Profitability of Catfish Production among Small holder Farmers in Awka South Local Government Area, Anambra State, Nigeria

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KEYWORDS

Catfish
Farmers
Fish farming
Profitability,
Small holder

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ABSTRACT

Nigeria, fish farming, especially catfish production has been embraced by many, regardless of age and educational qualification. According to the Federal Department of Fisheries (FDF), fisheries subsector has made significant contributions to Nigerian economy. The broad objective of the study is to determine the profitability of catfish production among smallholder farmers in Awka South Local Government Area, Anambra State. Fish production in Nigeria is not on the same level as the rapid population growth of about 200 million; with the projection of above 200 million by 2030. Thus, there exists a great deficit of fish production in the country and the inability of this industry to meet up with the supply of fish consumed annually due to the fast growing human population. The production of catfish in Nigeria is given much attention as a result of its capability to fill the demand and supply gap. Catfish production is a sustainable aquaculture and therefore, it is a lead way to national food security, wealth creation as well as nature conservation A multi stage sampling procedure was adopted in the selection of the sample size. In the first stage, Awka South Local Government Area was selected because of the dominance of catfish production in the area. 100 catfish farmers were finally selected for the study. Descriptive statistics, gross margin analysis, multiple regression analysis and likert-type scales were used for data analysis. The study recommends that catfish is highly profitable and can contribute to food security and subsequently, economic development in Nigeria.

INTRODUCTION

In Nigeria, fish farming especially, catfish production has been embraced by many, regardless of age and educational qualification (Inoin *et al*., 2017). Nigeria is blessed with a large expance of water bodies, consisting of marine and fresh waters, which is about 900 kilometers and over 14 million hectares, respectively; out of which 75% of freshwater is suitable for fish farming (Adelaja *et al*., 2018). This has made Nigeria to become the largest producer of fish and fisheries products in sub-Saharan Africa and currently, second to Egypt in Africa (Bolorunduro, 2016). According to the Federal Department of Fisheries (FDF, 2016), fisheries subsector has made significant contributions to Nigerian economy.

In 2017, fish consumption per capita in Nigeria, rose to 13.3kg; although it is below the world's average of 20.5kg (FAO, 2018). With this, fish production in Nigeria is not on the same level as the rapid population growth of about 200 million; with the projection of above 200 million by 2030 (Adelaja *et al*., 2018). Thus, there exists a great deficit of fish production in the country and the inability of this industry to meet up with the supply of fish consumed annually due to the fast-growing human population (Adelaja *et al*., 2018). Umaru *et al*., (2021) opined that apart from fish being a major protein source, it is also recommended for those whose

lives are threatened by cardiovascular diseases and other disorders, including rheumatoid, arthritis, diabetes, ulcer and renal diseases.

In Nigeria, the total annual demand for fish is estimated at 2.7 million metric tonnes (mmt). Just 30% of this demand is met domestically, resulting in an annual expenditure of N126 billion (US$625m) on fish imports. Nigeria's per capita fish consumption is 11 kg; this is significantly lower than the global average of 21 kg (NBS, 2016). With importation of more than 750,000 mt of fish, more than USD 600 million are spent on hard currency and thousands of jobs are exported (USAID, 2021). Catfish can easily be raised in warmer climates, both in fish ponds and tanks. The cultivation of catfish generally is becoming more popular by the day, as a result of its high market demand and health benefits. Raised catfish can be matured for harvesting at four months of age, thereby ensuring a quick business.

The production of catfish is given much attention today in Nigeria as a result of its capability to fill the demand and supply gap. Furthermore, it is known for its fast growth, high disease resistance, high prolificacy, omnivorous feeding, relatively cheap and environmental-friendly production (Ologbon *et al*., 2013). Catfish production is a sustainable aquaculture and therefore, it is a lead way to national food security, wealth creation as well as nature conservation. Several studies have been done on catfish production. A few of these studies examined profitability (Ugwumba and Chukwuji, 2010; Kassali and Mariana, 2011); technical efficiency of catfish production (Onoja and Chile, 2011; Emokaro and Ekunwe, 2009). Olajide (2016) carried out a study on the economics of catfish production in Osun State, Nigeria but to the best of my knowledge, this research is the first to establish the profitability of catfish production in Awka South Local Government Area of Anambra State. The major objective of the present study is to determine the profitability of catfish production among small holder farmers in Awka South LGA, Anambra State. Findings from this present study have therefore contributed to the scanty literature on the profitability of catfish production in Nigeria.

