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Research Article

Factors Influencing Catfish Fingerling Production in Ibadan Metropolis, Oyo State, Nigeria

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Abstract

Although catfish farming is a highly lucrative investment for Nigerian entrepreneurs, its success depends on many factors. This paper examines the factors influencing catfish fingerling production among catfish farmers in Ibadan metropolis, Oyo state, Nigeria. The study used primary data from 31 catfish farmers who produce fingerlings in the area. Data were collected using a structured questionnaire and analysed with descriptive statistics, chi-square analysis, and ordinary least square regression model. Descriptive statistics were used to analyse socio-demographic features, mode of operation, and production capacity of the farmers. Chi-square analysis was used to investigate the relationship between the mode of operation and the fingerling production capacity, and the ordinary least square regression was used to determine the factors influencing catfish fingerlings production. Results show that most fish farmers (61.3%) operate full-time. Over half (54.8%) used leased or rented ponds, 38.7% used earthen ponds, and a majority (83.9%) farm mainly for profit. The mean fish seed per production cycle was 15,451.6 (±1,231.4) pieces. There was a significant relationship between the number of catfish fingerling rearing units and the farmers' production capacity ($x2=26.672$, $p=0.000$). Being educated ($p<0.10$) and having years of experience ($p<0.01$) in fingerling production improved production capacities while part-time operation ($p<0.10$) and sourcing water from boreholes ($p<0.05$) hindered production. Also, the total variable cost had a positive relationship with production at $p<0.05$. Capacity-building programmes and diversification of water sources are suggested for a more productive and efficient system.

Keywords

Production Capacity, Earthen Ponds, Ibadan Metropolis, Fingerlings

1. Introduction

1.1. Background to the Study

Fish play a substantial role in feeding the population globally as a result of their high nutritional quality, and provide vital minerals, fatty acids, and micronutrients [1]. Globally, nations relied primarily on fish captured from the wild to meet the fish protein requirement during ancient times. However, in the late 1980s, capture fisheries reached a comparatively inert point [3]. Ever since then, aquaculture has been a way to close the gap between the supply and demand of fish for human consumption [3]. Nigeria, as the world's leading African catfish producer and second largest fish producer in Africa next to

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Egypt, is endowed with a huge area of water bodies comprising fresh and marine waters, which is around 900 kilometres and above 14 million hectares, respectively [25]. About 75% of the freshwater, such as lakes, rivers, *et cetera*, is suitable for fish farming [25].

Fish has been verified to supply sufficient digestible and the cheapest animal protein sources as well as other essential elements with low levels of cholesterol [2]. Fish is an abundant source of sulphur as well as essential amino acids like leucine, arginine, lysine and valine, as well as appropriate for supplementing diets that are high in carbohydrate. Also, fish is a suitable source of riboflavin, thiamine, iron, calcium, phosphorus, vitamins A and D, and is abundant in polyunsaturated fatty acids, which are significant in decreasing the level of lipid in the blood [5]. Fish serves as a vital pillar of Nigeria's food security and economy, helping combat malnutrition by supplying essential micronutrients. As a result, fish farming is among the fastest-developing sectors of food production [17].

Fish, as well as fisheries items, are regarded as the most significant component of nutrition and food security for a lot of underprivileged populations in Low-Income Food-Deficient Countries (LIFDCs) [15]. Fish is a significant component of Nigeria's household diet, accounting for about 40% of the nation's protein intake with yearly consumption per capita of 13.3kg, which is less than the recommended global average of 20.5kg/person/year [9]. Nigeria's fish production is not comparable with the rapid growth of the population of 218,541,212, with a forecast of more than 260 million by 2030. Thus, there exists a boundless deficit of fish production in Nigeria, and the incapability of the fish industry to meet the high demand has been pinned down to the thriving human inhabitants [2].

