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## Economic analysis of catfish production in Anambra West metropolis Anambra state, Nigeria

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### Abstract

The study assessed the economic analysis of catfish production in Anambra West Metropolis, Anambra state, Nigeria. The sample size for the study comprised one hundred and twenty catfish farmers in Anambra West metropolis who were purposively selected. Data were collected using structured interview schedule by the researcher and other research assistants. Simple descriptive statistics like percentage, frequency, mean scores standard deviation and Net Farm Income were used for data analysis and result presentation. The study found that catfish production is a profitable business in the area with estimated total cost of ₦14,246,163 Net Farm Income of ₦20,000,000 and ROI of 2.47. Catfish producers in the area cited high feed costs, lack of capital and others as major constraints. The study suggests government engagement to manage and lower the import taxes levied on dealers who import foreign feeds and to develop local feed mills to increase feed production and nutritional content.

**Keywords:** Economic, analysis, catfish, production

### 1. Introduction

One of Nigeria's most important aquaculture sectors is catfish farming, which is also widely regarded as a profitable enterprise. In developing nations like Nigeria, which has an ever-increasing population of nearly 200 million people, catfish farming offers enormous promise for creating employment opportunities, generating revenue, reducing poverty, and enhancing food security (Wuyep & Rampedi, 2018) [19]. Due to its high protein content and the fact that it contains vital nutrients for boosting the health of persons with illnesses like cardiovascular diseases and others, fish is a common food in every family in Nigeria. The average Nigerian consumes roughly 41% of their total protein from fish, which is less than the average global intake of 13.3 kg per person per year. This suggests that despite poor production, there is a significant demand for fish in the nation. This increasing demand for fish has demonstrated that the country's catfish marketing and production industries have promising futures (Balami *et al.*, 2019; Ashley & Adelaja, 2022) [5, 3]. The world's largest producer of African catfish, one of Africa's most valuable freshwater fish species is Nigeria. The Federal Department of Fisheries (2013) [9] estimates that the fishing sub-sector contributed around 5% of Nigeria's Gross Domestic Product (GDP). In accordance with statistics from the Food and Agriculture Organization (2022), the nation's aquaculture production increased from 22,000 tonnes in 1999 to more than 300,000 tonnes in 2017. The aquaculture sector is currently worth about N261.8 billion. Ninety percent of Nigerian farmers involved in the fish value chain produce catfish, which supports one million direct jobs across the chain (Daily Trust, 2022) [7].

According to Cowan (2021) [4], economic analysis of catfish production is the assessment of the costs and benefits to determine the economic viability associated with catfish production in the state. Nigeria requires about 3.6 million metric tonnes (MMT) of fish yearly to meet the dietary requirement of her citizens. This figure shows that there is high demand for fish to meet the dietary needs of the ever growing population of over 180million people in Nigeria. But, the total aggregate domestic fish supply from all sources both captured and farmed is about 1.2MMT with importation of frozen fish accounting for about 2.4million metric tonnes per annum (Nnodim, 2022) [15].

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This shows that Nigeria still depend on massive importation of fish to meet her fish needs as there still exist a deficit of 2.5 million metric tonnes as the current demand has escalated to more than 3.6million per annum. Between 2019 and 2020 importation of frozen fish had increased from \$789.74 million to \$ 1.27 billion respectively, representing 38 per cent (about \$480.2 million) increase. while between January and June in 2021 Nigeria imported the blue whittling specie worth N62.4bn; forage fish, mostly belonging to the family of Clupeidae) imports cost N35.53bn and mackerel hit N25.75bn. while in 2022, Nigeria imported \$2.14bn worth of fish into the country (Daily Trust, 2022; Jaiyeola, 2022) [7, 13]. Nearly half of the fish consumed in Nigeria are produced in artificial ponds, making the catfish farming sub-sector one of the most lucrative and quickly expanding agricultural industries. *Clarias gariepinus*, popularly known as the African catfish, is the most widely farmed catfish species in Nigeria because to its tolerance of the local environment, resistance to illnesses, and quality traits that minimizes loss for farmers (Idris-Adeniyi, 2018) [11]. The productivity and revenue of catfish farmers in Nigeria have been enhanced over time by efforts made by the federal and state governments. This has been done through introducing improved catfish production technologies to fish farmers in all 36 states and encouraging their use. For instance, the Nigerian Special Program for Food and Security (NSPFS) was an inland fisheries and aquaculture program that lasted for four years. As part of the South-South Cooperation initiative, a total of 70 Chinese technicians are providing assistance to private fish farmers in rural areas, with the goal of improving their income and standard of living. Additionally, local fish production was prioritized by both the federal and state governments in 2008, and catfish was chosen because it is native to the nation. In order to encourage private fish farmers to master the skill of fingerling production and hatchery in order to increase local fish production, the Federal government also implemented a basic but effective technology across all 36 states of the nation in 2009 (Fison, 2008).

