areas of Chikun, Igabi, Kaduna South and Kaduna North. The study revealed that study farms were inefficient of farm input while catfish feed (-430.850) marginal physical product was value lower than labour cost (1.004).

## 3. Material and Methods

### 3.1 Research Design
The research design adopted for this study was the ex-post facto research design. The choice of using ex-post facto was informed by the fact that variables of the study would not be manipulated and as such would not provide the opportunity for manipulating the variable. This is because the events had already taken place and therefore the research has been conducted after the fact.

### 3.2 Study Area
The study was carried out in Calabar urban which comprises of three local government areas of Calabar South, Calabar Municipal Council and Akpabuyo. These study areas were regarded as rainforest region with favorable weather and aquatic surroundings for fish cultivation. Data used for the study was purely secondary in nature extracted from ten fish farms financial records for the year 2018.

### 3.3 Sample and Sampling Techniques
The sample size consists of ten (10) fish farms located in Calabar South (2), Calabar Municipal (4) Council and Akpabuyo (4) local government area of Cross River State. Sampling method used in the study was stratified sampling techniques; the choice was due largely to the distance in farms location. Sample selection for the study involved fish farms that employ not less than five workers, fish farm with not less than three fish pond, fish farm with the capacity of producing fingerlings and modern fish pond facilities installed. The study fish farms registered with Cross River State Ministry of Youth and Skill Acquisition and Corporate Affairs Commission to carryout production of aquatic and frozen food.

## 3.4 Source of Data and Method of Data Collection

Data used for the study was purely secondary in nature extracted from ten fish farms financial records for the year 2018. The fish farms were able to separate every cost element into fixed and variable and were disclosed to the researcher.

## 3.5 Model Specification

The study made use of the following explanatory variables, such as: fixed and variable cost while profitability was represented by profit margin after expenses and government taxes.

In explicit manner, regression model is given as:

$$Y = X_0 + X_1 + X_2 + X_3 + X_4 + eu \qquad (1)$$

Where:
Y = profitability
$X_1$-$X_4$ = cost function
X0 = regression constant
Eu = error term

## 3.6 Method of Data Analysis

A multiple regression model was used to show the existing relationship between variables used in the study. The study also used descriptive statistic to show the mean score of fish farm that keep record of fixed and variable cost in their books of accounts.

## 4. Results and Discussion

## 4.1 Results Presentation and Interpretation

**Table 1:** Profitability determination of study fish farms

|  | ₦'000 |
|---|---|
| **Total Revenue (TR)** |  |
| Sales of fingerlings | 48,720,000.00 |
| Sales of matured fishes | 19,660,000.00 |
| **Total Revenue** | **68,380,000.00** |
| **Variable Cost (VC)** |  |
| Feed | 6,520,205.09 |
| Water | 1,164,489.00 |
| Fuel / Diesel | 1,356,344.00 |
| Chemical and Drugs | 287,800.00 |
| Salaries | 3,030,000.00 |
| **Total Variable Cost** | **12,358,839.09** |
| **Fixed Cost (FC)** |  |
| Concrete/Earthen Pond | 2,194,000.00 |
| Farm structure | 4,036,600.00 |

| | |
|---|---|
| Machinery/Equipment | 4,180,000.00 |
| **Total Fixed Cost** | **10,410,600.00** |
| Total cost (TC) (FC+VC) | 22,769,439.09 |
| Gross Margin GM (TR-TVC) | 56,021,160.91 |
| Net Farm Income NFI (GM/TFC) | 45,610,560.91 |
| Net Return on Investment NROI (NFI/TC) | 2.03 |

Table 1 is used to determine the profitability of fish farms in the study area. The result shows a total variable cost (TVC) of₦12,358,839.09, total fixed cost (TFC) of ₦10,410,600.00, total revenue (TR) from sales of fingerlings and matured fishes at ₦68,380,000.00, gross margin (GM) of ₦56,021,160.91, net farm income (NFI) of ₦45,610,560.91 and a positive net return on farm investment at 2.03 which indicates that the farmer will earn ₦2.3 return for every one naira invested in fish production.

**Table 2:** Average variable cost of fish production

| Variable cost | Means | Percentage |
|---|---|---|
| Feed | 6520205 | 52.76 |
| Water | 1164489 | 9.42 |
| Fuel | 1356344 | 10.97 |
| Chemical | 287800 | 2.33 |
| Salaries | 3030000 | 24.52 |

**Source:** Computed from financial statement of the study fish farms.

Table 2 shows the average variable cost of fish farming in the affected zone. Purchase of feed indicated 52.76 per cent of the production cost, salaries recorded 24.52 per cent while fuel/diesel 10.97 per cent, water and chemical used for production had 9.42 per cent and 2.33 per cent respectively. The result of this study agrees with that of Olawumi et al., (2010) who found that cost on labour and fingerlings feed had the highest portion of fish farming production in Ogun State.