Furthermore, in 2020, about 92.7 million Nigerians did not consume protein on a daily basis, and this was linked with a high poverty level in the country [21, 22]. It was revealed from the Nigerian Protein Deficiency Report in 2020 that there exists a gap in the consumption of protein across the country because of its cost and household income level, which has been the main limitation to adequate protein intake in the nation. Moreover, the Federal Government of Nigeria disclosed that despite the massive frozen fish importation by the country, the current demand for fish has increased to above 3.6 million metric tonnes annually, making it impossible to close the fish shortfall of 2.5 million metric tonnes [27]. The WorldFish stated that fish production in Nigeria was below 1 million tonnes annually and, as a result, Nigeria spent more than ₦500 billion yearly on fish importation [25].

The Federal Government of Nigeria offered financial aid to government programmes and projects inspiring production of fish, yet production of fish in the country has remained low [17]. This has been ascribed to insufficient materials from the small-scale fish farmers as a result of the use of low-quality fish seeds, expensive feeds, insufficient information, outdated methods, dearth of credit, and lack of equipment for fish production [17]. This study will close the gap in knowledge by providing empirical evidence on the determinants of catfish production in Ibadan, Oyo State, Nigeria. Information gathered from this research will be helpful to the Fisheries Department and the Federal Government of Nigeria by providing data on the factors influencing catfish fingerling production among catfish farmers. Furthermore, the results will give the Government an idea of the necessary support it could render to fish farmers so as to enhance the production of fish seeds.

1.2. Objectives of the Study

The main objective of this study is to determine the factors influencing catfish fingerling production in Ibadan, Oyo State, Nigeria. The specific objectives are to:

1) Examine the mode of operation of catfish farming in Ibadan metropolis.
2) Analyse the production capacity of the farmers.
3) Investigate the relationship between the mode of operation of fish farming and the production capacity of the farmers.
4) Determine the factors influencing catfish fingerling production among catfish farmers in Ibadan metropolis.

2. Literature Review

2.1. Conceptual Review

2.1.1. Nigeria's Fisheries and Aquaculture Production

In 2019, the fisheries sector contributed 0.84% and 1.09% in 2020 to Nigeria's Gross Domestic Product (GDP), respectively [12]. Nigeria is a net fish importer of fish. The total fish production is about one million metric tonnes, and the bulk of the produced fish is locally consumed, whereas around 10% is shipped [25]. About 94 million hectares are utilised for the production of fisheries, and around 1,477.651 individuals work as fishers [12]. Aquaculture produced more than 300,000 tonnes, which is less than the capture fisheries production of above 750,000 tonnes, and freshwater fisheries of about 523,320 tonnes [20].

Nigeria spent a huge amount on frozen fish importation, which is roughly 2.4 million metric tonnes yearly, and as a result of this, it is having a serious effect on the foreign exchange reserves of the country [15]. It has been reported that fish importation increased by $480.2 million or 38% between 2019 and 2020 from $789.74 million to $1.27 billion [11]. However, in 2025, the sector contributed about 4.92 trillion to Nigeria's economy, representing approximately 4% of the agricultural Gross Domestic Product [13].

2.1.2. Feeding and Fingerlings Safety

According to the International Institute of Tropical Agriculture (IITA), there exist many kinds of feeds for catfish based

on sizes, feeding habits (surface feeder or feed in the aquatic column), and whether the water has been mixed with antibiotics [14]:

1) At the early stage of fry, flour-type or finely ground meal feeds containing 45 to 50% protein should be introduced.
2) For fry in the nursery ponds, crumbles or fines of 28 or 32% protein are appropriate for fish grow-out till fry reach a certain length of 1-2 inches.
3) Fingerlings of larger size ought to be nourished with small floating pellets of about 1/8-inch, of 35% protein.
4) Fingerlings of about 5-6 inches should be nourished with floating feed of about 5/32-3/16 inches comprising protein between 28 to 32%.

Moreover, during the cold or harmattan season, a slow-sinking feed is suitable. Catfish are administered antibiotics via absorption in the feeds. Subject to the specific antibiotic preferred, the feed might either be sinking or floating.

