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Assessing the Economic Performance of Catfish Farming in Nsukka and Enugu Metropolis, Nigeria: A Comparative Perspective

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Abstract

Despite the significant contribution of catfish farming to Nigeria's agricultural sector, there is limited research on its economic viability and opportunities. This study presents a comparative analysis of the economic performance of catfish farming in both the Nsukka Local Government Area (LGA) and Enugu Metropolis, Nigeria. Specifically, it compared the socioeconomic characteristics of catfish farmers, evaluated the profitability of catfish production, and identified the constraints faced by farmers in these locations. A multistage sampling technique was used to select 120 respondents, and primary data were gathered using a structured questionnaire. Descriptive statistics and profitability indicators were employed to achieve the objectives. The results indicated that most catfish farmers in both locations are young, married, and have a formal education. The findings also revealed that catfish farming is a profitable venture in both Nsukka LGA and Enugu Metropolis, with mean gross margins of ₦662,534.45 and ₦861,733.22, respectively. The return on investment (ROI) for catfish farmers in Nsukka LGA was 1.09. In contrast, the ROI for Enugu Metropolis was 1.40, demonstrating greater profitability in that area. However, the enterprise faces significant challenges, including high feed costs, elevated interest rates on bank loans, inadequate access to quality fingerlings, and high-water supply costs. The study recommends strategic interventions to address these challenges and enhance the profitability and sustainability of catfish farming in the areas studied, including input cost management, better access to credit, and government support for research and development.

Keywords: *Catfish farming, Economic performance, Profitability, Investment, Nigeria.*

Introduction

Aquaculture has emerged as a vital sector in Nigeria's agricultural economy, playing a significant role in enhancing food security, providing a sustainable source of protein, generating employment, and contributing to household income for millions of people in urban and rural areas (Ogunji & Wuertz, 2023; Falola et al., 2022). The sector has witnessed substantial growth over the past few decades, particularly in urban and peri-urban regions where market access and infrastructure support aquaculture development. This growth has positioned Nigeria as a leading aquaculture producer in Sub-Saharan Africa (Adeleke et al., 2020; FAO, 2022), with southeastern states like Enugu experiencing a notable surge in catfish farming activities, driven by the proliferation of small and medium-scale farms. Among the various aquaculture practices, catfish farming has gained prominence due to increasing population, rising consumer preference for fish protein, declining capture fisheries, adaptability to diverse local environmental conditions, and relatively low production costs, as well as its fast growth rate (Abdel-Hady et al., 2024; Manyise et al., 2024; Mukaila et al, 2023). Catfish (*Clarias gariepinus* and *Heterobranchus spp.)* is one of the most cultivated fish species, contributing significantly to food security and livelihoods, particularly in urban and peri-urban areas in Nigeria (Olagunju, 2024; Adeleke et al, 2020).

Within Nigeria, different geographical regions demonstrate varying levels of catfish farming development and economic performance based on local conditions, market dynamics, and resource availability (Engle et al., 2022; Olagunju et al., 2022). Southeastern Nigeria, particularly Enugu State, has witnessed a proliferation of catfish farms, with Nsukka and Enugu Metropolis becoming key production hubs (Umaru et al., 2021). Nsukka and Enugu metropolis represent two distinct centers in southeastern Nigeria with different socioeconomic profiles, infrastructure development, and market characteristics that potentially influence catfish farming operations. Nsukka, a university town, characterized by its rural settings and limited market infrastructure, contrasts with Enugu metropolis, an urban centre, which serves as a major administrative and commercial hub in the region with a more diverse economic landscape and potentially different market demands and access to resources. These differences may significantly impact the structure, operation, and economic outcomes of catfish farming enterprises in both locations.

In addition, earlier studies (Arifa et al., 2022; Kumar et al., 2020; Diatin et al., 2020; Olagunju et al., 2022; Mukaila et al., 2023) showed several factors can influence the economic performance of catfish farming, including the socioeconomic characteristics of the farmers, the scale and intensity of production, access to inputs and credit, market dynamics, and the prevalence of constraints such as disease outbreaks, high feed costs, poor water management and inadequate infrastructure influence production efficiency, profitability, and overall economic viability. Thus, while catfish farming has proven profitable and contributes significantly to local economies in both locations, its operational dynamics, farmer characteristics, and challenges are likely shaped by their distinct

environments. Similarly, despite its growth, Ajagbe et al. (2024), Mukaila et al. (2023), and Mbokane et al. (2022) noted that catfish farming faces persistent challenges, including high feed costs, limited access to credit, inadequate water management, and inconsistent government policies, which vary across locations due to differences in infrastructure, market access, and farming practices.