**Table 3:** Average Fixed cost of fish production

| Variable cost | Means | Percentage |
|---|---|---|
| Concrete Pond | 2,194,000 | 21.07 |
| Farm Structure | 4,036,600 | 38.77 |
| Machine/Equipment | 4,180,000 | 40.15 |

**Source:** Computed from financial statement of the study fish farms.

Table 3 represents the average fixed cost of fish production in the affected study zone. Purchase of farm machinery represent 40.15.76 per cent of the production cost, farm structure recorded 38.77 per cent and concrete and earthen pond represent 21.07 per cent respectively.

**Table 4:** Regression result on effect of variable cost on return on profitability of fish farms

| Variables | | Coefficient | Std Error | t-Statistics | Prob |
|---|---|---|---|---|---|
| C | | 4850 | 51602 | -.009 | .993 |
| Feed | | -.417 | .619 | -.674 | .537 |
| Water | | 1.367 | 7.448 | .184 | .863 |
| Fuel | | 28.510 | 53.126 | .537 | .620 |
| Chemical | | -30.030 | 71.142 | -.422 | .695 |
| Salaries | | 14.924 | 15.069 | .990 | .378 |
| R² | = | 0.82 | | | |
| R²Adj | = | 0.60 | | | |
| F-stat | = | 3.706 | | | |
| DW | = | 1.285 | | | |

**Source:** Author's compilation from regression result.

The regression result shows that an increase in profit margin by ₦4.85 will result to a significant (1 per cent) decrease in feed and chemical related cost incurred by the farmers. The result also indicates that an increase in staff salaries, fuel and diesel, and water will result to 1 per cent increase in profitability of the study farms. The R square and Adjusted R square value constitute an important indicator for interpreting the model coefficient of variation. As revealed in the result, the R Square is 0.82 and the Adjusted R square is 0.60. This means that the cost of production explains 82 per cent variation in the study farm profitability. The forecasted values are statistically significant; leaving about 18 per cent variability in farm profitability to other factors not considered in the model. The probability value (p-value) of different variable cost of production shows a positive figure higher than 0.05 for the 95% confidence level. This implies that there is a positive strong relationship between the production cost and profitability, but the relationship was not significant to the model. The Durbin-Watson statistics value indicates a positive autocorrelation amongst the variables, meaning that the relationship between the dependent and independent variables are strong and significant to the study. The F-statistics of the estimated coefficient was observed to be 3.706and the statistical table value is 1.704 at 0.05 per cent confidence interval. Given that the computed figure of 3.706 is higher than the table value of 1.704 with the degree of freedom n – 5 (50-5) =45 at 0.05 per cent level of significance. The null hypothesis is rejected and the alternative accepted. Therefore, the study concluded that there is a substantial relationship between variable cost accumulated by fish farmers and profitability.

**Table 5:** Regression result on effect of fixed cost on return on profitability of fish farms

| Variables | Coefficient | Std. Error | t-Statistics | Prob. |
|---|---|---|---|---|
| C | 672 | 138 | 4.874 | 0.003 |
| Concret Pond | -4.312 | 7.160 | -.602 | 0.569 |
| Farm Structure | 12.398 | 2.782 | 4.456 | 0.004 |
| Machine | - 11.939 | 3.173 | -3.762 | 0.009 |
| R² = 0.92 | | | | |
| R²Adj = 0.87 | | | | |
| F-stat = 2.571 | | | | |
| DW = 2.167 | | | | |

**Source:** Author's compilation from regression result, 2021.

The regression result in Table 5 shows that the presence of farm structure resulted to decrease in profit margin by -₦67.2. This structure (building) provides shade to fishes from having frequent contact with sum light, and it takes about 39 per cent of fixed cost incurred by fish farmers in the study area. The result also indicates that a decrease in machinery / equipment and construction of concrete pond related cost incurred by the farmers were capable of decreasing profit margin by a significant figure. The machinery / equipment and construction of fish pond constitute about 61.22 per cent fixed cost incurred by the farmers. The R square and Adjusted R square value constitute an important indicator for interpreting the model coefficient of variation. As revealed in the result, the R Square is 0.92 and the Adjusted R square is 0.87. This means that as important indicators for interpreting the model coefficient of variation, cost of production explains 92 per cent variation in the study farm profitability. The forecasted values are statistically significant; leaving about 8 per cent variability in farm profitability to other factors not considered in the model. The probability value (p-value) of different variable cost of production shows a positive figure higher than 0.05 for the 95 per cent confidence level. This implies that there is a positive strong relationship between the productions fixed cost and profitability. The relationship between farm structure and machinery owned by the farmer exerts significant effect on the model, meaning that the higher the acquisition of this cost the lower the profit margin and verse visa. The relationship between cost on the construction of concrete pond and profitability were not significant to the model. The Durbin-Watson statistics value indicates a positive auto-correlation amongst the variables, meaning that the relationship between the dependent and independent variables are strong and significant to the study. The F-statistics of the estimated coefficient was observed to be 2.57and the statistical table value is 1.704 at 0.05 per cent confidence interval. The null hypothesis is rejected and the alternative accepted. Therefore, the study concludes that there exists a significant relationship between fixed cost accumulation methods in fish farming and profitability.