2.1.3. Period and Technique of Feeding

Fresh fry ought to be nourished up to 6 times per day between 6.00 am and 8.00 pm. More so, it was found that feeding every 3-4 hours within 24 hours is always better [5]. The supply of water is cut off during fish feeding to prevent food substances from washing out. During individual feeding, the feed is separated into two or three rations to be administered when the fish have devoured the entire food substances. Once the fry indicates pleasing behaviour, the feeding should come to an end, and the supply of water must be restarted [14].

2.1.4. Challenges of Aquaculture

Aquaculture is a lucrative business; however, it is regularly accompanied by a diversity of challenges and hazards, and the huge capital invested in the business might vanish quickly [4]. In Nigeria, hazards in the production of fish have been classified as business and pure risks [6]. Business hazards can be observed as intrinsic aspects of a business which require to be precisely managed for the profitability and success of the business. They occur due to threats and weaknesses of business analysis in Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis, whereas pure hazards occur as a result of unanticipated circumstances like disease outbreaks, theft, unforeseen extreme climatic elements, legal actions against farms, malicious damage, and so on. An additional key aquaculture challenge is high feed cost, which directly influences the yield and the profitability of catfish production [6].

2.2. Theoretical Review

The theories underpinning this study are the Oxbow theory of aquaculture and the backward bending supply theory.

2.2.1. Oxbow Theory of Aquaculture (Herminio R. Rabanal, 1988)

Oxbow theory of aquaculture proposes that fish farming originated from early humans observing and exploiting naturally formed oxbow lakes left behind by meandering rivers. It outlines how early riverine communities transitioned from hunting and gathering fish to structured farming. The transition started with natural formation, to natural seasonal stocking, to human exploitation, and to aquaculture. According to the theory, the earliest form of fish production was by nature, humans learned to recognise, exploit, and replicate what had already been created naturally. Additionally, the process of hatchery and fingerling production is basically a technological response to how to replicate the natural restocking once provided by oxbow flooding.

2.2.2. Backwards Bending Supply Theory (Lionel Robbins, 1930)

This is an economic concept that describes a situation where, beyond a certain point, an increase in price results in a decrease in quantity supplied, causing the supply to slope downward instead of continuously upward sloping. This theory mostly applies to economies of natural resources, including fisheries. The main assumption backing this theory is that of a fixed income target by economic agents, which provides no incentive to supply more once met. This theory explains the paradoxical behaviour of artisanal and small-scale fishers who reduce their fishing effort when prices rise. For instance, a fisher who used to catch 100kg of fish to earn ₦50,000 will only need to catch 50kg if the prices of fish double to earn the same amount. Therefore, such fishers will stay home rather than fish more, thus the supply of fish to the market falls despite higher prices.

2.3. Empirical Review

In a study, the socioeconomic and feed efficiency in the production of catfish in Oyo State, Nigeria was analysed [5]. A total of 200 respondents were randomly selected from 4 local government areas of Oyo state, Nigeria. Results showed that the mean age of catfish farmers was 41 ±1.65 years. The survival rate of catfish was found to be between 73.3% and 97.5%, and feed was the highest variable cost incurred in catfish production. The mean feed conversion ratio (FCR) was 1.42 ±0.12, gross yield had a mean value of 0.93 ±0.08 g/ft^2, and the mean growth rate of catfish was 7.68 ±0.29 (g/day). Accordingly, catfish farmers ought to understand that the higher the Feed Conversion Rate (FCR), the lower the production cost and the higher the income.

Another study examined the relationship between farmers' socioeconomic characteristics and catfish output in Oyo State, Nigeria [16]. Using multistage sampling techniques, a total of 120 catfish farmers were selected and interviewed. The data obtained were analysed using descriptive statistics and ordinary least squares (OLS) regression. Based on the findings, most of the farmers were male (63.3%), aged between 31-40 years (65.0%), operated on a part-time basis and managed be-

tween 1-2 ponds with output worth below ₦500,000 per production cycle (62.5%). The majority were married (82.4%) with an average household size of 5 persons and were highly educated (91.8%). Two-thirds were cooperative members, of which 52.5% were loan beneficiaries. The OLS regression results showed that fish output was influenced significantly by age at $p<0.01$, and by marital status, education, and cooperative membership at $p<0.05$.

