

**ASSESSMENT OF THE EFFICIENCY OF FISH MARKETING
CHANNELS IN THE LAKE KAINJI INLAND FISHERIES AND
ALONG
NIGERIA-NIGER BORDER**

BY

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ABSTRACT

Improvement of food, nutritional security and poverty reduction in Africa can be addressed through better integration of intra-regional fish trade into the nation-state policy agenda. Data crucial to the development of regional fish trade needs to be obtained. However, there is paucity of information on market structure, products and value of fish trade along regional borders in Africa. This study therefore investigated fish marketing structure, the marketing actor's characteristics, fish distribution channels, market profitability and efficiency along the Nigeria-Niger border and Lake Kainji inland fisheries.

A multistage sampling procedure was used in the selection of respondents for this study. Random sampling was carried out in selecting four states Sokoto, Katsina, Jigawa and Yobe along the Nigeria-Niger border, Niger state was purposively selected based on its location in the Lake Kainji inland fisheries. Data was collected from 150 respondents in each of the states comprising 50 producers, processors and marketers each, amounting to 750 with the use of a structured questionnaire. Data on socio-economic characteristics, marketing operations, marketing channel, market structure, profitability and trade flow were obtained. Data were analysed using descriptive statistics, budgetary indices, gini coefficient, linear regression, Stochastic production frontier model and ANOVA at $\alpha_{0.05}$.

There was a predominance of male producers, marketers and processors in Katsina (100.0%, 98.0%, 98.0%), while in Niger state, processors were dominated by women (54.0%). Majority of producers (36.0%), processors (40.0%) in Sokoto state, marketers (36.0%) and processors (53.0%) in Katsina state; and processors (50.0%) in Niger were within the age of 31-40 years. The producer-consumer channel had an efficiency of 618.47 while that for producer-retailer-consumer channel was 435.85. The minimum and maximum average volume (kg) of fish traded within and across the States were for fried (882.25 ± 339.15 , 730.72 ± 283.39) and fresh fish (1702.23 ± 978.32 ; 1673.20 ± 439.88). An average volume (kg) traded of 1386.46 ± 760.57 for dried fish was traded across the regional border. 478.22 ± 292.01 and 91.04 ± 80.53 were the highest and least marketing efficiency among artisanal fishermen and retailers respectively for fresh fish. Processors had the highest average gross margin per kg (₦1157.94 \pm 492.26) while wholesalers had the least ₦387.94 \pm 363.87 for smoked fish. The Gini coefficient value for most of the actors showed partial inequality in the revenue distribution of fresh, smoked, dried, fried, spiced and frozen fish, except for wholesalers of smoked fish (0.34), retailers of spiced fish (0.45) and

wholesalers (0.41) and retailers (0.43) of frozen fish. The linear regression b values for all the forms of fish were positive except for dried and fried whose b values were -7.66 and -5.15 respectively.

The direct marketing channels were most efficient for fresh and processed fish. The market structures for most of the producers (capture), marketers and processors were monopolistic in nature and there was barrier into entry for fried and dried fish. Therefore there is need for better organization of fish markets.

Key Words: Marketing Channels, Profitability, Marketing Efficiency, Gini coefficient, Performance

DEDICATION

This work is dedicated to the Lord Almighty and My parents Mr. and Mrs. B. A. Ihenyen.

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CERTIFICATION

I certify that this work was carried out by IHENYEN, EDOWAYE HILDA in the Department of Aquaculture and Fisheries Management, Faculty of Agriculture and Forestry, University of Ibadan, Ibadan, Oyo State, Nigeria.

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ABBREVIATIONS

FDF:	Federal Department of Fisheries
FMARD:	Federal Ministry of Agriculture and Rural Development
GDP:	Gross Domestic Product
MANR:	Ministry of Agriculture and Natural Resources
NEPAD:	New Partnership for Africa's Development
NPC:	National Population Commission
NTWG:	National Technical Working Group
UN:	United Nations
WHO:	World Health Organisation

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Fish is one of most valuable commodities traded internationally. Developing countries in Africa continue to play a major role in supplying world markets. These countries accounted for 61% of all fish exports by quantity and 54% by value worth 35.3 billion dollars in 2012 (Food and Agriculture Organisation, 2012). The fishery sector (captured and farm-raised) in Africa generates a variety of benefits including food and nutrition security, employment, livelihoods, exports and foreign currencies, conservation and biodiversity values. Due to its low cost, about 200 million people amounting to 30% of the continent's population eat fish as their main source of animal protein and micro nutrition (NEPAD, 2015) which is particularly important in Africa where one in three children are stunted as a result of poor nutrition (WorldFish, 2015a).

Global fish trade has rapidly increased in recent decades; an estimated 45% of the world catch is now traded internationally. In 2010, global inland fisheries production was estimated at 11.2 million tonnes, of which Africa contributed about 2.5 million tonnes (WorldFish, 2015a). Africa produces 9.9 million tonnes of fish per annum; however, its share of global fish trade is just 4.9%. Of the 9.9 million tonnes of fish produced in 2010, one third came from inland fisheries while 1.49 million tonnes came from aquaculture (fish farming). The bulk of this production is exported to the United Kingdom which is Africa's biggest fishery customer (Plaatjes, 2015) while a large amount of small pelagic food fish are imported by Africa from the European Union (Tacon and Metian, 2009, Gordon *et al.* 2013).

The fishery sector accounts for a significant share of western Africa's national income, the average contribution of the fisheries and aquaculture sector is 4.1% of GDP, almost half of which is linked to the post-harvest industry (FAO, 2014). West Africa has four big fish producers, they are Nigeria, Senegal, Ghana and Mauritania with a combined production output of more than 1.3 million tonnes, the first three countries accounted for 63 percent of West Africa's fisheries production in 2008 (Ndiaye, 2013). However, the West African States (ECOWAS) are still by far the largest fishery products importer by volume in Africa (70%) of (FAO, 2016) which Ghana and Nigeria are the largest markets (FAO, 2007). Nigeria's top

suppliers are United States and Chile followed by Europe (18%), and Asia (10%); meanwhile, African suppliers provide 7% (Mauritania, Algeria and Mauritius- 1% and 3%). Ghana on the other hand is largely supplied by African countries with Morocco and Namibia providing about 2/3 of Ghana's imports (FAO, 2016).

Trade is important in the fishery industry as a creator of employment, food supplier, income generator, and contributor to economic growth and development in several African countries. Domestic and intra-regional trade of fish (both marine and inland waters) is important with great potential for enhancing regional integration and food and nutritional security (WorldFish, 2015a). However, trade in Africa is constrained by inadequate market and trade infrastructure, poor policy implementation, high transport costs, complex and unaligned trade rules, poor exploitation of resources to marketing challenges, lack of appropriate funding and infrastructure, inadequate technology resulting in high losses, tariffs and non-tariff barriers and poor market information which prevents her from optimizing the social and economic benefits available from fish trade (WorldFish, 2015a, Ndiaye, 2013).

In May 2014, the second Conference of African Ministers of Fisheries and Aquaculture (CAMFA) endorsed the African Union Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa, which prioritizes fish trade and aims to promote responsible and equitable fish trade and marketing by significantly harnessing the benefits of Africa's fisheries and aquaculture (WorldFish, 2015b). Due to this, the European Commission funded a project known as "Fish Trade for a Better Future Programme" which is implemented by WorldFish in collaboration with the New Partnership for Africa's Development (NEPAD) and the African Union Inter-African Bureau for Animal Resources (AU-IBAR). The project aims to improve food security and alleviate poverty through integration of intra-regional fish trade into nation state policies of sub-Saharan Africa (WorldFish, 2015b) by generating information on the structure, products and value of intra-regional fish trade.

Therefore, this study was conducted to understand the marketing structure of fish trade in the Lake Kainji inland fisheries and Nigeria-Niger border by evaluating the fish products, marketing channels, profitability and efficiency of the markets in the area.

1.2 JUSTIFICATION

According to Federal Ministry of Agriculture and Rural Development (2014), Nigeria has a total fish demand of 2.66 million metric tonnes, with a supply of 1.08 million metric tonnes leaving a deficit of 1.58 million metric tonnes. This large deficit has left Nigeria with the option of importing an estimated 1.9 million metric tonnes of fish valued at over N125 billion per annum (Agbo, 2015). Some of these fish come from other African countries like Senegal, Guinea and Guinea Bissau (Ndiaye, 2013) while European Union countries, led by the Netherlands, supply 60 percent of the imports (Tacon and Metian 2009). Nigeria is the world's single largest importer of small pelagic food fish. Frozen mackerel and herring account for 90 percent of this trade (Gordon *et al.*, 2013).

Tsamenyi and McIlgorm (2010) examined fish trade among the Africa-Caribbean-Pacific (ACP) members of the Commonwealth of Nations and point out that this fish trade accounted for only 9 percent of the countries' total value of fish exports. This, however, is a distinct improvement over 1996, when ACP countries did not have recorded fish trade with each other. Trade with the EU accounted for 57 percent of export value in 2007. Presently, intra-regional trade in fish has not been effective in achieving sustainable food and nutritional security and reducing poverty in Africa, nevertheless in order to promote intra-regional fish trade to achieve these goals data on the products, channels, structure and efficiency of the actors and markets have to be properly collected.

A number of researches have been carried out on the economics, efficiency and market structure of several agricultural products in Nigeria, including fish marketing, research in this area span all most of the zones in Nigeria including the South east, South South and South West and some part of the Northern regions of Nigeria. Okeoghene (2013) assessed the marketing of frozen fish in Edo State Nigeria, only gross margin and t-test analysis was used in the assessment. Osarenren and Ojor (2014) analysed smoke-dried fish marketing in Etsako Local Government Area of Edo State using gross margin analysis. Bassey *et al.*, (2015) analysed the determinants of fresh fish marketing and the profitability among captured fish traders in South-South Nigeria using marketing margins and marketing efficiency indices. Esiobu and Onubuogu (2014) worked on the socio economics of frozen fish marketing in Owerri. Onyemauwa (2012) analysed fresh and dried fish marketing in Southeast Nigeria using profitability and percentage profitability index.

Odebiyi *et al.*, (2013) analysed the economics of the fish value chain in Ogun waterside Local Government Area, Fadipe *et al.*, (2014) analysed dried fish marketing in Kwara State while Olasunkanmi (2012) analysed the economics of fish farming in Osun State. Madugu and Edwards (2011) assessed the marketing and distribution channels of processed fish in Adamawa state of Nigeria but did not specify the actual type of processed fish worked on. Iliyasu *et al.*, (2011) researched the economics of smoked and dried fish marketing in Yola North and South Local Government area of Adamawa State by analyzing their profitability and the operational and transport efficiencies. Ismail *et al.*, (2014) concentrated on the analysis of only dried fish marketing in Borno State.

However research on fish economics, market efficiency and market structure is limited in Lake Kainji inland fisheries and in the States along the Nigeria-Niger border. None of these researches addressed the profitability, marketing channels, market structure and efficiency of the various actors involved in marketing of the various fish products available in the market in this region. According to Umoinyang (2014), efficiency in fish marketing has the potential of stimulating production which will help to bridge the gap between fish production and consumption in the country. Therefore, this research is imperative to provide baseline information for decision makers, policy makers and other stakeholders, both at national, regional and international levels; for making informed decision to boost fish production in the Lake Kainji inland fisheries and to stimulate intra-regional trade in the States along the Nigeria Niger border in order to improve food and nutritional security which will reduce poverty in Nigeria and Africa at large.

This study answered the following questions:

- i. What are the socio economic characteristics of the fish producers and marketers and processors in the study area?
- ii. What are the channels of distribution of the various forms of fish in the study area?
- iii. How profitable and efficient are the actors in the various levels of operation in the study area?
- iv. What is the structure of fish market in the study area?

1.3 OBJECTIVES OF THE STUDY

General Objective

The general objective of the study is to assess the efficiency of fish marketing channels in Lake Kainji-inland fisheries and Nigerian-Niger border.

The specific objectives of this study are to:

- i. Determine the socio-economic characteristics of fish producers, marketers and processors in the study area;
- ii. Determine the profitability and efficiency of the actors involved in fish marketing and trade flow at the various levels of operation in the study area;
- iii. Identify the channels of distribution of the different forms of fish in the study area;
- iv. Determine the market structure of the fish markets in the study area.

1.4 Research Hypothesis

The following null hypotheses were tested:

H₀₁: The socioeconomic characteristics of the respondents does not influence their productivity (technical inefficiency)

H₀₂: There is no profitability in marketing of fish in the study area

H₀₃: The channels of distribution of the different forms of fish do not have influence on profitability

H₀₄: There is inequality in the distribution of income among the actors at the various levels of operation

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 THEORETICAL FRAMEWORK

According to Gumbau and Maudos (2000), two alternative hypotheses have been put forward to explain the positive correlation usually found between performance and concentration. On the one hand, the so called traditional hypothesis of collusion, or structure-conduct-performance paradigm (Bain, 1951) affirms that concentration favours the adoption of collusive agreements, thus leading to the obtaining of monopoly rents. On the other hand, the hypothesis of efficiency (Demsetz, 1973 and 1974) posits that concentration of the market is the result of the greater efficiency of some firms which consequently gain in market share and are more profitable. In this case, the positive correlation between profitability and concentration is spurious, efficiency being the variable that genuinely explains profitability.

Traditionally, the most usual way of testing both hypotheses has been to introduce concentration and market share as explanatory variables of profitability, on the assumption that market share will reflect the effect of efficiency. In this case, if the market share positively affects profitability, and concentration is not significant, the hypothesis of efficiency is not rejected.

Normally, differences in efficiency are identified with differences in market share, because increasing returns to scale are being assumed. Thus, large sized firms produce with lower unit costs thus obtaining higher levels of profitability. However, this argument implies identifying efficiency with the concept of "efficiency of scale", ignoring other forms of inefficiency such as technical inefficiency. If we bear in mind that the empirical evidence shows the low importance of inefficiency of scale compared to technical inefficiency, the identification of differences in efficiency with differences in market share (size) presents problems.

Furthermore, the market share may not only reflect efficiency but also be a manifestation of the residual influence resulting from market power or other factors unrelated to efficiency.

Shepherd (1986) argues that although the advantages of efficiency may increase market share and result in higher profits, market power is not only obtained by collusion; firms may have market power when they enjoy high market shares. Shepherd (1986) also affirms that the

empirical results only suggest that market share is more important than concentration in explaining profitability, suggesting that to support the efficient structure hypothesis "would require evidence to be obtained on specific firms, taking into account that all or most high profits reflect higher efficiency" (Shepherd, 1986).

2.1.1 The Structure-Conduct-Performance Theory

The Structure-Conduct-Performance model (S-C-P) defined as the relationship between market structure, firm conduct and firm performance postulates that the existence of entry barriers is the major determinant of firm profits, thus the greater cost of entry makes it easier for existing firms to maintain monopoly profits (Sinkey, 1986). It postulates that as market structure deviates from the paradigm of a perfect competition, the degree of competitive conduct will decline and there will be a consequent decrease in output (supply) and allocative efficiency, and an increase in prices. This implies that the performance of markets can be assessed based on the level of competition and efficiency in those markets (Williams *et al.*, 2006).

According to USAID, (2008), Structure-Conduct-Performance (S-C-P) is an analytical approach or framework used to study how the structure of the market and the behavior of sellers of different commodities and services affect the performance of markets, and consequently the welfare of the country as a whole. Specifically:

- **Market structure** consists of the relatively stable features of the market that influence the rivalry among the buyers and sellers operating in a market. Some examples of market structure include the number of buyers and sellers of food commodities in the market, the number of sellers of agricultural inputs such as fertilizer and veterinary drugs, barriers to entry into the market and the nature of trading relations (vertical coordination mechanisms) among market participants. According to Bain (1959), market structure consists of characteristics of the organization of a market which seem to influence strategically the nature of competition and pricing within the market (Go *et al*, 1999). In particular, these are the degree of seller and buyer concentration, entry conditions, and the extent of agent and product differentiation (Gregory, 1995).

It therefore describes the nature of the degree of competition and pricing in the market. At one end of the market spectrum is perfect competition while at the other extreme end is monopoly. Concentration of establishment in the hands of a few firms in an industry is generally criticized on the grounds of competition loss. A market is said to be more concentrated when there are fewer number of firms in production or the more unequal the distribution of market share. The higher the concentration level in an industry, the higher would be the degree of monopoly and absence of competition. Nonetheless, high concentration brings greater innovation and technological change and thus the benefits associated with it may perhaps be sufficient to offset the adverse monopoly effects of high concentration (APEC, 2008).

- ***Market conduct*** refers to the patterns of behavior that traders and other market participants adopt to affect or adjust to the markets in which they sell or buy. These include price setting behavior, and buying and selling practices.

- ***Market performance*** refers to the extent to which markets result in outcomes that are deemed good or preferred by society. Market performance refers to how well the market fulfills certain social and private objectives. These include price levels and price stability in the long and short term, profit levels, costs, efficiency and quantities and quality of food commodities sold.

2.1.2 Efficient Market Hypothesis (EMH)

The Efficient Market Hypothesis is a cornerstone of modern financial theory and was summed up by Eugene Fama in his influential article “Efficient Capital Markets” in 1970. It states that it is impossible to “beat the market” as financial markets should widely be seen as efficient regarding to the distribution of information. According to this, it is impossible, by means of information, to gain exceedingly high returns on investment in comparison to the whole market. Since market participants behave rational, stocks are always traded at their fair value and represent the net present value of all future cash flows of the concerning investment. There are no under- or over-valued stocks. When information arises, the news spread very quickly and they are incorporated into the prices of securities without delay. This can be seen as a result of the stock market efficiency which causes that share prices always reflect all relevant information. Furthermore, they do not follow a certain pattern; hence, they are not predictable.

