

**MARKET LINKAGE MECHANISMS AMONG CATFISH  
FARMERS IN EDO SOUTH AGRICULTURAL ZONE,  
EDO STATE, NIGERIA**

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BENIN CITY, NIGERIA**

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**BEING A PROJECT SUBMITTED TO THE DEPARTMENT OF  
AGRICULTURAL ECONOMICS AND EXTENSION SERVICES, FACULTY OF  
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## CERTIFICATION

This is to certify that this research work was carried out by **Jonathan Oshioke OBANOR** with Matriculation Number **AGR1900041** in the Department of Agricultural Economics and Extension Services, Faculty of Agriculture, University of Benin and that the research project was approved in partial fulfillment of the award of the bachelor of Agriculture (B.Agric).

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Date: \_\_\_\_\_

Date: \_\_\_\_\_

## **DEDICATION**

This project is dedicated to Almighty God, my source and strength for His omnipresence, love and faithfulness.

## ACKNOWLEDGEMENTS

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## ABSTRACT

This study focused on market linkage mechanisms among catfish farmers in Edo South Agricultural Zone, Edo State Nigeria. The specific objectives were to: describe the socio-economic characteristics of catfish farmers; identify existing markets utilized by catfish farmers; identify the mechanisms for linking farmers to the markets; ascertain the linkage strengths of the identified mechanisms; identify sources of information on market linkages among catfish farmers; examine preferred choice of market outlets among catfish farmers; establish reasons for farmers' preference for chosen market outlets and identify the constraints to effective market linkage among catfish farmers.

A multi-stage sampling procedure was used for a simple random sampling of 20 catfish farmers from each of the four (4) selected Local Government Areas in Edo South Agricultural Zone giving a total of 80 farmers. Data were collected through the use of structured questionnaire in line with the objectives of the study. Data were analysed using descriptive statistics such as frequency counts, percentages and mean scores as well as inferential statistics being Pearson-Product Moment Correlation (PPMC).

Results showed that more than half (53.8%) of the proportion of catfish farmers were male, most (80%) of them were married with mean age of 42 years. Direct contact (98.7%) was the most used mechanism for market linkage. Results also showed that most (96.2%) of the farmers utilized local markets, fellow farmers (86.2%) were the most used source of information and high transportation costs (mean = 4.39) was the major constraint encountered by catfish farmers for effective market linkages. It was concluded that direct contact was the most used linkage mechanism and high transportation costs was a major constraint faced by catfish farmers in linking to markets. The study therefore recommended that Government and relevant stakeholders should invest in improving road networks and transportation systems to reduce transportation costs and ease market linkage for catfish farmers.

## **CHAPTER ONE**

### **1.0 INTRODUCTION**

#### **1.1 Background of study**

The agricultural sector has been a cornerstone of Nigeria's economy, contributing significantly to employment, income generation, and food security. In Nigeria, the fishery subsector occupies a unique position in the agricultural sector and has recorded the fastest growth rate in agriculture in terms of Gross Domestic Product (GDP) (Folayan 2017). In recent years, the aquaculture sub-sector, particularly catfish farming, has gained prominence due to its potential for high returns on investment and its role in addressing the protein needs of the rapidly growing population (Adebayo and Ajayi, 2020). Catfish, a member of the vertebrate classification, is widely recognized for its nutritional value and contribution to human health (Gebremichael, Szabó, Sándor, Nagy, Ali, and Kucska, 2023; Olaleye, Odeseye, David, Aregbesola, Asogwa and Adams, 2019). It serves as a vital source of dietary protein, particularly in Nigeria, where it supplements approximately 40% of the population protein intake (Oluwatayo and Adedeji, 2019; Olutumise, Ojo, and Olayemi, 2020; Egun and Oboh, 2022). Furthermore, Fish, whose consumption is devoid of any religious taboo or cultural limitation is an important source of animal protein contributing substantially to the existence and wellbeing of a large number of the people in Nigeria (Oladimeji, Abdulsalam, Mani, Ajao and Galadima, 2017).

Nigeria contributes more than 67% of the total global production, followed by Uganda, Cuba, Sudan, Hungary, Netherlands, Benin, and Brazil as stated by the Food and Agriculture Organization (FAO), 2019. Also, Nigeria is the largest producer of catfish in Africa and the world and the second-largest aquaculture producer in Africa after Egypt (Dauda, Natrah, Karim, Kamarudin, Bichi, 2018). According to Olagunju, (2020), the African catfish (*Clarias gariepinus*) is the most prevalent cultivated species due to its efficient food conversion ratio (FCR) and ability of rapid growth rate that allows for two cycles to be accomplished in a year. It can also withstand different adverse environmental conditions. Nigeria has been recognized as one of the most suitable regions for aquaculture in the world as a result of good climatic conditions, favorable land and desirable aquatic resource (Ogunji and Wuertz, 2023). Catfish farming has become a viable enterprise, with numerous smallholder farmers engaged in the practice (Ajagbe, Ajagbe, Ariwoola, Abdulazeez, Oloba, Oyewole, Kareem, Ojubolamo, Olomola, and Oke, 2020). However, despite its potential, the industry faces significant challenges, particularly in terms of market access and linkages (Ogundipe, Obi and Ogundipe, 2020).

Catfish marketing involves series of activities that occur from the point of catching or harvesting the fish to the final consumption by the consumer (Mokhaukhau, Belete and Hlongwane, 2022). These activities encompass processing, packaging, transportation and distribution, among others (Adeosun and Adebukola, 2012; Abdel-Moemin and Abdel-Rahman, 2022). Marketing and distribution channels are important characteristics in the process of getting produce from source to consumers (Isibor and Okonkwo 2023).

Marketing of catfish is not usually a direct contact between the producer and consumer; rather, a network of linkages between various actors and stakeholders ((Igwenagu, Ohajianya, Nwaiwu, Gbolagun, and Ehirim, 2020). Hence, Market Linkages connect the organizations and intermediaries involved in producing the products and delivering the services across the length and breadth of the market. As such when linkages are absent or weak, markets become inefficient (Osagie and Edebiri, 2019).

Markets that are well-integrated help in reducing variability in prices encountered by both consumers of catfish and marketers. In developing countries, complex environments, market failures, information asymmetries and low business capacity represent significant challenges that require time and commitment to overcome (Quader, Jairu, and Gorai, 2023). In light of this, it is imperative to create linkages as an integral part for the smooth functioning and betterment of the stakeholders involved in catfish market chain from the farmers, processors, traders to the final consumers (Quader *et al.*, 2023). Extension workers play crucial role in facilitating market linkages by offering market information, connecting farmers with potential buyers, and supporting the negotiation process (Ogunleye, Akintunde and Adewale, 2023).

## **1.2 Problem statement**

Market access remains a significant hurdle for catfish farmers, despite the sector's rapid expansion in recent years. As more farmers venture into catfish farming due to its profitability and relative ease of entry, the competition for market space intensifies,

exacerbating the challenges related to market access. The limited availability of formal markets, coupled with the dominance of informal market channels, means that many farmers struggle to secure consistent buyers for their produce. This poor state of market access not only affects the income stability of these farmers but also threatens the long-term sustainability of catfish farming (Ogunleye and Okoro, 2021).

The inefficiencies in market linkage mechanisms further compound the difficulties faced by catfish farmers. In many instances, these farmers are forced to rely on middlemen, who often take advantage of the farmers' weak bargaining positions to offer prices that are far below market value. The absence of direct market access channels limits the farmers' ability to negotiate better prices, reducing their profit margins and making their operations less viable (Onyekwere and Adigun, 2021). This dependency on intermediaries not only diminishes the farmers' returns but also perpetuates a cycle of poverty and vulnerability among smallholder catfish farmers in the Edo South Agricultural Zone (Eze and Nwachukwu, 2019). Understanding the existing market linkage mechanisms among catfish farmers in Edo South is crucial for identifying gaps and opportunities for intervention.

Agricultural extension services are traditionally viewed as a critical support system for farmers, offering technical advice, market information, and facilitating access to inputs and markets. However, in the context of catfish farming in Edo State, the existing market linkage mechanisms that extension workers are expected to utilize are often outdated or

insufficiently developed to meet the needs of modern catfish farmers. This inadequacy leads to a gap in service provision, leaving farmers to navigate the complexities of the market on their own.

Without efficient linkages, farmers face increased transaction costs, including transportation and storage costs, which further erode their profits (Olayemi and Olufemi, 2021). Additionally, the lack of timely and accurate market information prevents farmers from making informed decisions about when and where to sell their produce, often resulting in significant post-harvest losses. These challenges underscore the urgent need for a more robust and effective market linkage framework that can support catfish farmers in accessing profitable markets and maximizing their returns.

Hence this study was conducted to answer the following research questions;

1. What are the socio-economic characteristics of catfish farmers in Edo South Agricultural Zone?
2. What are the existing markets utilized by catfish farmers in the study area?
3. What are the mechanisms for linking farmers to the markets in the study area?
4. What are the linkage strengths of the identified mechanisms in the study area?
5. What are the sources of information on market linkages among catfish farmers in Edo South Agricultural Zone?
6. What are the preferred choice of market outlets among catfish farmers in the study area?

7. What are the reasons for farmers' preference for chosen market outlets in the study area?
8. What are the constraints to effective market linkage among catfish farmers in Edo South Agricultural Zone?

### **1.3 Objectives of the study**

The broad objective of this study was to examine the market linkage mechanisms among catfish farmers in Edo South Agricultural Zone. The specific objectives of the study were to:

1. describe the socio-economic characteristics of catfish farmers in Edo South Agricultural zone, Edo State, Nigeria;
2. identify existing markets utilized by catfish farmers;
3. identify the mechanisms for linking farmers to the markets;
4. ascertain the linkage strengths of the identified mechanisms;
5. identify sources of information on market linkages among catfish farmers;
6. examine preferred choice of market outlets among catfish farmers;
7. establish reasons for farmers' preference for chosen market outlets;
8. identify the constraints to effective market linkage among catfish farmers.

#### **1.4 Justification of study**

The importance of effective market linkages in enhancing the productivity and profitability of agricultural enterprises cannot be overstated. Efficient market linkage mechanisms can significantly reduce transaction costs, improve access to market information, and increase farmers' income (Ogunleye *et al.*, 2023). For catfish farmers in Edo South Agricultural Zone, these linkages are particularly crucial given the perishable nature of their produce and the competitive nature of the market. This study is justified on several grounds. First, it provides an in-depth analysis of the role of agricultural extension workers in market linkage processes, highlighting areas where their interventions are most needed. Second, it identifies the existing linkages between catfish farmers and markets, evaluates their efficiency, and proposes strategies for improvement. Third, by exploring the willingness of farmers to engage with extension services, the study provides insights into the potential uptake of these services, which is essential for designing effective extension programs. Lastly, the study addresses a significant gap in the literature by focusing on the specific context of catfish farming in Edo State, thereby contributing to the broader discourse on agricultural market linkages in Nigeria. This study will also prove to be an invaluable reference material for future research studies.

## **1.5 Hypothesis of the study**

The research hypothesis was expressed in the null form as follows:

H<sub>0</sub>: There is no significant relationship between the socio-economic characteristics of catfish farmers and their market linkage mechanisms in Edo South Agricultural Zone, Edo State.