Although there is still a significant gap between supply and demand, it is anticipated that farmers who adopt fish improved production technologies will increase their output directly, which will have a knock-on effect on their income, food security, and employment opportunities in those farming communities. This suggests that there may be business obstacles preventing catfish producers across the nation from being productive and profitable. Therefore this study is important to ascertain the economics of catfish production in the state in order to boost productivity, income and eliminate constraints encountered by fish farmers in Anambra West Metropolis local government area, Anambra State, Nigeria. The broad objective of this study was to assess the economic analysis of catfish production in Anambra West Local Government Area Anambra State, Nigeria. The specific objectives were to describe the socio economic characteristics of catfish farmers in Anambra West Metropolis; determine the cost and returns of catfish production and identify the constraints faced by the catfish producers in the study area.

## 2.0 Methodology

### 2.1 Study Area

The study was carried out Anambra State, Nigeria. The state is located in the southeastern region of the country and is situated between latitudes 5° 40' and 6° 46' north of the equator and longitudes 6° 35' to 7° 21' east of the Greenwich Meridian. The state is located at an elevation of 112m above

sea level. The state is bounded in the east by Enugu State, in the West by Delta State, in the South by Imo State and in the North by Kogi State. The state consist 21 local government areas with Awka as the state capital while Onitsha, Nnewi and Ekwulobia are the major commercial hubs (Dada *et al.*, 2017; SI & JS, 2018) [6, 18].

According to National Population census (2006), the state has a population of about 4,177,828 million people and covers a total land mass of about 4,844km<sup>2</sup> and population density of about 1,141/km, making it the second most densely populated state after Lagos in Nigeria. The state comprises 21 local government areas and has four agricultural zones: Anambra, Awka, Onitsha and Aguata. The state has a tropical climate with two main seasons: rainy and dry seasons. It has an average annual rainfall of 1386mm and temperature of 25.9 °C with relative humidity between 65-80% all year round. The five main rivers and their tributaries that drain Anambra State are River Niger, Anambra River, zمامu/Ezu River, Idemili River and Ulasi river while other smaller perennial streams in the state are Oyi, Nkisi and Obizi (Nwigwe *et al.*, 2020) [16]. Agriculture is an important economic sector in Anambra as many of the people are involved in farming due to the state rich arable soil as well as other resources that makes it suitable for agro-based activities like fishing for communities along riverine areas. (Ajibabe *et al.*, 2020) [11].

### 2.2 Population and Sampling Techniques.

All registered fish farmers in Anambra West Local Government area constituted the population for study. A multistage sampling technique was used in the selection of the sample size. The first stage was the purposive selection of Ezi-Anam, Ifite-Anam, and Inoma LGAs out of the 21 LGAs due to the high concentration of fish farms in those areas. The second stage was the random selection of 2 town communities from each of the LGAs, giving a total of 6 town communities. In the third stage, 20 catfish farmers from the list of registered fish farmers in each of the towns were selected giving a total of one hundred and twenty (120) respondents for the study. Thus, the sample size of the study was 120 respondents.