Existing studies (Olagunju et al., 2022; Onyekuru et al., 2019; Akoh et al., 2025; Akure et al., 2024; Cheatham et al., 2023; Adelesi & Baruw, 2022) on catfish farming in Nigeria have largely focused on general profitability analyses or technical production challenges, with limited comparative studies specifically examining the socioeconomic and economic nuances between locations like Nsukka and Enugu Metropolis. Understanding these location-specific differences is crucial for formulating targeted policies and interventions to optimize resource utilization, improve market access, mitigate production risks for catfish farmers, enhance productivity, and the sustainability of the sector. This study, therefore, seeks to address this gap by comparatively assessing the socioeconomic profiles of catfish farmers in Nsukka and Enugu Metropolis, evaluating the profitability of their production systems, and identifying the key constraints they face. By providing evidence-based insights into these critical aspects, this research aims to contribute to the sustainable development of catfish farming in Enugu State and offer valuable lessons for similar agro-economic settings across Nigeria. The findings will be beneficial for policymakers, development agencies, extension services, prospective and current farmers, and other stakeholders in the aquaculture value chain.

Materials and Methods

The study was carried out in Enugu Metropolis and Nsukka Local Government Area (LGA) of Enugu State, Nigeria. Enugu metropolis is the capital city of Enugu State, and it comprises Enugu East, Enugu North, and Enugu South LGAs. Enugu State lies between latitudes 5°56'N and 7°36'N and longitudes 6°53'E and 7°55'E of the Greenwich Meridian (Enugu State Agricultural Development Project, ENADEP, 2009). A multi-stage sampling technique was used to select catfish farmers from Enugu Metropolis and Nsukka (LGA). The first stage was a purposive selection of six communities with a large number of catfish farmers from Enugu Metropolis and Nsukka LGA. The second and final stage was a random selection of 10 catfish farmers from the list of farmers in each of the 12 communities, giving a total of 120 respondents for the study, that is, 60 in Nsukka LGA and 60 in Enugu Metropolis.

Primary data was used for the study and was collected from the catfish farmers using a well-structured questionnaire. The questionnaire captured information such as the socio-economic characteristics of the respondents, costs incurred, and revenues obtained in catfish rearing and production constraints faced by the farmers. Descriptive statistics such as frequency distribution and percentages, gross margin, and net farm income techniques were used to achieve the objectives.

Model Specifications

Gross margin analysis was expressed as:

GM = TR -TVC

Where:
GM = Gross Margin (₦)
TR = Total Revenue (₦)

TVC = (Total Variable Cost) (₦)
NFI (Net Farm Income) = GM -TFC
TFC = Total Fixed Cost

$$\text{Return on Investment} = \frac{GM}{TVC}$$

Results and Discussion

Socio-economic characteristics of catfish farmers

The study revealed that catfish farming in both Nsukka LGA and Enugu Metropolis is predominantly male-dominated, with males constituting 68.3% and 76.7% of the respondents, respectively. The male dominance in catfish farming suggests potential barriers to women's participation, highlighting the need for initiatives to promote gender inclusivity. In terms of marital status, the majority of the respondents were married, accounting for 63.3% in Nsukka LGA and 68.3% in Enugu Metropolis. The high percentage of married respondents implies that family responsibilities may influence farming decisions, labour allocation, and income management. The age distribution showed that most farmers in both locations fell within the 21-40 age range, with 45% in Nsukka LGA and 51.7% in Enugu Metropolis. The mean ages of 41 and 43 years in Nsukka LGA and Enugu Metropolis, respectively, suggest that the catfish farmers are relatively young and energetic, which could contribute to innovation, productivity, and sustainability of the catfish business. The result aligns with a study by Omeje *et al.* (2021) among

catfish farmers in Kainji Lake Basin, Nigeria. Regarding household size, the majority of respondents in both locations had household sizes ranging from 1 to 4 persons, accounting for 48.3% in Nsukka LGA and 60% in Enugu Metropolis. The mean household sizes were 6 and 5 persons in Nsukka LGA and Enugu Metropolis, respectively. The result is in agreement with Jimmy et al (2024) and Gbigbi (2021) that the mean household size of Catfish farmers is between 6 and 8. The educational qualifications of catfish farmers differed between Nsukka LGA and Enugu Metropolis. In Nsukka, 3.3% had no formal education, while in Enugu Metropolis, all farmers had formal education. The mean years of schooling were 11 years in Nsukka and 13 years in Enugu, indicating that the farmers can manage catfish production effectively. However, additional training or support could further enhance productivity.