## CHAPTER TWO

### 2.0 LITERATURE REVIEW

#### 2.1 Market performance indicators in catfish marketing

Profitability is a key measure of market efficiency and sustainability in catfish farming. Studies show that net income in catfish production varies depending on access to markets, cost of inputs, and price stability (Oladoja and Adeokun, 2010). Farmers who sell directly to consumers or through cooperatives tend to achieve higher profit margins compared to those relying on intermediaries.

The quantity of catfish sold by farmers and traders is influenced by seasonality, consumer demand, and transportation efficiency (Omogegbee *et al.*, 2019). Farmers with access to structured market linkages experience higher sales volumes and reduced post-harvest losses due to efficient distribution networks (Awuor *et al.*, 2019).

Price fluctuations in catfish marketing arise from supply chain inefficiencies, import competition, and middlemen's influence (Akanni, 2010). Studies suggest that organized fish markets and cooperative sales reduce price volatility and improve farmers' bargaining power (Awuor *et al.*, 2019).

Timely access to market information influences decision-making on pricing, sales strategies, and input procurement. Many farmers in Nigeria rely on word-of-mouth,

traders, and local markets for pricing and sales updates (Omoregbee *et al.*, 2019). However, limited extension services and poor digital adoption hinder real-time access to market intelligence, affecting market efficiency (Anugwa *et al.*, 2017).

## **2.2 Market linkage mechanisms in catfish farming**

Market linkage mechanisms are essential for ensuring that catfish farmers can effectively connect with buyers, secure competitive prices, and reduce post-harvest losses. The efficiency of these linkages determines the profitability and sustainability of catfish farming. Different marketing channels and distribution networks exist for catfish, ranging from direct farm-gate sales to wholesalers and retailers. However, challenges such as poor infrastructure, reliance on intermediaries, and limited access to modern marketing tools hinder the efficiency of market linkages (Oladoja and Adeokun, 2010). Strengthening these linkages through cooperatives, digital platforms, and improved extension services is necessary for optimizing market performance (Omoregbee *et al.*, 2019).

### **2.2.1 Market channels and distribution networks**

One of the most common market channels in catfish farming is direct sales to consumers, which includes farm-gate sales and on-site transactions. This approach allows farmers to maximize profits by eliminating intermediaries and directly negotiating prices with buyers. Direct sales are particularly advantageous for farmers located near urban centers

where demand for fresh fish is high (Awuor *et al.*, 2019). However, for rural farmers, limited access to consumers due to poor transportation networks can hinder their ability to market catfish efficiently (Omoregbee *et al.*, 2019). While direct sales provide better profit margins, they may require additional marketing efforts by farmers to attract customers.

Retailers and wholesalers also play a significant role in catfish distribution, as they serve as intermediaries between farmers and final consumers. Wholesalers buy in bulk from farmers and sell to supermarkets, hotels, restaurants, and fish markets. These buyers often have the advantage of determining prices, which may not always favor the farmers (Oladoja and Adeokun, 2010). Retailers, on the other hand, sell in smaller quantities to individual consumers, offering a more flexible market option. However, dependence on wholesalers can lead to price fluctuations, especially when there is an oversupply of catfish in the market (Akanni, 2010).

The role of middlemen and intermediaries in catfish marketing cannot be overlooked. Middlemen often serve as aggregators, purchasing fish from multiple farmers and reselling at higher prices. While they help in bridging the gap between farmers and distant markets, they also significantly influence price determination, often paying farmers lower prices than what consumers eventually pay (Omoregbee *et al.*, 2019). Due to the lack of bargaining power among smallholder catfish farmers, middlemen dominate the supply chain, reducing the income of producers. This system creates inefficiencies,

where farmers struggle with low farm-gate prices while consumers pay higher retail prices.

Fishermen's cooperatives and associations have emerged as an effective means for improving market access for catfish farmers. These groups help farmers pool resources, collectively market their fish, and negotiate better prices with buyers (Anugwa *et al.*, 2017). Cooperatives also provide financial support and enable farmers to access bulk storage and transportation facilities, reducing post-harvest losses (Awuor *et al.*, 2019). However, many small-scale farmers are yet to take full advantage of cooperative structures due to poor organization and lack of government support (Omogbee *et al.*, 2019).

The emergence of e-commerce and digital marketing in catfish sales is gradually transforming the industry, providing farmers with new opportunities to reach a wider customer base. Online platforms allow farmers to advertise and sell catfish directly to consumers, restaurants, and supermarkets, bypassing traditional middlemen (Omogbee *et al.*, 2019). Social media, mobile payment systems, and online marketplaces are increasingly being used to connect farmers with buyers. However, the adoption of digital marketing remains low due to limited digital literacy, poor internet access in rural areas, and lack of trust in online transactions (Awuor *et al.*, 2019). Expanding digital market access can enhance price transparency and improve farmers' profitability.

### **2.2.2 Role of extension services in market linkages**

Extension services play a crucial role in providing market information, technical assistance, and training to catfish farmers, enabling them to make informed marketing decisions (Omogbee *et al.*, 2019). Extension agents serve as intermediaries between research institutions and farmers, ensuring the adoption of improved marketing strategies. Studies have shown that regions with active extension service delivery experience better market performance as farmers gain access to valuable insights on pricing trends, quality standards, and post-harvest handling techniques (Anugwa *et al.*, 2017). However, the effectiveness of extension services is often hindered by poor funding, inadequate personnel, and lack of farmer awareness about available support programs.

Despite the importance of extension services, many catfish farmers in Nigeria have limited access to these resources due to weak institutional support (Omogbee *et al.*, 2019). Studies indicate that only a small percentage of farmers receive marketing-related guidance from extension officers, relying instead on informal sources such as fellow farmers, traders, and personal experience (Oladoja and Adekun, 2010). The low adoption of extension services is particularly evident in rural areas, where extension officers face logistical challenges in reaching remote farming communities (Awuor *et al.*, 2019).

To improve market efficiency, there is a need for increased frequency of extension agent contact with catfish farmers. More frequent interactions between farmers and extension agents can enhance knowledge transfer and promote the use of modern marketing techniques (Anugwa *et al.*, 2017). Additionally, incorporating digital extension services through SMS alerts, radio programs, and mobile apps can help bridge the information gap and improve farmers' access to timely market updates (Omoregbee *et al.*, 2019).

### **2.2.3 Information flow in catfish marketing**

Efficient information flow is critical for effective catfish marketing, as it enables farmers to make informed decisions regarding pricing, sales, and input procurement (Oladoja and Adeokun, 2010). The major sources of market information include fellow farmers, traders, extension agents, family members, newspapers, and online platforms (Omoregbee *et al.*, 2019). Studies indicate that 95% of catfish farmers rely on informal sources such as other marketers and farmers, while only a small fraction receive information from formal channels like extension officers (Anugwa *et al.*, 2017). This reliance on word-of-mouth information often leads to distorted market prices and inefficiencies in decision-making.

The impact of poor information access on price fluctuations and profitability is significant. Farmers without accurate pricing information are often exploited by middlemen, leading to inconsistent earnings (Awuor *et al.*, 2019). Additionally, lack of market intelligence contributes to seasonal price volatility, where farmers face low prices

during peak harvest periods and struggle to sell surplus fish (Omoregbee *et al.*, 2019). Poor access to market information also affects input procurement, as farmers may purchase feeds and fingerlings at higher prices due to lack of competitive price awareness (Oladoja and Adeokun, 2010).

To address these challenges, there is a strong need for improved market intelligence systems for catfish farmers. Establishing digital price boards, market information hotlines, and farmer-focused radio programs can enhance information flow and ensure greater transparency in price negotiations (Anugwa *et al.*, 2017). Strengthening linkages between extension services, cooperatives, and market information platforms can further empower farmers and enhance their competitiveness in the market (Omoregbee *et al.*, 2019).

### **2.3 Factors affecting effective market linkage**

Effective market linkage mechanisms ensure that catfish farmers can sell their products at competitive prices, minimize losses, and maintain stable market access. However, various factors, including socio-economic characteristics, infrastructural challenges, financial constraints, and market uncertainties, influence the effectiveness of these linkages. The ability of farmers and marketers to participate effectively in the market depends on their experience, education, and gender roles (Oladoja and Adeokun, 2010). Additionally, challenges such as high transportation costs, lack of credit access, and competition from imported fish continue to hinder catfish farmers' profitability (Omoregbee *et al.*, 2019).

Addressing these barriers is crucial for ensuring a more efficient and competitive catfish marketing system.

The age, education, and experience of catfish farmers significantly influence their market participation. Studies indicate that most catfish farmers fall within the active age group of 31-40 years, which suggests that young and middle-aged individuals dominate the industry (Oladoja and Adekun, 2010). Farmers with higher educational levels and more years of experience are better positioned to access profitable markets because they have a better understanding of pricing strategies, quality standards, and value addition techniques (Awuor *et al.*, 2019). Conversely, farmers with limited education often rely on traditional marketing methods, which may reduce their competitive edge. The ability to interpret market trends, access credit facilities, and adopt modern farming practices is often linked to educational attainment and experience in the industry (Omoregbee *et al.*, 2019).

Gender disparities also play a role in catfish marketing and production. Studies have shown that men dominate catfish production, while women are more actively involved in marketing and processing (Omoregbee *et al.*, 2019). The involvement of women in marketing is often due to cultural norms, financial accessibility, and household responsibilities, which limit their ability to engage in large-scale production (Anugwa *et al.*, 2017). However, despite their dominance in marketing, women face greater financial and logistical challenges, such as limited access to credit and market infrastructure, which

restrict their ability to expand their businesses (Awuor *et al.*, 2019). Addressing these disparities through targeted financial interventions and support programs for women entrepreneurs can improve market participation and overall efficiency.

Cooperative societies have emerged as a vital tool for improving market linkages among catfish farmers. These groups help farmers access bulk markets, negotiate better prices, and pool resources for storage and transportation (Oladoja and Adeokun, 2010). Studies show that farmers who participate in cooperatives experience better market integration and higher profitability compared to those who operate individually (Omogbee *et al.*, 2019). However, many small-scale farmers remain unorganized, limiting their ability to benefit from group marketing strategies and financial assistance programs (Awuor *et al.*, 2019). Strengthening cooperative structures through government support and policy incentives can improve farmers' bargaining power and enhance market efficiency.

High transportation costs and poor road infrastructure are among the biggest challenges of effective market linkages. The cost of transporting catfish from production sites to major markets is often high due to poor road networks, fuel costs, and the perishable nature of fish (Omogbee *et al.*, 2019). Studies indicate that 83% of catfish farmers cite poor transportation as a major constraint, making it difficult to reach distant markets where prices may be more favorable (Oladoja and Adeokun, 2010). Additionally, lack of proper cold-chain logistics and delays in transportation lead to high post-harvest losses, further reducing farmers' profits (Awuor *et al.*, 2019). Investing in better road

infrastructure, cold storage facilities, and transport subsidies can help mitigate these challenges and enhance market efficiency.

Storage and processing limitations also pose significant constraints in catfish marketing. Due to the high perishability of fresh catfish, farmers who lack access to storage facilities are forced to sell their produce at low prices, especially during periods of surplus (Omoregbee *et al.*, 2019). Inadequate smoking, drying, and refrigeration facilities further limit farmers' ability to engage in value addition, which could otherwise increase profitability (Anugwa *et al.*, 2017). Research shows that processors using improved drying and smoking techniques have higher profit margins compared to those selling fresh catfish without preservation (Awuor *et al.*, 2019). Expanding farmers' access to modern processing facilities, cooperative storage systems, and government-subsidized preservation technologies is essential for reducing post-harvest losses and improving profitability.