An interview schedule was used to collect data from respondents. The instrument which captured the objectives of the study was administered to the respondents on their farms by the researcher and other research assistants. To ascertain respondents perceived constrain to catfish production in the area, respondents were asked to indicate from the list of variables their perceived constraints to catfish production in the state. This was achieved using a three point Likert of very serious constraints= 2, serious constraint=1 and not a constraint=0. The values of the variables was added and divided by 3 to get a mean score of 1.0 which was used as the cut off. Hence, variables with mean score of 1.0 and above were considered as constraints while those with mean score below 1.0 were not considered as a constraint. To ascertain the cost and returns of catfish production, the Net Farm income (NFI) budgeting model was adopted. The Net Farm Income (NFI) is Gross Revenue (GR) minus Total Cost (TC). The model is expressed as follows:

$$NFI = TR - TC (TFC + TVC)$$

Where,

NFI= Net Farm Income

TC= (TVC+TFC)= Px. X

GR= Gross revenue= Py. Y (TR-TVC)

Where,

- Py=Unit price of fish per kg
- Y=Quantity of fish per kg
- Px= Unit price of input
- X=quantity of input
- TC= Total cost (N)
- TFC=Total Fixed Cost (N)
- TVC=Total Variable Cost (N)

$$ROI = \frac{GM}{TVC}$$

Where,

- ROI = Return on Capital Invested
- GM= Gross Margin
- TVC= Total Variable Cost

### 2.3 Data analysis

Data on socio-economic characteristics of respondents(objective 1) and constraints encountered in catfish production (Objective 3) were analyzed using frequency, percentage count, mean scores and standard deviation while the budgeting model was used to determine the cost and returns of catfish production (objective 2).

### 3.0 Results and Discussion

#### 3.1 Socio-economic distribution of catfish farmers in Anambra West Metropolis

Data presented in Table 1 show that the majority (50.0%) of the catfish farmers in the state fall within the age bracket of 31 – 40. The mean age of the catfish farmers was 42.4 years. The result indicates that most of the farmers are young and are in their productive age. This is in line with the findings of Ikpoza *et al.* (2020), who revealed that most of the catfish farmers in Nigeria were young people within the productive age of 40-49 years.

Entries in Table 1 show that majority (83.3%) of catfish farmers were male while the remaining 16.7% were female. This implies that catfish production is dominated by male. This may be as a result of their access to productive resources than the women such as land and capital needed to set up the business. This is on line with the findings of Aloysius *et al.* (2020) [2], who posited that majority (72.1%) of catfish business in Anmbra State were dominated by males.

Data in Table 1 reveal that a greater proportion (79.2%) of the catfish farmers was married. This implies that family labour will be more and readily available for them. This is in agreement with the findings of Dokuboba *et al.* (2019) [8], who showed that the majority (74%) of catfish farmers were

married people.

Entries in Table 1 show that majority (83.3%) of the respondents were part-time catfish farmers in the state. This may be due to the fact that the business is capital intensive and they may be constrained by inadequate access to credit. This confirms the findings of Onyekuru *et al.* (2019) [17], who stated that only 20% of the total population sampled was involved in full-time catfish production in the state.

Entries in Table 1 show that majority (66.7%) of catfish farmers have family size of 6 – 10 people in their household. The mean household size of farmers was 7. From the result, it shows that the respondents' had large family size. This will constitute as a readily source family labour for the business. This confirms the findings of Oyetola *et al.* (2022), who revealed that 52% of catfish farmers had household size between 6-10 persons.

Data presented in Table 1 reveal that a greater proportion (56.7%) of farmers attended secondary school as their highest level of education. This implies that catfish farmers in the state had one form of education and therefore are literate to understand and adopt any innovation on catfish production that would increase their productivity and income. This confirms the findings of George (2019), who posited that catfish farmers are literate and understand catfish management

Entries in Table 1 show that majority (54.2%) of the farmers has been in catfish farming for about 6- 10 years. The mean years of farmers farming experience was 9 years. This implies that farmers in the study area have had long years of experience in catfish production and hence are knowledgeable and will adopt catfish production technology that will boost their income. This is in line with the results of Nwabueze and Ofuoku (2020), who revealed that catfish farmers have long (7.8) years of experience in the business.

