Available online at www.koozakar.com/journals/ajspim

Koozakar

African Journal of Science Policy and Innovation Management

AJSPIM

# Policy Analysis of Catfish Farming in Osun State, Nigeria

**Olabiyi O. Bamisaiye[1*], Funmilayo B. Oyekanmi[2], and Akinyele J. Ajiboye[2]**

[1]Federal University Oye-Ekiti, Ekiti- State, Nigeria

[2]University of Ilesha, Osun-state, Nigeria

[*]Corresponding author

Email: olabiyi.bamisaiye@fuoye.edu.ng

## Article information

https://doi.org/10.69798/27343175

ISSN (Online): 3066-3660



Published by Koozakar LLC. Atlanta GA 30350, United States

A Journal of the African Institute for Science Policy and Innovation, AISPI, Obafemi Awolowo University, Ile-Ife.

**Edited by:** Prof. Olawale Adejuwon

## ABSTRACT

Nigeria's aquaculture sector, dominated by catfish farming, plays a crucial role in food security, employment generation, and rural income development. However, the sector is constrained by unstable input markets, inconsistent policies, infrastructural deficits, climate variability, and limited access to credit. This study examines the policy environment shaping catfish farming in Osun State. Specifically, it aims to: determine the socio-economic characteristics of catfish farmers; assess the level of policy awareness among producers; and evaluate the effects of policy measures on catfish production. A mixed-method approach was adopted, combining descriptive statistics, market-based policy tools, and the Policy Analysis Matrix (PAM). Primary data were collected from 360 farmers, while secondary data were sourced from the Federal Ministry of Agriculture and Rural Development (FMARD), Federal Department of Fisheries (FDF), Central Bank of Nigeria (CBN), and the Osun State Ministry of Agriculture. PAM results show that the Nominal Protection Coefficient on Input (NPCI) is greater than one, indicating high input costs due to weak input market support, while the Nominal Protection Coefficient on Output (NPCO) is less than one, suggesting that farmers receive prices below the social value of output. The Effective Protection Coefficient (EPC) is also less than one, reflecting negative protection, whereas the Domestic Resource Cost Ratio (DRC) is less than one, indicating that catfish farming is socially profitable and competitive in the absence of policy distortions. The study further reveals that although farmers are somewhat aware of policies, access to practical support such as credit, training, and extension services remains limited, indicating a policy implementation gap. It concludes that current policies provide inadequate support and recommends improved input subsidies, stronger regulatory enforcement, better infrastructure, and expanded access to credit and extension services.

**Keywords:** Catfish, Agricultural policies, Policy analysis matrix, Osun State, Nigeria

## INTRODUCTION

Nigeria is the largest fish consumer in Africa and ranks among the leading fish-consuming nations globally, with annual consumption estimated at about 3.2–3.3 million metric tonnes (Adeniyi, 2021). Despite this high demand, domestic production has historically lagged behind consumption, resulting in a persistent supply gap often filled through imports. However, recent developments indicate modest progress. Nigeria's fish production recorded an increase of about 300,000 metric tonnes in 2025 the first significant rise in over a decade reflecting renewed efforts by the Ministry of Marine and Blue Economy to reduce import dependence and strengthen national food security (Business Day, 2026). This growth has been attributed to ongoing reforms and targeted interventions within the sector.

At the continental level, Africa produces over 3.3 million tonnes of wild freshwater fish annually, with an estimated value of USD 6.3 billion as of 2019 (Mapfumo, 2022). Globally, the 2024 edition of The State of World Fisheries and Aquaculture (Nielsen *et al*., 2025) reports that total fisheries and aquaculture production reached 223.2 million tonnes in 2022, representing a 4.4% increase from 2020. This includes 185.4 million tonnes of aquatic animals and 37.8 million tonnes of aquatic plants, highlighting the growing importance of aquaculture in meeting global food demand.

Within this context, catfish farming has emerged as one of the most dynamic and commercially viable components of Nigeria's agricultural sector. With rising domestic demand for affordable animal protein and the declining contribution of capture fisheries, aquaculture has become essential for achieving national food security (FAO, 2022). Catfish accounts for approximately 70% of total aquaculture production in Nigeria due to its resilience, rapid growth, and strong market demand (Adewuyi *et al*., 2020).

Despite its significant potential, the productivity and profitability of catfish farming remain constrained by unfavorable policy environments, particularly at the state and local government levels. Inconsistent policy implementation, inadequate input support, limited access to credit, and weak institutional frameworks continue to hinder the sector's growth and its capacity to fully meet Nigeria's fish demand.

Nigerian history of fish farming is actually based on the history of culturing of catfish (Solomon and Ezigbo 2010). Preferred species of catfish include *Heteroclarias claridae*, *Heterobranchus bidorsalis*, *and Clarias gariepinus*. Key reasons why fish producers principally grow catfish in Nigeria are; the fish readily adapts to a controlled culture environment; and retailing is done live; which preserves premium worth (Asa and Solomon, 2015).

Catfish are appropriate when ponds are being stocked because they thrive in lowly oxygenated environments more when compared to different available species. One of the distinctive characteristics of catfish is its rapid growth rate and strong adaptability to both natural and artificial environments, where it thrives successfully under culture conditions. In addition, catfish species can be selectively bred to enhance desirable traits, thereby improving overall productivity and performance.

Catfish farming is also relatively less demanding in terms of resource use. Compared to other aquaculture species, it requires lower energy input for pond construction and management, reduced operational expenses, fewer labour hours (man-days), and a lower rate of feed wastage. These advantages make catfish culture a more cost-efficient and commercially attractive option for fish farmers (Asa and Solomon, 2015).

Nigeria is 923,766 $km^2$ of land mass, with close to 1.75 million hectares of usable land for the development of catfish farming (Ekelemu and Irabor, 2013). Marine, brackish and fresh water are abundant in Nigeria due to an extended coastline (853km), vast perennial swamp lands (1,010,000ha), fresh water swamp (12,500,000ha), 741,509 hectares of salt water and 48,695 hectares of sea water (Idris *et al*., 2024). Also, there are slightly over 100 species of catfish, which are known for their rapid growth, high market value, and strong demand in both coastal and inland waters. Despite the wide diversity of fish species available for aquaculture, only a limited number are currently cultivated for commercial purposes.