Thus, neither technical analysis, which is the study of past stock prices, nor even fundamental analysis, which describes the analysis of financial information such as company earnings, asset values, etc. would enable an investor in the long term to achieve returns greater than those that can be obtained by holding a randomly selected portfolio of individual stocks with comparable risk. So, it does not matter how much the investor informs him beforehand as the extent of the attainment of returns is due to chance and the only way to get higher returns seems to be a holding in riskier investments (Lidner, *et al.*, 2010).

2.1.3 Adaptive Market Hypothesis (AMH)

An alternative to the EMH from a behavioral perspective, the adaptive market hypothesis (AMH), proposed by Lo (2004), states that markets are adaptable and switch between efficiency and inefficiency at different epochs. In this theory (Lo, 2004), the degree of market efficiency is related to environmental factors characterizing market ecology such as the number of competitors, the magnitude of profit opportunities available and the adaptability of market participants. Some practical implications of the AMH are: there are changes over time in the risk-reward relationships due to the preferences of the market population; current preferences are influenced by the movement of past prices due to the forces of natural selection, in contrast to the weak form of EMH where history of prices is not taken into account; arbitrage opportunities, being constantly created and disappearing, exist at different points in time.

Under the AMH point of view, it is desirable to detect nonlinear phenomena in certain periods of time and not only in the full series.

2.2 Fish Production in Nigeria

Nigeria is blessed with abundant natural aquatic resources with abundant fish resources. Nigerian freshwater bodies are the richest in West Africa in terms of fish abundance (Meye and Ikomi, 2008). According to Ekpo and Essien-Ibok (2013), Nigeria has approximately 14 million hectares of inland water bodies majorly fished by artisanal fishermen. She has a coastal line of about 900km, a continental shelf area of 37,934km² and an exclusive economic zone area of 210,900km² and thus has the sole rights for the operation of its fisheries and natural resources within the Exclusive Economic Zone (Omotayo, 2007).

The fisheries sub-sector in Nigeria is made up of artisanal, industrial and cultured fisheries. The artisanal covers the operations of small-scale canoes, fisheries operating in the coastal areas, creeks, lagoons, inshore water and the inland rivers. The artisanal fishery is plagued by challenges (Bolarinwa, 2014, Adebayo *et al.*, 2014), however, it still forms the bulk of fish being produced in the country (Adebayo and Anyanwu, 2013). Nigeria produces 1.08 million metric tonnes (FMARD, 2014) and this high demand provides good marketing opportunities (Peter and Heijden van der, 2012). The demand for fish in Nigeria cannot be met through capture production alone (Adeoye, 2012) and currently Nigeria spends about N150 billion (US\$1billion) annually to bridge the gap between supply and demand (CBN, 2011) hence an intervention from culture fisheries is needed to meet the ever increasing demand of fish in the country (Kigbu *et al.*, 2014). Table 2.1 and 2.2 show fish demand and supply and production from the year 2000 to 2013.

2.3 Importance of Fisheries and Aquaculture

2.3.1 Fish as Food

Foods from the aquatic environment are a complete and unique source of both the macro- and micronutrients required in a healthy diet. There are benefits as well as potential risks, of fish consumption however, the benefits far outweigh the risks, which may be principally from mercury and dioxins that may be present in the fish (Food and Agriculture Organisation/World Health Organisation 2011).

The beneficial health outcomes from fish consumption are:

- reduction in the risk of death from coronary heart disease because it is low in fat, calories, and cholesterol (USAID, 2010);
- Improved neurodevelopment in infants and young children when the mother consumes fish before and during pregnancy (FAO/WHO 2011) In 2009, fish accounted for 16.6 percent of the world population's intake of animal protein and 6.5 percent of all protein consumed. Globally, fish provides about 3.0 billion people with almost 20 percent of their intake of animal protein, and 4.3 billion people with about 15 percent of such protein (FAO, 2012).
- supplies micronutrients such as irons, iodine, calcium, vitamin A, and Vitamin B in the diets of people (Adebayo and Anyanwu 2013).

Table 2.1: Nigeria Fish Supply and Demand

Year	Projected population (Million)	Projected Domestic Fish Demand (Tonnes)	Projected Domestic Fish Supply	Deficit (Tonnes)
2000	114.4	1,430,000.00	467,098.00	962,902.00
2001	117.6	1,470,000.00	480,163.60	984,836.40
2002	121.0	1,412,500.00	507,928.20	1,004,572.00
2003	124.4	1,555,000.00	522,627.10	1,063,082.60
2004	128.0	1,600,000.00	536,917.60	1,063,072.40
2005	131.5	1,643,750.00	552,433.10	1,091,317.00
2006	135.3	1,691,250.00	567,948.60	1,230,301.40
2007	139.1	1,732,750.00	583,872.40	1,154,873.00
2008	143.0	1,782,300.00	600.612,80	1.186,887.20
2009	147.1	1,838,750.00	617,353.20	1,221,397.00
2010	151.2	1,810,000.00	634,500.20	1,255,440.00
2011	155.5	1,943,750.00	652,606.60	1,291,143.00
2012	160.0	2,000,000.00	689,958.00	1,328,508.00
2013	164.0	2,113,750.00	709,683.10	1,365,042.00
2014	169.1	2,175,000.00	730,248.00	1,404,067.10
2015	174.0	2,055,000.00	671,492.30	1,444,752.10

Source: Federal Department of Fisheries (2008)

Table 2.2 Nigeria Fish Production in Tonnes by sectors 2000 to 2013
Source: Federal Ministry of Agriculture and Rural Development, 2014

SECTORS/YEAR	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
ARTISANAL-: SUB-TOTAL	418,069	433,537	450,965	446,203	434,830	490,594	518,537	504,226	511,382	598,211	616,981	638,486	668,754
Coastal & Brackish Water	236,801	239,311	253,063	241,823	227,523	259,831	269,878	260,098	264,988	309,981	328,332	346,381	370,918
Inland :Rivers & Lakes	181,268	194,226	197,902	204,380	207,307	230,763	248,659	244,128	246,394	288,230	288,649	292,105	297,836
AQUACULTURE (Fish Farm)	25,720	24,398	30,664	30,677	43,950	56,355	84,533	85,087	143,207	152,796	200,535	221,128	253,898
INDUSTRIAL (Commercial Trawlers)	23,308	28,378	30,091	33,882	30,421	32,595	33,778	26,193	29,986	29,698	31,510	33,485	45,631
Fish (Inshore)	13,877	15,792	16,065	17,542	16,063	19,724	19,129	18,040	18,585	18,820	19,261	19,736	27,977
Shrimp (inshore)	8,056	12,380	12,797	11,416	12,469	10,946	13,767	5,995	9,881	10,878	12,249	13,749	17,654
EEZ	1,375	206	1,229	4,924	1,889	1,925	882	2,158	1,520	.m	-	-	-
GRAND-TOTAL	467,098	486,313	511,720	510,762	509,201	579,544	636,848	615,507	684,575	780,705	849,026	893,099	968,283
GRAND-TOTAL	467,098	486,313	511,720	510,762	509,201	579,544	636,848	615,507	684,575	780,705	849,026	893,099	968,283

- **2.3.2 Employment**

Apart from the value of fish as a high source protein, the Fisheries sector occupies a very important place in the socioeconomic development of the country, as it contributes to economic growth and human welfare. Fish along with shrimp and prawn are important agricultural products and is currently contributing to the welfare of people by gainfully employing millions of people (Belton *et al.*, 2011). According to FAO (2014) about 12.3 million people are employed in this sector either directly or indirectly. Fisheries sub-sector plays an important role in the Nigerian economy as it contributes 4.5% of agriculture's 42% contribution to national GDP i.e. fisheries contribute 1.8% of total GDP in 2007 (National Technical Working Group, 2009). The fisheries sector of the Nigerian economy employs a tangible number of Nigerians in marketing, processing and research. Both the primary and secondary sectors of the Nigerian fisheries industry employed about 26.5 million Nigerians as at 2008. The female folk involved with processing and trading account for 73% of those employed in the sector (Federal Department of Fisheries, 2008, Soyinka and Kusemiju, 2007; Bolarinwa, 2012).

- **2.3.3 Trade**

According to El Naggar (2013), Fish and fishery products continue to be among the most-traded food commodities worldwide. Following a drop in 2009, world trade in fish and fishery products has resumed its upward trend due to sustained demand, trade liberalization policies, globalization of food systems and technological innovations. Estimates for 2011 indicate that exports of fish and fishery products exceeded US\$125 billion, with average prices increasing by more than 12 percent.

A large portion of fish production is destined for export, around 40 percent of global production being traded internationally, and exports from developing countries accounting for some 60% of this and it is an important source of foreign exchange for many countries, An increasing amount of trade in fish products is between developing countries, however, rather than from developing to developed countries. Demand for fish in developing countries continues to grow, due both to population growth and increased per capita consumption. (Finegold, 2009).

2.4 STATUS OF FISH TRADE IN AFRICA

Global fish trade has been increasing very rapidly in recent years. An estimated 45 per cent of the world catch is now traded internationally. Trade is important for economic growth and development and is made easier by the use of improved technology in refrigeration, transportation and communications (The Fish Site, 2015).

World fish trade is increasing annually – in 2004 nearly half of global fish exports originated from developing countries. Africa's share of fish export value doubled during the last decade to US\$3.2 billion in 2004. Fish trade is an important part of the economy in many of the twenty-five West and Central African countries participating in the Sustainable Fisheries Livelihoods Programme (SFLP). The contribution of fish trade to national economies is often described in national statistics in terms of overall volume and value, normally based on nominal first-sale value supported by customs and catch data. However, how trade contributes to the livelihoods of specific groups within society is less known due to limited localized information, though it is clear that through employment, market margins and profits, trade can contribute positively to the livelihoods of people in both coastal and inland areas (FAO, 2007).

According to the Fish Site (2015), Africa's share in global exports continues to be minor, estimated at US\$ 4.8 billion in 2011. Expansion of export volumes was primarily due to the growth in exports of fresh, chilled or frozen fish (which constituted over 50 per cent of the total); and to a lesser extent, prepared and preserved fish and fish meal.

These exports generated fairly low per unit values, but helped drive export revenues due to the large volumes exported. While export volumes of crustaceans and molluscs have remained largely stagnant over the past two decades, they contributed significantly to the growth in export values, generating almost 30 per cent in value in 2006-2008.

The top ten African exporters accounted for 89.5 per cent of the total value of fish and fishery products exports from the continent. Morocco (leading with 29 per cent), Namibia (15.8 per cent), South Africa (12.3 per cent), Mauritius (7 per cent) and Senegal (6.3 per cent) – are among the top 50 global fish exporters, with Morocco contributing 1.1 per cent to global trade (1.11 per

cent of value) and Namibia around 0.6 per cent. Exports grew from 3.5 per cent in 1980 to around 4 per cent during the early 1990s and then stabilised around 4.6 per cent. The number one market for the top ten African exporters of fish products is Europe (70 per cent), followed by Asia (15 per cent), Africa (11 per cent), North America (2 per cent). Oceania and South America are estimated respectively at 1 per cent (The Fish Site, 2015)

As a whole, Africa has a trade surplus of around US\$ 1.6 billion. But viewed individually, 24 African countries have a trade surplus while 29 countries run a deficit. On average, the surplus tends to be larger than the deficit. While nine African countries run a trade surplus of over US\$ 100,000, only three have a deficit of less than US\$ 100,000. Morocco has the largest surplus of almost 1.4 billion of which US\$ 700,000 for Nigeria alone, thus lowering the total trade surplus in the continent. When fisheries trade and production are compared at country level, it is apparent that regional trades are being driven only by a small number of countries. Only 6 countries export more than 250 000 t per year: Tanzania, Ghana, Nigeria, Senegal, Namibia and South-Africa. Interestingly none of those countries (nor any of the other majors fishing nations such as Uganda or Kenya) has a positive fish trade balance (export – import) when considered in quantity. In fact, a more thorough analysis reveals a fundamental structural unbalance in fish trade in sub-Saharan Africa. While the trade balance measured in value terms has increased from almost zero in 1990 to USD 750 million in 2001, the same balance has remained desperately negative in quantity. The huge revenues generated through fish trade in the sub-Saharan countries do not seem to be successful in reducing the gap between fish demand and supply in these countries (Bene, 2008).

The trade balance of selected countries is presented in Figure 2.1. As indicated, Morocco has by far the largest trade surplus, followed by Namibia (US\$ 500 million), Senegal (US\$ 300 million) and South Africa (US\$ 299 million), Seychelles (because of tuna imports), Kenya and Tunisia have individually less than US\$ 200 million. Angola, Democratic Republic of Congo, Cameroon, Ghana, Côte d'Ivoire, Egypt and Nigeria are fish and fishery products trade deficit countries. In 2011, Nigeria alone imported around US\$ 1 245 394 while the trade deficit was higher than US\$750 million (The Fish Site, 2015).

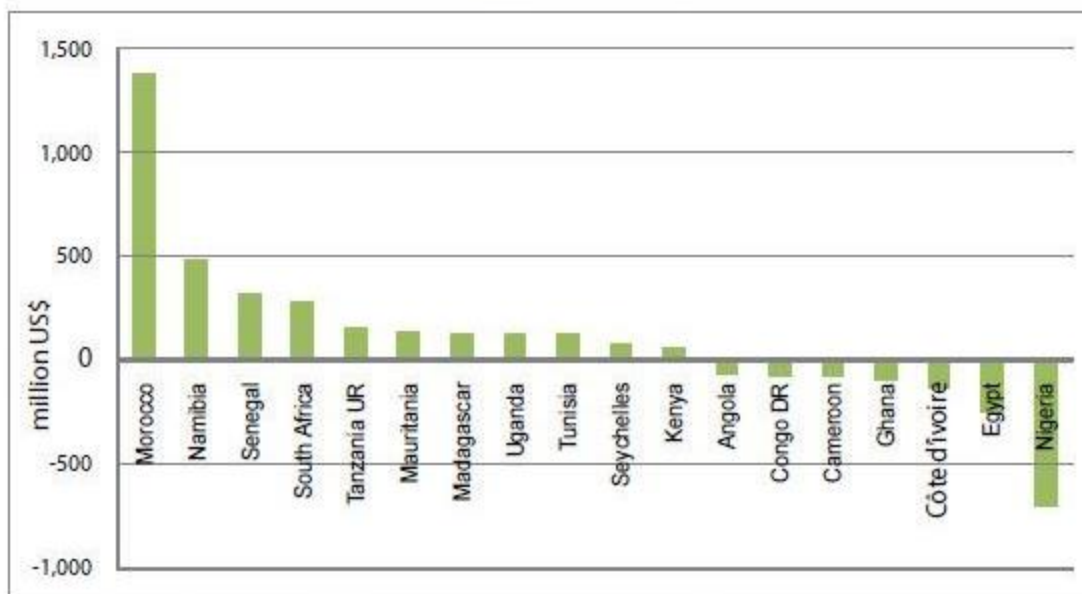


Figure 2.1 Fishery products trade balance of selected African countries (average 2006-2011)

Source: The Fish Site (2015).

2.4.1 Informal Cross Border Trade (ICBT)

Lesser and Moisé-Leeman (2009) describe informal cross-border trade (ICBT) as involving legitimately produced goods and services, which escape the government regulatory framework, thereby avoiding certain tax and regulatory burdens; hence fully or partly evading payment of duties and charges. Such trade includes those which pass through unofficial routes and avoid customs controls, as well as those that pass through official routes with border crossing points and customs offices yet involve illegal practices. Little (2007) defines it as "a normal market response to cumbersome, time consuming export regulations and regional price distortions, and should be encouraged as a means to increase intra-regional trade (and 'regionalization'), meet local demand that is not being met by national production and markets, and ensure regional food security".

ICBT has negative impacts on the formal economy of a nation through potential losses of tax revenues, possible promotion of illegal trade and corruption, violation of health and sanitary requirements and, to some extent, a negative environmental impact (Njoku *et al.*, 2013) but it can also have positive macroeconomic and social ramifications such as food security and income creation particularly for rural populations who would otherwise suffer from social exclusion as the major reason for ICBT is unemployment due to economic reforms, rural-urban migration and low wages. If properly harnessed, ICBT has the potential to support Africa's on-going efforts at poverty alleviation (Afrika and Ajumbo 2012, Ogalo, 2010). Informal cross border trade has a gender dimension as most of the informal cross border traders are women (World Bank, 2007). According to the United Nations Development Fund for Women (UNDFW) (2009), in the South African Development Community (SADC) region, women constitute about 70 percent of the informal cross border traders.

2.4.2 Barriers to Intra Regional Trade

There are many challenges of intra-regional fish trade resulting in persistent food and nutrition insecurity in Africa. Some of the most prominent ones are discussed below:

2.4.2.1 Poor policies and weak institutions:

Market access and demand driven agriculture are hampered by poor agricultural policies. Agricultural policy and institutional frameworks are of particular relevance because they affect agricultural performance most directly and also are controllable to a certain extent by policy-makers (FAO, 2009). Policies in agricultural markets are usually set up to deal with specific issues or unplanned which results in distorted markets and discourages competition. Such debilitating policies include but are not limited to, export bans, import duties, subsidies, and price and inflation regulation (Common Market for Eastern and Southern Africa, 2015).

2.4.2.2 Poor market access and exclusion of small farmers from formal markets:

There are several reasons for poor market access and these include: lack of market information, poor infrastructure, tariff and non-tariff barriers (NTBs). Sanitary and Phytosanitary barriers have been shown to be the significant barriers to trade in Africa, affecting mainly agricultural commodities. Market access is also hindered by labeling and traceability requirements which are becoming stringent with increasing dominance of supermarkets and changes in consumer tastes and preferences (Common Market for Eastern and Southern Africa, COMESA. 2015).