In analysing the socio-economic determinants of net income in aquaculture of Kainji Lake Basin, Nigeria, primary data were used [18]. The study adopted a two-stage sampling procedure to select 120 table-sized fish farmers. Data were collected using questionnaire and analysed using descriptive statistics, budgetary technique and multiple regression analysis. The results showed that the majority (92%) of the farmers reared only catfish using earthen pond system. The total expenses incurred and revenue generated were ₦14,953,330.7 and ₦20,188,142.00, respectively, while the net profit margin and return on investment were 25.9% and 35.0%, respectively. Farmers' age, experience, and household size were positive and significantly ($p<0.05$) related to farmers' income, while high cost of feed (3.24), poor pricing (3.11), poor access to capital (3.09), and persistent poaching/theft (2.67) constrained farmers' output.

Investigation of the factors influencing smallholder farmers' participation in fish farming in Lesotho was carried using primary data collected from 400 farmers who were selected by a multi-stage sampling procedure [23]. The data were analysed using descriptive techniques and binary logistic regression model. Results showed that government and social capital encouraged fish farming at $p<0.05$, while membership in farmer associations, path dependency and culture, hindered engagement in fish farming at $p<0.05$ in the country. Based on the results, institutional, technical and socioeconomic factors influence participation in this potential sector for economic growth.

A study assessed the determinants and challenges of catfish production in Nsukka local government area of Enugu State, Nigeria [19]. The sample comprised 40 catfish farmers from whom data were sourced. The data were analysed using likert rating technique and multiple regression analysis. The significant determinants of catfish production in the study area were fingerlings quantity, cost of water, and feed quantity at $p<0.05$. The main constraints faced by the farmers include high cost of feed, high cost of water, poor access to capital, and unavailability of quality breed fingerlings.

Analysis of the socioeconomic benefits and challenges faced by small-scale fish farmers in Chiredzi Rural District, Zimbabwe was done [23]. The study adopted a multistage sampling procedure to select 120 fish farmers. Data collected were analysed using descriptive statistics, benefit-cost ratio, and 4-points likert scale. About 85% of the farmers used earthen pond systems and cultivated only Nile Tilapia. The benefit-cost ratio indicated that aquaculture is not profitable in the study area. Meanwhile, it contributed to food and nutrition security. The main challenges encountered by the farmers are adverse weather, diseases, and limited technical assistance.

The economic viability of *Clarias gariepinus* fingerlings production in Ibadan, Oyo State, Nigeria was examined [7]. The study used primary data sourced from 31 purposively selected hatchery farmers. Data were analysed using descriptive statistics, profitability ratios, 3-points likert scale, and Pearson chi-square correlation test. Findings showed that *Clarias spp.* was mostly cultured alone (38.7%) for over 6 months (77.4%), broodstocks were mainly sourced from private farms (61.3%), and fingerlings were harvested more than thrice per year (71.0%). The average fish seed produced per cycle is 15,451.6. The costs and returns per cycle showed a higher total variable cost (₦237,919.90) than the total fixed cost (₦104,705) incurred, of which fish feed had the highest proportion (22.6%). The profitability results showed a positive benefit-cost ratio (1.54), expense structure ratio (0.44), and return on investment (0.54), showing that production of catfish fingerlings is economically viable. Furthermore, there exist significant relationships between cost of fish feed ($x2=16.336$, $p<0.01$), poor fish breed ($x2=9.772$, $p<0.05$), obsolete technologies ($x2=17.718$, $p<0.01$), and transportation cost ($x2=16.118$, $p<0.01$) with production capacity of catfish fingerlings. Thus, challenges faced by fingerling-producing farmers significantly influence the production capacity of catfish fingerlings in Ibadan.