Table 1: Socioeconomic Characteristics of the Catfish Farmers

Socio-economic Characteristics	Nsukka (*n=60*)		Enugu (*n=60*)	
	Frequency	Percentage	Frequency	Percentage
Gender				
Male	41	68.3	46	76.7
Female	19	31.7	14	23.3
Marital status				
Married	38	63.3	41	68.3
Single	19	31.7	13	21.7
Divorced	1	1.7	2	3.3
Widowed	2	3.3	4	6.7
Age				
≤20	11	18.3	14	23.3
21-40	27	45.0	31	51.7
41-60	14	23.3	11	18.3
61-80	8	13.4	4	6.7
Mean	*41.31 years*		*43.73 years*	
Household size				
1– 4	29	48.3	36	60.0
5 – 8	18	30.0	21	35.0
9 -12	13	21.7	3	5
Mean	*6.53 persons*		*5.88 persons*	
Education qualification				
No formal Education	2	3.3	-	
Primary	17	28.3	13	21.7
Secondary	31	51.7	35	58.3
Tertiary	10	16.7	12	20
Years of education				
0 – 6	19	31.7	25	41.7
7 – 12	34	56.7	30	50
≥13	7	11.6	5	8.3
Mean	*11.82 years*		*13.67 years*	
Years of experience				
≤10	16	26.7	12	20.0
11 – 15	33	55.0	39	65.0
≥16	11	18.3	9	15.0
Mean	*11.71 years*		*12.91 years*	
Mode of Operation				
Full time	38	63.3	43	71.7
Part-time	22	36.7	17	28.3
Size of Operation				
Small-scale	22	36.7	14	23.4
Medium-scale	35	58.3	41	68.3
Large-scale	3	5.0	5	8.3
Monthly Income				
30,000-60,000	9	15.0	4	6.7
61,000-100,000	39	65.0	41	68.3
101,000-250,000	12	20.0	15	25
Mean	89,151.75			105,148.02

The result is consistent with Jimmy et al. 2024 and Solomon and George (2019), who reported relatively high literacy levels among catfish farmers. The study also revealed that catfish farmers in both locations had significant experience, with a mean year of experience being 11 years in Nsukka LGA and 12 years in Enugu Metropolis. This level of experience is in line with a study by Enwelu *et al. (*2023) and suggests that the farmers are well-equipped to handle challenges and make informed decisions, which can enhance their productivity and overall success in catfish farming. The study found that the majority of respondents in both Nsukka LGA (63%) and Enugu Metropolis (71.7%) were full-time catfish farmers, indicating that catfish production is their primary source of livelihood. The high percentage of full-time catfish farmers suggests that many households in both locations depend on catfish farming for their livelihood. This highlights the importance of supporting and sustaining the catfish industry.

In terms of scale, most respondents in both locations operated medium-scale catfish farms, with 58.3% in Nsukka LGA and 68.3% in Enugu Metropolis. The dominance of medium-scale catfish farms suggests opportunities for growth and expansion into larger-scale operations, which could increase productivity and income. The income analysis showed that the majority of respondents in both locations earned between ₦61,000 and ₦100,000 per month. However, farmers in Enugu Metropolis had a higher mean monthly income of ₦105,148.02 compared to ₦89,151.75 in Nsukka LGA. The difference in mean monthly income between Nsukka LGA and Enugu Metropolis may be attributed to factors like market access, production costs, or demand. Understanding these factors could help bridge the income gap.

Profitability of catfish production

Tables 2a and 2b present the cost and return analysis of catfish farmers in Nsukka LGA and Enugu metropolis. Results in Table 2a showed that the mean quantity of catfish produced and sold within a production cycle in Nsukka LGA was 805.3, and the average price per kg of catfish was ₦1,580.5. The result further showed that the mean total cost of catfish production was ₦669,526,80, and the mean total revenue was ₦1,272,776.65. Therefore, the results of the gross margin (₦ 662,534.45) and the Net Farm Income (₦603,250.85) analyses indicated that catfish farming was both viable and profitable in Nsukka LGA. The return on investment of the catfish farmers was 1.09, implying that catfish farmers in the Nsukka LGA returned ₦1.09 for every 1.00 Naira invested in the business. This result is in agreement with the findings of Ikechukwu (2023), who found that catfish production was a profitable enterprise with a return on investment of ₦1.11 for every capital invested. However, the result disagrees with the findings of Enimu and Edet (2018) in Delta state, which found that the return on investment was less than ₦1.