These include hybrid and key species such as the tilapiines (*Oreochromis*, *Sarotherodon*, and *Tilapia* species), Osteoglossidae (*Heterotis niloticus*), Clariidae (*Clarias* and *Heterobranchus* species), and the common carp (*Cyprinus carpio*). According to African Union Inter African Bureau for Animal Resources (AU-IBAR, 2013), these species dominate commercial aquaculture due to their adaptability, growth performance, and market acceptance.

Realizing the market potentials of fish farming in Nigeria as well as the drive to create employment and income in the fishery sub-sector, the government of Nigeria has articulated and implemented several policy measures and strategies to boost local fish production through fish farming. Some of these include; the Presidential Initiative on Fish Farming (PIA), Agricultural Transformation Agenda (ATA), Fish Farming and Inland Fishery Project (FFIFP) (1992), Fisheries Infrastructures Provision/Improvement (FIP) (2001), Fishing Terminal Projects (FTP) (2000), National Accelerated Fish Production Project (NAFPP) (1993), (PIA, 2003). Some of these measures involved tax exemptions and input subsidy schemes to stimulate increased production (Falodun, 2012).

The Presidential Initiative on Fish farming has as one of its main focus (Oluwemimo and Damilola, 2013) free fingerlings distribution to producers in small-scale fish enterprises whereas farmers operating on a large-scale were given subsidy up to half of the price, additionally to making Nigerians aware of the varied strategies of fish culture (Oluwemimo and Damilola, 2013). The Agricultural Transformation Agenda (ATA, 2011) is geared toward raising the level of production annually by 1.25 billion, manufacturing 400,000 metric tonnes of feeds, 250,000 metric tonnes of matured fish sizes and 100,000 metric tonnes of value-added fish and fisheries products. In spite of the level of work put in, fish cultivation has still not met the figures needed to make Nigeria self-sufficient (Igwe and Mgbaja, 2014).

Osun State is one of the few States in Nigeria that has maintained deliberate policy attention toward increasing catfish production since the beginning of the civilian administration in 1999 (Taiwo, 2024). The State has consequently emerged as a significant producer of catfish in Southwestern Nigeria, supplying major urban markets such as Osogbo, Ile-Ife, and Ilesa.

However, despite this policy attention, empirical evidence from other agricultural sub-sectors in Nigeria such as cocoa in Ondo State, rice in Kebbi State, and poultry production in various parts of the country shows that effective policy formulation and consistent implementation play a decisive role in improving productivity, market efficiency, technology adoption, and farmer welfare. Similarly, international experiences in countries such as Vietnam, Egypt, and China demonstrate that well-coordinated aquaculture policies, including subsidies, credit access, input regulation, and extension systems, have significantly transformed fish production systems into highly competitive industries (FAO, 2020). In contrast, catfish farmers in Osun State continue to face persistent structural and policy-related constraints. These include high costs of imported feed ingredients, weak hatchery regulation, inadequate extension services, limited access to affordable credit, poor policy coordination at the state level, and infrastructural deficits such as unreliable power supply, inadequate water systems, and poor rural road networks.

Against this background, this study fills a critical gap by providing a systematic assessment of the policy environment governing catfish production in Osun State. It employs a mixed-method approach combining qualitative analysis and quantitative techniques, particularly the Policy Analysis Matrix (PAM), to evaluate competitiveness, efficiency, and the extent of policy-induced distortions in the sector. In doing so, the study contributes to broader policy discourse on how agricultural policy design and implementation influence sectoral performance in developing economies, with specific insights for strengthening aquaculture development in Nigeria.

The broad objective of this study therefore, is to examine the factors influencing catfish farming in Osun State. Specifically, the study seeks to determine the socio-economic characteristics of catfish farmers in the study area, assess the level of policy awareness among producers, and evaluate the effects of policy measures and strategies implemented to enhance catfish production in the state.

# LITERATURE REVIEW

## Policy Analysis in Agriculture

Agricultural policy analysis evaluates how government interventions affect production, resource allocation, market structure, and welfare. Tools such as price distortion measures, comparative advantage assessment, and the Policy Analysis Matrix (PAM) are widely used in agricultural economics (Monke & Pearson, 1989). According to public policy theory, government interventions may take the form of subsidies, taxes, regulations, trade policies, institutional frameworks, credit and insurance programs. These interventions influence input and output markets and therefore shape production efficiency and profitability. The PAM framework decomposes revenue, cost, and profit into; Private values (market prices); Social values (efficient prices without distortions); and Divergences (policy effects). PAM indicators include:

**NPCO** = Private Output Price/Social Output Price
**NPCI** = Private Input Cost/Social Input Cost
**EPC** = Effective Protection Coefficient
**DRC** = Domestic Resource Cost
**PCR** = Private Cost Ratio

A DRC < 1 indicates comparative advantage and social efficiency.

## Conceptual Framework

In production, output is a function of inputs, thereby making resources used independent while the product is the dependent variable. Fig 1 shows w the input variables which are direct independent variables and the moderator variable (Ojo, 2014). A moderator variable is one that modifies the relationship between two other variables (direct independent variables and output variables). In the proposed model for catfish production, the direct variables are land, labour, capital, and management. The moderator variable is government policy on catfish farming (Ojo, 2014). For direct independent variables to generate optimal output, the moderator variable must be favourable. Optimal output (objective) is realized when both direct independent variable and moderator variable are available in adequate quantity and quality. This requires the knowledge of the basic models and methods of analysing the cost and returns as well as review of available literature on analytical techniques.