The effect of catfish production on smallholder farmers' welfare in Osun State, Nigeria was examined, using the Odo-Otin Local Government Area of Osun State as a case study [8]. A purposive sampling technique was used in selecting 109 catfish farmers and a structured questionnaire was used to collect data. Descriptive statistics, gross margin analysis and a multiple regression model were used to analyse data. Results showed that the most (67.9%) of the catfish farmers were male, married (64.2%), with a mean age of 44 years (±13.1), and more than three-quarters (78.9%) had tertiary education. The majority of the catfish farmers (85.3%) raised fish to table size (grow-out) and 55.0% used static renewal technology. The average gross margin of ₦172,246 ($545) per production season (5-6 months) and BCR of 1.66 indicate that catfish farming is profitable and feasible. Regression results indicate that cost of feed and quantity of catfish harvested significantly increase the quantity of catfish sold, and quantities of catfish harvested and sold significantly increase food expenditure by farmers.

3. Methodology

3.1. The Study Area

The study area is Ibadan metropolis. Ibadan is the capital city of Oyo state, located in the southern part of Nigeria, on seven hills of about 200 metres average elevation and 100 miles from the Atlantic coast [10]. Ibadan is situated about 120km northeast of Lagos, placing it in the tropical forest zone that transitions into the derived savanna. Ibadan is the most populous city in Nigeria, with a population of 4.3 million

within its metropolitan area [26], and a landscape spanning approximately 3080 km^2. Ibadan is characterised by a tropical wet and dry climate with a lengthy wet season and relatively constant temperatures throughout the year, which makes farming activities, including fishery management predictable most times. The indigenous language in Ibadan is Yoruba, and the source of livelihood in the city is a combination of trading, agriculture, and public services/formal employment. Being a major commercial hub and the capital of Oyo state, the economy of Ibadan is highly diversified but rests heavily on the informal sector, especially trade in agricultural food products such as banana, millet, cassava, yam, rice, plantain and fishing.

3.2. Sample and Sampling Techniques

A list of hatchery fish farmers was collected from the Catfish Farmers Association of Nigeria (CAFAN) in Ibadan, Oyo State, Nigeria. From the list, catfish farmers who raise fingerlings were purposively selected for the study. A total of 40 registered catfish farmers were sampled. Data were elicited using a semi-structured questionnaire. However, thirty-one completed copies of the questionnaire were retrieved for this study.

3.3. Validity and Reliability of Research Instrument

A construct validity test was done by a panel of subject-matter experts to ensure that the questions in the questionnaire cover all aspects of the study concept. Cronbach's Alpha was used to inspect the consistency of the research instrument and to certify that it measures what it ought to measure [24].

3.4. Analytical Tools

Descriptive statistics were used to analyse socio-demographic features, mode of operation, and production capacity of catfish farmers. Chi-square analysis was used to assess the relationship between mode of operation and production capacity of the catfish farmers, and the ordinary least square regression model was used to determine the factors influencing catfish production.

Ordinary Least Square Regression Model

The model is defined as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} + \beta_{15} X_{15} + \varepsilon \quad (1)$$

Where:

Y = Total quantity of catfish fingerlings produced (kg)

β_0= Model intercept

X_1= Age of respondents (years)

X_2= Educational level (secondary=0, tertiary=1)

X_3= Cooperative membership (no=0, yes=1)

X_4= Fish farming experience (years)

X_5= Fish farming training (no=0, yes=1)

X_6= Access to credit (no=0, yes=1)

X_7= Access to extension contact (no=0, yes=1)

X_8= Mode of operation (full time=0, part time=1)

X_9= Source of water (river/stream=0, borehole/deep well=1)

X_{10}= Types of rearing structure (plastic/tarpaulin tanks=0, earthen ponds=1)

X_{11} = Source of broodstock (own fish farm=0, private farms=1)

X_{12}= Culturing period of broodstock (months)

X_{13}= Harvesting period of fingerlings (number/year)

X_{14}= Total fixed cost (₦)

X_{15}= Total variable cost (₦)

ε= Error term

4. Results and Discussion

4.1. Socio-demographic Features of Catfish Farmers

The socio-demographic characteristics of respondents in the study area are presented in Table 1. Results showed that the mean age of the farmers was 39.8±9.4 years. The majority were male (80.6%) and married (80.6%), more than half (51.6%) had a tertiary education, and the mean household size was 4.4±0.7 persons. Many (42.0%) of the respondents had between 1 and 5 years of fish farming experience, fish farming is the primary source of income (61.3%), and about 35.5% of those who were into other occupations aside from fish farming were civil servants (35.5%). The majority (74.2%) were members of the catfish farmers cooperative, about 48.4% had access to credit and extension contact, the majority (71.0%) had attended fish farming training before, and more than half (54.8%) finance fish farming with personal savings.