Data presented in Table 1 show that 43.3% of farmers agreed that they had one or more extension contact in the area in a year. This imply that catfish farmers in the state maybe lacking in up-to-date research information relevant to catfish production that could boost the production and there maybe information gap as regards to the profitability of the business to encourage new entrants into the industry; thereby leading to low perception of the profitability of the business. This is in line with the findings of Onuche *et al.* (2020), who reported that the number of extension contact increased the likelihood of positive perception of innovation. Also, the study of Aminu *et al.*(2021), revealed that majority (80.9%) of catfish farmers in the state had no contact with extension services in the study area

**Table 1:** Socio-economic characteristics of catfish farmers in Anambra West Metropolis

Socio-economic characteristics	Frequency (n=120)	Percentage %	Mean
<b>Age (years)</b>			
≤ 30	15	12.4	42.4
31-40	30	25.0	
41-50	60	50.0	
51-60	10	8.3	
> 60 and above	5	4.2	
<b>Sex</b>			
Male	100	83.3	
Female	20	16.7	
<b>Marital status</b>			
Single	20	16.6	
Married	95	79.2	

Divorced	5	4.2	
<b>Household size</b>			
≤ 5	30	25.0	7.0
6-10	80	66.7	
11-15	10	28.3	
<b>Educational qualification</b>			
No formal education	9	7.5	
Primary education	36	30	
Secondary	68	56.7	
HND/BSC	7	5.8	
<b>Years of Farming experience</b>			
≤5	40	33.3	9.0
6 – 10	65	54.2	
11- 15	10	8.3	
16 - 20 and above	5	4.2	
<b>Farming status</b>			
Part-time	100	83.3	
Full-time	20	16.7	
<b>Farm size (hectare)</b>			
< 1	28	23.3	
1 – 1.5	52	43.3	
> 1.5	40	33.4	
<b>Sources of labor</b>			
Family labor	80	66.7	
Hired labor	40	33.3	
<b>No of extension contact (Yearly)</b>			
No contact	20	16.7	
1-10	70	58.3	
≥11	30	25.0	

Source: Field Survey, 2022

### 3.2 Estimated cost and returns of catfish farmers in Anambra West Metropolis

Data in Table 2 show that the total quantity of catfish produced and sold within a production cycle between (2021/2022) was 12,500 and the average price per kg catfish was ₦1600. The result show that total cost of catfish production was ₦14,246,163 and the total revenue of ₦20,000,000. Therefore, the results of the Net Farm Income analysis indicate that catfish production in the state was

highly profitable. The returns on investment was 2.47 for the catfish farmers, indicating that catfish farmers in the study area returned on the ₦2.47 for every ₦1.00 naira invested in the business, thus further confirming the profitability of catfish production in the study area. This is in agreement with the findings of Ikechukwu (2023) <sup>[12]</sup>, who revealed that catfish production was profitable in Anambra State with return on investment of ₦1.11 for every capital invested.

**Table 2:** Cost and returns of catfish production in Anambra West Metropolis

Variable	Total cost for the production period (₦)	Average cost (₦)	Percentage (%)
<b>A. Fixed Cost</b>			
Land (ha)	1,500,000	12,5000	42.9
Water tank	171,000	14,250	0.6
Buckets and basins	51,000	4,250	0.6
Cost of concrete pond construction and piping for water inlet and outlet	3,510,000	292,500	34
Installation of pumping unit	300000	25,000	8.0
Pond net cover	111,000	9,250	0.6
Ph meter	54000	4,500	0.6
Well dug	120000	10,000	2.5
Pumping water machine	150000	12,500	9.0
Weighing scale	120000	10,000	0.6
Net for catching matured fish	57,000	4,750	0.6
Total fixed cost	6,144,000	512,000	100
<b>B. Variable cost</b>			
Feed	4,500,000	375,000	50.8
Fingerlings	800460	66,705	19.2
Medication	400440	33,370	0.6
Transportation	500,121	41,676.75	2.9
Cost of electricity for pumping water	250,110	20,842.5	7.9
Labour (mandays)	650,310	54,192.5	10.0
Petrol for pumping water	600000	50,000	7.5