2.4.2.3 Underdeveloped infrastructure, including electricity supply, storage facilities and road networks:

Poor road networks, high cost of storage, epileptic power supply which increases the rate of fish spoilage and tends to increase the cost of doing business. There are few rural roads and transport costs in Africa are among the highest in the world, reaching as much as 77% of the value of exports (African Development Bank, 2011).

2.4.2.4 Lack of market information:

Unreliable information on production trends and prices result in production that is not demand driven and informed by market forces. This result in cycles of production surpluses and gluts, fueling price volatility. These affect proper planning and thus worsen food insecurity (COMESA, 2015).

2.4.2.5 Poor technology and mechanization:

In Africa, most agricultural practices are still subsistence in their nature. Poor technology affects the whole production chain, including agro-processing. In particular, poor harvesting and storage

techniques result in post-harvest losses (PHLs). 'Post- Harvest Food Loss' is defined as measurable qualitative and quantitative food loss along the supply chain, starting at the time of harvest till its consumption or other end uses (Hodges *et al.*, 2011). In most of Africa and developing countries, PHLs occurs mostly on the field, at handling and storage, processing and packaging and distribution level and this can be reduced by access to the right technology while in developed countries, PHLs occurs mostly at consumption level (COMESA, 2015).

2.5 Fish marketing in Nigeria

Kotler and Keller (2012) defined marketing as a science and art of exploring , creating and delivering value to satisfy the need of a target market at a profit. Bearden *et al.*,(2007) defined marketing as an organizational function and a set of process for creating, communicating and delivering value to customers and managing customer relationships in ways that benefits organisation and its stakeholders.

Marketing of fish could be regarded as the performance of all business activities involved in the flow of fish from the point of production (Fisherman or fish farmer) to the final consumer (Olukosi *et. al.*, 2007). A fish market is a market place used for marketing of fish and fish products. As the fish, like any other production moves closer and closer to the ultimate consumer, the selling price increases since the margins of the various intermediaries and functionaries are added to it. The price efficiency is concerned with improving the operation of buying, selling and other connected aspects of marketing process so that it will remain responsive to consumer direction (Ali *et al.*, 2008).

Marketing plays an important role in a market economy. Agricultural marketing is central to agricultural development and overall growth and development of the economy (Awoyinka, 2009). Marketing ensures that the right product is available at the right place, at the right price, at the right time in order to fully meet consumer expectations (Okoh *et al.*, 2008). The marketing of agricultural commodities in Nigeria involves various markets or exchange points. Currently, people involved in marketing of fish are on the increase, this might be as a result of the profitability of the venture or increase in population (Ali *et al.*, 2014) The number of exchange points depends on the nature of the point of production and that of consumption. The

effect of marketing process is assessed by the ability of the market to create time, place, form and possession utility. In marketing, fish passes through various market intermediaries and exchange points before they reach the final consumer. These market intermediaries include *inter alia* the whole sellers and retailers. They each play important role in the marketing system (Nwabuike, 2015) and sometimes exploit either their consumers by charging higher prices or the producers by paying them lower prices (Ali *et al.*, 2014) According to Ogbeba (2009), some functions of marketing include: collection of fish, transportation to the market centres, pricing, buying and utilization.

2.5.1 CLASSIFICATION / TYPES OF FISH MARKETS IN NIGERIA

According to Cheke (2014), types of fish markets in Nigeria consist of:

- i. Fresh Fish Market (For captured fisheries, Artisanal fisheries)
- ii. Live Cat Fish Market (For Aquaculture Products)
- iii. Imported Fish Markets (Cold rooms, Refrigerated Trucks and other Modern Facilities/ Refrigerated Trucks)
- iv. Industrial Fish Market (By Trawler Operators, with Cold Rooms Trawlers and other Modern Facilities - Refrigerator trucks)
- v. Introduction of Modern Fish Markets (By Federal Government of Nigeria since 2010 in 6 Geo-Political Zones of Nigeria.

These modern fish markets are fenced all round and within the fenced perimeters are found constant power supply, generator, borehole, processing house (of EU standard), Lock-up shops , Toilet facilities for both male and female; Special area for live fish, dedicated car park and conference room for the management.

The Modern Fish Market addresses some key challenges of inadequate infrastructure in the Nigeria fish value-chain; such as the maintenance of adequate power supply, continuous water supply, a steady and reliable avenue for various fish and fishery products data collection; as well as a very hygienic and conducive environment for business, and a standard processing house / centre for various types of fish and other fish product processing- Filleting, Salting, Smoking etc. The Model Fish Market solves the problem of glut as there is adequate information flow between the operators in the markets in the various Geo-Political Zones (Cheke, 2014).

2.5.2 Role of Gender in Fisheries Production, Marketing and Processing

Nigerian women play very important role in the various Sector of Nigerian fisheries; they are engaged in a wide range of activities (especially in processing and marketing)-like other women in fisheries all over the World; the Nigerian women in fisheries are no exception; they are the back bone of fresh and dry fish marketing (Cheke, 2012)

In Nigeria, marketing of fish and fish products commences from the harvesting stage to the value chain where it then gets to the final consumer. Both men and women play key roles in the marketing and distribution of fish in Nigeria. In aquaculture production, both men and women are involved in fish farming whilst the women are more involved at the retailing level of the farmed fish products. In the capture fisheries sector i.e. trawling and artisanal fisheries: the men dominate at the production stage whilst the women are the key processors and sellers of the products (Cheke, 2014).

In a study done by Madugu and Edward (2011) in Adamawa state, both male and female were equally engaged in fish processing and marketing. In Nasarawa state, the ratio of male to female fish marketers was reported to be 40:60 percent respectively by Abah *et al.*, (2013), however, Ali *et al.*, (2008) in a study done in Maiduguri reported that that male marketers (81.67%) form the greater proportion of the marketers compared with female marketers (18.33%).

2.5.3 Problems of fish marketing in Nigeria

Marketing involves a lot of problems which often times hinder the objectives of the producer which is to satisfy consumer wants and to ensure the profitability of the firm. Fish producers and marketers experience several types of problems in the course of their business; the type of constraints they encounter may be peculiar to the type of fish they sell. Some problems of fish marketing in Nigeria include among others greater uncertainty in fish production, highly perishable nature of fish, high handling cost, fluctuations in prices, difficulties in adjusting supply to variations in demand, transportation of fish from areas of surplus to areas of deficit, providing different kinds of finished products to meet the diversified demands of final consumers, and inconsistent trade policies (Ali *et. al.*, 2008, Onu and Illiyasu, 2008) According

to Nwabueze and Nwabueze (2010) transportation is the major constraint in fresh fish marketing in the Oshimili South Local Government Area of Delta state, transportation of fresh fish in this area is plagued by bad roads, long distances, and high cost of transportation. Other constraints affecting fresh fish marketing in this area are shown in Table 2.3. According to Bada (2010) who assessed the frozen fish market in Ibadan, Oyo state the major constraints faced by the frozen fish marketers is power supply followed by storage cost, spoilage, transport cost, finance and lastly market levies. Okeoghene (2013) in a study in Edo state on frozen fish market found that inadequate storage facility was the major constraint in the area, closely followed by inadequate capital, high marketing costs and poor patronage.

2.6 Fish Marketing Channel

Marketing channel is simply the path of a commodity from its raw form to the finished product or the path of a product as it moves from the producers to the final consumers (Olukosi *et. al.*, 2007). In other words, it is the sequence of intermediaries or middlemen, and the marketers through which goods passes from producers to consumers (Olukosi *et. al.*, 2007). It is a chain of various systems involved in marketing from production sector to consumer sector with intra- and interlinkages.

It refers to a set of individuals, participants, players or organizations which facilitate the transfer fish as they pass from the fishermen to the final consumers (Ezihe *et. al.*, 2014). These participants are also known as intermediaries. The intermediaries of marketing channels are involved in providing various functions that may or may not change the form of fish before it gets to the final consumers such functions include providing services of processing, preservation, packing, transporting (Ezihe *et al.*, 2014).

In distribution channel a number of intermediaries are important who participate in the transfer of goods and property rights from the producer to the final client. Each of these participants becomes another level in the distribution channel and their number determines the length of the channel (Szopa and Pekala, 2012). Olowa (2015b), outlined the classes of middlemen include farm-gate middlemen, the commissioned agent, cooperative marketing agency, the wholesaler and retailer. Marketing and distribution channels are necessary in the process of getting produce

Table 2.3: Problems of fresh fish marketing in Oshimili South Local Government Area

Problems	Number of Respondents	Percentage (%)
Sources of fish supply	32	25.4
Availability of fish	28	22.2
Cost of fish	51	40.5
Preservation	36	28.6
Transportation	83	65.9
Credit/loans	60	47.6
Input	45	35.7
Middlemen	59	46.8
Level of Education	25	19.8
Years of experience	54	42.9
Gender	33	26.2

Source: Nwabueze and Nwabueze (2010)

from source to consumers. In any developing economy with multiple urban centres like Nigeria middlemen plays major role (marketing functions) in the continuum between producers and final consumer of products. Their middlemen are perceived to be the cause of high prices of food in the market. This have led to the agitation that middlemen should be eliminated from the marketing continuum (Olowa, 2015a). There are two major types of distribution channels. These are the direct and indirect marketing channel. In the direct channel, the producers sell directly to the consumers, whereas in the indirect marketing channels there are other participants that exist in between the producers and the end users. Marketing channels for a particular commodity vary from one part of the country to another, so it is always difficult to talk of a typical marketing channel for a particular commodity (Olowa, 2015a).

The choice of a distribution channel depends not only on how to bring a product or service to the market at a lower cost but also upon the volume and quality of fish catch, distance of the market, demand of the consumers and the different limitations of each market and of each channels operating in the market. This is in accordance with the specific constraints of each channel member. The marketing channels for fish may also vary according to the type of fish being marketed (Imam *et al.*, 2014, Rahman *et al.*, 2012).

A study carried out by Okeoghene (2013) on frozen fish marketing in Edo state shows the marketing channels in Figure 2.2 exist in the area for frozen fish, He opined that the longer the marketing channel the greater the marketing cost. A study carried out by Ismail *et al.*, (2014) in Borno state on dried fish marketing showed that dried fish marketing channel is divided into two parts. That is, wholesalers and retailers of fresh and already processed fish (dried fish). The wholesalers and retailers of fresh fish are located on the upper part of the channel followed by raw fish processors who also sell the processed fish. The raw fish processors buy from the wholesalers and sell through commission agents or directly to wholesaler of already dried fish, who then sell to the retailers and consumers.

There are also retailers of raw fish who buy raw fish from producers and wholesalers, processed it through fish processors, before selling to the consumers. On the lower part of the channel are wholesalers of dried fish who use the services of commission agents to buy from fish processors who are wholesalers of processed dried fish or buy directly from the processors and sell to retailers and consumers as shown in Figure 2.3.

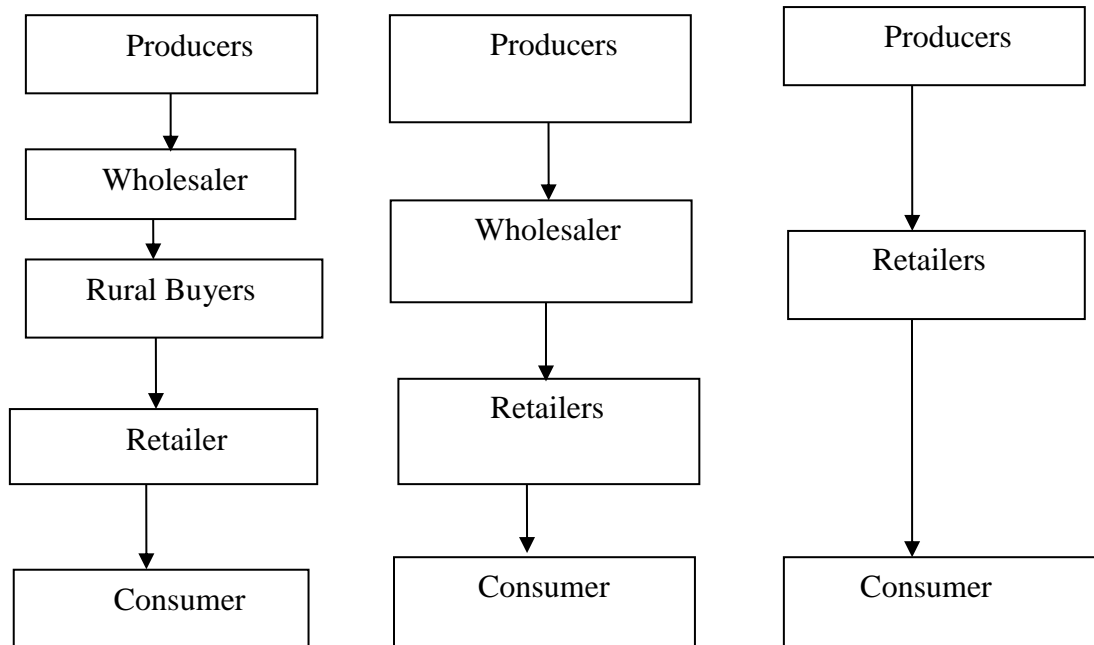


Figure 2.2: Marketing channel for Frozen Fish in Edo State

Source: Okeoghene, (2013)

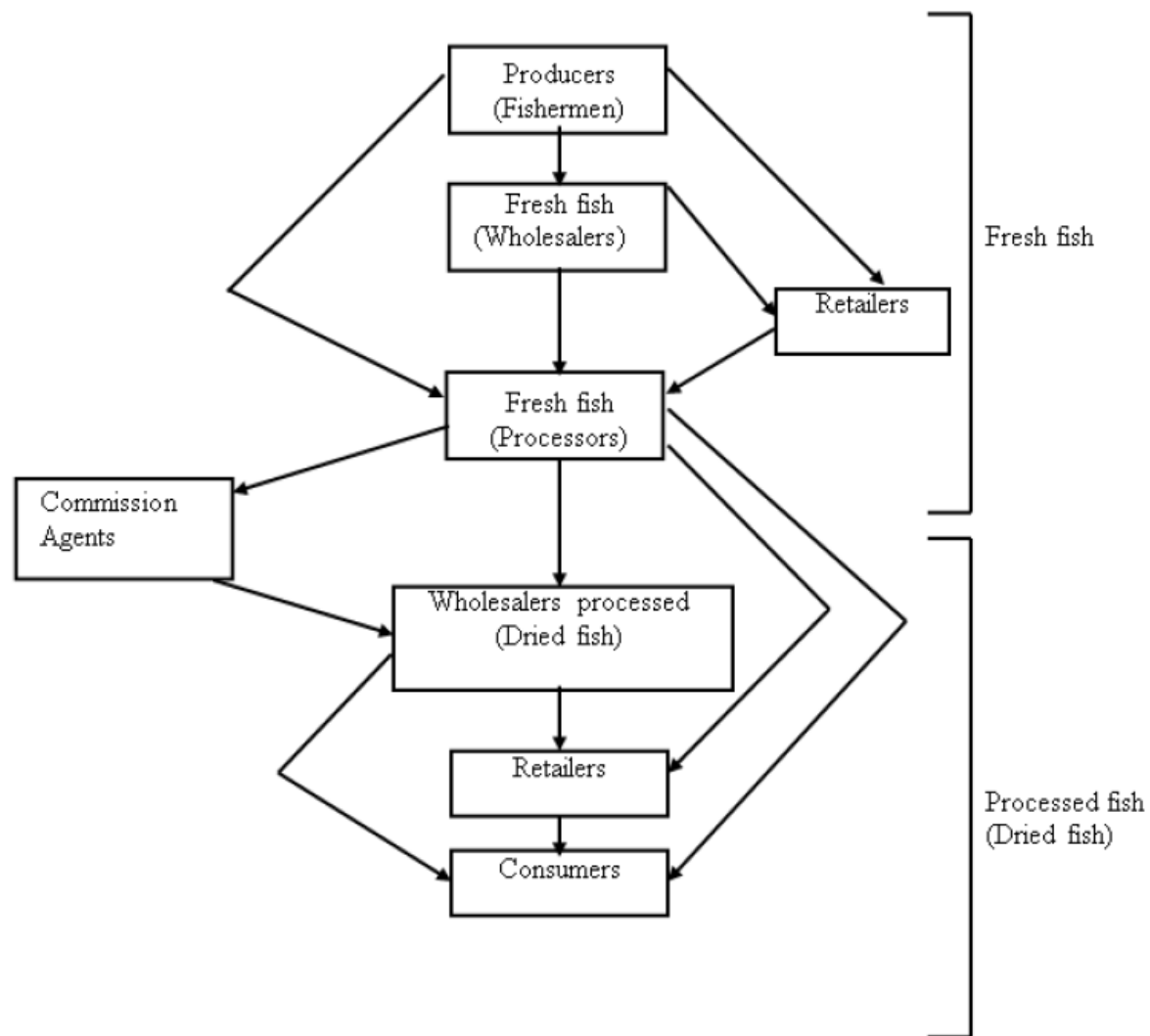


Figure 2.3: Marketing channel of Dried fish in Borno state

Source: Ismail *et. al.*, (2014).

Ezihe *et al.*, (2014) in Makurdi, Benue state reported that Fish marketers in the study area purchase and sell their stock through distinctive pathways. Some retailers, especially fish dealers, buy directly from fishermen, process as well as retail the fish themselves to the consumers, while the others are seen performing the job of rural assemblers, buying fish from different sellers and reselling from wholesalers to retailers. Some final consumers buy directly from the fishermen without the services of an intermediary. In other words, this is a clear indication that intermediaries in fish marketing make fish distribution faster.