Table 1. *Socio-demographic characteristics of catfish farmers (n = 31).*

Variables	Frequency	Percent	Mean (S. D.)
Age (years)			
≤ 30	6	19.3	39.8 ± (9.4)

Variables	Frequency	Percent	Mean (S. D.)
31-40	14	45.2	
41-50	8	25.8	
≥50	3	9.7	
Gender			
Male	25	80.6	
Female	6	19.4	
Marital status			
Single	6	19.4	
Married	25	80.6	
Educational level			
Secondary education	15	48.4	
Tertiary education	16	51.6	
Household size			
1-5	28	90.3	4.4 ± (0.7)
6-10	3	9.7	
Years of hatchery experience			
1-5	13	42.0	
6-10	8	25.8	
11-15	5	16.1	
>15	5	16.1	
Fish farming as primary source of income			
Yes	19	61.3	
No	12	38.7	
Other source of income			
Business man/woman	7	22.6	
Civil servant	11	35.5	
Clergy	6	19.3	
Agribusiness (Piggery and Poultry farming)	7	22.6	
Member of catfish farmers cooperative society	23	74.2	
Access to credit	15	48.4	
Access to extension contact	15	48.4	
Attended any fish farming training	22	71.0	
Source of finance			
Personal savings	17	54.8	
Friends/Relatives	1	3.2	
Cooperative society	8	25.8	
Bank loan	3	9.7	
Personal savings and Cooperative society	1	3.2	

Variables	Frequency	Percent	Mean (S. D.)
Personal savings and Bank loan	1	3.2	

Source: Field Survey, 2025

4.2. Mode of Operation of Catfish Farmers

Table 2 describes the mode of operation of catfish farmers in Ibadan metropolis. Results show that about 61.3% operated fish farming on a full-time basis, more than half (54.8%) of the farmers used leased/rented ponds, the majority (83.9%) were profit-oriented, and less than half (48.4%) sourced water from rivers/streams. More so, many (38.7%) used earthen ponds, the average rearing units was 5, and the majority (77.4%) used a flow-through system for fish production, while 22.6% used an improvised re-circulatory aquaculture system.

Table 2. Mode of Operation of Catfish Farmers (n = 31).

Variables	Frequency	Percent
Mode of operation		
Full time	19	61.3
Part time	12	38.7
Mode of land/pond acquisition		
Purchase	5	16.1
Lease/Rent	17	54.8
Inheritance	8	25.8
Gift	1	3.2
Reasons for going into fish farming		
To make profit	26	83.9
To augment income	4	12.9
For household consumption	1	3.2
Source of water		
River/stream	15	48.4
Borehole	5	16.1
Deep well	9	29.0
Borehole and Deep well	1	3.2
River/stream and Borehole	1	3.2
Types of rearing structure/facilities		
Earthen ponds	12	38.7
Plastic/Tarpaulin tanks	4	12.9
Concrete tanks	9	29.0
Earthen ponds and Concrete tanks	4	12.9
Earthen ponds, Wooden troughs, Plastic/Tarpaulin tanks and Concrete tanks	2	6.5
Number of hatchery rearing units		
1-5	25	80.7

Variables	Frequency	Percent
6-10	4	12.9
11-15	1	3.2
16-20	1	3.2
Mean	5.0	
Types of hatchery production system used		
Flow-through system	24	77.4
Improvised Recirculatory Aquaculture System	7	22.6

Source: Field Survey, 2025

4.3. Production Capacity of Catfish Farmers

Presented in Table 3 are the production capacities of catfish farmers in the study area. According to the results, the mean production capacity (number of fish seed produced per cycle) was 15,451.6 (±1,231.4) pieces, and more than half (51.6%) of the farmers produced between 10,001 and 20,000 fish seed per production cycle.