Maintenance	200100	16,675	0.9
Miscellaneous	200622	16,718	0.2
Total Variable Cost	8,102,163	675180.25	100
C.Total Cost (TC)	14,246,163	1,187,180	
D. Total Revenue (total sales of catfish)	20,000,000	1,666,666.667	
E. Net farm income (NFI) TR-TC	12,246,163	1,020,513.583	
F. ROI GM/TVC	2.47	0.21	

**Source:** Field Survey, 2022 Cost of land is not depreciated as it is leased for only one production cycle; ₦=naira (the Nigerian currency) and 1.0 naira = USD 460 as at April,2023

### 3.3 Constraints militating against catfish production in Anambra West Metropolis

Data in Table 3 show that feed constitute the largest cost in catfish production in the study area. The researcher observed that the majority of farmers purchased foreign feeds from input dealers at a very high price due to high import duties levied on the dealers by the government. Feed is a critical input to achieve a very good table size fish, and it is paramount that the fingerlings are feed optimally until maturity stage following the standard feeding plan. Also, land is a major production factor and the cost of purchasing land is a major expense to catfish farmers, perhaps due to the increasing demand for land for other industrial purposes in Anambra State as the state is known for its high commercial activities. In addition, high cost of labor is another constraint as the business is labor intensive and the farm manager need to hire labor in addition to family labor to ensure smooth running of the farm. Therefore, labor is needed for carrying out a wide varying of activities such as sorting, feeding, pond conditioning, changing of water, harvesting and others.

Furthermore, data in Table 3 indicate that the cost of fingerlings is another constraint and this may be as a result of inadequate supply due to few hatcheries, may lead to the few in market inflating the price of their fingerlings since the market it's not competitive. The results are in line with the findings of Kehinde (2022) <sup>[14]</sup>, who revealed that cost of feed, pond construction, fingerlings and labor are major cost that reduced catfish farmers' profit.

Furthermore, results presented in Table 3 reveal that inadequate capital is another major constraint hindering catfish production in the study area and this is as a result of the fact that the business is capital intensive. Therefore capital is a critical input to ensure efficient management of the fish farm. Capital is needed for timely purchase and application of inputs such as fingerlings, feed, pond construction, land procurement and others. This is in agreement with the findings of Omitoyin and Osakuade (2021), who reported that lack of financial assistance was among the major constraints faced by farmers in catfish production.

**Table 3:** Constraints militating against catfish production in Anambra West Metropolis

Constraints	Mean $\bar{x}$	Std. Deviation
High cost of feed	2.0*	0.00
Inadequate capital	1.69*	0.58
High cost of concrete pond construction	1.47*	0.50
High cost of rent for land	1.46*	0.50
High cost of fingerlings	1.23*	0.75
High cost of labour	1.11*	0.65
High cost of transportation	0.08	0.26
Lack of organized market	0.06	0.24
High cost of water supply	0.12	0.32
High spread of pests and diseases	0.14	0.35
Inadequate storage facilities	0.10	0.30
Inadequate supply of seed	0.30	0.75
High interest rate on bank loan	0.23	0.71
Poor road network from farm to market	0.18	0.39
Lack of quality supply of fingerlings	0.31	0.50
High cost of electricity bill	0.31	0.46
High mortality rate	0.21	0.41
High cost of water supply	0.12	0.32
Use of incompetent extension staff in dissemination of catfish production technologies	0.43	0.50
Epileptic power supply	0.47	0.50
Poor extension coverage	0.40	0.49

**Source:** Field Survey, 2022

### 4.0 Conclusion and Recommendations

The study came to the conclusion that catfish farming is a very profitable business in the study area, with a Net Farm Income of ₦20,000,000.00 and a ROI of ₦2.47. Additionally, the research shows that catfish farmers in the state cited high feed costs, high concrete pond construction costs, lack of capital, high labor costs, and other issues as the biggest business challenges.

The study suggests government engagement to manage and lower the import taxes levied upon dealers who import

foreign feeds and to develop local feed mills to increase feed production and nutritional content of locally made feeds. Additionally, in order to increase the productivity and income of catfish farmers, the government, the private sector, and other relevant stakeholders should provide financial support in the form of matching grants to catfish farmers in the area.