2.7 Market Structure, Conduct and Performance

2.7.1 Market Structure

Market structure refers to a set of market characteristics that determine the economic environment in which a firm operates (Thomas and Maurice, 2011). The market structure conduct and performance (SCP) framework was derived from the neo-classical analysis of markets (Shaik *et al.*, 2009). According to USAID (2008) Structure-Conduct-Performance (S-C-P) is an analytical approach or framework used to study how the structure of the market and the behaviour of sellers of different commodities and services affect the performance of markets, and consequently the welfare of the country as a whole. The set-up of the market consists of the degree of concentration of buyers and sellers, integration, product differentiation and the degree of competition between buyers and sellers.

According to Olukosi *et al.* (2007), market structure tends to consider whether the number of firms producing a product is large or whether the firms are of equal sizes or dominated by a small group. It is also concerned with whether entry for new firms is easy or difficult and whether the purchases for the products are in a competitive state or not. It equally relates to the degree of market knowledge that is available to the participants. Market structure analysis emphasizes the nature of market competition and attempts to relate the variables of market performance to types of market structure and conduct. It is a description of the number and nature of participants in a market. Market conduct deals with the behaviour of firms. Firms that are price makers are expected to act differently from those in a price taker type of industry.

The term competition always indicates the presence of at least two sellers and two buyers of a definite commodity, in this kind of market situation, each seller acts independently of the other sellers and each buyer also acts independently of the other buyers (Reddy *et al.*, 2010).

Market performance is an appraisal of the process of marketing and how successfully its aims and objectives are accomplished. Marketing efficiency reveals the degree of market performance, the concept of marketing efficiency is however a complex one (Eronmwon *et al.*, 2014). Market performance is the assessment of how well the process of marketing is carried out and how successfully its aims are accomplished, Giroh, *et al.*, (2013). The performance of a marketing channel is related to its structure and the strategies (conduct) of the actors operating in these channels.

2.7.2 Measurement of Market Inequality

The term Gini coefficient” (or Gini-Index) has become by far the most popular measure for inequality since it was first introduced by the Italian statistician Corrado Gini (1884-1965) almost a century ago. It summarizes the extent of inequality in a single figure. It can theoretically take any value between zero (perfect equality, i.e. everybody has the same income, this also indicates lower level of market concentration, higher competition between participants and consequently efficiency in the market structure) and one (perfect inequality, i.e. all income goes to a single person, this indicates higher level of market concentration, higher competition between market participants and consequently inefficiency in the market structure) (Luebker, 2010). The setup of the market consist of the degree of concentration of buyers and sellers’ integration, product differentiation and the degree of competition between buyers and sellers (Ismail *et al.*, 2014).

Several studies have utilized Gini Coefficient as one of the measures of market structure, Most of them have found inequality in the distribution of income in fish markets thus resulting in an inefficient market structure. Irhivben *et al.*, (2015) reported the estimated value of the Gini-coefficient as 0.70 in Catfish market in Ibadan metropolis which means that there was a high level of inequality in the share of the market. Adeleke and Afolabi (2012) reported a Gini coefficient value of 0.5292 for fresh fish market in Ondo State Nigeria, which showed high level of concentration and consequently high inefficiency in the Ondo State fresh fish market

structure. Phiri *et al.*, (2013) reported gini coefficient index for fishers' income to be 1.01 indicating that there was perfect inequality among fishers in income distribution. However, Ugwumba *et al.*, (2011) analysed the market structure of fresh fish market in Anambra and reported Gini coefficient indices of 0.26 for producers/suppliers, 0.34 for wholesalers and 0.19 for retailers reflected evidence of a perfectly competitive market.

2.7.3 Product differentiation

Fish is highly susceptible to deterioration without any preservative or processing measures and immediately a fish dies, a number of physiological and microbial deterioration set in and thereby degrade the fish (Davies and Davies, 2009). Various factors are responsible for fish spoilage. The quality of capture is important at determining the rate of spoilage. Notably are the fish health status, the presence of parasites, bruises and wounds on the skin and the mode by which the fish was captured. The caught fish quality depends on the handling and preservation, the fish received from the hands of the fishers after capture. The handling and the preservation practice after capture affects the degree of spoilage of the fish (Akinneye *et al.*, 2007).

Unlike conventional marketing systems of agricultural products, fish marketing is characterized by heterogeneous nature of the products with respect to species, size, weight, taste, keeping quality and price. Market price of fish is determined by freshness, species and availability of fish in the market (Salim, 2008). Various forms of fish are sold in the Nigerian market, fish may be available in different forms as fresh, dried, smoked, canned, frozen, etc (Adebayo *et al.*, 2014). Preservation is usually applied to extend its shelf-life of fish when not sold fresh. These include freezing, smoking, drying and heat treatment (Sterilization, pasteurization, etc). Efficient preparation of fish is important when top quality, maximum yield and highest possible profits are to be achieved (Davies and Davies, 2009). According to Davies *et al.*, (2008), the processed fishery products are still stored using traditional processing and storage technologies, respectively. The handling and the preservation practice after capture affects the degree of spoilage of the fish (Akinneye *et al.*, 2007).

2.7.4 Scale Economies

Entry analysis goes beyond asking whether impediments exist and whether entry could conceivably occur. Typically, it also asks whether entry would occur and, if so, whether it is

likely to happen quickly enough and to be substantial enough to fix the anticompetitive problem that is central to a case (Organisation for Economic Co-operation and Development, OECD, 2007). Entry and exit conditions are important factors that determine existing firms' possibilities to exert market power. A dominant firm with a very high market share might not be able to make use of its position, if any significant deviation of the price from marginal costs will lead to entry by new competitors. Entry by new firms can also affect innovativeness and put pressure on the existing firms not only to refrain from misusing their market power, but also to operate as efficiently as possible (Heger and Kraft, 2008).

Structural barriers have more to do with basic industry conditions such as the benefits, costs of entry and demand than with tactical actions taken by incumbent firms. The benefits are the expected profits and growth of demand connected with entry. Structural barriers may exist due to conditions such as economies of scale, product differentiation, network effects, excess capacity, limit pricing and advertising (OECD, 2007, Heger and Kraft, 2008).

2.8 Economics of Fish Marketing

2.8.1 Market Efficiency and Profitability

The level of efficiency and profitability of the market and marketing functions are very important for sustainable marketing of agricultural products like fish (Umoinyang, 2014). Nwaru *et al* (2011) stated that an efficient marketing system ensures that goods which are seasonal will be available all year round, with little variation in prices, which can be attributed to cost of marketing functions like storage, processing, transportation, etc. Efficiency can be expressed as value of output/value of input. Marketing efficiency can be maximized by using strategies that reduce marketing costs: such as the use of co-operatives; increasing the size of activities; improving the business volume; creating awareness of markets among farmers; recruiting experienced market personnel; and introducing novel methods of marketing using managerial control (Omowa, 2012).

The output of marketing is consumer's satisfaction with the goods and services and the inputs are the various resources of labor, capital and management that marketing firms use in the process accomplishing particular job without reducing consumer's satisfaction with the output of improvement in efficiency (Urgessa 2011). However, if a reduction in marketing costs, results in

reduction in consumer's satisfaction, then the cumulative effect may not bring an improvement in marketing efficiency. Effective and efficient marketing systems the one that will induce the production of those products and quantities which when sold to the consumer will result in maximum returns after the deduction of minimum marketing charges and farm production costs (Muhammed 2011).

Efficiency has three components: technical, allocative and economic. Technical efficiency refers to input-output relationship. A firm is said to be efficient if it is operating on the production frontier. On the other hand, a firm is said to be technically inefficient when it fails to achieve the maximum output from the given inputs, or fails to operate on the production frontier. An efficient farm utilizes fewer resources than other farms to generate a given quantity of output. Allocative efficiency has to do with the profit maximizing principle. Under competitive conditions, a firm is said to be allocatively efficient if it equates the marginal returns of factor inputs to the market price of output (Okoruwa *et al.*, 2009).

Irhivben *et al.*, (2015) reported that catfish marketing system is efficient with efficiency value of 0.98 very close to 1. This implies that marketers are able to cover their activity cost (that is overhead cost and variable cost) with no loss in the business. Bassey *et al.*, (2015) analysed fresh fish market and profitability in Akwa Ibom state and reported that the markets for fresh fish sampled were efficient.

2.8.2 Profitability of Fish Marketing

Economic analysis is necessary in assessing the profitability and viability of agricultural enterprises. There are different methods such as investment, profit, gross margin analysis, cost and returns that can be used to assess profitability of intermediaries in the marketing channels. They are used in agriculture for farm planning and comparing different farms with similar characteristics or different enterprises on the same farm (Chamdimba, 2007). Gross profit margin measures company's manufacturing and distribution efficiency during the production process. It is a measurement of how much of each pula of a company's revenue is available to cover overhead, other expenses and profits. The ideal level of gross profit margin depends on the type of industries, the length of time the business has been in operation and other factors. A high gross profit margin indicates that the company can make a reasonable profit, so long as the

company or business keeps the overhead cost in control. On the other hand, a low gross margin indicates that the business is unable to control its production cost (Hofstrand, 2013).

Okeoghene (2013) measured the profits or losses of the marketers in the fish marketing channels of frozen fish in Edo state using Gross Margin analysis; he found that the business was profitable. Ali *et al.*, (2008) analyzed the profitability of smoked and dried fish marketing in two local governments in Adamawa state using return on investment, profit and market margin, He found that the returns on investment were higher in smoked and dried fish marketing than if the capital were kept in a savings account at the bank at a prevailing interest rate of 20%.

Dambatta *et. al.*, (2016) assessed profitability of major fisheries enterprises in Kano state and reported a gross margin which showed profitability values of N 74,350 for fishermen during raining period, also, Gbigbi and Osun (2014) analysed the economic returns of fish production in the Niger Delta and reported that artisanal fish production is profitable as shown by gross margin, net returns and enterprise economic efficiency which were N90, 496.03, N49, 377.18 and 0.20 respectively also Magawata *et. al.*, (2014) reported that fish processing in Argungun area of Kebbi state is profitable.

2.9 Value Chain

The value chain concept is used to describe approaches aimed at improving market prospects for producers and scaling up profit margins. Value chain focuses on the actors (private and public, including service providers) and the sequence of value adding activities involved in bringing a product from production to the end consumer. In agriculture and fisheries they can be thought of as a 'farm to fork' set of inputs, processes and flows (Miller and da Silva, 2007).

A value chain describes the full range of value-adding activities required to bring a product or service through the different phases of production, including procurement of raw materials and other inputs, assembly, physical transformation, acquisition of required services such as transport and/or cooling, and ultimately response to consumer demand (Weber & Labaste, 2009). The chain presented in the Figure 2.4 simplifies the complex series of activities that can take place as products move from the producer to the consumer. For example, the fish value chain involves different species of fish that follow different chains, both fresh and processed fish, from capture

fisheries and from aquaculture. The movement of fish from one stage of the chain to another stage represents a value adding activity (Chiwaula *et al.*, 2012).

2.10 Conceptual Framework

The conceptual framework summarizes the research by showing how the independent and dependent variables interact and influence each other.

The conceptual framework as shown in Figure 2.5 shows that the independent variables such as socio-economic characteristics, actors in the marketing channels and market structure influence the dependent variable which is the efficiency of the marketing channel. The intervening variables such as government policies also have indirect effect on the efficiency of the marketing channels.

The intervening variables were not measured because of their indirect effect on the efficiency of the marketing channels. The independent variables and the intervening variables will cause the marketing channel to be efficient or not efficient.

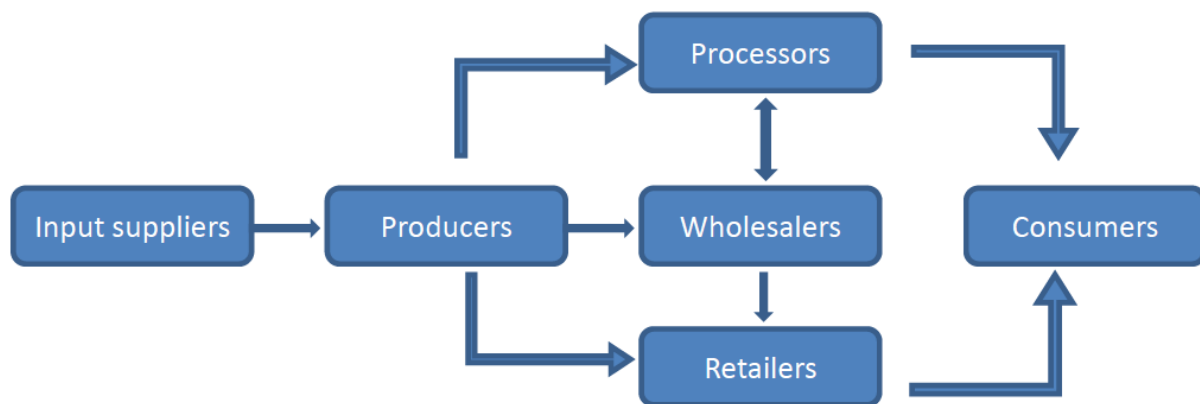


Figure 2.4: Simplified Fish Value Chain

Source: Chiwaula *et al.*, (2012)

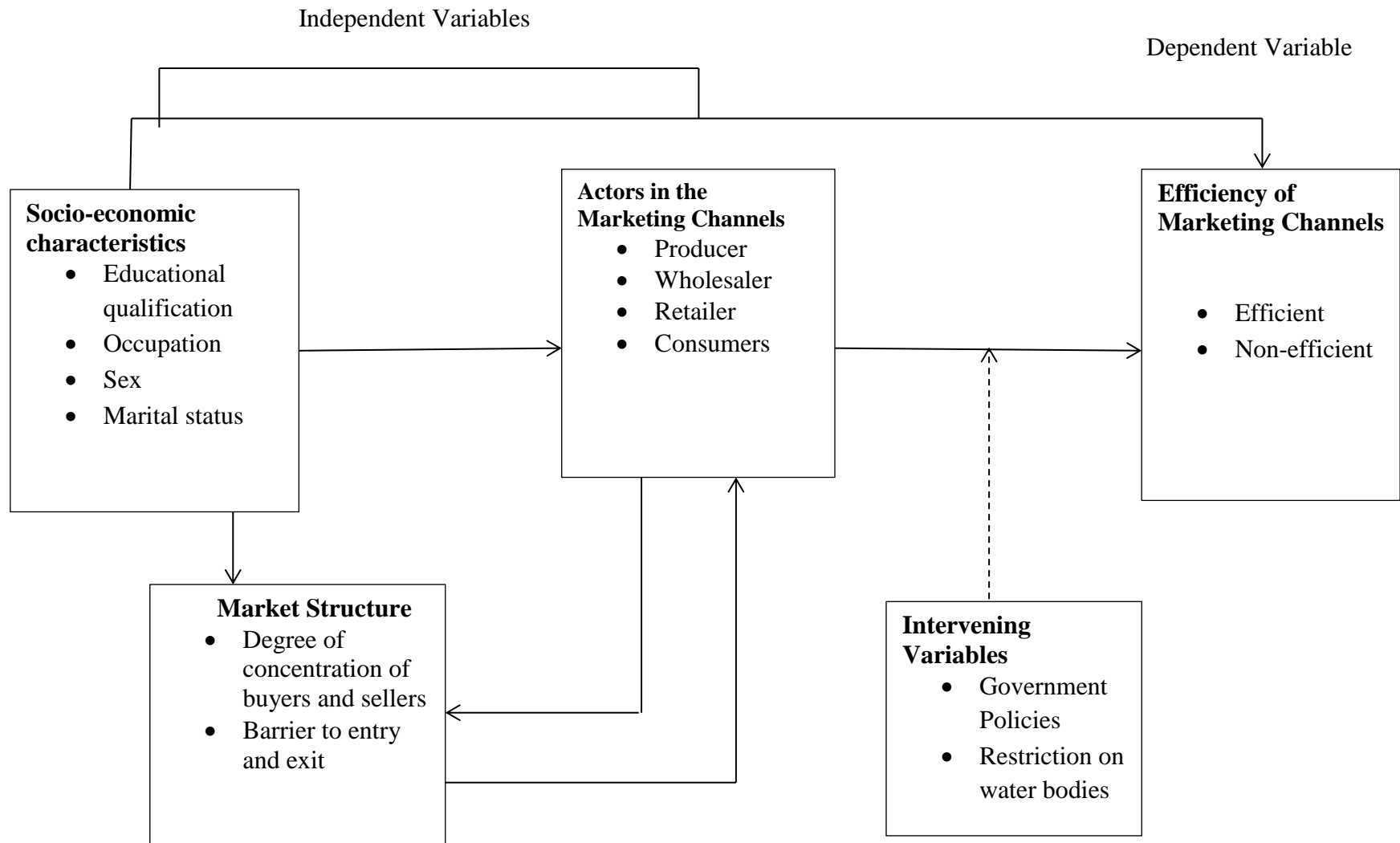


Figure 2.5: Conceptual Framework on the efficiency of fish marketing channels in Lake Kainji inland fisheries and along Nigeria-Niger border

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Area

3.1.1 Lake Kainji Fisheries

Lake Kainji was formed by damming the River Niger at Kainji Island. The dam was closed on 2nd August 1968 and the reservoir created behind it has a surface area of 1,120km² at maximum-recorded level. The lake is 137km long and 24km wide (Welcome, 1972). Kainji Lake is in the Guinea savannah vegetation zone of the north-western Nigeria. Kainji Lake is located between longitude 9°50" and 10°55" East and Latitude 4°20" and 4°45" North. It has a length of 134 km, a maximum width of 21.1km and a maximum depth of 60 meters. It has a surface area of 1270km² and a mean annual water temperature of 27.85°C after construction (Abiodun, 2003). Although the primary aim of the impoundment is to generate hydroelectric power. The lake also offers opportunities for developmental projects like fisheries, irrigation and Navigation. Kainji Lake has its source from Futa Jalon in Niger republic.