Table 3. *Production capacity of catfish farmers in Ibadan metropolis (n = 31).*

Variables	Frequency	Percent
Production capacity (number of fish seed produced per cycle)		
≤ 10,000	10	32.3
10,001-20,000	16	51.6
>20,000	5	16.1
Mean	15,451.6 (±1,231.4)	

Source: Field Survey, 2025

4.4. Relationship Between Mode of Operation and Production Capacity of Catfish Farmers

Table 4 presents the chi-square results of the relationship between fish farming practices and the production capacity of catfish farmers. The results indicate a significant relationship between the number of fingerling rearing units ($x2 = 26.672$, $p<0.01$) and production capacity of catfish farmers, while other variables of fish farming practices had no significant relationship with production capacity of the catfish farmers.

Table 4. *Chi-square analysis showing the relationship between mode of operation and production capacity of the catfish farmers.*

Variables	x^2	df	P value
Mode of land/pond acquisition	4.541	6	0.604
Reason for going into fish farming	5.738	4	0.220
Mode of operation	0.916	2	0.633
Source of water	6.252	8	0.619
Types of rearing structure/facilities	10.226	8	0.250

Variables	x^2	df	P value
Number of fingerling rearing units	26.672	6	0.000***
Types of fingerlings production system used	1.827	2	0.401
Types of fish culture	6.265	10	0.793
Source of broodstock	1.285	2	0.526
Culturing period of broodstock	3.128	6	0.793
Harvesting period of fingerlings	4.109	4	0.391

Source: Data Analysis, 2025
Note: *** Significant at $p < 0.01$ (1%)

4.5. Factors Influencing Catfish Fingerling Production in Ibadan Metropolis

The factors influencing catfish fingerlings production in Ibadan metropolis are presented in Table 5. The factors were examined using ordinary least square regression model. The model was significant at $p<0.01$, and the R-squared of 0.897 depicted that the independent variables are associated with about 89.7% change in the outcome variable, suggesting a reliable goodness of fit.

Having tertiary education was positive and significant at $p<0.10$. It was associated with a 0.236 unit increase in the production capacity of catfish farmers in the study area. Higher levels of education is an advantage to the production capacity of the catfish farmers.

Years of fish farming experience were positive and significant at $p<0.01$. A one-year increase in fish production experience was associated with a 0.944 unit increase in the production capacity of the farmers. That is, farmers who have been into fish production several years back, based on their experience, are likely to produce more than those who just started a few years.

The mode of operation was negative and significant at $p<0.10$. Operating on a part-time basis was associated with a 0.331 unit decrease in the farmers' production capacity. Therefore, fish farmers who operate on a full-time basis possess a higher chance of producing more catfish than those on a part-time operation.

Also, sourcing water from boreholes/deep well was negative and significant at $p<0.05$. It was associated with a 0.257 unit decrease in fish farmers' production capacity, implying that farmers who source water from boreholes will be less likely to be productive than those who use water from rivers/streams.

Total variable cost was positive and significant at $p<0.05$. A naira increase in total variable cost contributes a 0.399 unit increase in fish farmers' fingerlings production capacity. Therefore, there is a positive linear relationship between the total variable cost of production and the fingerling production capacity of catfish farmers in Ibadan metropolis.

Table 5. *Factors influencing catfish fingerling production in Ibadan metropolis.*

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	Beta	S. E	Beta		
Constant	-0.894	0.899		-0.995	0.336
Age	-0.409	0.276	-0.531	-1.484	0.159
Educational Level	0.319	0.179	0.236	1.787	0.094*
Cooperative membership	0.194	0.201	0.125	0.961	0.352
Fish farming experience	0.578	0.150	0.944	3.851	0.002***
Fish farming training	0.106	0.204	0.070	0.517	0.613
Access to credit	-0.184	0.250	-0.136	-0.736	0.473
Access to extension contact	-0.124	0.233	-0.092	-0.533	0.602
Mode of operation (b=full-time)	-0.459	0.222	-0.331	-2.072	0.056*