Another major challenge is lack of access to credit facilities, which significantly affects farmers' ability to expand production and market participation. Studies indicate that only 37.7% of catfish farmers access formal bank loans, while the rest rely on personal savings or informal credit sources (Oladoja and Adeokun, 2010). Without sufficient capital, farmers struggle to invest in feed, transportation, storage, and marketing (Omoregbee *et al.*, 2019). High interest rates, stringent collateral requirements, and lack of financial literacy further hinder farmers from securing loans (Anugwa *et al.*, 2017). Strengthening

microfinance institutions, farmer-friendly loan schemes, and cooperative-based lending systems can help bridge this financial gap.

Price volatility and market uncertainty further complicate catfish marketing. Seasonal fluctuations in supply and demand lead to inconsistent pricing, making it difficult for farmers to plan production and sales effectively (Omoregbee *et al.*, 2019). During peak harvest seasons, an oversupply of catfish often results in a sharp decline in prices, forcing farmers to sell at a loss (Oladoja and Adeokun, 2010). Conversely, periods of low supply lead to higher consumer prices, but many farmers are unable to take advantage due to production constraints (Awuor *et al.*, 2019). Developing price stabilization mechanisms, contract farming, and improved storage facilities can help mitigate these fluctuations and ensure steady income for farmers.

Finally, competition from imported fish has significantly impacted local catfish prices, reducing the profitability of Nigerian farmers. The influx of cheap imported frozen fish, particularly from China, has created unfair market competition, as imported fish is often sold at lower prices than locally farmed catfish (Awuor *et al.*, 2019). Studies show that many consumers prefer imported fish due to its lower cost and availability in supermarkets, putting local farmers at a disadvantage (Omoregbee *et al.*, 2019). To protect local farmers, trade policies, import tariffs, and promotional campaigns for locally produced fish need to be strengthened. Encouraging value addition and certification

programs can also help Nigerian catfish farmers compete more effectively in both local and international markets.

## **2.4 Conceptual framework**

Market linkages in aquaculture refer to the structured connections between fish producers, intermediaries, and consumers, facilitating the efficient flow of products, services, and information across the value chain. These linkages ensure that catfish farmers can access profitable markets, secure better prices, and minimize post-harvest losses through effective distribution channels. Efficient market linkage mechanisms enhance productivity, profitability, and sustainability by reducing transaction costs and market uncertainties (Omoregbee *et al.*, 2019).

Catfish farmers are the primary stakeholders in the aquaculture market system. They engage in production activities, including pond preparation, stocking, feeding, and harvesting. However, the market performance of these farmers depends on their access to inputs, credit, extension services, and reliable marketing channels (Oladoja and Adeokun, 2010). Many smallholder catfish farmers face challenges related to high production costs, inadequate access to credit, and poor storage facilities, which limit their ability to compete effectively in the market. Farmers often sell their produce at farm gates, through wholesalers, or directly to consumers, depending on their level of market integration (Anugwa *et al.*, 2017).

Market intermediaries play a critical role in catfish distribution by linking producers to consumers. These include wholesalers, retailers, and middlemen, who facilitate bulk purchasing, processing, transportation, and storage. Middlemen are particularly dominant in Nigeria's catfish market, influencing price determination and market access (Lawal and Idega, 2004). While wholesalers ensure a steady supply of catfish to urban markets and processing industries, retailers sell in smaller quantities to final consumers. The dependence on middlemen often increases transaction costs and reduces farmers' bargaining power, leading to lower farm-gate prices (Omoregbee *et al.*, 2019).

Consumers are the end-users of catfish, and their preferences significantly shape the demand for different forms of catfish, including fresh, smoked, or processed fish. Consumption patterns are influenced by income levels, availability, processing methods, and price fluctuations (Akanni, 2010). Consumers in Nigeria often purchase catfish from open markets, supermarkets, hotels, or directly from farms. Market segmentation based on income groups affects catfish pricing, with higher-income consumers willing to pay premium prices for high-quality processed fish (Adeokun, 2000).

Government institutions and NGOs play an essential role in strengthening market linkages by providing infrastructure, policy support, extension services, and credit facilities. Policies on fishery management, market regulations, and trade liberalization significantly impact market access and competitiveness (FAO, 2004). However, studies indicate that many catfish farmers in Nigeria lack adequate access to extension services,

limiting their ability to adopt improved marketing strategies (Omoregbee *et al.*, 2019). Non-governmental organizations also contribute by promoting cooperative marketing, value addition, and financial inclusion to enhance smallholder farmers' market participation (Awuor *et al.*, 2019).

## **2.5 Theoretical framework**

### **2.5.1 Market structure and performance theory**

The market structure and performance theory examines how the structure of a market influences its efficiency, competitiveness, and overall performance. This theory suggests that market outcomes such as pricing, profitability, and consumer access to products depend on the level of competition, the number of buyers and sellers, and the degree of market regulation (Oladoja and Adeokun, 2010).

In the context of catfish marketing, the market structure is often oligopolistic, where a few dominant intermediaries control pricing and distribution, limiting farmers' direct access to consumers (Omoregbee *et al.*, 2019). Studies have shown that in many Nigerian fish markets, middlemen determine farm-gate prices, reducing farmers' profit margins (Anugwa *et al.*, 2017). Furthermore, price volatility and inefficiencies in transportation contribute to market failures, increasing transaction costs and reducing market performance (Awuor *et al.*, 2019).

To improve market performance, policies promoting direct farmer-to-consumer sales, cooperative marketing, and government intervention in pricing regulations can enhance market efficiency (Akanni, 2010). A more competitive market structure with multiple entry points would help eliminate excessive dependence on middlemen, ensuring fair pricing and profitability for catfish farmers.

### **2.5.2 Value chain theory**

The value chain theory describes the various stages and actors involved in the catfish marketing system, from production to consumption. This theory highlights the importance of efficient linkages between different market players, ensuring that value is added at each stage to maximize profitability and product quality (Omoregbee *et al.*, 2019).

The catfish value chain involves; Producers (Farmers): Engage in fish farming, harvesting, and preliminary processing. Intermediaries (Wholesalers, Retailers, Middlemen): Handle bulk purchases, processing, transportation, and storage. Final Consumers: Purchase catfish in various forms (fresh, smoked, processed) from local markets, supermarkets, or restaurants (Awuor *et al.*, 2019) and Support Institutions (Government, NGOs, and Financial Institutions): Provide infrastructure, credit, market information, and extension services to enhance the efficiency of the value chain (Anugwa *et al.*, 2017).

Inefficiencies in the catfish value chain often arise due to poor transportation networks, high post-harvest losses, lack of storage facilities, and price instability (Oladoja and Adeokun, 2010). Studies have shown that value addition through improved processing techniques such as smoking, drying, and freezing can increase market value and reduce post-harvest losses (Akanni, 2010).

To strengthen the catfish value chain, it is essential to:

- Improve access to storage and processing technologies.
- Strengthen cooperative marketing to reduce exploitation by middlemen.
- Enhance market information systems for better price negotiation (Omoregbee *et al.*, 2019).

A well-functioning value chain increases farmers' competitiveness, ensures stable pricing, and enhances profitability.

### **2.5.3 Transaction cost theory**

The transaction cost theory analyzes how intermediaries influence the efficiency of market linkages by increasing or reducing transaction costs. Transaction costs refer to expenses incurred in marketing, transportation, negotiations, contract enforcement, and information gathering (Awuor *et al.*, 2019).

In catfish marketing, intermediaries such as wholesalers and middlemen play a significant role in bridging the gap between farmers and consumers. However, their involvement often increases transaction costs due to multiple handling, storage, and transportation fees (Omoregbee *et al.*, 2019). Research shows that in many Nigerian markets, farmers receive lower prices for their products due to the high bargaining power of middlemen (Oladoja and Adeokun, 2010). Key transaction costs in the catfish marketing system include: Transportation Costs: High fuel prices, bad road networks, and lack of logistics support increase costs for farmers (Anugwa *et al.*, 2017). Information Costs: Farmers lack real-time market information, making them vulnerable to price manipulation by intermediaries (Omoregbee *et al.*, 2019). Storage and Processing Costs: Poor storage facilities lead to post-harvest losses, reducing market efficiency (Awuor *et al.*, 2019).

To reduce transaction costs and improve efficiency, the following strategies are recommended: Developing alternative market platforms (e-commerce, direct sales, cooperative networks) to bypass middlemen and reduce unnecessary costs. Improving infrastructure (roads, cold storage, and transport facilities) to minimize wastage and high transportation costs (Akanni, 2010). Enhancing market information systems through digital tools to improve farmers' price negotiation abilities (Omoregbee *et al.*, 2019). When transaction costs are minimized, farmers can achieve higher profits, consumers can access lower prices, and market efficiency is improved.

## **CHAPTER THREE**

### **3.0 METHODOLOGY**

#### **3.1 Study area and scope**

The study was conducted in Edo South agricultural zone, which is in Edo State, South-South Nigeria and is located within Latitude 5°44N and 6°87N and Longitude 5°00 E and 6°43E of the Equator. It has a total land area of 8,778.921km. The District has 57.54

percent of the total population of the State according to Edo State Employment and Expenditure for Result (SEEFOR), 2017. Edo South currently consists of seven (7) local government areas (LGAs) namely: Uhunmwode, Orhionmwon, Ikpoba-Okha, Oredo, Egor, Ovia North East and Ovia South West. The headquarters of these local government areas are; Ehor, Abudu, Idogbo, Benin City, Uselu, Okada and Iguobazuwa respectively. It shares a boundary with Ondo State in the West, and is bounded in the North East by Owan West, Esan West and Igueben Local Government Areas; and in the South by Delta State. The dominant occupations among residents include arable farming, fish farming, petty trading, artisan work and civil service, with a growing number of individuals engaged in fish farming due to increasing demand for affordable animal protein, driven by population growth and urbanization. Edo South agricultural zone lies within the humid tropical rainforest belt of Nigeria and is characterized by favourable climatic conditions that support aquaculture. The zone experiences a bimodal rainfall pattern, with annual rainfall ranging between 1,500 mm and 2,500 mm, peaking during April to July and September to November. Average annual temperatures range from 25°C to 30°C, while relative humidity remains high, often between 70% and 90%. These climatic conditions are highly suitable for catfish farming, as they promote rapid growth and survival of the species. The zone also enjoys two distinct seasons (rainy season from April to October and the dry season from November to March) which guide farmers in planning production cycles efficiently.

Geographically, the zone is characterized by a generally flat to gently undulating terrain with fertile alluvial and loamy soils, particularly in lowland areas. The presence of rivers and streams, such as the Ikpoba and Siluko rivers, provides abundant water resources for pond-based aquaculture and the ease of groundwater access through boreholes also enhances water availability for catfish farming. These advantages make Edo South agricultural zone a highly favourable location for the cultivation of catfish, contributing significantly to the livelihoods of local farmers and the food security of the region.