3.2. Study Area for the Nigerian-Niger Border

The Nigerian Niger border region comprises of Sokoto, Katsina, Jigawa, and Yobe State. Sokoto State was situated in the North Western corner of Nigeria; Sokoto state occupies 25,973 square kilometres. Sokoto shares its borders with Niger republic to the North, Zamfara state to the East, Kebbi state to the South East and Benin Republic to the West, (Nigeria Galaria 2015).

Katsina state is one of the seven states in North-west Nigeria. It is located in the Sudan savannah agro-ecological zone. The state lies between longitude 12°59' N and latitude 7°36' E. The state is bounded in the East by Kano and Jigawa States, in the West by Zamfara State, in the South by Kaduna State and in the North by Niger Republic. It has a total land area of 1.64 million ha. Rainfall in Katsina State ranges from 400-800 mm in the Northern and Southern part, respectively (Adekunle *et al.*, 2005). The state has a population of about 5,792,579 (National Population Commission., 2006).

Jigawa state is located in the north-west part of the country between latitudes 11.00-13.00°N and longitudes 8.00-10.15°E. Kano and Katsina border Jigawa to the west, Bauchi state to the east

and Yobe state to the north-east. Jigawa is a rural and agrarian state where majority of its peoples earn their living through farming that relies heavily on rainfall using traditional implement, the state is blessed with large expanse of Agriculture land rivers and floods plain suitable for crops livestock's and fish production out of the 2.24 million hectares total land area about 1.6 m ha are estimated to be cultivable during the rainfall season while about 30,8000 ha of the landmass is cultivable during the dry season through irrigation (Ministry of Agriculture and Natural Resources., 2010). Jigawa state has 27 LGAs. Yobe state is located in North East Nigeria between latitude 12.1871° and longitude N11.7068°E.

The eastern boundary is immediate to Borno State, to the west is Jigawa and Bauchi States, and to the north boundary is the international border with Niger Republic It is endowed with vast agricultural and livestock development potentials. The state also possesses one of the richest fishing grounds in the northeastern region of the country. Farming, fishing and livestock rearing are, therefore, the most important agricultural practices employing about 245,478 people, representing 26.6 percent of the total labour force of the state. the map of the study area is shown in Figure 3.1.

3.3 Population of the Study

The population of the study includes all producers, marketers and processors in the Lake Kainji inland fisheries and the States along the Nigeria- Niger border.

3.4 Sampling procedure and sample size

A multistage sampling procedure was employed in the States along the Nigeria-Niger Border:

Stage 1: States were randomly selected from states from the Nigeria-Niger border.

Stage 2: Purposive selection of Local governments based on the prevalence of fishing activities in the area

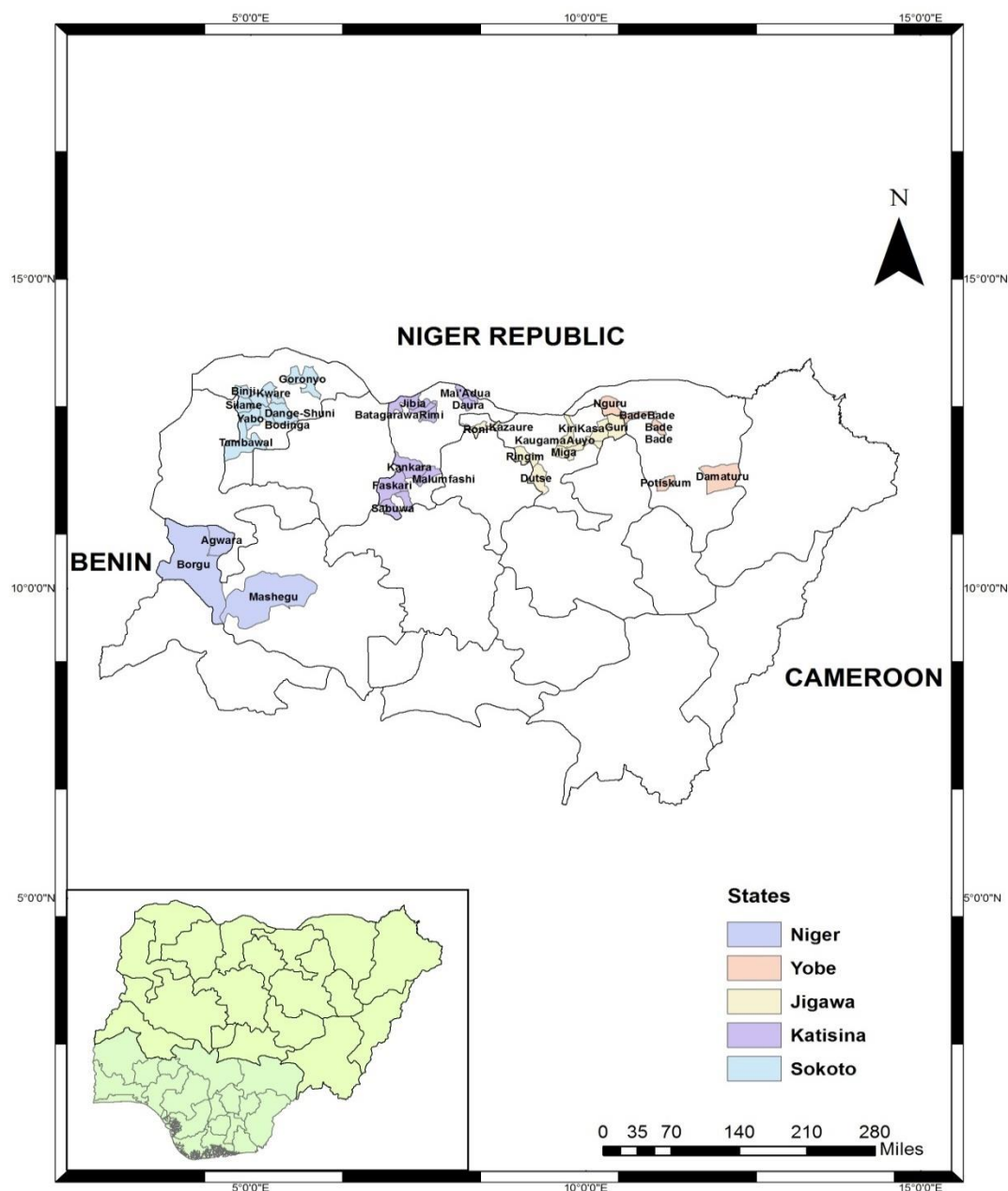


Figure 3.1: Map showing the Local Governments sampled along the Nigeria-Niger border and Lake Kainji-inland fisheries

Stage 3: Random selection was used to select the respondents from these local government areas. There were Twenty nine local government areas that were sampled within all the states in total, they were: Goronyo, Binji, Kware, Silame, Yabo, Tambuwal, Bodinga, and Dange-shuni in Sokoto state. Jibia, Batagarawa, Kankara, Faskari, Sabuwa, Malumfashi, Mai'Adua, and Daura in Katsina state. Roni, Kazuje, Ringim, Dutse, Kaugama, Auyo, Miga, Kirikasa, and Guri in Jigawa state. Nguru, Bade, Potiskum and Damaturu in Yobe state.

Niger state was selected based on the presence of the Kainji dam. 3 Local government areas were selected from around the dam based on the intensity of fishing activities there. They were Borgu, Agwara and Mashagu.

Sample Size

The sample size from each state was 150 respondents with a total of 750 respondents in all the states. The 150 respondents in each state comprised of 50 producers (which was further divided into 25 culture producers and 25 capture producers except in Niger state where only capture producers were sampled), 50 marketers and 50 processors.

3.5 Data Collection

Quantitative method was used for collection of primary data; this was collected with aid of a structured questionnaire which was administered to the respondents by trained enumerators.

3.6 Questionnaire Design

A structured questionnaire was used in the collection of data. One type of questionnaire was used for the three levels of operation (Producer, Marketer, and Processor). The questionnaire was divided into five sections,

Section A: comprised information on socio economic characteristics of actors like Age, Sex, Marital Status, Household size, Highest education attained, occupation, type of operation for producers and other sources of income

Section B: comprised information on location like Country, Geopolitical zones, agricultural extension project zone and village

Section C: comprised information on fishermen and fish farmer operations

Section D: comprised information on market channel, forms of fish sold, the quantity of fish bought and sold, transportation form and cost, capital cost, operational cost, revenue and constraints faced by the actors in the marketing channel

Section E: comprised information on Informal Cross Border Trade.

A sample of the questionnaire is shown in Appendix VIII.

3.7 Validation of Instrument

The questions in the instrument were reviewed by face validity. The statements in the instrument were thoroughly examined by lecturers of the department of aquaculture and fisheries management and a lecturer from the department of agricultural extension and rural development.

3.8 Measurement of variables

3.8.1 Independent Variables

The independent variables for the study are the socio economic characteristics of the actors involved in fish marketing, the marketing channels and marketing structure.

3.8.1.1 Socioeconomics Characteristics of actors in the marketing channel

Age: Actual age in years (Interval level)

Sex: Male, Female (Nominal level)

Marital Status: Single, Married, Divorced, Widowed (Nominal level)

Household head: (Nominal level)

Household size: actual number of members (Interval level)

Number of males and females within the household: Actual number of males and females (Interval level)

Highest education attained: Primary, Secondary, Tertiary and Qu'aranic school (Ordinal level)

Occupation: Producer, Marketer, Input supplier and Processor (Nominal level)

If you are producer, which do you operate: Capture, Culture, Both (Nominal level)

Other sources of income: (Nominal level)

3.8.1.2 Marketing Channel:

Marketing channel was identified using the participants and the route through which different forms of fish were transferred from producers to consumers and a distribution channel was drawn (Madugu and Edward, 2011).

3.8.1.3 Market Structure

The structure of dried fish markets was described based on findings on concentration, product differentiation and ease of/or barrier to entry or exist.

3.8.2 Dependent Variable

3.8.2.1 Profitability and Efficiency of the actors in the marketing channel

Actual values for quantity sold, quantity bought, transportation cost, cost of preservation and storage, operational cost, capital cost, and revenue were collected (Interval level).

3.9 Data Analysis

3.9.1 Socioeconomic Characteristics

Descriptive Statistics was used in the analysis of socioeconomic characteristics. It included the use of mean, frequencies and percentages.

3.9.2 Marketing channel

Descriptive Statistics was used in the analysis of marketing channel. It included the use of mean, frequencies and percentages

3.9.1 Profitability and Efficiency of the actors in the marketing channel

The Budgetary techniques used include:

3.9.1.1 Gross margin = $TR - TVC$

Where

TR = Total Revenue

TVC=Total Variable Cost

3.9.1.2 Marketing Margin: The marketing margin represents the difference in price paid to the first seller and that paid to the final buyer. The absolute marketing margin is calculated as follows:

$$MM = TR - PC$$

Where

MM = Marketing Margin,

TR = Total marketing Revenue

PC =Purchase cost (Omonona and Udoh, 1999).

The efficiency of the market channels will be measured by

$$M.E = \frac{TR}{TC}$$

Where M.E. is Market Efficiency (Omonona and Udoh, 1999:

3.9.1.3 Market Structure

a) Concentration

The Gini coefficients were used to determine the degree of market concentration of sellers in the market. The Gini coefficients were computed by using the following formular according to Okereke and Anthonio (1988):

$$G = 1 - \Sigma xy$$

Where:

G = Gini coefficient.

x = Percentage share of each class of seller.

y = Cumulative percentage of the sales.

The Gini coefficient ranges from zero to one. A perfect equality in concentration (low) of sellers is expected if GC tends towards zero, while perfect inequality in concentration (high) of sellers is expected if GC tends towards one, if $G = 1$ market is imperfect, and if $G = 0$ market is perfect and competitive.

b) Ease of/or Barrier to Entry or Exit

In a perfect competitive market, there is ease of entry or exit by sellers. The market becomes imperfect when sellers concentration is not even (imbalance).Scale economies is the measure that was used to determine entry and exit conditions in the market. It is a measure that examines the average cost function associated with the sellers' marketing activities. This was computed using least square regression of the form:

$$b_0 + b_i x_i + e$$

(Pomeroy, 1989)

Where:

y = Total cost of marketing per class of seller per week (N).

x_i = Number of dried fish (cartoon) sold per week.

b_i = Coefficient of explanatory variables.

b_o = Intercept

e = Error term.

If the coefficient of b_i is negative, it means as quantity increases, cost decrease. This increase in cost could form barrier to entry especially by sellers that are not financially sound.

3.10 HYPOTHESES TESTING

Hypothesis 1: This study made use of Cobb-Douglas production functional form of the stochastic frontier production function to analyse the collected data. Battese and Coelli (1995) proposed a Stochastic Frontier Production Function which has firm effects assumed to be distributed as a truncated normal random variable, in which the inefficiency effects are directly influenced by a number of variables. This was achieved by using the Frontier 4.1 statistical package. The Cobb-Douglas functional form was assumed for the operation of the respondents and the empirical stochastic frontier production model is expressed as (Itam *et al.*, 2014):

$$L_n Y = L_n \beta_0 + \beta_1 L_n X_{1i} + \beta_2 L_n X_{2i} + \beta_3 L_n X_{3i} + \beta_4 L_n X_{4i} + V_i - U_i$$

Where,

Y = Output of respondents in terms of total revenue (₦)

X_1 = Total purchase cost (₦)

X_2 = Total marketing cost (₦)

X_3 = Other operational cost (₦)

X_4 = Fixed cost (depreciated (₦))

V_i = Error factor assumed to be independently and identically distributed

U_i = Technical inefficiency effects

L_n = Natural logarithm

The intercept (β_0) and the coefficients of the independent variables which range from β_1 to β_4 are parameters to be estimated. The inefficiency effects (U_i) are assumed to be non-negative, half normal distribution $N(0, \delta^2 u)$.

The influence of socio-economic factors on the monthly revenue of the marketing actors was assessed by the Technical Inefficiency model outlined as (Omobepade *et al.*, 2014; Itam *et al.*, 2014):

$$U_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3$$

Where,

U_i = Technical Inefficiency

Z_1 = Sex of respondents (Dummy, Female = 2, Male = 1)

Z_2 = Age of respondents (years)

Z_3 = Highest level of education

δ_0 - δ_3 are the parameters to be estimated.

The inefficiency model and production function were analysed at $P < 0.05$

Hypothesis 2: ANOVA $\alpha_{0.05}$

Hypothesis 3: ANOVA $\alpha_{0.05}$

Hypothesis 4: Gini Coefficient

CHAPTER FOUR

4.0

RESULTS

4.1 Socioeconomic characteristics of Producers, Marketers and Processors in Sokoto State

4.1.1 Sex of respondents:

Table 4.1 shows the socioeconomic characteristics of producers, marketers and processors in Sokoto state. From the results in Table 4.1, there were all male (100.0%) producers, 98.0% male marketers and 80.0% male processors. 2.0% and 20.0% of the marketers and processors respectively were female.

4.1.2 Age of respondents

Majority (36.0% and 40.0% respectively) of the producers and processors were within the age of 31-40 years, while majority (36.0%) of the marketers was within the age of 41-50 years. The mean age for the producers, marketers and processors were 44, 45 and 45 respectively as shown in Table 4.1.

4.1.3 Marital Status of respondents

There was a predominance of married respondents in Sokoto State followed by single respondents while none were divorced or widowed. 86.0%, 88.0% and 92.0% of producers, marketers and processors respectively were married while 14.0%, 12.0% and 8.0% of producers, marketers and processors were single as shown in Table 4.1

4.1.4 Household size of respondents

Majority (44.0%, 54.0% and 54.0% respectively) of the producers, marketers and processors had household sizes of within 6-10 persons. 32.0%, 26.0% and 22.0% of producers, marketers and processors respectively had household sizes of 5 persons and below.

The mean household sizes of producers, marketers were 8 persons while for processors were 10 persons as shown in Table 4.1.

Table 4.1: Socioeconomic characteristics of Producers, Marketers and Processors in Sokoto State

Variables	Categories	Main Occupations									
		Capture		Culture		Producer		Marketer		Processor	
		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Sex	Male	25	100.0	25	100.0	50	100.0	49	98.0	40	80.0
	Female	0	0.0	0	0.0	0	0.0	1	2.0	10	20.0
Age	≤ 30	2	8.0	1	4.0	3	6.0	1	2.0	1	2.0
	31-40	7	28.0	11	44.0	18	36.0	17	34.0	20	40.0
	41-50	7	28.0	7	28.0	14	28.0	18	36.0	15	30.0
	51-60	7	28.0	5	20.0	12	24.0	9	18.0	8	16.0
	> 60	2	8.0	1	4.0	3	6.0	5	10.0	6	12.0
	Mean±SD	45±10.97		44±8.75		44±9.84		45±9.1		45±45.18	
Marital Status	Single	4	16.0	3	12.0	7	14.0	6	12.0	4	8.0
	Married	21	84.0	22	88.0	43	86.0	44	88.0	46	92.0
	Divorced	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Widowed	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Household size	≤5	8	32.0	8	32.0	16	32.0	13	26.0	11	22.0
	6-10	11	44.0	11	44.0	22	44.0	27	54.0	27	54.0
	11-15	6	24.0	4	16.0	10	20.0	6	12.0	5	10.0
	16-20	0	0.0	1	4.0	1	2.0	4	8.0	0	0.0
	> 20	0	0.0	1	4.0	1	2.0	0	0.0	7	14.0
	Mean±SD	8±4		8±6		8±5		8±4		10±8	
Educational Qualification	primary education	3	12.0	4	16.0	7	14.0	9	18.0	6	12.0
	secondary education	5	20.0	8	32.0	13	26.0	15	30.0	21	42.0
	Tertiary education	1	4.0	9	36.0	10	20.0	7	14.0	4	8.0
	Qu'aranic education	16	64.0	4	16.0	20	40.0	19	38.0	19	38.0
	≤ 10	20	80.0	19	76.0	39	78.0	19	38.0	23	46.0
Marketing experience	11—20	2	8.0	5	20.0	7	14.0	17	34.0	19	38.0
	21-30	0	0.0	1	4.0	1	2.0	10	20.0	4	8.0
	31-40	2	8.0	0	0.0	2	4.0	4	8.0	3	6.0
	>40	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Mean±SD	10±8.7		9±5.63		10±7.24		17±9.03		13±8.29	
Membership of cooperative	No	9	36.0	9	36.0	18	36.0	19	38.0	20	40.0
	Yes	16	64.0	16	64.0	32	64.0	31	62.0	30	60.0

4.1.5 Educational Qualification of respondents

From the analysis in Table 4.1, majority (40.0% and 38.0% respectively) of the producers and marketers had qu'aranic education, while majority (42.0%) of the processors had up to secondary school education. 26.0% and 30.0% of producers and marketers respectively had up to secondary school education while 38.0% of processors qu'aranic education. Culture producers had the highest number (36.0%) of respondents with tertiary education.