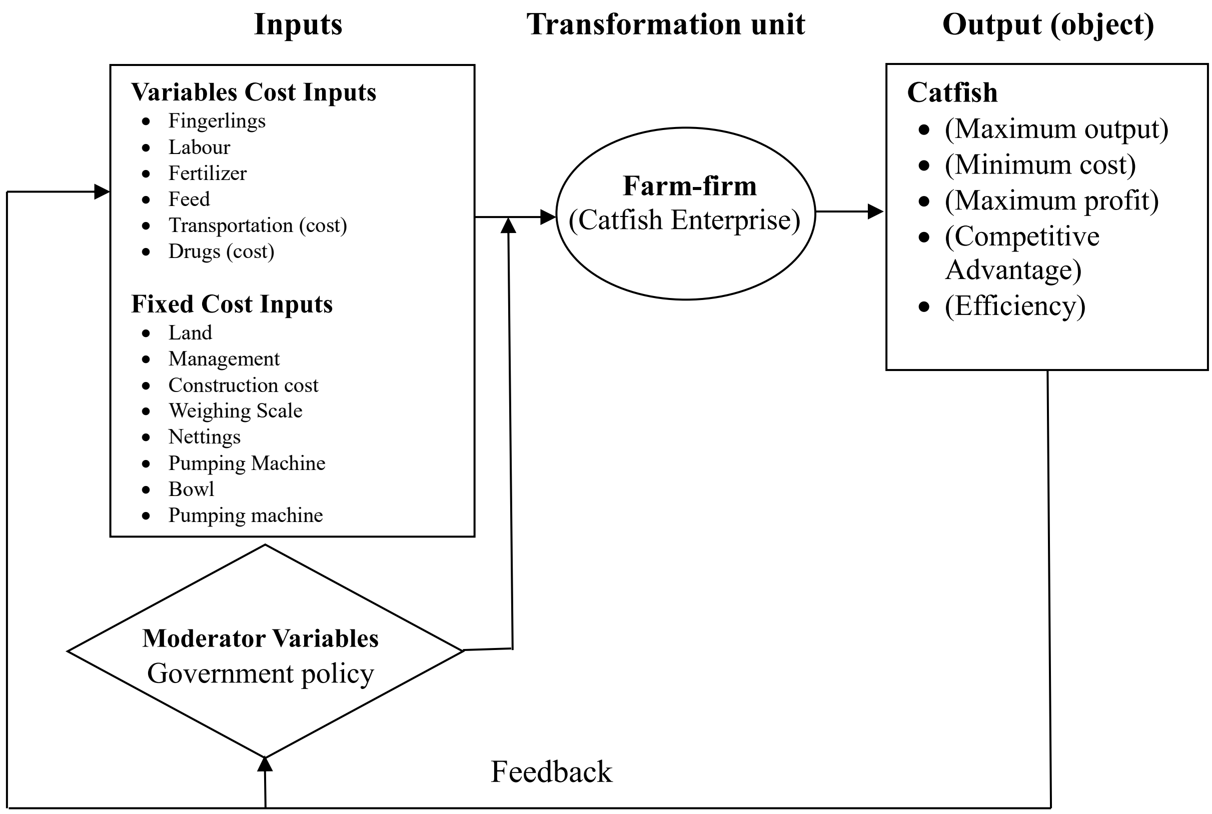


**Figure 1:** Conceptual framework for catfish production
**Source:** Adapted from Bamisaiye (2026)

**Aquaculture Policy Gaps in Nigeria**

Studies highlight persistent policy challenges: weak hatchery regulation (George *et al*., 2022), high input cost due to dependence on imports (Olagunju & Adisa, 2021), weak integration of research, extension, and training (Olaoye *et al*., 2019), and inconsistent implementation of agricultural policies (FMARD, 2021). PAM has been used to evaluate fish, cassava, maize, and rice competitiveness. Catfish farming generates strong social benefits, but it often imposes financial burdens on individual farmers (Adeparusi *et al*., 2020). Policy distortions reduce competitiveness in smallholder aquaculture (Adesina *et al*., 2022). Common constraints include: high feed price volatility, limited access to finance, poor quality control of inputs, market price instability, and inadequate infrastructure. These factors interact with policy interventions to influence production outcomes.

## METHODOLOGY

**Study Area**

The study was carried out in Osun state, Nigeria. The State can be found in Southwestern Nigeria, and lies among latitude 7.0° and 9.0° N, and line of longitude 2.8° and 6.8° E. The State covers a total area of roughly 8,602km$^2$ and lies between 300m and 600 m higher than the sea level with a mostly mild and undulating landscape. The average rainfall ranges from 1,125 mm in the derived savannah to 1475mm in the rain forest belt. The mean annual temperature ranges from 27.2°C in the month of June to 39.0°C in December, (National Bureau of Statistics, (NBS, 2012). The soil varieties are very varied however most areas contain a high proportion of clay and sand and are principally dominated by laterite. Osun state is well drained with some rivers that the indigenes of the area use for domestic chores and fish production. The area is principally agrarian and engages in crop, fishery and poultry productions, (National Population Commission (NPC, 2006). Osun State is divided into three zones by the Agricultural Development Project - ADP (Ogunsumi *et al*., 2010). These zones, are Oshogbo, Iwo and Ife/Ilesha zones. The ADP headquarters is at Iwo ADP acts as the bridge between agricultural research and farmers, ensuring that modern farming knowledge actually reaches rural communities to improve food production and income. They are also involved in Extension services, training of farmers, Input support linkage, technology dissemination, monitoring and supervision, and rural development support.

The choice of Osun State was purposive because the State government is embarking on a huge promotion of fish farming to enhance the federal government goals of poverty reduction, employment generation and guaranteeing improved nutrition among the people (Faruk, *et al*., 2019).

**Data Collection and Sampling Procedure**

Multi-stage sampling technique was used for this study. First, six Local Government Areas (LGAs) (Ife-North, Ife-East, Ife-central, Oshogbo, Ede-north, and Ede-south) were possessively chosen because of the predominance of commercial catfish farmers in these areas (Umaru *et al*., 2021). The second stage involved the random choice of two communities from each of the six LGAs in the State. At the ultimate stage, thirty catfish farmers in every community were randomly chosen from the list of fish farmers that was obtained from the State Agricultural Development Programme (ADP). In all, three hundred and sixty farmers were sampled for the study. The sample size for this study was determined using the Cochran (1951) formula for large populations. Assuming a 95% confidence level, a 5% margin of error, and maximum variability ($p = 0.5$), the computed sample size was approximately 384 respondents. However, due to practical considerations such as cost, time constraints, and the use of cluster sampling, the sample size was adjusted to 360 respondents. This number is considered sufficiently representative of the population of catfish farmers in the study area.