### References

1. Ajibabe FO, Nwogwu NA, Adedun B, Abdulkadir TS,

- Ajibabe TF, Lasisi KH, *et al.* Application of Rusle integrated with GIS and remote sensing techniques to assess soil erosion in Anambra State, South-Eastern Nigeria. *Journal of water and Climate Change.* 2020;11(S1):407-422.
2. Aloysius OC, Matthew NC, Odinaka AO, Johnpaul OC. Analysis of the Resource Management ability of Catfish farmers in Nigeria: A Case of Ogbaru Local Government area, Anambra State. *Journal of agricultural Economics.* 2020;5(5):156-164.
  3. Ashley-Dejo SS, Adelaja OA. Economics of catfish hatchery farmers and its contribution to household poverty alleviation in Nigeria. *Agricultural Tropica Et Subtropica.* 2022;55(1):19-29
  4. Cowan C. Economic Analysis: Definition, Techniques & Principles; c2021. Available at <https://study.com/economic-analysis-definiyion-techniques-principles.html>
  5. Balami S, Sharma A, Karn R. Significance of nutritional value of fish for human. *Malaysian Journal of Halal Research.* 2019;2(2):32-34
  6. Dada F, *et al.* Macmillan Nigeria secondary atlas. Yaba: Macmillan Nigerian Publishers Limited; c2017.
  7. Daily Trust. Why Nigeria's N261.8bn catfish industry is in danger; c2022. Available at <https://dailytrust.com/why-nigerians-n2618bn-catfish-industry-is-in-danger/>
  8. Dokuboba AMACHREE, Jamabo N, Joseph DE. Socio-economic characteristics of small-scale catfish farming enterprise in Obio/Akpor Local government Area, Rivers State, Nigeria. *International journal of Fisheries and Aquaculture.* 2019;11(3):62-71.
  9. Federal Republic of Nigeria Official Gazette. Report on the census 2006 final results; c2009.
  10. Grema HA, Kwaga JKP, Bello M, Umaru OH. Understanding fish production and marketing systems in North-western Nigeria and identification of potential food safety risks using value chain framework. *Preventive Veterinary medicine.* 2020;181:105038
  11. Idris-Adeniyi KM, Busari AO, Badmus AO, Adeniyi RT. Economic Analysis of Catfish production among Fish farmers in Osogbo Metropolis, Osun State, Nigeria. *UNIOSUN Journal of Sciences.* 2018;3(1):103.
  12. Ikechukwu CC. Profitability of fish farming in Awka, Anambra State, Nigeria. In *Faculty of agriculture International Conference, 2023, March, 336-341.*
  13. Jaiyeola T. Nigeria imports \$3.49bn fish, eggs, milk, others; 2022, August 28. Available at <http://www.google.com/amp/s/punchng.com/nigeria-imports-3-49bn-fish-eggs-milk-others/%3famp>
  14. Kehinde AD. Economics of catfish production in Osun State, Nigeria. *Economics.* 2022;22(1).
  15. Nnodim O. 2.4 million metric tonnes fish imports depleting Nigeria's forex-FG; 2022, June 14. Available at <https://www.google.com/amp/s/punchng.com/2-4-million-metric-tonnes-fish-imports-depleting-nigerians-forex-fg/%3famp>
  16. Nwigwe CA, Meludu NT, Okeke CC, Obiekwe NJ. Cost and Returns Analysis for Small-scale Dry Season Tomato Production in Onitsha Agricultural Zone of Anambra State; c2020.
  17. Onyekuru NA., Ihemezie EJ, Chima CC. Socioeconomic and profitability analysis of catfish production: a case study of Nsukka Local Government Area of Enugu State, Nigeria. *Agro-Science.* 2019;18(2):51-58.
  18. SI U, JS O. Technical efficiency of Catfish Production among small holder Farmers in Anambra State of Nigeria. *Case Studies Journal;* c2018. ISSN (2305-509X)- Volume, 5.
  19. Wuyep SZ, Rampedi IT. Urban fish farming in Jos, Nigeria: Contributions towards employment opportunities, income generation, and poverty alleviation for improved livelihoods. *Agriculture.* 2018;8(7):110.