METHODOLOGY

Study area: The study was carried out in Awka South LGA of Anambra State, Nigeria. Anambra State is one of the states in Nigeria; it is located in the south eastern region of the country. It is located at Latitude 6 12′ 45N′ and 7 4′ 19′ E and Longitude 6.21269N and 7.07199E. It occupies a total land area of 144.5 Ha, with a population of 11 million residents (NPC, 2006). The state features two distinct seasons, which are the rainy and dry seasons, with an estimated total precipitation of about 2950mm. Average humidity is pegged at 70% while average temperature of the area is 27^0C.

The area is supports a wide range of farming activities, hence, it is predominantly occupied by farmers while its green vegetation supports livestock farming. Major crops grown in the area include food crops like yam, maize, cocoyam and cassava. Towns that make up Awka South Local Government Area include Amawbia, Awka, Ezenato, Isiagu, Mbaukwu, Nibo, Nise, Okpuno and Umuawulu. Anambra state has four Agricultural zones which are Awka south, Aguata zone, Anambra zone and Onitsha zone. Anambra state has 21 local government area which are; Awka south, Awka North, Dunukofia, Njikoka, Anicha, Anambra North, Anambra West, Oyi, Ayamelum, Orumba North, Orumba South, Aguata, Nnewi North, Nnewi south, Onitsha North, Onitsha South,Ihiala, Ekwusigo, Idemili North, Idemili South and Ogbaru.

Sampling Procedure and Sample Size:

A multistage sampling procedure was adopted in the selection of the sample size. In the first stage, Awka South LGA was selected because of the dominance of catfish producers in the area. All catfish farmers in Awka South LGA, formed the population of the study. In the second stage, 5 communities, which are Awka, Mbaukwu, Nibo Okpuno and Nise were randomly selected from the study area. In the third stage, 20 catfish farmers were randomly selected from each of the five communities; a total of 100 catfish farmers were selected for the study.

Method of Data Collection:

Primary data were used for the study. These were obtained through administration of a well-structured questionnaire to catfish farmers in the study area. The questionnaire contained pertinent questions that border on production pattern and inputs, socioeconomic characteristics of the producers as well as constraints faced by the farmers in catfish production. Questionnaire was administered by the researchers between February and May, 2023.

Analytical Tools and Techniques:

The following analytical tools were employed in the analysis

Descriptive Statistic: Frequency distributions and percentages, as well as mean distributions were adopted to describe the socio-economic characteristics of catfish farmers, describe catfish production pattern and constraints to catfish production in the study area.

Budgetary Analysis: Analysis of costs and returns was used to estimate the costs and returns while gross and net margins as well as rate of return on investment were used to measure the profitability of catfish production in the study area. Costs are expenses incurred during the operations of the production unit. Variable and fixed cost items used in the production were estimated. The depreciated values of the fixed cost items were also estimated. Revenue is the price per unit output multiplied by quantity of output. The gross margin of an enterprise gives the profit that is likely to be obtained from the production process. Afolami and Ayinde (2012) defined gross margin as the difference between the gross farm income (GFI) and the Total Variable Cost (TVC), while net farm income (NFI) was defined as the difference between gross margin and total fixed production costs. It is expressed as follows:

GM = TR – TVC
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Where:
GM = Gross margim (N/Ha)
TR = Total Revenue (N/Ha)
TVC = Total Variable Cost (N/Ha)
And
NFI = GM – TFC
Farm Gross Ratio = GM/TR
Net profit (π) = Total Revenue (TR) – Total Cost (TC)
Rate of Returns (ROR) = (TR/TC)
Rate of Return on Investment (RORI) = (NM/TC)
Multiple Regression analysis: Multiple regression analysis was employed in the study, to determine the socioeconomic factors influencing catfish production in the study area. The regression functional analysis was used in four functional forms from which the lead equation was chosen on the basis of the values of the coefficient of Multiple Determination (R^2) as well as signs and significance of the regression parameters. This is used explicitly as:

$Y = a + b_1x_1 + b_2X_2 + X_n + e_i$

Where:

Y = Output

The regression function postulated for catfish production in the study area is shown in the explicit form, using four functional forms; the linear, semi-log, double log and exponential. The four functional forms were evaluated using the ordinary least square method. The explicit forms of the functional forms are as follows:

The model were explicitly specified as: linear, semi-log, Exponential and Double-log.