Primary and secondary data were collected and used for this study. Primary data was collected using pretested and a set of structured questionnaire. Data collected included socio-economic characteristics of the respondents such as age, sex, marital status, and level of education among others. Data were also collected on production variables such as variety of fish cultured, fish pond size and capacity, species and range of fish cultured, number of fish stocked, types and costs of feed and medication, number of fish harvested, number of workers employed and total costs of inputs. Secondary data were sourced from the relevant documents.

The specific data obtained and utilised in the analysis included time-series and cross-sectional information on fish and aquaculture production (particularly catfish output levels), producer prices, input costs (such as feed, fingerlings, labour, and medication), credit access to farmers, government budgetary allocations and policy interventions in agriculture, extension service coverage, and market statistics. In addition, macroeconomic indicators such as inflation rates, interest rates, and exchange rates were collected from the CBN (2015), while national and regional food production statistics, consumption patterns, and food security indicators were sourced from the NBS (2012) and FAO (2022). These datasets were used to support trend analysis, policy evaluation, and to complement the primary data obtained from catfish farmers in the study area.

**Analytical Framework**

To evaluate the consequences of policy measures and strategies put in place to boost catfish production inside the State, Policy analysis matrix was used. The policy analysis matrix is a product of two accounting identities: Firstly, one that defines profitability as the distinction between revenues and cost. Secondly the different measurements as a result of divergences (distorting policies and market failure) due to the distinction between observed parameters and parameters which will exist if the divergences were removed. In fish farming, the inputs used mainly are land, labour, fish feed, breeding stock(fingerlings/juvenile), cement, fertilizer, liming material, nets (harvesting and protection) measuring scale (balance), pumping machine, drugs(antibiotics) and simple farm tools.

The steps for constructing a PAM table are as follows (World Bank, 1976):

i. Collection of mean data per hectare on yield and quantities of all inputs used for fish farm (in kilograms) and labour (in man-day's). variables such as the farm and production variables considered in the study include pond size measured in square metres and the number of ponds operated by each farmer. Stocking density, expressed as the number of fish per pond, was also captured alongside the quantity of feed used in kilograms and the corresponding cost of feed in naira. The cost of fingerlings was recorded, as well as labour input measured in man-days and the associated labour cost. In addition, the cost of medication and chemicals used in fish health management was included. Water management practices, such as whether the system is flow-through or static, were examined, while the mortality rate of fish was measured in percentage terms. Finally, harvest size, expressed as the average weight of fish in kilograms, was used to assess production performance.
ii. Calculating the mean costs in naira value of all domestic items used, interest and land rent.
iii. Determining the private (market) prices and estimation of social prices of product and inputs.
iv. Tabulation of the private and social prices of product and inputs estimated
v. Preparation of the farm budget from the data to be obtained.
vi. Data will be extracted from the farm budget to form PAM of total fish production in the study area.
vii. Derivation of various policy parameters (NPC, NPI, EPC, DRC) from the PAM result.

**Determination of Private Prices (observed market prices)**

Fish output, fish feeds and fertilizer etc. had their private prices determined by the following steps (World Bank, 1976);

i. The (free on board) *f.o.b* price at the point of export derived from World Bank commodity estimates or any other related body, freight, insurance and unloading at the point of import, Lagos or Apapa, was added together to (cost, insurance and freight) *c.i.f* price at Lagos or Apapa and expressed in us dollars.
ii. The foreign currency of the *c.i.f price* was converted to Naira currency at prevailing exchange rate officially.
iii. Tariffs were added to the *c.i.f* price.
iv. A subsidy, if any, was deducted.
v. Port charges and Landing charges (including the cost of bags) were added.
vi. Local transport and marketing cost to relevant markets were added. The foregoing resulted in wholesale price at market.
vii. Transport and marketing cost (assembly cost of bags and intermediary margins) were deducted.

viii. Local storage (10% of harvested weight of fish) was deducted. At the end, the import parity price at farm gate obtained.

Private prices for locally made tools used for production was determined by calculating their cost of repairs and depreciation where necessary.

$$D_{sc} = \frac{C-S}{Y}$$

Where;

| | |
|---|---|
| $D_{sc}$ = | depreciation per year by straight line method |
| C = | purchase cost |
| S = | salvage value at the end of usage period |
| Y = | expressed years of usage |

Private price of agricultural credits (interest) was determined by computing the average annual interest as thus;

$$I_t = r\ [LF - (\sum Pi)]$$

Where;

| | |
|---|---|
| $I_t$ = | interest payment in period t |
| $P_i$ = | principal payment in period t |
| R = | rate of interest |
| LF = | size of the loan |

**Estimation of Social Prices**

Social prices are adjusted with import parity prices at the farm gate as this does not represent the opportunity cost to the society (Monke & Pearson, 1989). Hence, economic outputs are achieved when locally available resources are efficiently utilized in the production process. This efficiency ensures optimal levels of output and maximizes financial returns. It is particularly important for outputs (E) and inputs (F) that are traded internationally, where competitiveness and cost-effectiveness are critical. The suitable social valuations are by world prices (*c.i.f* import prices for product or service that are foreign or *f.o.b* export prices)

The tradable inputs to which imports parity apply, was estimated using the prevailing black-market rate, *c.i.f* prices, and domestic handling cost. The black-market rate was used to multiply *c.i.f* prices of fish feeds and fertilizer at the border values which was expressed in domestic currency. Domestic handling costs were subtracted to obtain social prices at farm gate. Non – tradable inputs are the fingerlings/juveniles, simple farm tools, land, and labour. They are defined as goods which tend to be produced at a cheaper price when produced locally than to rely on importation, because the price when exported is lower than the local production cost or as highly perishable goods hence their market price were retained as their social price (Pearsons *et al.,* 2003).

**Steps for Calculating Social and Private Prices for Fish Output and Inputs**

The stepwise calculation of the import price of fish, fertilizer and fish feed at the farm gate both at private and social prices were arrived at as presented as follows:

**Step1:** The CBN ruling official rate value at private price and at social price was arrived at by using the prevailing black market price.

**Step2:** The *cif* price of a tonne of fish, fertilizer and fish feed in dollars.

**Step3:** The *cif* price of a tonne of fish, fertilizer and fish feed in dollars are multiplied by the exchange rate of private and social prices with their respective values.