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
Source of water	-0.159	0.069	-0.257	-2.308	0.036**
Types of rearing structure	0.052	0.005	0.132	1.048	0.311
Source of broodstock	-0.125	0.179	-0.089	-0.698	0.496
Culturing period of broodstock	0.037	0.107	0.040	0.346	0.734
Harvesting period of fingerlings	0.094	0.112	0.098	0.839	0.414
Total fixed cost	0.264	0.294	0.099	0.897	0.384
Total variable cost	0.683	0.280	0.399	2.437	0.028**
ANOVA	Sum of Squares	Df	Mean Square	F	Sig.
Regression	12.735	15	0.849	8.730	0.000***
Residual	1.459	15	0.097		
Total	14.194	30			
Model Summary					
R Square	0.897				
Adjusted R Square	0.794				

Source: Data Analysis, 2025
Note: ***, **, * Significant at $p<0.01$, $p<0.05$, and $p<0.10$, respectively.

4.6. Discussion of Findings

This study examined the factors that influence catfish production in the selected catfish farms in Ibadan metropolis, Oyo State, Nigeria. The finding showed that the respondents were in an active and highly productive stage of life, as they would be strong enough to embark on strenuous job-related activities on fish farms. The catfish business was engaged by both genders, but was dominated by males. Similarly, some authors found that the majority of catfish farmers in Southwest Nigeria were male, which is attributed to the strenuous nature of fish farming operations, while females were generally engaged in fish value addition [9].

Majority of the respondents were married and were literate; this agreed with the findings from a previous study that virtually all catfish producers had at least primary education [9], which can impact their productivity level and ascertain their level of understanding and implementation of improved techniques of fish breeding. The results further highlighted the presence of additional hands to help on the farms, catfish farmers years of experience, and that fish farming was the primary occupation of the majority who were members of a cooperative society. In accordance with these findings, a previous finding showed that the majority of Nigerian catfish hatchery farmers were members of a cooperative society [9], and this improved their access to some benefits such as adequate information, quality farm inputs, credit facilities, extension services, and planned marketing of goods.

Most of the fish farmers leased/rented the land/pond used for the business, and were into the business on full time basis mainly for profit, which is the main priority for venturing into any form of business [6-8]. More so, many relied on rivers/streams water, earthen pond structures, and the average number of rearing units was 5. A larger percentage used a flow-through system for catfish production, and this may be attributed to the availability of good water sources. The number of rearing units had a significant relationship with the mode of operation of catfish in Ibadan metropolis. Being educated, years of fish farming experience, and the total amount of variable costs improve farmers' fingerling production capacity, while the mode of operation (part time) and source of water (boreholes/deep well) hinder the farmers' production capacity.

5. Conclusion

This study examined the factors influencing the production of catfish fingerlings in Ibadan metropolis using correlation analysis and the ordinary least square regression model. It found a significant relationship between the number of fingerling rearing units and the production capacity of the farmers. Also, there was a positive relationship between farmers' literacy level, years of experience, and total variable cost of production, while a negative relationship was found between mode of operation (part-time) and water source (boreholes/deep well) to ponds. It was concluded that a larger per-

centage of the people ventured into fish farming to make profits, and they operated on a full-time basis.

6. Recommendations

In light of the findings of this study, it is recommended that:

1) Capacity-building programs should be organised to equip fish farmers with the knowledge and skills required for a more productive and efficient production system.
2) Catfish farmers should be encouraged to diversify their water sources to reduce vulnerability to seasonal shortages and contamination.

Abbreviations

LIFDCs	Low-Income Food Deficit Countries
IITA	International Institute of Tropical Agriculture
CAFAN	Catfish Farmers Association of Nigeria

Author Contributions

Olubunmi Olanike Alawode: Conceptualization, Formal Analysis, Methodology, Software, Supervision, Validation, Visualization, Writing – review & editing

Abiodun Wakeel Olayiwola: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Writing – original draft

Conflicts of Interest

The authors declare no conflicts of interest.

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