### **3.2 Sample size and sampling procedure**

A multi-stage sampling procedure was adopted in selecting the catfish farmers for the study as follows.

**First stage:** This involved a purposive selection of four (4) out of seven (7) LGAs in Edo South based on their significant level of involvement in catfish farming.

**Second stage:** A comprehensive list of all catfish farmers was obtained from each of the Agricultural Development Programme (ADP) offices of the selected LGA secretariats.

**Third stage:** This comprised a simple random sampling of 20 catfish farmers from each of the four (4) selected LGAs giving a total of 80 farmers for the study.

### **3.3 Data collection**

Data for study was sourced from primary and secondary sources. Primary data were collected using structured questionnaire to address the various objectives; the

questionnaire were administered to catfish farmers in the study area. While secondary data were collected were collected from published journal articles, books and ADP publications.

### **3.4 Measurement of variables**

#### **a. Socioeconomic characteristics**

**Sex:** Sex was measured as either male or female and was assigned nominal values. Male (1) and female (2)

**Age:** This was measured in years by asking farmers to state their actual age in years

**Marital status:** This was measured as either Married (1) Single (2) Divorced/Separated (3) Widowed (4)

**Educational level:** The educational level was assigned to nominal values; 1 was assigned to farmers with no formal education, 2 was assigned to farmers with primary school education, 3 was assigned to farmers with secondary school education, 4 was assigned to farmers with tertiary education.

**Household size:** Farmers were asked to fill in the number of persons living under one roof and feeding from same pot.

**Nature of catfish farming:** This was measured as Full-time (1) or Part-time (2)

Secondary occupation: Farmers were asked to indicate their secondary occupation, this was measured with the option of, Catfish farming (1) Other livestock farming (2) Crop farming (3) Civil service (4) Petty trading (5) and others (6)

Catfish experience: This was measured in years.

Purpose of catfish farming: Farmers were asked the purpose of farming using Commercial (1) Domestic (2) and Both (3)

Aspect of catfish farming: Farmers were asked their area of involvement and this was measured using Hatchery operator (1) Table fish producer (2) and Others (3)

Major kind of pond: Farmers were asked to indicate their major kind of pond used and this was measured using Concrete pond (1) Earthen pond (2) Plastic-tank pond (3)

Number of ponds: This was measured in numbers

Stocking rate per cycle: This was measured in numbers

Stocking cycle annually: This was measured in numbers

Type of feed used: Farmers were asked to indicate the type of feeds they used and this was measured using Local feed only (1) Imported feed only (2) Formulated feed only (3) Mixed feed (4)

Major source of water: This was measured by asking farmers to write their major source of water

Quantity sold per cycle: This was measured in numbers

Price per kilogram sold: This was measured in numbers

Annual income from catfish farming: This was measured in numbers

Membership of farmers' association/cooperative: Farmers were asked to indicate if they belonged to farmers' association or cooperatives and this was measured using Yes (1) or No (2)

Benefits derived from membership: Farmers were asked to indicate the benefits they derived and this was measured using Access to market (1) Better pricing (2) Collective bargaining (3) Access to credit (4) Training and capacity building (5) Others (6)

Contact with extension agents: Farmers were asked if they have been visited by extension personnel in the past one year, this was measured using, Yes (1) and No (2)

Frequency of visits: Farmers were asked how many times did an extension agent visit and how many times did they visit the extension agent and this was measured in numbers

**b. Existing markets utilized by catfish farmers.**

Existing markets utilized by catfish farmers was measured by asking the farmers to tick the options they used.

**c. Mechanisms for linking farmers to markets**

Mechanisms for linking farmers to markets was measured by asking the farmers to tick the options they used

**d. Linkage strengths for identified mechanisms**

Farmers were asked to indicate the strengths the market linkage mechanisms they engage in. This was measured using a five-point Likert scale of Very Strong (5) Strong (4) Neutral (3) Weak (2) Very weak (1)

**e. Sources of information on market linkages among catfish farmers.**

Farmers were asked to identify their sources of information by ticking the options they make use of.

**f. Preferred choice of market outlets**

Farmers were asked to indicate their preferred choice of market outlets and this was measured using a five-point Likert scale of Highly preferred (5) Preferred (4) Neutral (3) Somewhat not preferred (2) Not preferred (1)

**g. Reasons for farmers' preference for chosen market outlets.**

Farmers were asked to indicate their reasons for preference for chosen market outlets and this was measured using a five-point Likert scale of Strongly agree (5) Agree (4) Neutral (3) Disagree (2) Strongly disagree (1)

#### **h. Constraints to effective market linkage among catfish farmers.**

Farmers were asked to indicate the challenges they face in linking to market and this was measured using a five-point Likert scale of Very serious (5) Serious (4) Neutral (3) Somewhat not serious (2) Not Serious (1)

### **3.5 Analytical technique**

**Objective 1:** To describe the socioeconomic characteristics of catfish farmers in Edo South Agricultural Zone, Edo State, Nigeria this was achieved using descriptive statistical tool such as frequency counts, percentage and mean scores.

**Objective 2:** To identify existing markets utilized by catfish farmers, this was achieved using descriptive statistics tools such as frequency counts and percentage.

**Objective 3:** To identify mechanisms for linking farmers to markets. This was achieved using descriptive statistics such as frequency counts and percentage.

**Objective 4:** To ascertain the linkage strengths for identified mechanisms. This was achieved using frequency counts, percentage, mean scores and standard deviation.

**Objective 5:** To identify the sources of information on market linkages. This was achieved using descriptive statistics tools such as frequency counts and percentage.

**Objective 6:** To examine the preferred choice of market outlets. This was achieved using frequency counts, percentage, mean scores and standard deviation.

**Objective 7:** To establish the reasons for farmers' preference for chosen market outlets. This was achieved using frequency counts, percentage, mean scores and standard deviation.

**Objective 8:** To identify the constraints to effective market linkages. This was achieved using frequency counts, percentage, mean scores and standard deviation.

### 3.6 Test of hypothesis

Hypothesis 1 was tested using Pearson's Product Moment Correlation (PPMC)

Below is the mathematical expression of the model:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Where

$r$  = Pearson's correlation coefficient

$n$  = the number of paired scores

$\sum x$  = the sum of  $x$  scores

$\sum y$  = the sum of y scores

$\sum xy$  = the product of the two paired scores

$\sum x^2$  = the sum of squared x scores

$\sum y^2$  = the sum of squared y scores

## **CHAPTER FOUR**

### **RESULTS AND DISCUSSION**

This chapter presents the results of data analysis, interpretation and discussion of findings. The analysis, interpretation and discussion were done in line with the objectives and hypotheses of the study as outlined below:

## **4.1 Socio-economic characteristics**

### **4.1.1 Sex**

The result shown in Table 4.1 indicates that more than half (53.8%) the proportion of the catfish farmers were male, while the remaining 46.2% were female. This implies that more than half of the catfish farmers in the study were male. This disagrees with the findings of Okodede, Onyemekihian, and Konkwo (2024), who reported that fish farming is male-dominated with low representation of females due to the labour-intensive nature of fish farming.

### **4.1.2 Age**

As shown in Table 4.1, 38.8% of the catfish farmers were within the age range of 41-50 years, 28.8% were within the age range of 31-40 years, 17.5% were within the age range of 51-60 years while only 1.3% were above 60 years. This shows that the majority of catfish farmers are middle-aged. The result corresponds to the findings of Okodede *et al.* (2024), who reported that catfish farming is dominated by individuals in their 30s and 40s, as they are within the economically active age.

### **4.1.3 Marital Status**

Result as shown in Table 4.1 indicate that most (80%) of the catfish farmers were married, while 17.5% were single and 2.5% were divorced. This implies that married people dominate catfish farming as an indication of the productive potential of the catfish

business to support household livelihood. This finding is supported by Okodede *et al* (2024), who noted that married individuals tend to have more household responsibilities than the singles, thus pushing them to be more productive in their ventures in order to meet up with the demands of family life.

#### **4.1.4 Educational level**

The result in Table 4.1 indicates that more than half (57.5%) the proportion of catfish farmers had attained tertiary level of education, 31.3% had secondary education, and 11.2% had primary education. Since more than half of the farmers had tertiary education, this implies a high level of literacy among catfish farmers in the study area. This corresponds to the findings that education positively influences farmers' ability to adopt modern fish farming techniques, improving productivity (Adeogun *et al.*, 2021).

#### **4.1.5. Household Size**

The result as shown in Table 4.1 indicates that less than half (46.3%) the proportion of catfish farmers had household sizes within the range of 5-6 persons, while 35% had household sizes ranging from 3-4 persons, 12.5% had household sizes of 1-2 persons and 6.3% had a household size of 7 and above. The mean household size was 4.39. This result implies that more than half of the catfish farmers have higher household sizes of 5

persons and above. Catfish production requires a great deal of human efforts from stocking, routine management to harvesting will certainly benefit higher household sizes. This result corresponds with that of Chinda and Okwu (2018) who observed that larger household sizes contribute to labour availability, reducing the need for hired workers.

**Table 4.1: Socioeconomic characteristics of catfish farmers**

<b>Variables</b>	<b>Description</b>	<b>Freq.</b>	<b>Perc.</b>	<b>Mean</b>
Sex	Male	43	53.8	
	Female	37	46.2	
Age	30	11	13.8	
	31 – 40	23	28.8	
	41 – 50	31	38.8	
	51 – 60	14	17.5	
	61+	1	1.2	42
Marital status	Single	14	17.5	
	Married	64	80	

	Divorced	2	2.5	
	Primary	9	11.2	
Educational level	Secondary	25	31.3	
	Tertiary	46	57.5	
	≤ 2	10	12.5	
Household size	3 – 4	28	35	
	5--6	37	46.3	4
	7+	5	6.3	
Nature of catfish farming	Full-time	27	33.7	
	Part-time	53	66.3	
	Catfish farming	27	33.7	
	Livestock farming	4	5	
Secondary occupation	Crop farming	8	10	
	Civil service	12	15	
	Petty trading	29	36.3	
	≤ 5	32	40	
Farming experience	1--10	40	50	
	11+	8	10	7
	Commercial purpose	19	23.8	
Purpose of farming	Both	61	76.2	
	Hatchery	0	0	
Aspect of catfish farming	Table fish	80	100	
	Concrete	14	17.5	
Major pond type	Earthen	2	2.5	
	Plastic tank	64	80	
	≤ 5	65	81.3	
Number of fish ponds	10-Jun	13	16.2	
	15-Nov	2	2.5	4
	≤ 2000	46	57.5	
Stocking rate per cycle	2001 - 5000	33	41.3	
	5001 - 8000	1	1.2	2294
	2--4	75	93.8	
Annual stock cycle	4--6	5	6.2	3
	Local feed	2	2.5	
Type of feed used	Imported feed	36	45	
	Mixed feed	42	52.5	
	Bore hole	79	98.8	
Major source of water	River	1	1.2	
	≤ 1000	70	87.5	
Quantity sold per cycle	1001 - 1500	7	8.8	

	1501 - 2000	3	3.7	739
	≤ 2000	1	1.2	
Price per kilogram sold	2001 - 3000	55	68.8	
	3001 - 4000	22	27.5	
	4001+	2	2.5	3000
	≤1000000	35	43.8	
Annual income from catfish farming	1000001 - 2000000	36	45	
	2000001 - 3000000	8	10	
	3000001+	1	1.2	1356563
Membership of association/cooperative	Yes	53	66.3	
	No	27	33.8	
Contact with extension workers	Yes	44	55	
	No	36	45	
Frequency of extension visit	≤ 0	37	46.3	
	1--2	27	33.7	
	3--4	16	20	1

**Source: Field survey, 2025**

#### **4.1.6. Nature of catfish farming**

As shown in Table 4.1, more than half (66.2%) the proportion of farmers engaged in catfish farming part-time, while 33.8% were full-time farmers. This means that more than half of the farmers practice fish farming as a secondary occupation. The result corresponds to findings by Egwenomhe *et al.* (2020) which highlighted that many

farmers in Edo South combine fish farming with other livelihood activities due to market uncertainties.