**Step4:** This is the fixed amount for import tariffs value of fish, fertilizer and fish feed for private and social prices.

**Step 5:** Total port charges: The port charges for a 20-ft container included, documents released, container cleaning, shipping line charges, telex release, amendment charges and Maritime Organization of West and Central Africa (MOWCA) levy, charged per container at the port irrespective of what it contained. but added to this for a fish container, were other official port charges, port development levy (7% of duty payable). Other charges included the ECOWAS trade liberalization scheme (ETLS) levy (0.5% of *f.o.b*), import duty (10% of *f.o.b*), Comprehensive Import Supervision Scheme (C.I.S.S) levy (1% *f.o.b*), VAT (5% of duty inclusive *c.i.f*).

**Step6:** Unloading charges includes: delivery, handling vehicle entry permit and positioning of containers for examination and rent /storage charges.

**Step7:** Sack price.

**Step 8:** Addition of step 3 to 7.

**Step 9:** Transport cost.

**Step 10:** The warehouse charge.

**Step11:** Ware house gate price: Addition of 8, 9 and 10.

**Step 12:** Implicit subsidy.

**Step 13:** Private and social transport cost of product to farm.

**Step 14:** 2.9percent of total expenses: addition of steps 11,12,13,14.

**Step 15:** Local storage charge.

**Step 16:** The farm gate price which is the sum of local storage value, mark-up price, transport cost to farm and implicit subsidy (if any) deducted from ware house gate price.

**Step 17:** Farm gate price with respect to private and social prices.

## RESULTS AND DISCUSSION

Table 1 shows a comprehensive overview of the demographic and socio-economic characteristics shaping fish production in the region. The age structure reveals that a majority (75%) of the respondents fall within the economically active bracket of 31–50 years, with an average age of 42.4 years, indicating the engagement of productive and physically capable individuals in aquaculture. The sector remains male-dominated, with 83.3% of respondents being men, reflecting prevailing land ownership norms and the labour-intensive nature of aquaculture. Marital status distribution shows that 90% of farmers are married, enhancing the availability of family labour, which aligns with the 66.7% dependence on household labour for production.

Educational attainment remains high, with 74.1% of the farmers having completed secondary or tertiary education. This level of literacy facilitates adoption of innovations and enhances management efficiency. Farming experience is also substantial, with an average of 8.5 years, which supports accumulated technical knowledge and increases the likelihood of adopting improved production techniques. The majority operate within small to medium-scale farm sizes, with 43.4% managing 1.0–1.5 hectares and an average farm size of 1.7 hectares. Concrete ponds dominate the production system (81.25%), representing farmers' preference for durable and easily managed infrastructure. Land acquisition patterns show reliance on both formal and informal systems, with 35.8% purchasing land and 25.0% receiving land through family allocation. Boreholes and wells are the primary water sources for 67.5% of farmers, highlighting the importance of groundwater resources in sustaining aquaculture activities.

Table 2 shows that a high proportion (81%) of farmers are aware of federal-level policies relating to agriculture or aquaculture. This suggests that federal policies are relatively well-publicized or communicated, possibly through mass media, farmer associations, or community announcements (Ross *et al.*, 2024). This shows that awareness does not necessarily translate to action, but it is a good starting point for policy implementation because most farmers know about these policies Only about one-third of farmers are aware of programs implemented at the state level. This indicates a significant gap in the dissemination of state programs, possibly due to poor communication channels, low extension services, or limited outreach by state authorities. This shows that the low awareness at the state level could lead to under-utilization of resources specifically designed to support local aquaculture development (Velmurugan *et al.*, 2026). A very small proportion (14%) of farmers have actually accessed government-provided credit facilities. This shows that while awareness might exist, access to financial support is limited, which could be due to stringent eligibility requirements, lack of collateral, bureaucratic hurdles, or lack of information about the process (Akahome and Ogodo, 2024). This shows that credit access restricts farmers' ability to invest in better inputs, technologies, or pond expansion, thereby limiting growth in the aquaculture sector.

Only a tiny fraction (7%) of farmers received visits from extension agents, who are critical for providing technical advice, new farming techniques, and problem-solving. This points to poor extension service delivery, which is a major challenge in improving farm productivity and adopting best practices.

**Table 1:** Socio-Economic Characteristics of Producers

| | Category / Statistic | Frequency (n=360) | Percentage (%) |
|---|---|---|---|
| Age (years) | 21–30 | 45 | 12.5 |
| | 31–40 | 90 | 25.0 |
| | 41–50 | 180 | 50.0 |
| | 51–60 | 30 | 8.3 |
| | >60 | 15 | 4.2 |
| Sex | Male | 300 | 83.3 |
| | Female | 60 | 16.7 |
| Marital Status | Single | 6 | 1.7 |
| | Married | 324 | 90.0 |
| | Divorced | 12 | 3.3 |
| | Separated | 6 | 1.7 |
| | Widow/Widower | 12 | 3.3 |
| Education Level | Adult Education | 6 | 1.7 |
| | Quranic Education | 5 | 1.3 |
| | Primary Incomplete | 3 | 0.8 |
| | Primary Complete | 15 | 4.2 |
| | Secondary Incomplete | 106 | 29.6 |
| | Secondary Complete | 160 | 44.5 |
| | Tertiary Education | 65 | 17.9 |
| Farming Experience (years) | 1–5 | 120 | 33.3 |
| | 6–10 | 195 | 54.2 |
| | 11–15 | 30 | 8.3 |
| | 16–20 | 15 | 4.2 |
| Primary Occupation | Fish Production | 89 | 24.6 |
| | Civil Service | 136 | 37.9 |
| | Trading | 44 | 12.1 |
| | Retiree | 34 | 9.6 |
| | Clergy | 27 | 7.1 |
| | Artisan | 30 | 8.7 |
| Household Size | 1–5 | 90 | 25.0 |
| | 6–10 | 240 | 66.7 |
| | 11–15 | 30 | 8.3 |
| Farm Size (ha) | <1.0 | 84 | 23.3 |
| | 1.0–1.5 | 156 | 43.4 |
| | 1.5–2.0 | 120 | 33.3 |
| Type of Labour Used | Family Labour | 240 | 66.7 |
| | Hired Labour | 90 | 25.0 |
| | Both | 30 | 8.3 |
| Pond Type | Concrete Pond | 293 | 81.25 |
| | Earthen Pond | 63 | 17.50 |
| | Mixed | 4 | 1.25 |
| Land Acquisition | Purchase | 129 | 35.8 |
| | Rent | 66 | 18.3 |
| | Family Allocation | 90 | 25.0 |
| | Government | 15 | 4.2 |
| | Inheritance | 60 | 16.7 |
| Water Source | Well/Borehole | 243 | 67.5 |
| | Stream | 90 | 25.0 |
| | Rainwater | 15 | 4.2 |
| | Tap Water | 12 | 3.3 |