## 5. Discussion of Finding

The estimated regression result for cost accumulation methods on the profitability of fish farming in Calabar, Cross River State were presented in table 4 and 5 above. The result

in table 4 indicates that decrease in feed and chemical cost increase profit margin while increase in water supply to the fishpond, electricity supply and improved salaries to workers enhance profit margin. This result contrasts the findings of Tsue et al (2012) that cost of feed and labour had an opposite correlation with the farmer's profit, with cost of feed being the most important variable decreasing the profit of farmers. In variable cost structure of fish farming, the result in table 2 indicates that feed (52.76) and salaries (24.52) to employee constitute higher per cent of fish farmer's variable cost. This affirms the result of Ike and Chuks-Okanta (2014) that feed and labour cost had higher mean score in variable cost structure in their study. The tested hypothesis of this study shows the existence of strong and significant relationship between accumulation of variable cost and profitability of the study fish farms in Calabar area of Cross River State. This agrees with the result of Omobepade et al (2015) that fish farmers in their study area recorded average positive gross margin and cost benefit ratio, hence aquaculture production was significant.

The study further showed the relationship between fixed cost and profitability of fish farming in Cross River State. The result in table 5 indicates that decrease in profit margin of the fish farmers is caused by decrease in acquisition of farm equipment and dilapidated concrete pond which necessitate increase in fixed cost while increase in farm structure decrease profit margin as this does not have direct effect on fish production in the study area. The result is in line with the findings of Emakaro et al. (2009) that pond size constitutes reasonable fixed cost expenditure incurred by fish farmers considered to have positive effect on profit margin. Tested hypothesis shows that there is a relationship between accumulated fixed cost and profitability of fish farming in the study area. This result is in consonance with that of Ike and Chuks-Okanta (2014) that aquaculture practice is a profitable venture that has the capacity to attract new investors and reduction of unemployment rate in Delta State, Nigeria.

## 6. Conclusion

From time immemorial when there was no modern implement for aquaculture production, fish farming has been a foremost source of food for humankind, facilitation of employment and improved economic welfares to farmers. Despite this, it still appears that fish farming does not have much impact in the lives of the farmers. This is because individuals who are into the practice of fish production do not see it as a lucrative venture that can contribute to household needs and economic diversification. Besides, many see fish farming as a venture for the poor that require little money to trade. Several literatures were reviewed in this study at different economic background, some showed contradictory result while others agreed to the findings of this study. However, an entity could be declared profitable within a short period, when total revenue is more than total variable cost. Otherwise, the total profit, which is the difference between aggregate revenue and variable cost in aggregate, must be encouraging. This estimate assists stakeholders to resolve whether to finance fish farming business or to put their resources

in other profitable venture and this is done creatively and strategically with a sound knowledge of creative accounting in earning management, good financial practices towards a guaranteed profit level, practical application of standard magnitude variance in deciding optimal capital structuring; breaking of tied ranks during investment decisions; effective working capital management, predicting financial progress of the fish farming business through the use scientific model called standard magnitude variance analysis by Asuquo, 2020 (Asuquo, 2011a; Asuquo, 2011b; Asuquo, Effiong & Tapang, 2012; Asuquo, 2020). These appraisals would help investors to determine the choice of investment options available in the study area. Given the two methods of cost estimation used in this study, in addition to information technology synchronization, the regression result and elasticity of production cost on the profitability of fish farming has proved that cost estimation and record keeping recognizing the relevant financial standards and disclosures for financial reporting in fish farming business is a critical factor that will assist fish farmers in the measurement of profit as supported by submissions made by (Asuquo, 2013; Asuquo & Udoayang, 2020; Asuquo, Dan & Effiong, 2020; Asuquo, 2012b). This is evidenced as the regression result of both fixed and variable cost showed the existence of significant relationship between cost accumulation and profitability of fish farming in Cross River State.

## 7. Recommendation

From the findings, the study recommended that fish farmers should develop better cost-effective techniques that minimize feed and equipment related costs to enhance future returns. In order to gain full insight on the prospects of fish farming, it is imperative that information on various cost-return analyses be done so as to advance strategies and financial plan processes for increased fish production and performance of fish farms towards their imperishability and continuity.

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**Conflict of Interest Statement**
The author declares no conflicts of interests.

**About the Author**
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