#### **4.1.7. Secondary occupation**

The result presented in Table 4.1 indicates among part-time farmers, 36.2% engaged in petty trading, 33.8% focused solely on catfish farming, while 15% worked in civil service, 10% were into crop farming and 5% engaged in livestock farming. This implies that more than half the proportion of farmers combine fish farming with other sources of income. Imade and Ahmadu (2022) highlighted that farmers often diversify their income streams to reduce financial risks associated with fluctuating fish prices.

#### **4.1.8. Farming experience**

Result in Table 4.1 shows that half (50%) the proportion of catfish farmers has been farming for 6-10 years, while 40% had 5 years or less of experience and 10% had more than 11 years of experience. The mean years of farming experience of the farmers was 6.94 years, this implies that more than half of the farmers had good experience in catfish farming. It is expected that experienced farmers will be more productive, have more market linkage mechanisms thus make more profits. According to Adeogun *et al.* (2021), experience plays a crucial role in farm profitability, as experienced farmers make better decisions on stocking rates and feeding practices.

#### **4.1.9 Purpose of catfish farming**

As shown in Table 4.1, 76.2% of catfish farmers farmed for both commercial and domestic purposes, while only 23.8% focused solely on commercial production. This implies that the majority of the farmers produce for both income generation and household consumption. This result corresponds with the findings of Egwenomhe *et al.* (2020) which highlighted that fish farmers in Edo South often consume part of their production to supplement family nutrition.

#### **4.1.10 Aspect of catfish farming**

Table 4.1 shows all (100%) farmers were engaged in table fish production, with no hatchery operators. This implies the farmers focused on growing fish to market size. This corroborates the findings made by Imade and Ahmadu (2022), who reported that Edo State has a low number of hatchery operators.

#### **4.1.11 Type of fish pond**

The result in Table 4.1 show that 80% of catfish farmers used plastic tanks, while 17.5% used concrete ponds and 2.5% used earthen ponds. This means that most of the farmers prefer plastic tanks due to routine management. This finding aligns with Egwenomhe *et al.* (2020) who reported that fish farmers in Edo South use plastic tanks due to space constraints and ease of management. Imade and Ahmadu (2022) also noted that plastic tanks require less water and are easier to maintain than concrete or earthen ponds.

#### **4.1.12 Number of fish pond**

As shown in Table 4.1, most (81.3%) of the farmers owned 5 or fewer ponds, while 18.7% had more than five fish ponds. The mean of number of fish ponds owned is 4.08. This result implies that most of the farmers operate on a small scale due to financial and other constraints. Egwenomhe *et al.* (2020) noted that land constraints and high construction costs limit pond expansion in Edo South.

#### **4.1.13 Stocking rate per cycle**

The result in Table 4.1 indicates that more than half (57.5%) the proportion of catfish farmers stocked 2,000 or less per cycle, while 41.3% stocked between 2,001-5,000 and 1.2% stocked within the range of 5,001-8000 per cycle. The mean value for stocking rate per cycle is 2,293.75. This implies that more than half of the farmers operate with a moderate stocking density. Imade and Ahmadu (2022) noted that financial constraints often limit stocking capacity among smallholder fish farmers in Edo State.

#### **4.1.14 Annual stock cycle**

As shown in Table 4.1, most (93.8%) of the catfish farmers stocked their ponds 2-3 times per year, while 6.3% stocked 4-6 times per year. The mean value for annual stock cycle is 2.59, this result shows that most catfish farmers in the study area follow a 2-3 cycle system, balancing production costs with market demand. A 2-3 cycle system is common

among small and medium-scale farmers due to feed costs, financial constraints, and market fluctuations (Egwenomhe *et al.*, 2020). Farmers stocking 4-6 times per year require higher investment and efficient water management (Imade and Ahmadu, 2022), but frequent stocking can increase production costs (Adeogun *et al.*, 2021).

#### **4.1.15 Type of feed used**

The result as shown in Table 4.1 indicates more than half (52.5%) the proportion of catfish farmers used a mix of local, foreign and formulated feed, while 45% relied only on imported feed and 2.5% used only local feed. This shows that more than half of the farmers combine both feed types with the aim of reducing costs while maintaining quality. This corresponds with the findings of Imade and Ahmadu (2022) who reported that farmers in Edo State prefer imported feed for its superior nutritional quality but mix it with local alternatives to reduce costs.

#### **4.1.16 Major source of water**

The result shown in Table 4.1 indicates that most (98.8%) catfish farmers used boreholes while only 1.2% depended on river water. This implies that most farmers rely on boreholes for a consistent and controlled water supply. Egwenomhe *et al.* (2020) reported that borehole water is the preferred choice among catfish farmers in Edo South due to its availability and quality control.

#### **4.1.17 Quantity sold per cycle**

As shown in Table 4.1, most (87.5%) of the catfish farmers sold 1,000 or fewer quantities per cycle, while 8.8% sold between 1,001-1,500 and 3.7% sold within the range of 1,501-2,001. The mean value for quantity sold per cycle is 738.71, this result implies that most of the farmers operate on a small-scale commercial level. This findings aligned with Adeogun *et al.* (2021), who reported that smallholder farmers struggle with economies of scale, making it difficult for them to compete with larger producers. Small production volumes often lead to higher unit costs, reducing overall profitability and limiting expansion opportunities.

#### **4.1.18 Price per kilogram sold**

Result in Table 4.1 shows that majority (68.8%) of catfish farmers sold their fish for ₦2,001–₦3,000 per kg, while 27.5% sold for ₦3,001–₦4,000 per kg, 2.5% sold for ₦4,001 and above per kg and 1.2% sold for ₦2,000 or less per kg. The mean of price sold per kg is ₦3,000. This result shows the fluctuations of catfish prices and that the majority of farmers operate within the mid-price range. This corroborates with the findings of Egwenomhe *et al.* (2020) which reported that catfish prices fluctuate based on feed costs, market demand, and competition from imported fish.

#### **4.1.19 Annual income from catfish farming**

As shown in Table 4.1, 45% of catfish farmers earned ₦1,000,001–₦2,000,000 annually, while 43.8% earned less than ₦1,000,000 annually. 10% earned between ₦2,000,001–₦3,000,000 annually and only 1.2% earned above ₦3,000,001. The mean value for annual income is ₦1,356,562.50. This result shows that more than half of the farmers earn ₦1,000,001 or less annually. This aligns with findings from Olagunju (2019), who reported that small and medium-scale catfish farms in Nigeria often struggle with profitability. Also Imade and Ahmadu (2022) reported that limited market access, high feed costs, and small production scales affect profitability in Edo State.

#### **4.1.20 Membership of association/cooperative**

The result in Table 4.1 shows that more than half (66.3%) the proportion of catfish farmers were members of associations or cooperatives, while 33.7% were not. This implies more than half of the farmers belonged to a cooperative. Cooperative membership provides access to financial resources, group bargaining power, and improved market opportunities. Adeogun *et al.* (2021) disclosed that cooperative membership among fish farmers enhances knowledge-sharing, credit accessibility, and overall business sustainability. Egwenomhe *et al.* (2020) also noted that membership in associations in Edo South improves fish farmers' market integration and bargaining power. Also Imade and Ahmadu (2022) highlighted that training programs enhance farm profitability and efficiency. However, Egwenomhe *et al.* (2020) noted that access to

training opportunities in Edo South remains uneven, with many farmers relying on informal knowledge.

#### **4.1.21 Contact with extension agents**

The result as shown in Table 4.1 revealed that more than half (55%) the proportion of catfish farmers had contact with extension agents, while 45% did not. This means more than half of the farmers received technical guidance. Extension services help farmers adopt improved practices in pond management, feeding, and disease control. This corroborates with the findings by Imade and Ahmadu (2022) who indicated that extension visits positively influence fish farming efficiency. However, Egwenomhe *et al.* (2020) noted that many farmers in Edo South still lack access to regular extension services, limiting their ability to adopt new technologies.

#### **4.1.22 Frequency of extension visits**

The result in Table 4.1 revealed that 46.3% of catfish farmers had no extension visits, 33.7% had 1-2 visits and 20% had 3-4 visits per year. This means less than half of the farmers receive regular extension visits. Limited extension contact can slow down the adoption of modern farming techniques. Adeogun *et al.* (2021) found that fish farmers with frequent extension visits were more likely to adopt improved feeding and pond management techniques, leading to better production outcomes.

## **4.2 Existing markets utilized by catfish farmers**

The result in Table 4.2 revealed that most (96.2%) of the catfish farmers utilized local markets for selling their catfish, while a majority (71.2%) engaged in farm gate sales. Less than half (46.3%) the proportion of farmers utilized urban markets. However, restaurants and food service industry, fish processing factories, online platforms, supermarkets and retail chains, trade fairs and export markets were utilized by 22.5%, 11.3%, 10%, 8.8%, 1.3% and 0% respectively indicating minimal engagement with these outlets.

This finding corresponds to the work of Busari *et al.* (2021) who observed that catfish farmers preferred local markets due to proximity and lower transportation costs, while urban markets were utilized to a lesser extent due to logistical challenges. The high utilization of local markets and farm gate shows that proximity and reduced transportation costs are critical considerations for catfish farmers who highlighted that who noted that 41.6% of catfish farmers in Kwara State sold their products at local markets (Adedigba *et al.*, 2024). The minimal utilization of export markets and modern retail chains indicates potential barriers such as lack of access to larger markets, inadequate infrastructure, or limited knowledge about these channels (Olagunju and Babatunde, 2023).

**Table 4.2: Existing markets utilized by catfish farmers**

Existing markets	Utilized		Not utilized	
	Freq.	Perc.	Freq.	Perc.
Local markets	77	96.2	3	3.8
Urban markets	37	46.3	43	53.7
Farm gate	57	71.2	23	28.8
Export markets	0	0.0	80	100.0
Supermarkets and retail chains	7	8.8	73	91.2
Restaurants and food service industry	18	22.5	62	77.5
Fish processing factories	9	11.3	71	88.7
Trade fairs	1	1.3	79	98.7
Online platforms	8	10.0	72	90.0

**Source: Field survey, 2025**

### **4.3 Mechanisms for linking farmers to markets**

The result as shown in Table 4.3 revealed that most (98.7%) farmers established market linkages through direct contact with buyers. More than half (55%) the proportion of farmers engaged with extension workers, while cooperatives are utilized by 45% of the farmers. Linkages through leading farmers are employed by less than half (42.5%) the proportion of catfish farmers, social media (28.8%), middlemen (21.3%), market associations (20%), hired transport (12.5%), contract farming (7.5%), using dispatch riders (2.5%), private transport (1.3%) and private sector companies (1.3%) are minimally utilized. Notably, e-commerce platforms (0%) and digital market information systems (0%) were not utilized by the farmers.