**Table 2:** Policy Awareness Among Farmers

| Indicator | Frequency | Percentage |
|---|---|---|
| Aware of federal policies | 292 | 81% |
| Aware of state-level programs | 115 | 32% |
| Accessed government credit | 50 | 14% |
| Received extension visits in the last year | 25 | 7% |
| Received no training on improved aquaculture practices | 234 | 65% |
| **Total** | **360** | **100** |

This implies that farmers may rely on traditional methods, leading to lower productivity, inefficiency, or poor adoption of new technologies. The majority (65%) of farmers have not received any formal training on modern aquaculture techniques. This lack of training could contribute to low productivity, poor fish health management, and inefficient farm practices. This suggests that there is an urgent need for structured training programs to improve technical knowledge and skills among farmers. High awareness at the federal level shows that national communication efforts are somewhat effective, but the state-level programs are poorly known. Low credit access and minimal extension visits indicate significant structural challenges in support delivery. Training gaps highlight the urgent need for capacity-building programs to improve aquaculture productivity.

**Market-Level Policy Effects**

A PAM of fish production in Osun state, Nigeria, 2025

Table 3 shows on the first row the revenue, tradable value of the amount spent on inputs, non-tradable value of the total amount, and profit all measured in private prices. The figures are ₦903,912.03, ₦93,040.41, ₦156,191.14, and ₦654,679.72 respectively. The next arrays of elements on the table are social values of the information as sequentially entered in the first row and these were ₦931,354.20, ₦87,407.55, ₦165,087.66, and ₦678,858.98 respectively. In the third row are figures indicating differences recorded between social values and private values of the elements in the first two rows. The differences imply that there were market distortions.

**Table 3:** A PAM of upland fish in Osun State, Southwestern Nigeria

| Accounts | Revenue | Tradable Input Cost | Non-tradable Input Cost | Profit |
|---|---|---|---|---|
| Private Value | 903,912.03 | 93,040.41 | 156,191.14 | 354,679.72 |
| Social Value | 931,354.20 | 87,407.55 | 165,087.66 | 378,858.98 |
| Divergence | -27,442.17 | 5,632.86 | -8,896.52 | -24,179.26 |

**Source:** Osun state fish farm budget (2025)

**Summary result of PAM**

The values of the Nominal Protection Coefficients (NPC), Nominal Protection Coefficient of Tradable Inputs (NPI) and Effective Protective Coefficient (EPC) and Domestic Resource Cost (DRC) where derived from Table 42 and are as follows:

- Nominal Protection Coefficient (NPC) = A/E
  Private revenue / Social revenue
  ₦903,912.03 / ₦931,354.20 = 0.970

This implies that farmers were implicitly taxed on the product

- Nominal Protective Coefficient of Tradable Inputs (NPI) = B/F
  Private tradable input cost/social tradable input cost
  ₦93,040.41 / ₦87,407.55 = 1.064

The implication is that the farmers were not encouraged as they were taxed on the inputs

Effective Protective Coefficient (EPC) =A-B/E-F

₦903,912.03 - ₦93,040.41/₦931,354.20 - ₦87,407.55 = 0.960

This indicated that the overall impact of input supply policy measure is disincentive to produce.

Domestic Resource Cost (DRC) = G / E-F
₦165,087.66 / ₦931,354.20 - ₦ 87,407.55 = 0.196

This implies production represents an efficient use of domestic resources compared to imports

The result indicates the overall effect of government interventions affecting fish production impact is net disincentive to produce the particular commodity. It further shows that the fish producers were taxed in the input market. However, table 4 indicates that fish production enterprises were profitable hence the average returns and production cost respectively were ₦903,912.03 and ₦249,232.31 given a profit margin of ₦654,679.72. Thus, given a sufficient level of earnings that guarantees savings for future investments and for satisfying social demands. More so the social profit of ₦678,858.98 realized means that all the fish producers would add to GDP a value of ₦678,858.98 within the accounting period that covered by this study.

**Table 4:** Summary of PAM for fish production in Osun State, Nigeria, 2025

| NPC | NPI | EPC | DRC |
|---|---|---|---|
| 0.970 | 1.064 | 0.960 | 0.196 |

**Source:** Osun state PAM for fish production (2025)

- Input Cost Distortions (NPCI)
  NPCI>1

  *Indicates farmers pay higher-than-efficient prices for inputs, especially feed and fingerlings.*

- Output Price Distortions (NPCO)
  NPCO<1

  *Indicates farmers receive lower-than-efficient prices due to weak market protection.*

| Indicator | Result | Interpretation |
|---|---|---|
| NPCO | < 1 | Output under protected |
| NPCI | > 1 | Input market inefficient; high input cost |
| EPC | < 1 | Negative protection overall |
| DRC | < 1 | Catfish farming is socially profitable |
| PCR | < 1 | Privately profitable but constrained |

The Nigerian policy environment imposes a net penalty on catfish farmers. Farmers face higher input cost due to import-dependence for feed ingredients. Farmers receive lower output value due to lack of market protection mechanisms. Despite distortions, catfish farming remains socially efficient. The policy environment does not adequately support catfish farmers in Osun State. The very high import content of fish feed subject prices to exchange rate volatility and inflation. This aligns with studies that show feed price instability as the most significant constraint (George *et al*., 2022; Adeparusi *et al*., 2020) which reveals that the main constraints facing catfish farming is the cost of feed. The low NPCO indicates weak enforcement of policies banning imported frozen fish, which depresses prices of local fish. DRC < 1 means farmers have a comparative advantage; thus, with improved policies, production could expand significantly. Credit access remains extremely low (14%), consistent with Olagunju & Adisa (2021), who reported high collateral requirements as barriers to aquaculture financing. Weak extension service delivery remains a major gap in Osun State, with only 7% coverage—far below FAO (2020) recommended minimum of 40%.