Linear: Y=b0+b1×1+b2×2+b3×3+b4×4+b5×5+b6×6+b7×7+e.....(II)

Semi-log: Y=b0+b1log×1+b2 log X2+b3 log X3+b4 logx4+b5 logx5+b6 logx6+b7 logx7+log....(iii)

Exponential: log Y =Y=b0+b1×1+b2×2+b3×3+b4×4+b5×5+b6×6+b7×7+e.....(iv)

Double-log: log Y=b0+b1log×1+b2 log X2+b3 log X3+b4 logx4+b5 logx5+b6 logx6+b7 logx7+loge.....(v)

Likert scale rating technique

A likert scale is a psychometric scale in survey research. When responding to a likert questionnaire item, respondents specify their levels of agreement or disagreement on a symmetric agree - disagree scale for a series of item statement. The scale captures intensity of their feelings. A 4 - point rating scale was employed in this study. This was regarded as strongly agree (SA), agree (A), disagree (DA), and strongly disagree (SD), with corresponding values of 4, 3, 2, and 1 respectively. The mean score (MS) of the respondents based on the 4-point rating scale was computed as = 2.50 cut off point. Based on this, any score below 2.50 (MS<2.50) was taken as a weak factor and may not be considered while those with mean score of above 2.50 (MS>2.50) were taken as strong factors and thus be considered.

RESULTS AND DISCUSSION:

Socioeconomic Characteristics

The result of data visualization for the socioeconomic characteristics of the catfish producers in Awka South LGA is presented in Table 4.1. The information in Table 4.1 is discussed as:

Sex: the study revealed that the majority (64.0%) of catfish farmers are female, while the remaining 36.0% are male. This is an indication that catfish production in the area is dominated by women. This is against the observation of Ngeywo *et al*. (2015) who found that 82.5% of their respondents are male in socioeconomic and profitability analysis of catfish production in Nsukka, Enugu State.

Age: it was observed that a greater proportion of the respondents are within the age of 55 years and above, while the others are less than 35 years (28.0%), 45 – 54 years (20.0%), and the last 15.0% are 35 – 44 years. The average age of the farmers was found as 46 years. The farmers are mostly in their young and active age. The application of youthful energy will help to boost catfish production in the area.

Marital status: the table shows that the majority (61.0%) of the farmers are married, while the remaining 39.0% are single. This means that the enterprise is dominated by married respondents in the area. This result aligned with the assertion of FAO (2022) which noted that the catfish sector is also important for women and youth empowerment.

Experience: The study revealed a wealth of knowledge among farmers. Specifically, 44.0% of the farmers have 6-10 years of production experience. In contrast, 31.0% have less than 6 years of experience, 24.0% have between 11-15 years of experience, and a mere 1.0% have over 16 years of experience. On average, the farmers have approximately 8 years of experience. More experienced farmers are better equipped to identify and manage pests and diseases, which is crucial for the growth of the catfish sector (FAO, 2022).

Level of education: According to the study, 36.0% of the farmers had tertiary education, while 32.0% and 27.0% had secondary and primary education respectively. The remaining 5.0% had no formal education. The study suggests that the respondents are well-educated, which can help them understand the principles responsible for the growth of the sector. Education can also enable farmers to practice modern ways of catfish production.

Household: The study revealed that 49.0% of farmers have a household size ranging from 1-5 people, 46.0% have between 6-10 people, and a small 5.0% have more than 11 people in their households. On average, a farmer's household consists of approximately 6 people. Larger households can serve as a source of inexpensive labour supply.

Cooperative Membership: The study showed that 91.0% of the sampled catfish farmers are members of a cooperative. Being part of such an association aid in organizing their activities and enhancing their production experience. Conversely, the remaining 9.0% do not belong to any cooperative.

Access to Credit: The study also indicated that 89.0% of the farmers have access to formal credit. In contrast, the remaining 11.0% lack access to such credit facilities. Having access to credit can help farmers upscale their production capacity.