The majority (98.7%) of farmers make use of direct contact with buyers, this aligns with findings from Adedigba *et al.* (2024), who reported that catfish farmers often prefer direct sales to consumers to maximize profits and maintain control over pricing. The engagement with extension workers and cooperatives shows an awareness of the benefits of institutional support in accessing markets. This corresponds with the work of Enimu *et al.* (2023) who observed that a significant number of catfish farmers sourced their capital from cooperative societies, indicating the crucial role these organizations play in providing financial support and facilitating market linkages. But this is in contrast to the findings of Food and Agriculture Organization (2021) which emphasized the need for improved extension services and cooperative structures to enhance market access for catfish farmers. However, the minimal use of digital platforms indicates a gap in the

adoption of modern technologies for market linkages as observed by Uwana *et al.* (2023). The absence of e-commerce utilization among farmers shows barriers such as limited digital literacy, inadequate infrastructure, or lack of awareness about the benefits of these platforms. This corresponds with the findings of Food and Agriculture Organization (2023) which highlighted that the need for integration of digital tools in aquaculture to enhance market access.

**Table 4.3 Mechanisms for linking farmers to markets**

<b>Market linkage mechanisms</b>	<b>Used</b>		<b>Not used</b>	
	<b>Freq.</b>	<b>Perc.</b>	<b>Freq.</b>	<b>Perc.</b>
Direct contact	79	98.7	1	1.3
Extension workers	44	55.0	36	45.0
Linkage through leading farmer	34	42.5	46	57.5
Cooperatives	36	45.0	44	55.0
Market associations	16	20.0	64	80.0
Private sector companies	1	1.3	79	98.7
Contract farming	6	7.5	74	92.5
Through middlemen	17	21.3	63	78.7
Using dispatch riders	2	2.5	78	97.5
E-commerce platforms	0	0.0	80	100.0
Social media	23	28.8	57	71.2
Digital market information systems	0	0.0	80	100.0
Hired transport	10	12.5	70	87.5
Private transport	1	1.3	79	98.7

**Source: Field survey, 2025**

#### **4.4 Linkage strengths for identified mechanisms.**

The result in Table 4.4 shows that better prices (mean = 4.23) was a major linkage strength, reduced transportation costs (mean = 4.13), increased sales volume (mean = 4.08), quick sales (mean = 3.95), improved market information (mean = 3.86), increased profits (mean = 3.81), enhanced productivity (mean = 3.54) and wider market reach (mean = 3.46). This results aligns with the findings of Onuwa *et al.* (2023), who observed that catfish farmers with strong market linkages recorded higher net farm incomes due to better price negotiation and cost efficiencies. Reduced transportation costs are particularly relevant in rural areas where poor infrastructure limits market access, reinforcing the need for improved linkages (Egwenomhe *et al.*, 2022). This disagrees with the findings of Akinbile *et al.* (2020) that market linkages lead to better prices, stating that better pricing depends on the competitiveness of the market and the influence of middlemen.

The result corresponds with findings by Olanrewaju *et al.* (2022) who highlighted that improved market information have helped farmers achieve quick sales. However, the fact that improved market information was not ranked higher suggests that many farmers still struggle to access real-time information. Ogunbameru *et al.* (2022) found that poor infrastructure and lack of digital knowledge prevent farmers from using modern marketing tools, which aligns with findings by Adebayo and Ajani (2021) that many Nigerian catfish farmers still rely on informal sources to get market updates. Enhanced

productivity (mean = 3.54) and wider market reach (mean = 3.46) implies that market access does not always lead to higher production unless farmers also receive training and better inputs (FAO, 2021). The lowest ranking of government support (mean = 3.16) implies that farmers do not see much benefit from public programs. This corroborates with the findings of Egwenomhe *et al.* (2022), who found that many government initiatives to support fish farmers are not well implemented, this shows that while government policies exist, they are not very effective in helping catfish farmers. Akinyemi and Salisu (2023) also reported that farmers often prefer private organizations and cooperatives over government programs because they are more reliable.

**Table 4.4: Linkage strengths for identified mechanisms**

Linkage strengths	Very weak		Weak		Neutral		Strong		Very strong		Mean	Rank
	F	%	F	%	F	%	F	%	F	%		
Better prices	0	0.0	0	0.0	5	6.3	52	65.0	23	28.7	4.23*	1 <sup>st</sup>
Reduced transportation costs	0	0.0	1	1.3	8	10.0	51	63.7	20	25.0	4.13*	2 <sup>nd</sup>
Increased sales	0	0.0	1	1.3	7	8.8	57	71.2	15	18.7	4.08*	3 <sup>rd</sup>
Quick sales	0	0.0	2	2.5	15	18.8	48	60.0	15	18.7	3.95*	4 <sup>th</sup>
Improved market information	0	0.0	3	3.8	10	12.5	62	77.5	5	6.1	3.86*	5 <sup>th</sup>
Increased profits	1	1.3	3	3.8	15	18.7	52	65.0	9	11.2	3.81*	6 <sup>th</sup>
Enhanced productivity	0	0.0	9	11.3	21	26.2	48	60.0	2	2.5	3.54*	7 <sup>th</sup>
Wider market reach	2	2.5	16	20.0	15	18.8	37	46.2	10	12.5	3.46*	8 <sup>th</sup>
Government support	10	12.5	15	18.7	16	20.0	30	37.5	9	11.3	3.16*	9 <sup>th</sup>

**Source: Field survey, 2025**

#### **4.5 Sources of information on market linkage**

Result in Table 4.5 reveals that most (86.2%) catfish farmers relied on fellow farmers as their main source of market linkage information. A majority (72.5%) sourced information from social media, while more than half (52.5%) of the proportion obtained information from cooperatives, 51.2% engaged with agricultural extension services. Less than half (47.5%) the proportion of catfish farmers obtained information from online platforms, neighbours (41.3%), group meetings/discussions (38.8%), demonstrations (27.5%), market research reports (5%) and non-governmental organizations (5%).

The reliance on fellow farmers aligns with findings by Oke *et al.* (2021), who reported that 95% of catfish farmers in Ogun State sourced their marketing information from fellow catfish marketers and farmers. Similarly, Adedigba *et al.* (2024) noted that peer interactions serve as a crucial source of information on market linkages among catfish farmers in Kwara State, Nigeria. The significant use of social media platforms indicates a shift towards digital information sources, reflecting broader trends in agricultural communities as highlighted by the Food and Agriculture Organization (2023) which noted the use of digital platforms with traditional information sources to improve market access for aquaculture producers. The lower engagement with agricultural extension services shows underutilization of such support system designed to disseminate information enhancing market linkages (Omoregbee *et al.* 2019)

**Table 4.5: Sources of information on market linkages**

<b>Sources of Information</b>	<b>Used</b>		<b>Not used</b>	
	<b>Freq.</b>	<b>Perc.</b>	<b>Freq.</b>	<b>Perc.</b>
Agricultural extension services	41	51.2	39	48.8
Social media	58	72.5	22	27.5
Online platforms	38	47.5	42	52.5
Fellow farmers	69	86.2	11	13.8
Cooperatives	42	52.5	38	47.5
Market research reports	4	5.0	76	95.0
Neighbours	33	41.3	47	58.7
Demonstrations	22	27.5	58	72.5
Non-Governmental organisations	4	5.0	76	95.0
Group meetings/discussions	31	38.8	49	61.2

**Source: Field survey, 2025**

#### 4.6 Preferred choice of market outlets

Result as shown in Table 4.6 indicates local markets was the majority (mean = 4.19) ranked 1<sup>st</sup>, farm gate (mean = 4.03) ranked 2<sup>nd</sup>, urban markets (mean = 3.81) ranked 3<sup>rd</sup>, restaurants and food service industry (mean = 3.38) ranked 4<sup>th</sup>, online platforms (mean = 3.21) ranked 5<sup>th</sup>, supermarkets and retail chains (mean = 3.20) ranked 6<sup>th</sup>, fish processing factories (mean = 3.19) ranked 7<sup>th</sup>, export markets (mean = 2.89) ranked 8<sup>th</sup> and trade fairs (mean = 2.76) ranked 9<sup>th</sup>. This implies local markets provide a readily available customer base and allow for direct negotiation with buyers, which can lead to better pricing and reduced reliance on intermediaries. Similarly, farm gate sales offer convenience by minimizing transportation costs and ensuring quick sales. This corroborates the findings of Adedigba *et al.* (2024) who reported that over 80% of catfish farmers in Kwara State relied on local markets due to their ability to sell directly to consumers without additional logistics costs. Likewise, Liverpool-Tasie *et al.* (2024) noted that smallholder fish farmers in Nigeria often prefer selling directly to consumers at the farm gate to avoid post-harvest losses and maintain profit margins.

Urban markets (mean = 3.81) indicates that while farmers recognize the potential of larger urban customer bases, challenges such as transportation costs and competition limit their full engagement. This corresponds with the findings of Adeniran *et al.* (2023) who reported that market competition from larger commercial fish farmers and imported fish products further discourages their participation in urban markets. The relatively lower

preference for online platforms (mean = 3.21) shows that while digital marketing is growing in popularity, adoption remains limited. The FAO (2023) highlighted that Nigerian fish farmers face barriers such as digital illiteracy, unreliable internet connectivity, and trust issues with online transactions. Similarly, Uwana *et al.* (2023) found out that catfish farmers showed minimal engagement with e-commerce platforms due to a lack of awareness and logistical challenges in delivering fresh fish to customers. Export markets (mean = 2.89) indicates challenges due to infrastructural and regulatory barriers. Most Nigerian catfish farmers avoid export markets because of the high cost of meeting international standards, inadequate processing facilities and complex export documentation. FAO (2023) reported that a lack of institutional support and financing limits smallholder fish farmers' participation in global markets.

The preference for local and farm gate markets implies that improving infrastructure, such as feeder roads and transportation networks, could further enhance market access. Additionally, initiatives that support online marketing—such as digital literacy training and the development of e-commerce logistics—could encourage greater participation in digital platforms (Adesina and Balogun, 2022). To facilitate export market engagement, policymakers should provide financial incentives and technical support to help farmers meet international standards (Adeniran *et al.*, 2023).