4.1.6 Marketing Experience

Majority (78.0%, 38.0% and 46.0% respectively) of the producers, marketers and processors had marketing experience of 10 years and below. The mean marketing experience was 10 years, 17years and 13 years for producers, marketers and processors respectively as shown in Table 4.1.

4.1.7 Membership of Cooperative Societies

Majority (32.0%, 31.0% and 60.0% respectively) of the producers, marketers and processors in the state are members of cooperative societies as shown in Table 4.1.

4.2 Socioeconomic Characteristics of Producers, Marketers and Processors in Katsina State

4.2.1 Sex of respondents:

Table 4.2 shows the socioeconomic characteristics of producers, marketers and processors in Katsina state. From the results in Table 4.2, there were all male (100.0%) producers, 98.0% male marketers 98.0% male processors. 2.0% of the marketers and processors respectively were female.

Table 4.2: Socioeconomic characteristics of Producers, Marketers and Processors in Katsina State

Variables	Categories	Capture		Culturer		Producer		Marketer		Processor	
		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Sex of respondents	Male	25	100.0	25.0	100.0	50.0	100.0	49.0	98.0	49.0	98.0
	Female	0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	1.0	2.0
Age of respondents	less or equal 30	1	4.0	4.0	16.0	5.0	10.0	3.0	6.0	6.0	12.0
	31-40	3	12.0	5.0	20.0	8.0	16.0	18.0	36.0	26.0	52.0
	41-50	9	36.0	13.0	52.0	22.0	44.0	12.0	24.0	11.0	22.0
	51-60	11	44.0	3.0	12.0	14.0	28.0	16.0	32.0	7.0	14.0
	above 60	1	4.0	0.0	0.0	1.0	2.0	1.0	2.0	0.0	0.0
Mean±SD		49±9		42±9		45±10		44±10		39±8	
Marital Status	Single	1	4.0	1.0	4.0	2.0	4.0	4.0	8.0	7.0	14.0
	Married	24	96.0	24.0	96.0	48.0	96.0	46.0	92.0	43.0	86.0
	Divorced	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Widowed	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Household size	less or equal 5	2	8.0	5.0	20.0	7.0	14.0	6.0	12.0	5.0	10.0
	6-10	11	44.0	12.0	48.0	23.0	46.0	20.0	40.0	20.0	40.0
	11-15	4	16.0	7.0	28.0	11.0	22.0	19.0	38.0	17.0	34.0
	16-20	4	16.0	1.0	4.0	5.0	10.0	3.0	6.0	3.0	6.0
	above 20	3	12.0	0.0	0.0	3.0	6.0	1.0	2.0	1.0	2.0
Mean±SD		12±6		9±4		10±5		10±5		10±6	
Educational Qualification	primary education	0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	2.0	4.0
	secondary education	4	16.0	12.0	48.0	16.0	32.0	29.0	58.0	25.0	50.0
	Tertiary education	1	4.0	9.0	36.0	10.0	20.0	1.0	2.0	0.0	0.0
	Qu'ranic education	20	80.0	4.0	16.0	24.0	48.0	19.0	38.0	23.0	46.0
	Mass education	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	less or equal 10	2	8.0	22.0	88.0	24.0	48.0	7.0	14.0	11.0	22.0
How long have you been marketing fish	11—20	9	36.0	1.0	4.0	10.0	20.0	37.0	74.0	36.0	72.0
	21-30	11	44.0	0.0	0.0	11.0	22.0	4.0	8.0	3.0	6.0
	31-40	3	12.0	0.0	0.0	3.0	6.0	1.0	2.0	0.0	0.0
	above 40	0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	0.0	0.0
Mean±SD		22±8		7±2		15±10		16±6		15±5	
Are you a member of any cooperative society?	No	14	56.0	14.0	56.0	28.0	56.0	14.0	28.0	14.0	28.0
	Yes	11	44.0	11.0	44.0	22.0	44.0	36.0	72.0	36.0	72.0

4.2.2 Age of respondents

Majority (44.0%) of the producers were within the age of 41-50 years, while majority (36.0% and 53.0% respectively) of the marketers and processors was within the age of 31-40 years. The mean age for the producers, marketers and processors were 45, 44 and 39 years respectively as shown in Table 4.2.

4.2.3 Marital Status of respondents

There was a predominance of married respondents in Katsina State followed by single respondents while none were divorced or widowed. 96.0%, of producers and marketers and 86.0% of processors were married while 4.0%, 7.0% and 24.0% of producers, marketers and processors respectively were single as shown in Table 4.2.

4.2.4 Household size of respondents

Majority (46.0%, 40.0%, 40.0%) of the producers, marketers and processors had household sizes of within 6-10 persons. 22.0%, 38.0% and 34.0% of producers, marketers and processors respectively had household sizes of within 11-15. The mean household sizes of producers, marketers and processors were 10 persons as shown in Table 4.2.

4.2.5 Educational Qualification of respondents

From the analysis in Table 4.2, majority (48.0%) of the producers had qu'aranic education, while majority (58.0% and 50.0% respectively) of the marketers and processors had up to secondary school education. 32.0% producers had up to secondary school education while 38.0% and 46.0% of marketers and processors respectively had qu'aranic education. Culture producers had the highest number (36.0%) of respondents with tertiary education.

4.2.6 Marketing Experience

Majority (44.0%) of the culture producers had marketing experience within 21-20 years while majority of culture producers (88.0%) had marketing experience of 10 years and below, while majority (74.0% and 72.0% respectively) of marketers and processors had marketing experience of within 11-20 years. The mean marketing experience was 22 years, 7years, 16years and 15 years for capture producers, culture producers, marketers and processors respectively as shown in Table 4.2.

4.2.7 Membership of Cooperative Societies

Majority (44.0%, 72.0% and 72.0% respectively) of the producers, marketers and processors in the state are members of cooperative societies as shown in Table 4.2.

4.3 Socioeconomic Characteristics of Producers, Marketers and Processors in Jigawa State

4.3.1 Sex of respondents:

Table 4.3 shows the socioeconomic characteristics of producers, marketers and processors in Jigawa state. From the results in Table 4.3 there were all male (100.0%) capture producers, 94.0% male marketers, 98.0% male processors. 12.0% of culture producers, 6.0% and 2.0% of the marketers and processors respectively were female.

4.3.2 Age of respondents

Majority (34.0%, 34.0% and 44.0% respectively) of the producers, marketers and processors were within the age of 51-60 years, 30.0% of producers and 34.0% of marketers and processors were within the age of 41-50 years. The mean age for the producers, marketers and processors were 46, 45and 47 years respectively as shown in Table 4.3.

Table 4.3: Socioeconomic characteristics of Producers, Marketers and Processors in Jigawa State

Variables	Categories	Capture		Culture		Producer		Marketer		Processor	
		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Sex	Male	25	100.0	22	88.0	47	94.0	47	94.0	49	98.0
	Female	0	0.0	3	12.0	3	6.0	3	6.0	1	2.0
Age	less or equal 30	3	12.0	2	8.0	5	10.0	8	16.0	3	6.0
	31-40	6	24.0	2	8.0	8	16.0	7	14.0	7	14.0
	41-50	4	16.0	11	44.0	15	30.0	17	34.0	17	34.0
	51-60	11	44.0	6	24.0	17	34.0	17	34.0	22	44.0
	above 60	1	4.0	4	16.0	5	10.0	1	2.0	1	2.0
Mean±SD		46±11.46		48±10.43		47±10.94		45±10.32		47±8.87	
Marital Status	Single	3	12.0	2	8.0	5	10.0	8	16.0	3	6.0
	Married	22	88.0	23	92.0	45	90.0	42	84.0	47	94.0
	Divorced	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Widowed	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Household size	less or equal 5	4	16.0	3	12.0	7	14.0	3	6.0	8	16.0
	6-10	4	16.0	5	20.0	9	18.0	11	22.0	12	24.0
	11-15	7	28.0	6	24.0	13	26.0	10	20.0	17	34.0
	16-20	5	20.0	5	20.0	10	20.0	12	24.0	4	8.0
	above 20	5	20.0	6	24.0	11	22.0	14	28.0	8	16.0
Mean±SD		15±9		15±9		15±9		15±7		13±9	
Educational Qualification	primary education	1	4.0	0	0.0	1	2.0	4	8.0	3	6.0
	secondary education	16	64.0	13	52.0	29	58.0	24	48.0	18	36.0
	Tertiary education	0	0.0	2	8.0	2	4.0	3	6.0	1	2.0
	Qu'aranic education	8	32.0	9	36.0	17	34.0	18	36.0	26	52.0
Marketing experience	≤10	6	24.0	6	24.0	12	24.0	26	52.0	19	38.0
	11—20	9	36.0	10	40.0	19	38.0	17	34.0	19	38.0
	21-30	3	12.0	1	4.0	4	8.0	5	10.0	6	12.0
	31-40	0	0.0	0	0.0	0	0.0	0	0.0	1	2.0
	above 40	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Mean±SD		14.5±6.6		13.2±5.78		13.89±6.14		11.79±6.7		12.54±6.53	
Membership of cooperative	No	8	32.0	10	40.0	18	36.0	24	48.0	25	50.0
	Yes	17	68.0	15	60.0	32	64.0	26	52.0	25	50.0

4.3.3 Marital Status of respondents

There was a predominance of married respondents in Jigawa State followed by single respondents while none were divorced or widowed. 90.0% of producers, 84.0% of marketers and 94.0% of processors were married while 10.0%, 16.0% and 94.0% of producers, marketers and processors respectively were single as shown in Table 4.3.

4.3.4 Household size of respondents

Majority (26% and 34% respectively) of the producers and processors had household size of within 11-15 persons; majority of marketers had household sizes of within 16-20 persons. The mean household sizes of the respondent in Jigawa state were 15 persons for producers and marketers and 13 persons for processors as shown in Table 4.3.

4.3.5 Educational Qualification of respondents

From the result in Table 4.3, majority (52.0% and 48.0% respectively) of the producers and marketers had up to secondary school education, while majority (52.0%) of the processors had just qu'aranic education. 34.0% producers and 36.0% of marketers had only qu'aranic education. Culture producers had the highest number (8.0%) of respondents with tertiary education.

4.3.6 Marketing Experience

Majority (38.0%) of the producers had marketing experience of within 11-20 years while majority (52.0%) of the marketers had marketing experience of 10 years and below, 38.0% of processors had marketing experience of 10 years and below and also 11-15 years. The mean marketing experience was 14 years, 12years and 13years for producers, marketers and processors respectively as shown in Table 4.3.

4.3.7 Membership of Cooperative Societies

Majority (64.0% and 52.0% respectively) of the producers and marketers belong to cooperative societies. 50.0% of processors in Jigawa state are members of cooperative societies and 50.0% are not members of cooperative societies as shown in Table 4.3.

4.4 Socioeconomic Characteristics of Producers, Marketers and Processors in Yobe State

4.4.1 Sex of respondents:

Table 4.4 shows the socioeconomic characteristics of producers, marketers and processors in Yobe state. From the results in table 4.5, there were 94.0% male producers, 88.0% male marketers 80.0% male processors. 6.0% producers, 10.0% and 20.0% of the marketers and processors respectively were female.

4.4.2 Age of respondents

38.0%, 36.0% and 42.0% respectively of the producers, marketers and processors were within the ages of 41-50 years, 36.0% of marketers were also within the ages of 31-40 years and 32.0% of processors were within the age of 51-60 years. The mean age for the producers, marketers and processors were 47, 44 and 46 years respectively as shown in Table 4.4.

4.4.3 Marital Status of respondents

There was a predominance of married respondents in Yobe State followed by single respondents. 84.0% of producers, 82.0% of marketers and processors were married while 12.0%, 14.0% and 6.0% of producers, marketers and processors respectively were single as shown in Table 4.4. There were no widowed producers, 5.0% and 10.0% of marketers and processors respectively were widowed, while 4.0% of producers and 2.0% of marketers and processors were divorced.

4.4.4 Household size of respondents

Majority (34.0%) of the producers and marketers had household size of within 6-10 persons; majority of processors had household sizes of within 11-15 persons. The mean household sizes of the respondent in Yobe state were 7, 10 and 11 persons respectively for producers, marketers and processors as shown in Table 4.4.

Table 4.4 Socioeconomic Characteristics of Producers, Marketers and Processors in Yobe State

Variables	Categories	Major Occupation									
		Capture		Culture		Producer		Marketer		Processor	
		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Sex	Male	24	96.0	23	92.0	47	94.0	44	88.0	40	80.0
	Female	1	4.0	2	8.0	3	6.0	6	12.0	10	20.0
Age	≤ 30	1	4.0	0	0.0	1	2.0	2	4.0	2	4.0
	31-40	5	20.0	8	32.0	13	26.0	18	36.0	13	26.0
	41-50	11	44.0	8	32.0	19	38.0	18	36.0	16	32.0
	51-60	6	24.0	4	16.0	10	20.0	10	20.0	16	32.0
	> 60	2	8.0	5	20.0	7	14.0	2	4.0	3	6.0
	Mean±SD	46±10.15		48±10.43		47±10.23		44±9.33		46±9.47	
Marital Status	Single	4	16.0	2	8.0	6	12.0	7	14.0	3	6.0
	Married	20	80.0	22	88.0	42	84.0	41	82.0	41	82.0
	Divorced	1	4.0	1	4.0	2	4.0	1	2.0	1	2.0
	Widowed	0	0.0	0	0.0	0	0.0	1	2.0	5	10.0
Household size	≤ 5	13	52.0	9	36.0	22	44.0	14	28.0	8	16.0
	6-10	7	28.0	10	40.0	17	34.0	17	34.0	12	24.0
	11-15	4	16.0	5	20.0	9	18.0	14	28.0	22	44.0
	16-20	0	0.0	0	0.0	0	0.0	3	6.0	6	12.0
	> 20	1	4.0	1	4.0	2	4.0	2	4.0	2	4.0
	Mean±SD	6±5		8±5		7±5		10±7		11±5	
Educational Qualification	primary education	15	60.0	6	24.0	21	42.0	20	40.0	26	52.0
	secondary education	7	28.0	11	44.0	18	36.0	19	38.0	13	26.0
	Tertiary education	0	0.0	4	16.0	4	8.0	0	0.0	0	0.0
	Qu'aranic education	3	12.0	4	16.0	7	14.0	11	22.0	11	22.0
	Mass education	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	≤10	8	32.0	16	64.0	24	48.0	36	72.0	26	52.0
Marketing Experience	11—20	10	40.0	5	20.0	15	30.0	13	26.0	14	28.0
	21-30	5	20.0	3	12.0	8	16.0	0	0.0	10	20.0
	31-40	0	0.0	1	4.0	1	2.0	0	0.0	0	0.0
	> 40	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Mean ±SD	15±7		12±8.34		13±7.8		8±4.32		14±7.31	
Membership of cooperative	No	1	4.0	4	16.0	5	10.0	16	32.0	19	38.0
	Yes	24	96.0	21	84.0	45	90.0	34	68.0	31	62.0

4.4.5 Educational Qualification of respondents

From the result in Table 4.4, majority (42.0%, 40.0% and 52.0% respectively) of the producers, marketers and processors had up to primary school education, 36.0%, 38.0% and 26.0% respectively of producers, marketers and processors had secondary school education. 14.0% of producers and 22.0% of marketers and processors had only qu'aranic education.

4.4.6 Marketing Experience

Majority (48.0%, 72.0% and 52.0% respectively) of the producers, marketers and processors had marketing experience of 10 years and below. 30.0%, 26.0% and 28.0% of producers, marketers and processors respectively have marketing experience of within 11-20 years. The mean marketing experience was 13 years, 8 years and 14 years for producers, marketers and processors respectively as shown in Table 4.4.

4.4.7 Membership of Cooperative Societies

Majority (90.0%, 68.0% and 62.0% respectively) of the producers, marketers and processors belong to cooperative societies as shown in Table 4.4.

4.5 Socioeconomic Characteristics of Producers, Marketers and Processors in Niger State

4.5.1 Sex of respondents:

Table 4.5 shows the socioeconomic characteristics of producers, marketers and processors in Niger state. From the results in Table 4.5, there was a predominance of producers and marketers with 92.0% male producers, 88.0% male marketers and a predominance of female processors 54.0% female processors.

4.5.2 Age of respondents

Majority (34.0% and 38.0% respectively) of the producers and marketers fell within the age range of 41-50 years while majority of the processors were within the ages of 31-40 years.