Cost and Returns of Catfish Production

Table 4.2 presents information regarding the cost and returns of catfish production in the study area. According to Danielle (2021), cost and returns analysis is a method used to compare the costs and benefits

of various projects, policies, or actions. This approach is essential as it aids in decision-making, engages stakeholders, solves problems, and identifies areas for enhancement. The study determined that the sales revenue from mature catfish over a six-month period amounted to N2,149,082.25. The operating expenses, which represent the variable cost associated with producing marketable catfish, amounted to N1,706,126.15. Consequently, the profit margin derived by subtracting the operating expense from the sales revenue was N442,956.10. Additionally, depreciation on fixed costs for production was N14,386.75. When combined with operating costs, the total production cost reached N1,720,512.90. Notably, the net return stood at N428,569.35. An intriguing observation was the profitability index, which showcased a ratio of 79.4% when comparing operating expenses to sales revenue. This ratio indicates the portion of the gross profit that can fund the next production season's operating expenses. The return on investment (ROI) was 0.25, suggesting that for every N1 investment in the sector, farmers gain an additional N0.25. This ROI is notably close to the 0.19 figure reported by Olasunkanmi (2013). These results align with Emaziye *et al*. (2020), who emphasized that catfish production is indeed a lucrative endeavor.

Socioeconomic Determinants of Production Output

Table 4.3 presents the socioeconomic factors influencing production output. Out of the four potential production functions assessed, the Double-log regression model was selected as the primary equation. The analysis was conducted using RStudio version 4.3.1. This analysis yielded an Adjusted R-square value of 0.828, signifying that 82.8% of the variability in catfish production output can be explained by the chosen explanatory variables. The remaining 17.2% can be ascribed to factors outside the farmers' control, such as high inflation, pests, diseases, and other external influences. Furthermore, the F-statistics value of 54.07***, significant at the 1% level, indicates that at least one of the assessed variables has a significant impact on farmers' output.

A notable observation was the age coefficient, which stood at 0.150 and was negatively significant at a 5% probability level. This suggests that for each unit increase in a farmer's age, catfish output would decline by 0.150 units. This result underscores the relationship between age and risk avoidance: older farmers might find it challenging to handle the demands of catfish production.

Marital Status Coefficient: The coefficient for marital status was determined to be 0.078, positive and significant at the 5% probability level. This suggests that the inclusion of one more married farmer would enhance the overall farmers' output by an additional 0.078 units. This rise might be attributed to the increased labor supply typically observed among married individuals.

Education Coefficient: The coefficient for education stood at -0.011 and was found to be significant at the 1% level. This means that with each unit increase in the number of farmers advancing in educational qualifications, there is a decrease in the farmer's output by 0.011 units. Contrary to initial expectations, the data indicated that individuals with higher educational qualifications in the area tend to seek white-collar jobs rather than engage in catfish farming.

Household Size Coefficient: The coefficient for household size was -0.041 and was significant at the 10% probability level. This implies that for each unit increase in household size (i.e., people sharing meals from the same source), the farmer's output diminishes by 0.041 units. Such a result suggests that a significant portion of the farmers' production might be set aside for family consumption, impacting the quantity of fish available for sale.

Cost of Feed Coefficient: With a coefficient of 0.341, the cost of feed was positive and significant at the 1% level of significance. This suggests that an increase of one unit in the cost of feed will augment output by 0.341 units. This further points to the efficiency of the fingerlings in converting feed. Moreover, it seems that farmers prioritize the quality of the feed over its cost, reflecting the idea that any added expense will be passed onto the final product.

Cost of Labor Coefficient: Standing at 0.157, the coefficient of the cost of labor was positive and significant at the 1% probability level. This indicates that a unit increment in available labor will enhance the output by 0.157 units. Within the region, labor is viewed as a critical component in catfish production.

From the analysis, the significant determinants influencing output in the area include age, marital status, education, household size, cost of feed, and cost of labor. Based on these significant variables, we reject the null hypothesis.

Constraints to Catfish Production

The challenges facing catfish production are detailed in Table 4.4. Data was collected using a 4-point Likert scale. A decision on each variable was based on a mean threshold of 2.5. This means that any variable with a mean score below 2.5 was considered to disagree with the identified challenges, while those scoring 2.5 or above were in agreement with the stated challenges. Out of the nine listed items, seven met or exceeded the mean threshold of 2.5.