Table 4.6: Preferred choice of market outlets

Market outlets	Not preferred		Somewhat preferred		Neutral		Preferred		Highly preferred		Mean	Rank
	F	%	F	%	F	%	F	%	F	%		
Local markets	0	0.0	0	0.0	6	7.5	53	66.2	21	26.3	4.19	1 <sup>st</sup>
Farm gate	1	1.3	2	2.5	8	10.0	52	65.0	17	21.2	4.03	2 <sup>nd</sup>
Urban markets	0	0.0	6	7.5	28	35.0	21	26.3	25	31.2	3.81	3 <sup>rd</sup>
Restaurants and food service industry	2	2.5	9	11.3	40	50.0	15	18.7	14	17.5	3.38	4 <sup>th</sup>
Online platforms	3	3.8	14	17.5	32	40.0	25	31.2	6	7.5	3.21	5 <sup>th</sup>
Supermarkets and retail chains	3	3.8	8	10.0	42	52.4	24	30.0	3	3.8	3.20	6 <sup>th</sup>
Fish processing factories	1	1.3	11	13.8	42	52.4	24	30.0	2	2.5	3.19	7 <sup>th</sup>
Export markets	4	5.0	16	19.9	50	62.5	5	6.3	5	6.3	2.89	8 <sup>th</sup>
Trade fairs	4	5.0	21	26.2	47	58.8	6	7.5	2	2.5	2.76	9 <sup>th</sup>

Source: Field survey, 2025

#### **4.7 Reasons for farmers' preferences for chosen market outlets.**

Result in Table 4.7 shows reasons for catfish farmers' preferred choice of market outlets is distance to market (mean = 4.33) ranked 1st, price offered (mean = 4.05) ranked 2<sup>nd</sup>, transportation costs (mean = 4.03) ranked 3<sup>rd</sup>, market information availability (mean = 4.00) ranked 4th, reliability of buyers (mean = 3.94) ranked 5th, volume of sales (mean = 3.93) ranked 6th and payment terms (mean = 3.85) ranked 7th. Mean values (< 3) indicates strong reasons. This implies that farmers prioritize distance, price, transportation costs, market information availability and sales security when choosing their market outlets. This corroborates the findings of Adedigba *et al.* (2024) and Kataike *et al.* (2024), who reported that farmers prefer nearby markets to reduce transportation costs and post-harvest losses. Olagunju and Babatunde (2023) noted that farmers select outlets that offer competitive pricing to maximize profitability. The role of transportation costs agrees with Adeogun *et al.* (2021) who observed that poor infrastructure and high fuel costs significantly limit farmers' market choices. Market information availability corresponds with FAO (2023), which observed that farmers with better access to price trends and demand fluctuations make more informed marketing decisions. The significance of buyer reliability corroborates the work of Malit *et al.* (2021) who reported that stable buyer relationships reduce financial risks and ensure consistent sales. The preference for higher sales volumes agrees with Kataike *et al.* (2024), who reported that bulk buyers provide faster turnover and lower storage costs. The role of payment terms

aligns with Olufadewa *et al.* (2018), who observed that delayed payments discourage farmers from engaging with certain market outlets.

**Table 4.7: Reasons for farmers' preference for chosen markets**

Reasons	Strongly disagree		Disagree		Neutral		Agree		Strongly agree		Mean Rank	
	F	%	F	%	F	%	F	%	F	%		
Distance to market	0	0.0	0	0.0	1	1.3	52	65.0	27	33.8	4.33	1 <sup>st</sup>
Price offered	0	0.0	1	1.3	9	11.3	55	68.8	15	18.8	4.05	2 <sup>nd</sup>
Transportation costs	0	0.0	0	0.0	13	16.3	52	65.0	15	18.8	4.03	3 <sup>rd</sup>
Market information availability	0	0.0	0	0.0	8	10.0	64	80.0	8	10.0	4.00	4 <sup>th</sup>
Reliability of buyers	0	0.0	2	2.5	7	8.8	65	81.3	6	7.5	3.94	5 <sup>th</sup>
Volume of sales	0	0.0	2	2.5	12	15.0	56	70.0	10	12.5	3.93	6 <sup>th</sup>
Payment terms	2	2.5	3	3.8	12	15.0	51	63.8	12	15.0	3.85	7 <sup>th</sup>

**Source: Field survey, 2025**

#### 4.8 Constraints to effective market linkage

Result in Table 4.8 shows that high transportation costs (mean = 4.39) was a major constraint faced by catfish farmers in market linkage. Poor road infrastructure (mean = 4.18), limited access to finance (mean = 4.14), price fluctuations (mean = 4.14), unavailability of storage facilities (mean = 4.04), inadequate market information (mean = 3.85), unreliable buyers (mean = 3.85), competition from imports (mean = 3.80), seasonal demand (mean = 3.78), inadequate policy support (mean = 3.76), poor extension services (mean = 3.74), limited consumer awareness (mean = 3.65) and intermediaries' dominance (mean = 3.56) with mean values ( $< 3$ ) indicates serious constraints encountered by catfish farmers.

The challenge of transportation costs corroborates the findings of Adeoye *et al.* (2021) and Afolabi *et al.* (2022) who found out that high fuel prices and poor road networks increase farmers' expenses and post-harvest losses. Similarly this corresponds with the work of Onuche *et al.* (2020) that poor transportation networks contribute to post-harvest losses and inefficiencies in the fish value chain, further hindering the profitability of smallholder farmers. Farmers struggle to obtain credit for farm expansion, purchasing quality feed, or investing in cold storage facilities. Financial constraints were also reported in a study on catfish farming in Kwara State, where 71.8% of farmers faced capital inadequacy, preventing them from scaling their businesses and competing in broader markets Adedigba *et al.* (2024). The unavailability of storage facilities

corresponds with the findings of Iniodu *et al.* (2017) who identified inadequate storage as a major challenge in the Niger Delta, where 60.8% of farmers faced difficulties due to uncoordinated market demand and supply. This finding agrees with the work of Okeke and Nwoye (2019) who highlighted the dominance of intermediaries' limits farmers' direct market access and weakens their bargaining power. This finding is further corroborated by Onuche *et al.* (2020) who reported that weak government policies and limited financial incentives leave many smallholder farmers without the support needed to compete in commercial fish markets.

**Table 4.8 Constraints to effective market linkage**

Constraints	Not serious		Somewhat not serious		Neutral		Serious		Very serious		Mean Rank	
	F	%	F	%	F	%	F	%	F	%		
High transportation costs	0	0.0	0	0.0	2	2.5	45	56.3	33	41.3	4.39	1 <sup>st</sup>
Poor road infrastructure	0	0.0	1	1.3	2	2.5	59	73.8	18	22.5	4.18	2 <sup>nd</sup>
Limited access to finance	0	0.0	0	0.0	4	5.0	61	76.3	15	18.8	4.14	3 <sup>rd</sup>
Price fluctuations	0	0.0	0	0.0	8	10.0	53	66.3	19	23.8	4.14	4 <sup>th</sup>
Unavailability of storage facilities	0	0.0	0	0.0	16	20.0	45	56.3	19	23.8	4.04	5 <sup>th</sup>
Inadequate market information	2	2.5	5	6.3	9	11.3	51	63.8	13	16.3	3.85	6 <sup>th</sup>
Unavailability of reliable buyers	0	0.0	9	11.3	7	8.8	51	63.8	13	16.3	3.85	7 <sup>th</sup>
Competition from imports	2	2.5	8	10.0	12	15.0	40	50.0	18	22.5	3.80	8 <sup>th</sup>
Seasonal demand	0	0.0	5	6.3	22	27.5	39	48.8	14	17.5	3.78	9 <sup>th</sup>
Inadequate policy support	1	1.3	8	10.0	9	11.3	53	66.3	9	11.3	3.76	10 <sup>th</sup>
Poor extension services	1	1.3	9	11.3	14	17.5	42	52.5	14	17.5	3.74	11 <sup>th</sup>
Limited consumer awareness	5	6.3	4	5.0	16	20.0	44	55.0	11	13.8	3.65	12 <sup>th</sup>
Intermediaries' dominance	2	2.5	9	11.3	18	22.5	44	55.0	7	8.8	3.56	13 <sup>th</sup>

**Source: Field survey, 2025**

## **4.9 Test of hypothesis**

### **4.9.1 Relationship between socioeconomic characteristics and market linkage mechanisms**

Result in Table 4.9 shows the relationship between socioeconomic characteristics and market linkage mechanisms among catfish farmers. There was a negative significant correlation ( $r = -0.221$ ,  $p = 0.049$ ) with age and market linkage mechanisms, this implies that older farmers face challenges in adapting to modern market practices. The result shows there was a negative significant correlation ( $r = -0.397$ ,  $p = 0.000$ ) with farming experience with market linkage mechanisms. This implies that experience may lead to over-reliance on traditional market systems, reducing farmers' willingness to explore modern and more efficient market structures.

Result shows a positive significant ( $r = 0.235$ ,  $p = 0.036$ ) with number of ponds and market linkage mechanisms. This means that farmers with more ponds have better market access and stronger connections with buyers. Result also showed a positive significant ( $r = 0.361$ ,  $p = 0.001$ ) with stocking rate per cycle and market linkage mechanisms. This implies that farmers who stock their ponds at higher rates per cycle tend to have stronger market linkages. There was a positive significant ( $r = 0.778$ ,  $p = 0.000$ ) with quantity sold per cycle and market linkage mechanisms. This implies that farmers who sell larger quantities have significantly stronger market linkages.

Result also shows a negative but significant correlation ( $r = -0.578$ ,  $p = 0.000$ ) with the frequency of extension visits and market linkage mechanisms. This implies that while visits are frequent, they are not effective or focused on improving market linkages. There was a positive correlation ( $r = 0.596$ ,  $p = 0.000$ ) with extension contact and market linkage mechanisms. This implies that quality and effectiveness of interactions with extension agents are crucial for market linkages as extension services provide farmers with valuable information on market trends and pricing, thereby enhancing their market access. This result is line with findings of Adedigba *et al.* (2024) who reported that number of ponds and extension contact significantly influence market linkage mechanisms.

**Table 4.9: Relationship between socioeconomic characteristics and market linkage mechanisms**

<b>Socioeconomic Characteristic</b>	<b>Correlation (r)</b>	<b>Probability Level (p)</b>
Age	-0.221*	0.049
Educational level	-0.166	0.141
Household size	0.068	0.547
Farming experience	-0.397**	0.000
Number of ponds	0.235*	0.036
Stocking rate per cycle	0.361**	0.001
Quantity sold per cycle	0.778**	0.000
Price per kilogram sold	-0.038	0.736
Annual income from catfish	-0.213	0.058
Annual stock cycle	-0.162	0.151
Frequency of extension visits	-0.578**	0.000
Extension contact	0.596**	0.000

\*Correlation is significant at the 0.05 level (2-tailed).

\*\* Correlation is significant at the 0.01 level (2-tailed).

## CHAPTER FIVE

### 5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### 5.1 Summary

This study assessed market linkage mechanisms among catfish farmers in Edo South Agricultural Zone, Edo State, Nigeria. Data were collected from catfish farmers across four selected local government areas using structured questionnaire, and primary data were collected using well structured questionnaire administered to 80 catfish farmers selected through a three-stage sampling procedure. Data analysis involved frequency counts, percentages, and mean scores, while Pearson's Product Moment Correlation was used to examine relationships between farmers' socioeconomic characteristics and market linkage mechanisms.