Table 4.5 Socioeconomic Characteristics of Producers, Marketers and Processors in Niger State

Variables	Categories	Main Occupations					
		Producer		Marketer		Processor	
		Freq	%	Freq	%	Freq	%
Sex	Male	46	92.0	44	88.0	23	46.0
	Female	4	8.0	6	12.0	27	54.0
Age	less or equal 30	2	4.0	3	6.0	3	6.0
	31-40	16	32.0	15	30.0	25	50.0
	41-50	17	34.0	19	38.0	11	22.0
	51-60	13	26.0	11	22.0	8	16.0
	above 60	2	4.0	2	4.0	3	6.0
	Mean±SD	45±9.04		45.±9.77		42±9.95	
Marital Status	Single	0	0.0	1	2.0	0	0.0
	Married	50	100.0	48	96.0	47	94.0
	Divorced	0	0.0	1	2.0	2	4.0
	Widowed	0	0.0	0	0.0	1	2.0
Household size	less or equal 5	6	12.0	15	30.0	8	16.0
	6-10	32	64.0	29	58.0	37	74.0
	11-15	8	16.0	4	8.0	3	6.0
	16-20	3	6.0	1	2.0	1	2.0
	above 20	1	2.0	1	2.0	1	2.0
Mean±SD	9±4		7±4		8±4		
Educational Qualification	primary education	1	2.0	4	8.0	2	4.0
	secondary education	4	8.0	9	18.0	7	14.0
	Tertiary education	0	0.0	2	4.0	0	0.0
	Qu'aranic education	45	90.0	35	70.0	41	82.0
	Mass education	0	0.0	0	0.0	0	0.0
	Marketing experience	less or equal 10	22	44.0	25	50.0	36
Marketing experience	11—20	11	22.0	21	42.0	3	6.0
	21-30	4	8.0	1	2.0	0	0.0
	31-40	0	0.0	1	2.0	0	0.0
	above 40	0	0.0	0	0.0	0	0.0
	Mean±SD	11.68±6.09		10.40±5.88		6.90±2.73	
Membership of cooperative	No	17	34.0	15	30.0	18	36.0
	Yes	30	60.0	27	54.0	32	64.0

The mean age for the producers, marketers and processors were 45 years for producers and marketers and 42 years for processors as shown in Table 4.5.

4.5.3 Marital Status of respondents

There was a predominance of married respondents in Niger State. 100.0% of producers, 96.0% of marketers and 94.0% processors were married while 2.0% of marketers were single as shown in Table 4.5. There were no widowed producers and marketers while 2.0% of the processors were widowed. 2.0% and 4.0% of marketers and processors respectively were divorced.

4.5.4 Household size of respondents

Majority (64.0%, 58.0% and 74.0% respectively) of the producers, marketers and processors had household size of within 6-10 persons. The mean household sizes of the respondents in Niger state were 9 persons for producers and 8 persons for marketers and processors as shown in Table 4.5.

4.5.5 Educational Qualification of respondents

From the result in Table 4.5, majority (90.0%, 70.0% and 82.0% respectively) of the producers, marketers and processors had only qu'aranic education, 8.0%, 18.0% and 14.0% respectively of producers, marketers and processors had up to secondary school education.

4.5.6 Marketing Experience

Majority (44.0%, 50.0% and 72.0% respectively) of the producers, marketers and processors had marketing experience of 10 years and below. 22.0%, 42.0% and 6.0% of producers, marketers and processors respectively have marketing experience of within 11-20 years. The mean marketing experience was 12 years, 10years and 7years for producers, marketers and processors respectively as shown in Table 4.5.

4.5.7 Membership of Cooperative Societies

Majority (60.0%, 54.0% and 64.0% respectively) of the producers, marketers and processors belong to cooperative societies as shown in Table 4.5.

4.6 Socioeconomic Characteristics of all respondents in the Geopolitical zones

4.6.1 Sex of respondents:

There was a predominance of male respondents across the geopolitical zones with 95.6% in the North West, 87.3% in the North East and 75.3% in the North Central. The female respondents had a lower percentage with 4.4% in the North West, 12.7% in the North East and 24.7% in the North Central as shown in Figure 4.1.

4.6.2 Age of respondents:

The result in Figure 4.2 shows that majority (31.3% and 35.3% respectively) of the respondents in the North West and North Central fall within the age range of 41-50 years while the majority (37.3%) in the North Central falls within the age ranges of 31-40 years. The least number of respondents fall within the age category of less than or equal to 30 years with percentages of 7.8%, 3.3% and 5.3% in the North West, North East and North Central respectively. The mean ages of respondents in the North West, North East and North Central were 45, 46 and 43 respectively.

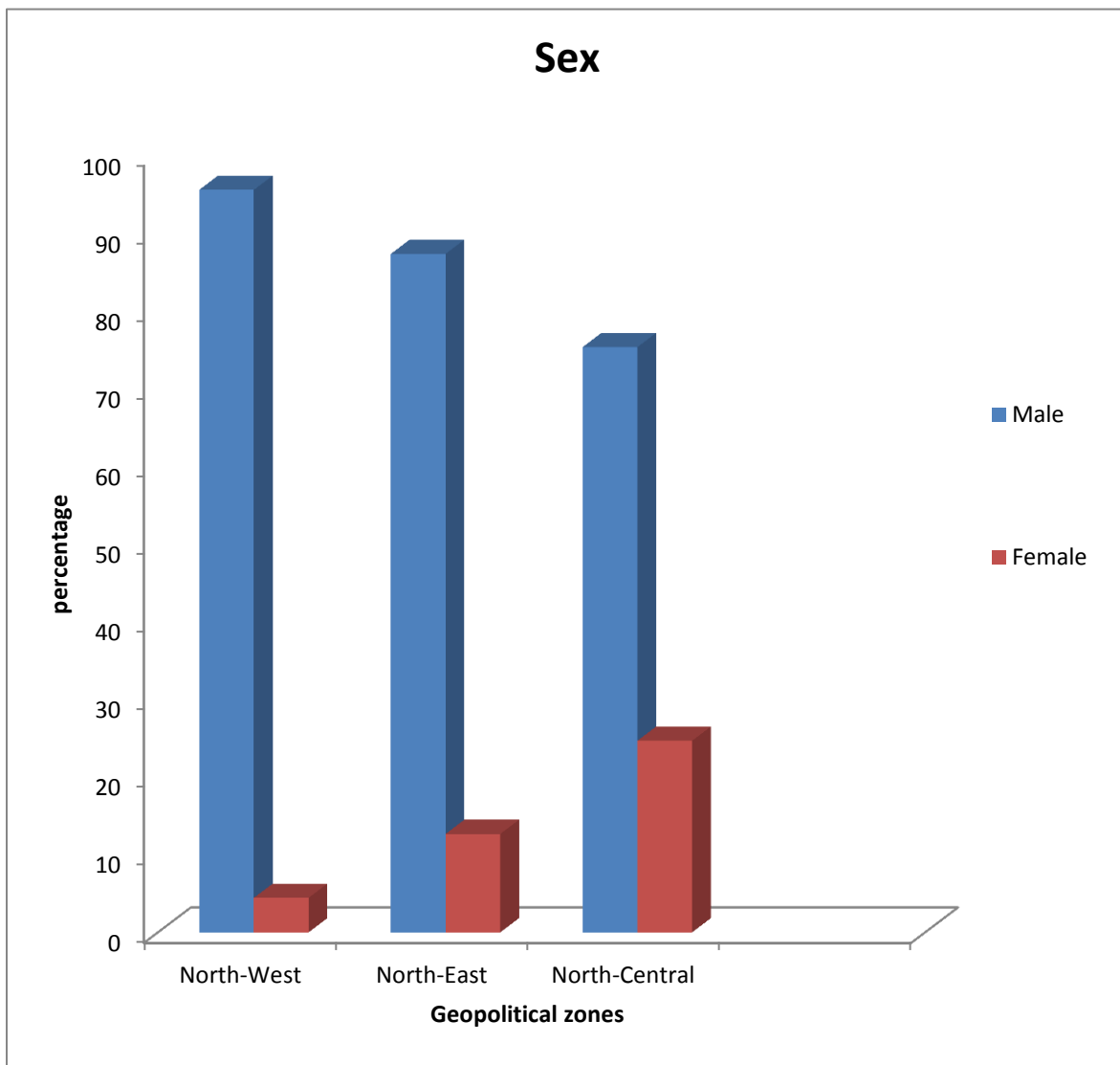


Figure 4.1: Sex of respondents based on Geopolitical zones

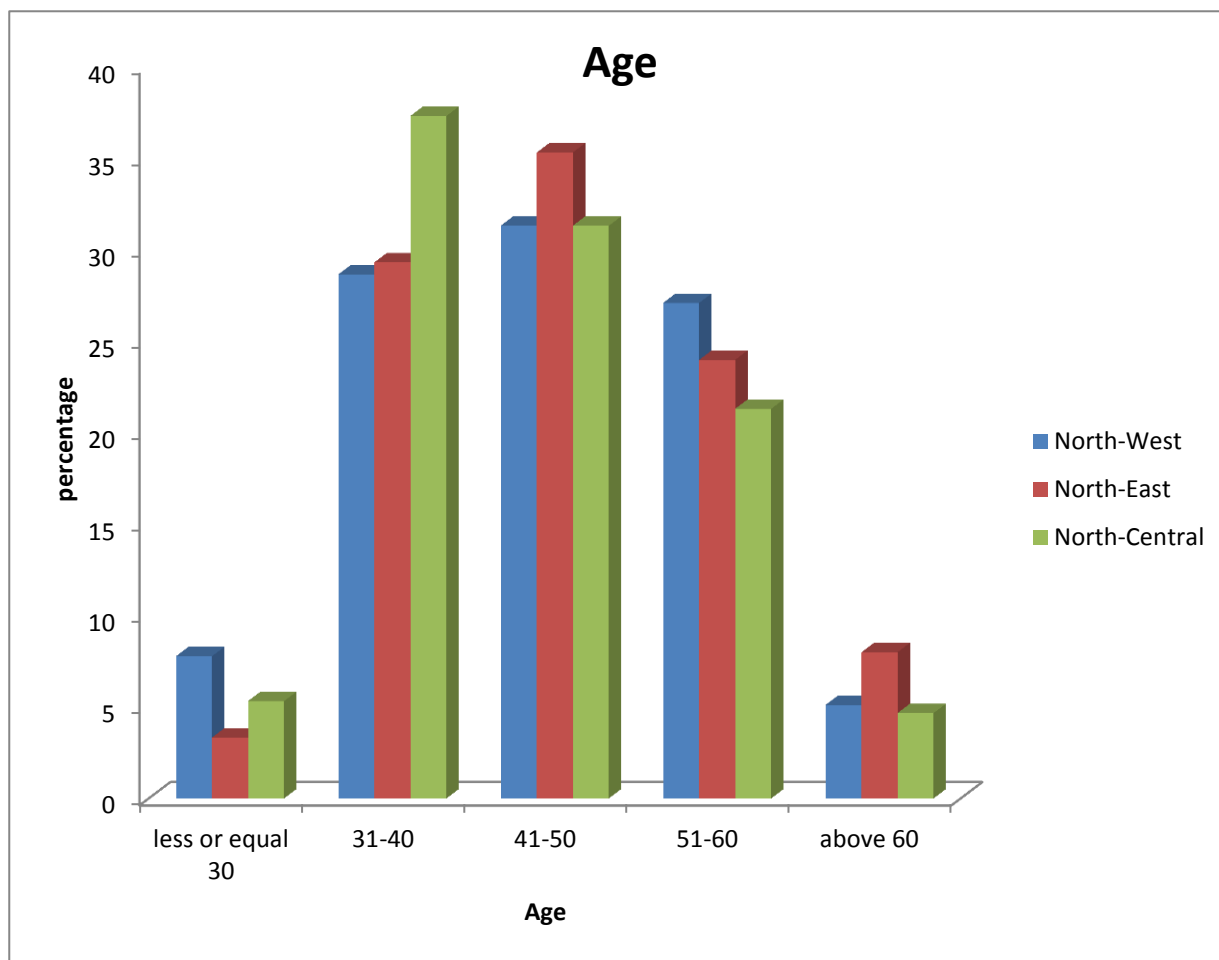


Figure 4.2: Age of respondents based on Geopolitical zones

4.6.3 Marital Status of respondents:

Figure 4.3 shows a predominance of married respondents across the three geopolitical zones with 89.8% in the North West, 82.7% in the North East and 96.7% in the North Central, this was followed by single respondents with 10.2% in the North West, 82.7% in the North East and 96.7% in the North Central. There are no divorced or widowed respondents in the North West while in the North East 2.7% are divorced and 4% are widowed. In the North Central 2.0% are divorced and 0.7% are widowed.

4.6.4 Household Size:

The results from Figure 4.4 shows that majority of the respondents have large household sizes. The respondents with the largest percentage are those with household sizes of between 6-10 across the 3 geopolitical zones with 38.0% in the North West, 30.7% in the North East and 65.3% in the North Central. 24.0%, 30.0% and 10.0% of respondents respectively in the North West, North east and North Central have family size of within 11-15. 9.3%, 6.0% and 3.3% in the North West, North East and North Central respectively have household sizes of between 16-20, 16.9% 29.3% and 19.3% have family sizes of less than 5 while respondents with the lowest percentage have household sizes of greater than or equal to 20 with 10.2% in the North West, 4.0% in the North East and 2.0% in the North Central. The mean household sizes in the North West, North East and North Central respectively were 11, 12 and 13 respectively.

4.6.5 Educational Qualification

Figure 4.5 shows that majority of the respondents in the North West have up to secondary school education, while majority of the respondents in the North East have primary education. Majority of the respondents in the North Central have qu'aranic education. 41.1% of respondents in the North West have qu'aranic education, while 19.3% of respondents in the North East have qu'aranic education. The least number of respondents in the three geopolitical zones have tertiary education with percentages of 8.4%, 2.7% and 1.3%.