The results in Table 2b indicated that the mean quantity of catfish produced and sold within a production cycle in the Enugu metropolis was 912.4, and the average price per kg of catfish was ₦1,620.3. The average total cost of catfish production was ₦678,256.60, and the average total revenue generated was ₦1,478,361.72. Therefore, the results of gross margin (₦861,733.22) and the Net Farm Income (₦800,105.12) analyses in Enugu metropolis showed that catfish farming was a profitable enterprise. The return on investment (ROI) of the catfish farmers was 1.40, implying that catfish farmers in the Enugu metropolis returned ₦1.40 for every 1.00 Naira invested in the business. The result is consistent with the findings of Enwelu et al. (2023), who noted that catfish production was profitable in Anambra State with a return on investment of ₦2.47 for every capital invested. However, it also disagrees with a study by Enimu and Edet (2018), which found a return on investment of 0.48 among catfish farmers in Delta State, Nigeria.

Comparatively, from Tables 2a and 2b, catfish farming was found to be more profitable in the Enugu metropolis when compared to that of Nsukka LGA. Though the cost of feed contributed more than 50% of total expenditure in both locations, the enterprise generated more revenue and consequently more profit and more return on investment in the Enugu metropolis. Therefore, catfish farmers had a higher return on investment (1.40) than those in Nsukka LGA, who had only 1.09 as a return on capital investment. This could be attributed to the fact that the Enugu metropolis had more full-time catfish farmers than Nsukka, as reported in Table 1. Catfish farmers who are full-time operators tend to be more dedicated and committed, and monitor any challenges that can reduce the efficiency of catfish production (Esiobu et al, 2022). Thus, the more time devoted to the enterprise, the higher the propensity to earn more. It can also be linked to the fact that the Enugu metropolis, being the state capital, may have more premium consumers who have more income than those in relatively rural Nsukka LGA.

Constraints faced by Catfish farmers

The constraints militating against the catfish production in Nsukka LGA and the Enugu metropolis are presented in Table 3. The results in the Table showed that the cost of feed (100%) was the major constraint in the catfish production. This is a further confirmation of the high cost of feed reported in Table 1, in which feed accounted for over 50% of the total cost of production in both Nsukka LGA and Enugu metropolis. The result is in agreement with that of Alawode and Ajagbe (2020), who ranked the cost of feed as the most important factor that militates against the level of profitability in cattish production. This suggests that if the cost of feed is reduced drastically, the welfare of the catfish farmers would increase due to increased profit levels.

Table 2a: Cost and Return of Catfish producers in Nsukka LGA per production cycle