The result of analysis shows that more than half (53.8%) the proportion of catfish farmers were male, the mean age of catfish farmers was 42 years. Most (80%) of the farmers were married, 57.5% had tertiary education, they had a mean household size of 4, 33.8% engaged in catfish farming full-time and 66.2% were engaged in catfish farming as their secondary occupation. The result showed that farmers had farming experience of (mean = 7) years, majority (76.2%) of the farmers engaged in catfish farming for both commercial and domestic purposes, all (100%) of the farmers were into table fish production, most

(81.3%) of the farmers owned 5 or fewer ponds, 57.5% of catfish farmers stocked 2,000 or less per cycle and most (93.8%) of the catfish farmers stocked their ponds 2-3 times per year. The result shows more than half (52.5%) the proportion of catfish farmers used a mix of local, foreign and formulated feed, 98.8% catfish farmers used boreholes, 87.5% of the farmers sold 1,000 or fewer quantities per cycle, 68.8% of farmers sold their fish for ₦2,001–₦3,000 per kg, 45% of farmers earned (mean = ₦1,356,562.50) annually, half (66.3%) the proportion of catfish farmers were members of associations or cooperatives and more than half (55%) the proportion of farmers had contact with extension agents with frequency of (mean = 1) visit. The result shows existing markets utilized by catfish farmers are local markets (96.2%), farm gate (71.2%), urban markets (46.3%), restaurants and food service industry (22.5%), fish processing factories (11.3%), online platforms (10%), supermarkets and retail chains (8.8%), trade fairs (1.3%) and export markets (0%). The mechanisms for linking farmers to markets are direct contact (98.7%), extension workers (55%), cooperatives (45%), leading farmers (42.5%), social media (28.8%), middlemen (21.3%), market associations (20%), hired transport (12.5%), contract farming (7.5%), using dispatch riders (2.5%), private transport (1.3%), private sector companies (1.3%), e-commerce platforms (0%) and digital market information systems (0%). The result shows a major linkage strength was better prices (mean = 4.23) followed reduced transportation costs (mean = 4.13), increased sales volume (mean = 4.08), quick sales (mean = 3.95), improved market information (mean = 3.86), increased profits (mean = 3.81), enhanced productivity (mean = 3.54) and wider market reach

(mean = 3.46). Fellow farmers (86.2%) was the major source of market linkage information followed by social media (72.5%), cooperatives (52.5%) and agricultural extension services (51.2%). Local markets was the major (mean = 4.19) preferred choice of market, followed by farm gate (mean = 4.03), urban markets (mean = 3.81), restaurants and food service industry (mean = 3.38), online platforms (mean = 3.21), supermarkets and retail chains (mean = 3.20), fish processing factories (mean = 3.19), export markets (mean = 2.89) and trade fairs (mean = 2.76). Reasons for catfish farmers' preference for chosen market outlets was distance to market (mean = 4.33), price offered (mean = 4.05), transportation costs (mean = 4.03), market information availability (mean = 4.00), reliability of buyers (mean = 3.94), volume of sales (mean = 3.93) and payment terms (mean = 3.85). The result showed constraints encountered by farmers to effective market linkage included high transportation costs (mean = 4.39), poor road infrastructure (mean = 4.18), limited access to finance (mean = 4.14), price fluctuations (mean = 4.14), unavailability of storage facilities (mean = 4.04), inadequate market information (mean = 3.85), unreliable buyers (mean = 3.85), competition from imports (mean = 3.80), seasonal demand (mean = 3.78), inadequate policy support (mean = 3.76), poor extension services (mean = 3.74), limited consumer awareness (mean = 3.65) and intermediaries' dominance (mean = 3.56). Number of ponds ( $r = 0.235$ ), stocking rate per cycle ( $r = 0.361$ ), quantity sold per cycle ( $r=0.778$ ), contact with extension workers ( $r = 0.596$ ) were significant and positively related to market linkage mechanisms while age ( $r = -0.221$ ), farming

experience (-0.397), frequency of extension visits (-0.578) were significantly and negatively related to market linkage mechanisms.

## **5.2 Conclusion**

Based on the findings of this study, it was concluded that catfish farmers utilized local markets (96.2%) the most, mechanism for linking to market was direct contact (98.7%) and the major strength of linkage mechanisms was better prices (mean = 4.23). The study also shows that fellow farmers (86.2%) was the most relied source of information on market linkages, majority (mean = 4.19) preferred local markets, distance to market (mean = 4.33) was the major reason for farmers preference for chosen market outlets and high transportation costs (mean = 4.39) was the major constraint faced by farmers for effective market linkages. The utilization and preference of local markets is connected to better prices and the reason of distance which helps against the challenge of high transportation costs.

## **5.3 Recommendations**

Based on the findings of this study, the following recommendations were made;

1. Government and relevant stakeholders should invest in improving road networks and transportation systems to reduce costs and ease market access for catfish farmers.

Policies should be enacted to regulate market operations, reduce the dominance of intermediaries and stabilize price fluctuations.

2. Improved access to affordable credit and financial services to help farmers overcome limited financing challenges and expand their operations.
3. Enhanced cooperative structures and market-oriented extension services to educate farmers on market linkages. Training programs should be provided to farmers on how to utilize e-commerce platforms and social media promoting digital literacy. Farmers should be encouraged to utilize alternative markets such as supermarkets/retail chains, restaurants/food service industry and export outlets.

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## RESEARCH QUESTIONNAIRE

DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION SERVICES

FACULTY OF AGRICULTURE

UNIVERSITY OF BENIN

Dear Sir/Madam

I am a final year student of the above named Institution. The purpose of this interview schedule is to assess; “MARKET LINKAGE MECHANISMS AMONG CATFISH FARMERS IN EDO SOUTH AGRICULTURAL ZONE, EDO STATE, NIGERIA”. Please you are kindly requested to fill in the information in appropriate space provided.

Your response would be used purely for research purpose and will be treated as confidential.

Thanks for your anticipated cooperation.

Yours faithfully,

Jonathan Oshioke OBANOR

Name of community \_\_\_\_\_

Local Government Area (LGA) \_\_\_\_\_

### INSTRUCTIONS

Please tick (√) or fill the necessary information as may be appropriate.

#### Section A: Socio-economic characteristics of catfish farmers

1. Sex: (a) Male [ ] (b) Female [ ]
2. Age \_\_\_\_\_ years
3. What is your marital status? (a) Single [ ] (b) Married [ ] (c) Divorced [ ] (d) Separated [ ] (e) Widowed [ ]
4. What is your highest level of education? (a) No formal education [ ] (b) Primary education [ ] (c) Secondary education [ ] (d) Tertiary education [ ]
5. What is your household size? \_\_\_\_\_
6. Nature of catfish farming: (a) Full-time [ ] (b) Part-time [ ]
7. If part-time in question six(6), what is your secondary occupation? (a) Catfish farming [ ]

(b) Other livestock farming [ ] (c) Crop farming [ ] (d) Civil service [ ] (e) Petty trading [ ]

Others (Please specify) \_\_\_\_\_

8. How long have you been involved in catfish farming? \_\_\_\_\_
9. What is your catfish farming for? (a) Commercial purposes [ ] (b) Domestic purposes [ ] (c) Both [ ]
10. What aspect of catfish farming are you involved in? (a) Hatchery operator [ ] (b) Table fish producer [ ] (c) Others (please specify): \_\_\_\_\_
  11. What major kind of fish pond do you have? (a) Concrete pond [ ] (b) Earthen pond [ ] (c) Plastic-tank pond [ ]
  12. How many fish ponds do you have? \_\_\_\_\_
  13. What is your stocking rate per cycle? \_\_\_\_\_
  14. What is your stocking cycle annually? \_\_\_\_\_
  15. What type of feed do you use? (a) Local feed only [ ] (b) Imported feed only [ ] (c) Formulated feed only [ ] (d) Mixed feed [ ]
  16. What is your major source of water? \_\_\_\_\_
  17. What is the average quantity of catfish sold per cycle? \_\_\_\_\_
  18. What is the average price per kilogram of catfish sold? \_\_\_\_\_
  19. What is your average annual income from catfish farming? \_\_\_\_\_
  20. Do you belong to any farmers' association or cooperative? (a) Yes [ ] (b) No [ ]
  21. If yes, what benefits do you derive from the association/cooperative? (a) Access to market information [ ] (b) Better pricing [ ] (c) Collective bargaining [ ] (d) Access to credit [ ] (e) Training and capacity building [ ] (f) Others (please specify) \_\_\_\_\_
  22. Do you have contact with extension agents? (a) Yes [ ] (b) No [ ]
  23. If yes, how many times does the extension agent visit in a year? \_\_\_\_\_
  24. How many times do you visit the extension agent in a year? \_\_\_\_\_

**Section B: Existing markets utilized by catfish farmers**

25. Which markets do you utilize for selling catfish?

S/N	Existing markets	Tick appropriately ✓
1	Local markets	
2	Urban markets	
3	Farm gate	
4	Export markets	
5	Supermarkets and retail chains	
6	Restaurants and food service industry	
7	Fish processing factories	
8	Trade fairs	
9	Online platforms	
	Others (specify).....	

**Section C: Mechanisms for linking respondents to markets**

26. How do you link with the market?

S/N	Market linkage mechanisms	Tick appropriately ✓
1	Direct contact	
2	Extension workers	
3	Linkage through leading farmer	
4	Cooperatives	
5	Market associations	
6	Private sector companies	
7	Contract farming	
8	Through middlemen	
9	Using dispatch riders	
10	E-commerce platforms (e.g Jumia, konga)	
11	Social media ( e.g Facebook, Whatsapp and Twitter)	
12	Digital market information systems e.g Nigerian Agricultural Market Information System (NAMIS)	
13	Hired transport	
14	Private transport	

	Others (specify).....	

**Section D: Linkage strengths for identified mechanisms**

27. What are the linkage strengths for the identified mechanisms?

S/N	Linkage strengths	Very strong	Strong	Neutral	Weak	Very weak
1	Increased sales					
2	Better prices					
3	Reduced transportation costs					
4	Improved market information					
5	Quick sales					
6	Government support					
7	Wider market reach					
8	Enhanced productivity					
9	Increased profits					
	Others (specify).....					

**Section E: Sources of information on market linkages**

28. How do you obtain information on market linkages?

S/N	Sources of information	Tick appropriately ✓
1	Agricultural extension services	
2	Social media	
3	Online platforms	
4	Fellow farmers	
5	Cooperatives	
6	Market research reports	
7	Neighbours	
8	Demonstrations	
9	Non-Governmental organisations	
10	Group meetings/discussions	
	Others (specify).....	


**Section F: Preferred choice of market outlets**

29. What are your preferred choice of market outlets?

S/N	Market outlets	Highly preferred	Preferred	Neutral	Somewhat not preferred	Not preferred
1	Local markets					
2	Urban markets					
3	Farm gate					
4	Export markets					
5	Supermarkets and retail chains					
6	Restaurants and food service industry					
7	Fish processing factories					
8	Trade fairs					
9	Online platforms					
	Others (specify).....					

**Section G: Reasons for respondents' preference for chosen market outlets**

30. What factors are responsible for your preferred choice of market outlet?

S/N	Reasons for your preferred choice of market	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Price offered					
2	Distance to market					
3	Market information availability					
4	Transportation costs					
5	Reliability of buyers					
6	Payment terms (e.g.,					

	cash, credit)					
7	Volume of sales					
	Others (specify).....					

**Section H: Constraints to effective market linkage**

31. What challenges do you face in linking with markets effectively?

S/N	Constraints	Very serious	Serious	Neutral	Somewhat not serious	Not serious
1	Inadequate market information					
2	High transportation costs					
3	Poor road infrastructure					
4	Unavailability of storage facilities					
5	Limited access to finance					
6	Price fluctuations					
7	Unavailability of reliable buyers					
8	Poor extension services					
9	Inadequate policy support					
10	Competition from imports					
11	Limited consumer awareness					
12	Intermediaries' dominance					
13	Seasonal demand					
	Others (specify).....					