## CONCLUSION

Policy distortions significantly constrain catfish farming in Osun State. Farmers face high private costs and receive lower private returns due to insufficient government support, market failures, and infrastructural bottlenecks. However, PAM analysis shows strong underlying comparative advantage, suggesting strong potential for expansion if appropriate policies are implemented.

## POLICY RECOMMENDATIONS

i. It is important that the ministry of agriculture provides a favourable policy environment to produce improved fish feed locally. This will help reduce the cost of catfish feeds. Feed alone accounts for about 76.99% of all variable costs necessary for running a catfish farm successfully.

ii. Since majority of the catfish producers are highly educated, which will enhance the ability of producers to adapt to new management techniques and methods, there is a need to revitalize and also fund the system to encourage an efficient delivery of the State-owned Agricultural Development Programmes (ADPs) as a means of disseminating useful information on improving catfish production.

iii. There is need for government to overhaul the policy initiative on catfish production in areas of planning, implementation and publicity to encourage more women and unemployed youths to engage in catfish production as a replacement for the subsisting policy on catfish which has a disincentive effect on producers.

iv. Conditions to access capital in form of agricultural loan schemes to increase catfish investment should be relaxed and farmer-friendly. This is because initial capital outlay is one significant factor that guarantees the success of a catfish enterprise.

## REFERENCES


Abbas, A. M., Ebukiba, E. S., Otitoju, M. A., Iduseri, E. O., Agbonika, D. A. S., Adole, S., Gamba, V., Olutumise, A. I., & Haruna, E. O. (2024). Prospects and sustainability of catfish farming amidst rising input costs in Nigeria. *FUOYE Journal of Agriculture and Human Ecology, 7*(1), 100–114.

Adeniyi, O. (2021). Fish composition and productivity of Lower River Niger, Agenebode, Nigeria (Doctoral dissertation). Postgraduate College, University of Ibadan, Ibadan, Oyo State, Nigeria.

Adeparusi, E., Agbebi, O. & George, F. (2020). Economic implications of aquaculture policy in Nigeria. *Journal of Fisheries Policy Studies, 16*(2), 55–67.

Adesina, R. S., Olagunju, F. I., & Adebayo, F. A. (2022). Policy distortions and competitiveness of aquaculture in Nigeria: A PAM approach. *African Journal of Agricultural Policy, 9*(1), 68–89.

Adewuyi, S. A., Olaoye, O. J., & Olagunju, F. I. (2020). Profitability and constraints of aquaculture production in Nigeria. *Aquaculture Reports, 17*, 100324.

Agriculture Organization of the United Nations. Fisheries Department. (2018). The state of world fisheries and aquaculture. Food and Agriculture Organization of the United Nations. 227*pages*

Ahmadu, J., & Isi, O. S. (2022). Profitability analysis of catfish (*Clarias gariepinus*) production in Edo State, Nigeria. *Selcuk Journal of Agriculture and Food Sciences, 36*(3), 458–465.

Akahome, J. E., & Ogodo, S. (2024). Exploring hurdles in accessing Islamic microfinance for sustainable poverty reduction in Nigeria. In Strategic Islamic Business and Management: *Solutions for Sustainability* (pp. 239-254). Cham: Springer Nature Switzerland.

Anetekhai, M. A, Akin-Oriola, G. A, Aderinola, O. J and Akintola, S. L. (2004). Steps Ahead for Aquaculture Development in Sub-Saharan Africa- the Case of Nigeria. *Aquaculture* 239: 237-248.

Asa, U. A., & Solomon, V. A. (2015). Determinants of Catfish Production in Akwa Ibom State, Nigeria. *Journal of Basic and Applied Sciences*, 11, 1-7.

AU-IBAR (2013). African Union Interaction Bereau for Animal Resources, Catfish Aquaculture Industry Assessment in Nigeria, *Great Britain Journal of West African Science*. 100 *pages*

Bamisaiye, O. O. (2026). Economic assessment of cattle production among sedentary farmers in Southwest Nigeria (Doctoral dissertation). Postgraduate College, Federal University Oye-Ekiti, Ekiti State, Nigeria.

Business Day (2026). Nigerias fisheries production rises by 300,000Metric Tonnes in 2025-Minister by Favour Okpale, April 27, 2026

CBN (2015). CBN Working Paper Series.60 *pages*

Cochran, W. G. (1951). Improvement by means of selection. In *Proceedings of the second Berkeley symposium on mathematical statistics and probability*, 2, 449-471. University of California Press.

Ekelemu, J. K., & Irabor, A. E. (2013). A review of aquaculture production in Nigeria: Problems and prospects. *Journal of Northeast Agricultural University (English Edition), 20*(3), 11–18.

Falodun, E. J., Ehigiator, O. J., & Egharevba, R. K. (2015). Response of Onion (Allium cepa L.) to spacing and inorganic fertilizer in Edo rainforest of Nigeria. *Biokemistri*, *27*(1), 8-13

FAO (2020). World fisheries and aquaculture. *Food and Agriculture Organization*, *2020*, 1-244.

FAO. (2022). *The state of world fisheries and aquaculture*. Food and Agriculture Organization of the United Nations. https://doi.org/10.4060/cc0461en

Faruk, M. O., Hasan, I., Dey, J., Ovi, M. H., Katha, Z. T., & Goni, M. O. (2019) *Nature-Based Solutions*. *8*, 76-82

FMARD (2008). Federal Ministry of Agriculture and Water Resources. National food security programme, Federal Government of Nigeria, Abuja.98 *pages*

FMARD (2013): Nigerian National Aquaculture Strategy: Presidential initiative on fish farming and aquaculture Blue-print. 52 *pages* http://www.fmard.gov.ng

FMARD. (2021). *Nigeria agricultural sector performance report*. Federal Ministry of Agriculture and Rural Development 154 *pages* https://ngfrepository.org.ng:8443/jspui/handle/123456789/3999

George, F., Adeparusi, E., & Olaoye, O. (2022). Input price distortions and competitiveness in aquaculture. *Journal of Aquaculture Economics, 8*(1), 44–59.