	Average Quantity/Cost (₦)	% Share	Price per Kg (₦)	Total (₦)
Revenue				
Catfish	805.3		1,580.5	**1,272,76. 65**
Variable Cost:				
Catfish feeds	340,500.7	50.86		
Drugs/Medications	43, 300.3	6.47		
Liming materials	19,750.5	2.94		
Labour (person-day)	49,600	7.41		
Fingerlings	73, 350.2	10.96		
Transportation	28,440.1	4.25		
Water	115,700	17.30		
Cost of electricity/fuel for pumping water	34,500.5	5.15		
Maintenance/Repairs	21750.4	3.25		
Total Variable Cost (TVC)				**610, 242.20**
Fixed cost (Depreciated Value)				
Pond	30,525.5	4.56		
Pumping machine	12,550.3	1.87		
Weighing Scale	1470.7	0.22		
Water tank	8655.6	1.29		
Bucket and Basins	1198.5	0.18		
Pond net cover	1312.5	0.20		
Net Harvesting	1455.3	0.23		
Ph meter	2114.8	0.32		
Total Fixed Cost (TFC)				**59, 283. 60**
Total Cost (TVC + TFC)				**669, 525. 80**
Gross Margin (TR -TVC)				**662, 534. 45**
Net farm income (TR-TC)				**603, 250. 85**
ROI/RCI GM/TVC				**1.09**
Revenue				
Catfish	912.4		1,620.3	**1,478,361.72**
Variable cost:				
Catfish feeds	355, 090.3	52.35		
Drugs/Medications	45,000.5	6.63		
Liming materials	20, 850.2	3.07		
Labour (person-day)	52,550.1	7.73		
Fingerlings	75,080.4	11.07		
Transportation	30,050	4.43		
Water	120, 500.4	17.77		
Cost of electricity/fuel for pumping water	35,357.2	5.21		
Maintenance/Repairs	23500	3.46		
Total Variable Cost (TVC)				**616, 628. 50**
Fixed cost (Depreciated Value)				
Pond	33,025.3	4.87		
Pumping machine	12,350.1	1.82		
Weighing Scale	1450.4	0.21		
Water tank	8500.6	1.25		
Bucket and Basins	1300	0.19		
Pond net cover	1300.7	0.19		
Net Harvesting	1500.3	0.22		
Ph meter	2200	0.32		
Total Fixed Cost (TFC)				**61, 628.10**
Total Cost (TVC + TFC)				**678, 256. 60**
Gross Margin (TR -TVC)				**861, 733. 22**
Net farm income (TR-TC)				**800, 105. 12**
ROI/RCI GM/TVC				**1.40**

Aside from the cost of feed, the other major challenges facing catfish production in Nsukka LGA, as stated in Table 3, include high interest rate on bank loans (95%), high spread of pests and diseases (95%), lack of quality supply of fingerlings (85%), high cost of water supply (83.3%), high mortality rate (81.7) and inadequate capital (80%). As regards the Enugu metropolis, the major hindrance to catfish production, in addition to the high cost of feed as indicated in Table 3, include high cost of labour (95%), high cost of water supply (93.3), interest rate on bank loan (91.7%), high mortality rate (86.7), high spread of pests and diseases (85%), and lack of quality and supply of fingerlings (85%).

Comparatively, the result further suggests that whereas high interest rate on bank loans (95%) and high spread of pests and diseases (95%) were the second and third most important constraints in Nsukka LGA, the case was not the same with that of Enugu metropolis, in which high cost of labour (95%) and high cost of water supply (93.3%) were ranked as the second and third most important constraints to catfish production. However, catfish producers in both Nsukka and Enugu metropolises ranked the lack of an organised market as the least contributor to inefficiencies in catfish production, with 31.7% and 18.7%, respectively.

Table 3: Constraints Against Catfish Production in Nsukka LGA and Enugu Metropolis

Items	Nsukka		Enugu	
	Frequency	Percentage	Frequency	Percentage
High cost of feed	60	100.0	60	100.0
Inadequate capital	48	80.0	35	58.3
High cost of fingerlings	34	56.7	27	45.0
High cost of water supply	50	83.3	56	93.3
High spread of pests and diseases	27	45.0	21	35.0
High cost of labour	33	55.0	57	95.0
High cost of transportation	47	78.3	55	91.7
Lack of organised market	19	31.7	10	16.7
High spread of pests and diseases	57	95.0	51	85.0
Poorly trained extension Personnel	42	70.0	21	35.0
Lack of Access to credit	44	73.3	38	63.3
High mortality rate	49	81.7	52	86.7
Lack of quality supply of fingerlings	51	85.0	51	85.0
High interest rate on a bank loan	57	95.0	55	91.7
Poor Extension Coverage	28	46.7	32	53.3
Poaching	20	33.3	27	45.0

Multiple Responses*

Conclusions and Recommendations

Catfish farming is a profitable enterprise in both Nsukka LGA and Enugu Metropolis, with higher profitability in Enugu. The industry has significant economic potential, contributing to livelihoods, food security, and employment. However, challenges such as high feed costs, interest rates, labor costs, pests and diseases, poor fingerling quality, and water supply costs hinder its viability. Strategic interventions are necessary to address these challenges and ensure sustainable growth, efficiency, and profitability in catfish farming. Therefore, to enhance catfish farming in Nsukka LGA and Enugu Metropolis, several key measures are recommended. These include promoting cost-effective feed alternatives, improving access to affordable credit, and breeding quality, disease-resistant catfish. Additionally, training farmers to detect pests and diseases early, addressing water scarcity issues, and establishing organized markets with marketing support can help lower costs, increase profitability, and ensure the industry's sustainability.

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