The research pinpointed several significant challenges to catfish production in the area, along with their associated mean scores:

- Inadequate capital (M = 3.01)
- Unorganized marketing (M = 2.93)
- Pest and disease issues (M = 2.67)
- High cost of feeds (M = 2.77)
- Scarcity of fingerlings (M = 3.12)
- Inadequate extension services (M = 2.98)
- Limited space (M = 2.99)

With a grand mean of 2.71, it is evident that the majority of the outlined challenges resonate with the surveyed farmers. Additionally, the standard deviation of 0.83, which exceeds the 0.5 threshold, indicates varied responses from farmers concerning the challenges. This variability underscores the robustness and validity of this study's findings.

SUMMARY OF FINDINGS

Summary of Findings

Socioeconomic Characteristics: The study focused on the socioeconomic characteristics of catfish producers in Awka South LGA. The majority of catfish farmers were found to be female (64.0%). Most farmers were in the age group of 55 years and above, with an average age of 46 years, indicating a predominantly young and active demographic. The majority were married (61.0%), and 44.0% had 6-10 years of production experience. A significant portion (36.0%) had tertiary education, and 91.0% were members of a cooperative. Access to formal credit was high (89.0%), indicating potential for production capacity enhancement.

Cost and Returns of Catfish Production: The cost and returns analysis revealed that over a six-month period, sales revenue from mature catfish was N2,149,082.25. Operating expenses amounted to N1,706,126.15, resulting in a profit margin of N442,956.10. The net return was N428,569.35, with a profitability index of 79.4%. The return on investment (ROI) was 0.25, indicating a positive economic outlook for catfish production.

Socioeconomic Determinants of Production Output: The study employed a double-log regression model to assess socioeconomic determinants of production output. The model had an Adjusted R-square value of 0.828, indicating that 82.8% of the variability in catfish production output could be explained by the chosen variables. Significant determinants included age (negative impact), marital status (positive impact), education (negative impact), household size (negative impact), cost of feed (positive impact), and cost of labour (positive impact).

Constraints to Catfish Production: Challenges identified through a Likert scale included inadequate capital, unorganized marketing, pest and disease issues, high cost of feeds, scarcity of fingerlings, inadequate extension services, and limited space. The grand mean of 2.71 and a standard deviation of 0.83 indicated that these challenges were significant and diverse among surveyed farmers.

CONCLUSION AND RECOMMENDATIONS

he research provides valuable insights into the socioeconomic characteristics, cost and returns of catfish production, socioeconomic determinants of production output, and constraints faced by catfish farmers in Awka South LGA.

In terms of socioeconomic characteristics, the study highlights that catfish production in the area is predominantly led by women, contrary to findings in other regions. The majority of farmers are in their active age, married, well-educated, and members of cooperatives, which indicates a diverse and knowledgeable

farming community. Access to formal credit is prevalent among the farmers, suggesting financial support for production activities.

The cost and returns analysis revealed a positive net return for catfish production, indicating its profitability. The profitability index and return on investment align with previous studies, reinforcing the notion that catfish farming is a lucrative venture. The study emphasizes the importance of cost and returns analysis in decision-making for farmers and stakeholders.

The socioeconomic determinants of production output, analyzed through a double-log regression model, underscore the influence of various factors. Age, marital status, education, household size, cost of feed, and cost of labor are identified as significant determinants affecting catfish production output. The findings provide valuable insights for policymakers and practitioners to tailor interventions that consider these determinants to enhance production.

The research also identifies key challenges faced by catfish farmers in the area. Inadequate capital, unorganized marketing, pest and disease issues, high cost of feeds, scarcity of fingerlings, inadequate extension services, and limited space are highlighted as major constraints. These challenges, with varying degrees of impact, indicate the need for targeted interventions to address specific issues and enhance the overall resilience of catfish farming in the region.

In conclusion, the study contributes significantly to the understanding of the catfish farming landscape in Awka South LGA. The findings provide a foundation for informed decision-making, policy formulation, and interventions aimed at improving the socioeconomic conditions of catfish farmers and fostering sustainable growth in the sector.

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