Idris, M., Garba, T. A., & Odewade, L. O. (2024). Nigerian hydrological and hydrogeological systems and water resources management: a systematic review. *Geology and Natural Resources of Nigeria*, *11*, 477-499.

Igwe, K. C., & Mgbaja, J. U. (2014). Evaluation of pond fish production in Umuahia South local government area of Abia State, Nigeria. *Global Journal of Science Frontier Research*, *14*(1), 39-48.

Liverpool-Tasie, L. S. O., Wineman, A., Amadi, M. U., Gona, A., Emenekwe, C. C., Fang, M., Olunuga, O., Onyeneke, R. U., Norbert, S., Adenike, T. M., Reardon, T., & Belton, B. (2024). Rapid transformation in aquatic food value chains in three Nigerian states. *Frontiers in Aquaculture, 3*, 1302100 *pages*.

Mapfumo, B. (2022). Regional review on status and trends in aquaculture development in sub-Saharan Africa–2020. 88 *pages*

Monke, E. A., & Pearson, S. (1989). *The policy analysis matrix for agricultural development*. Cornell University Press. 279 *pages*

Muraleedharan, N. V., & Velmurugan, V. P. (2026). A Review Study on the Influence and Impact of Knowledge Management Practices on the Performance and Growth of SMEs. *International Review of Management and Marketing, 16*(3), 618.

National Bureau of Statistics. (2012). *Agricultural and environmental statistics report.* 120 *pages*

National Population Commission (NPC) (2006) Official Census Report. Abuja, Nigeria. 334 *pages*

Nielsen, R., Llorente, I., Virtanen, J., & Guillen, J. (2025). Scientific Technical and Economic Committee for Fisheries (STECF).400 *pages*

Ogunji, J., & Wuertz, S. (2023). Aquaculture development in Nigeria: The second biggest aquaculture producer in Africa. *Water, 15*(24), 4224.

Ogunsumi, L. O., Farinde, A. J., & Alonge, G. C. (2010). Comparative analysis of extension services of agricultural development programme in Edo and Osun States, Nigeria. *American Journal of Social and Management Sciences*, 1, 186-190.

Ojo, O. J., Fagbuaro, O., & Julius, T. O. (2025). Comparative studies on growth potentials of parents and hybrids of *Clarias gariepinus*. *GSC Biological and Pharmaceutical Sciences, 30*(2), 56–65.

Ojo, T. O. (2014). Factors affecting the profitability of Moringa oleifera production in Oyo State, Nigeria (Unpublished master's thesis). Postgraduate College, Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria.

Olagunju, F. I., & Adisa, R. S. (2021). Policy constraints and productivity of aquaculture in Nigeria. *Journal of Agricultural Economics and Rural Development, 4*(2), 55–67.

Olagunju, O. F. (2024). *Economic assessment of catfish farming in Nigeria* (Master's thesis). University of Iceland.101 *pages*

Olagunju, O. F., Kristófersson, D., Kristjánsson, T., & Tómasson, T. (2024). Technical efficiency of African catfish production in Nigeria: An analysis involving input quality and COVID-19 effects. *Aquaculture Economics & Management, 28*(1), 82–108.

Olaoye, O. J., Adewuyi, S. A., & Ajiboye, B. O. (2019). Policy and institutional challenges in Nigerian aquaculture. *AquaScience, 15*(2), 88–102.

Oluwemimo, O., & Damilola, A. (2013). Socio-economic and policy issues determining sustainable fish farming in Nigeria. *International Journal of Livestock Production*, 4(1), 1-8.

Pearson, S. F., Levey, D. J., Greenberg, C. H., & Martínez del Rio, C. (2003). Effects of elemental composition on the incorporation of dietary nitrogen and carbon isotopic signatures in an omnivorous songbird. *Oecologia, 135*(4), 516-523.

Ross, J. B., Myers, L. M., Noh, J. J., Collins, M. M., Carmody, A. B., Messer, R. J. & Weissman, I. L. (2024). Depleting myeloid-biased haematopoietic stem cells rejuvenates aged immunity. *Nature, 628*(8006), 162-170.

Solomon, J. R., & Ezigbo, M. N. (2010). Polyculture of heteroclarias/tilapia under different feeding regimes. *New York Science Journal*, *3*(10), 42-57.

Srikulnath, K., Panthum, T., Singchat, W., Chaiyes, A., Prasanpan, J., Uno, U., Edem, U., & Obidiegwu, J. E. (2025). Addressing catfish supply gap in Nigeria: Strategies for sustainable aquaculture growth. *Sustainability, 17*(21), 9645.

Taiwo, A. M. (2024). Determinants of quality of life among fish farming households in Southwestern Nigeria (Doctoral dissertation). Postgraduate College, University of Ibadan, Ibadan, Oyo State, Nigeria.

Ugwumba, C. O. A. and Chukwuji, C. O. (2010) The economics of catfish production in Anambra State, Nigeria: A Profit Function approach, *Journal of Agriculture and Social. Sciences*, *6,* 105-109.

Umaru, I. L., Okoh, T. C., & Ishiwu, R. C. (2021). Profitability of catfish production in Enugu metropolis, Enugu state, Nigeria. *Open Journal of Agricultural Science*, *2*(2), 1-11.

Velmurugan, B., Samima, N., Banu, A. A., Safrin, J. H., & Balan, A. (2026). *From Catch to Consumer: Oceanic Wealth and Economic insights of Fisheries at State, National and Global Perspective*. Deep Science Publishing. 320*pg*

Wei, L. S., Liew, V. K., Tahiluddin, A. B., Harikrishnan, R., Hosain, M. E., Azra, M. N., & Wee, W. (2025). Dietary dill weed (Anethum graveolens) stimulated disease resistance of African catfish (Clarias gariepinus) against edwardsiellosis infection. *Bacteria, 4*(2), 23-33

World Bank. (1976). *Policy analysis methodology guidelines*.80 *pages*