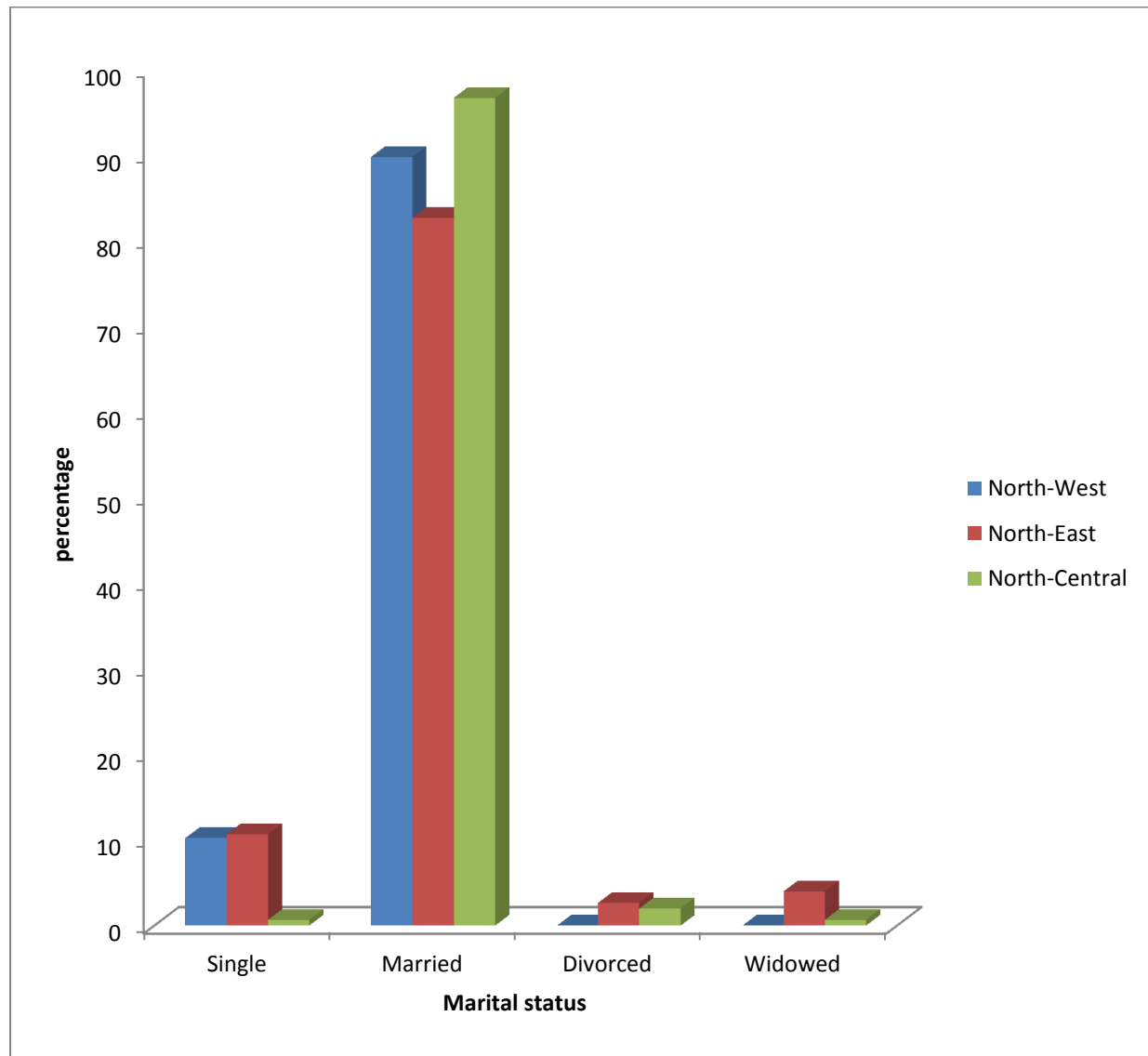


Figure 4.3: Marital Status of respondents based on Geopolitical zones

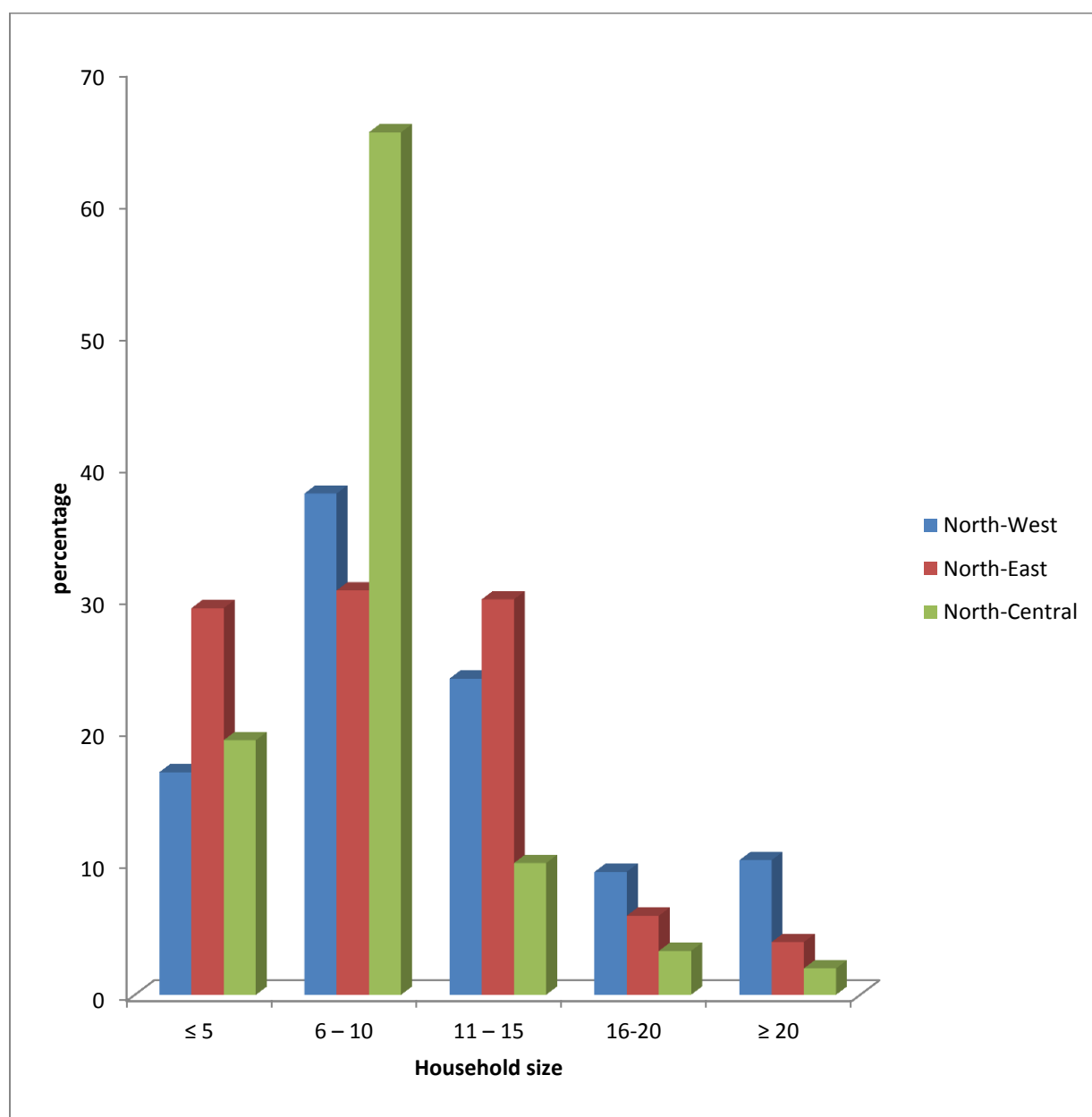


Figure 4.4: Household size of respondents based on Geopolitical zones

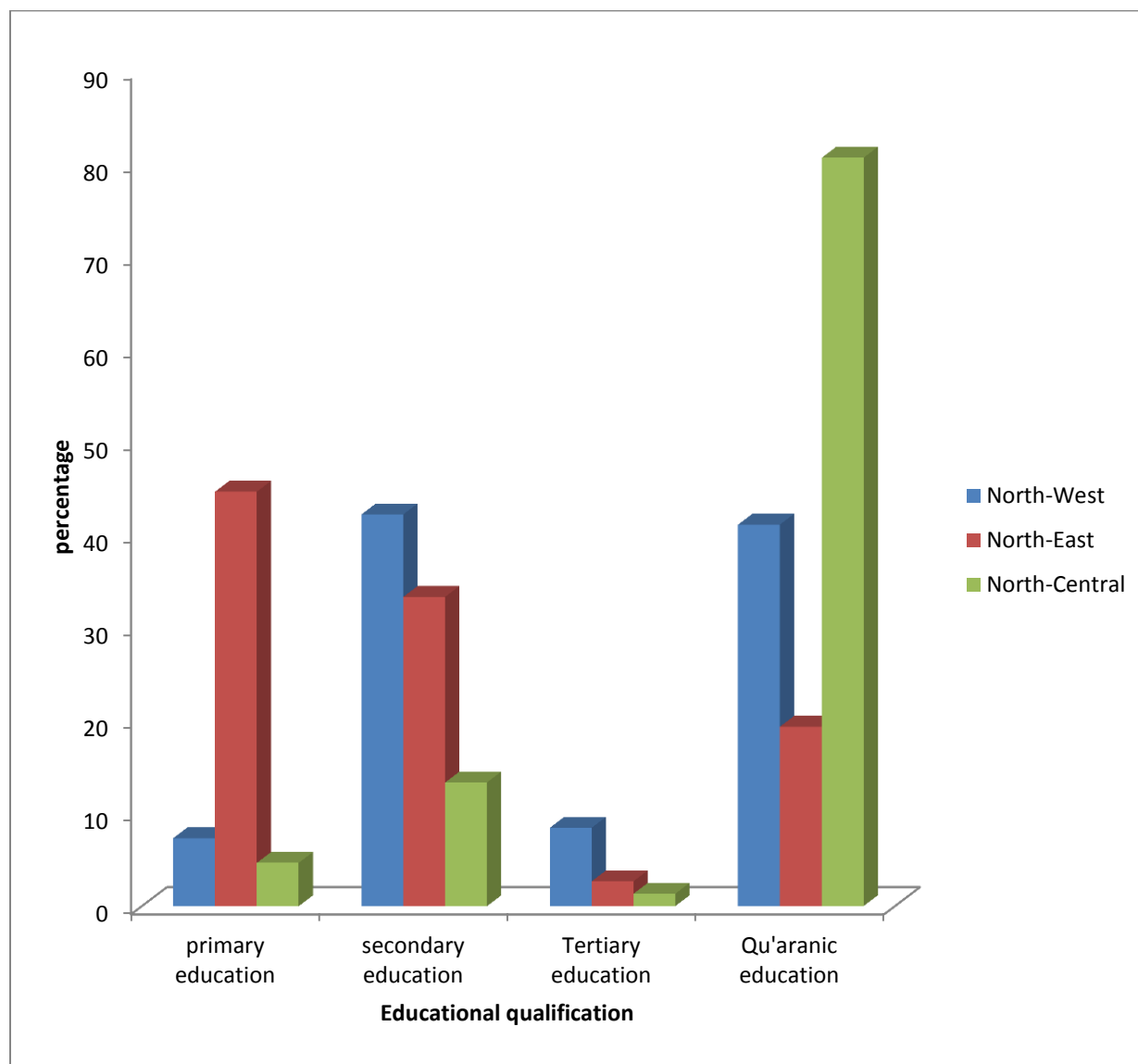


Figure 4.5: Educational Qualification of respondents based on Geopolitical zones

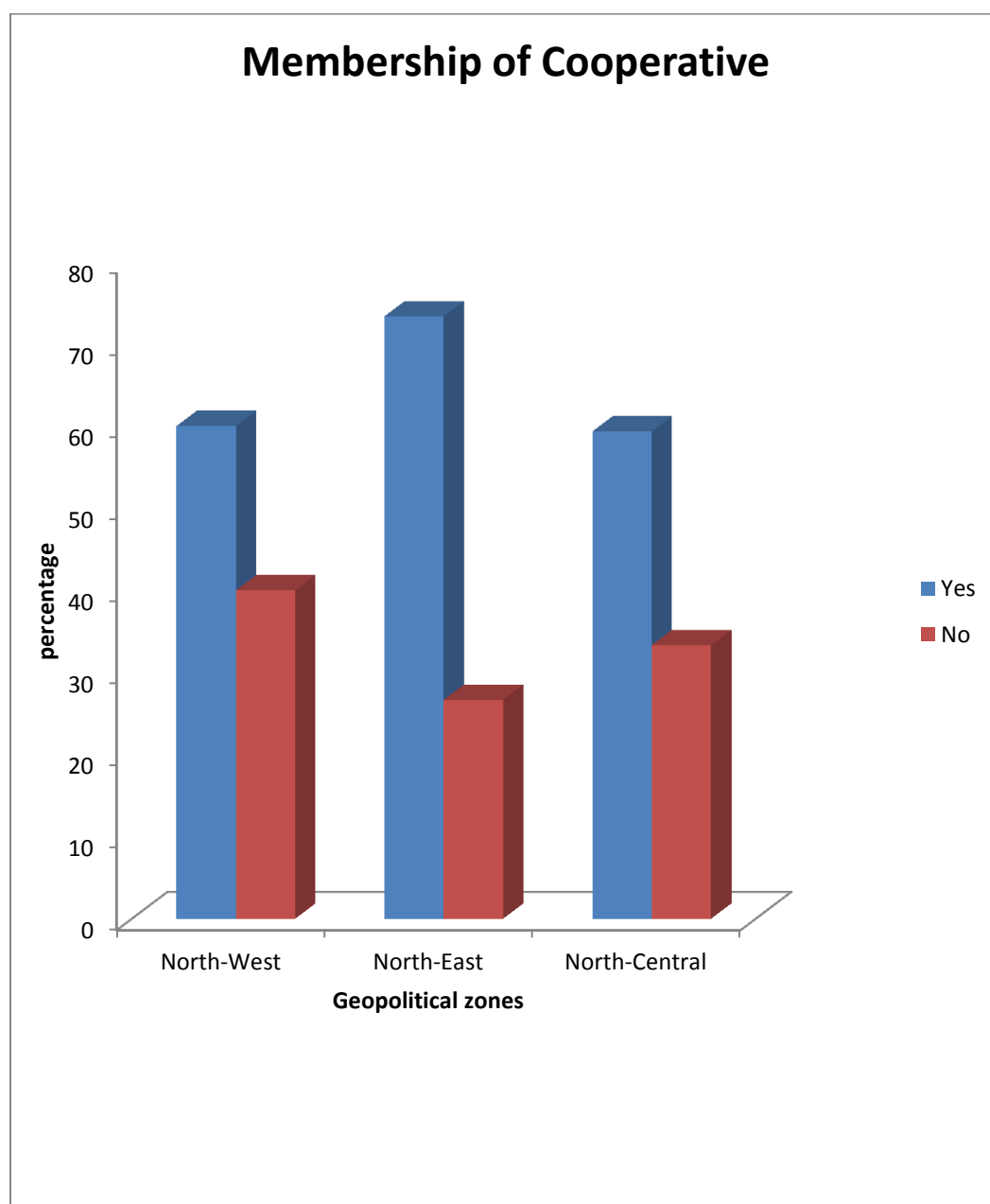


Figure 4.6: Membership of cooperative societies of respondents based on Geopolitical zones

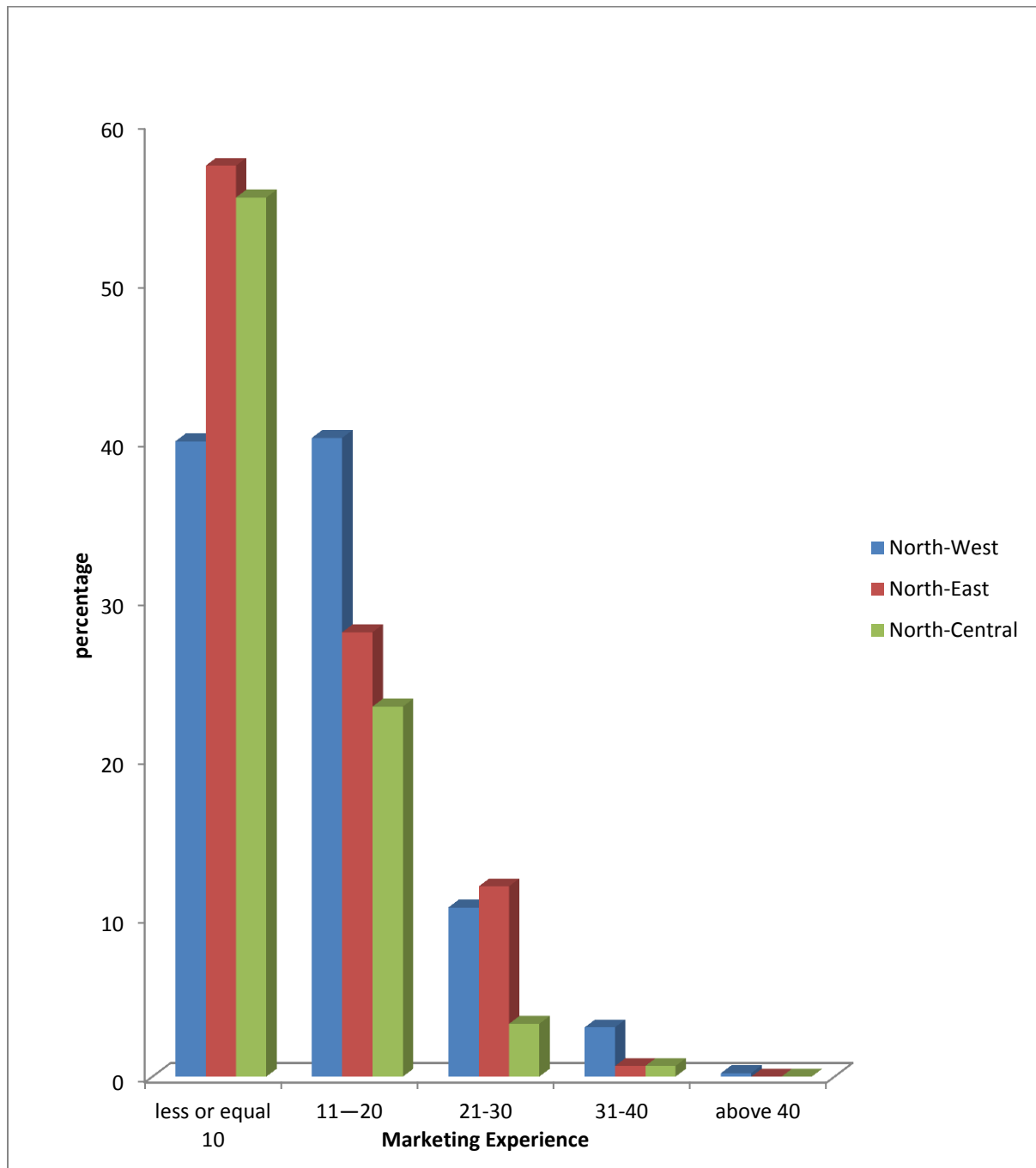


Figure 4.7: Marketing experience of respondents based in Geopolitical zone

4.7. FORMS OF FISH PRODUCTS MARKETED

Majority (44.93%) of the fish product marketed in Nigeria-Niger border and Lake Kainji-inland fisheries was fresh fish while spiced fish had the least percentage of 1.47% (Figure 4.8). The results of forms of fish products presented in Figure 4.8 indicated that Katsina, Yobe and Niger States had 47.33%, 28.00% and 26.00% respectively of fresh, smoked and dried fish products as the majorly marketed fish products. Appendix VI and VII shows fried and smoked fish being sold in Dannako, in Katsina State and Monday Market, New Bussa, in Niger State.

4.8 Profitability and Efficiency of Marketing Fish Products

4.8.1 Profitability and Efficiency of Fish Products Marketed

Presented in Table 4.6 are the variables indicating the volume, profitability and marketing efficiency of different fish products marketed in the States along Nigeria-Niger border and Lake Kainji-inland fisheries. The results showed that fresh fish had the highest average quantity sold of $1,701.89 \pm 973.37\text{kg}$, followed by smoked fish with $1,562.62 \pm 545.30\text{kg}$ while fried fish had the least quantity sold of $877.98 \pm 336.93\text{kg}$. Statistically, there was significant difference ($P < 0.05$) in the average quantity of fish products sold in the study area.

The highest average buying price of $\text{₦}1,124.43 \pm 711.48/\text{kg}$ was recorded in dried fish products while fresh fish had the least average buying price of $\text{₦}358.42 \pm 67.07/\text{kg}$. There was significant difference ($P < 0.05$) in selling price of fish products in the study area as dried and smoked fish products had the highest selling prices of $\text{₦}1,976.28 \pm 651.57/\text{kg}$ and $\text{₦}1,957.91 \pm 652.28/\text{kg}$ respectively while fresh fish had the least selling price of $\text{₦}786.88 \pm 376.05/\text{kg}$.

The costs associated with marketing of the fish products as presented in Table 4.6 indicated that fresh fish products had the highest average monthly cost of marketing of $\text{₦}41,063.32 \pm 39,766.87$ while fried fish had the least average marketing cost of $\text{₦}24,054.45 \pm 14,950.29$ as there was no statistical difference in the cost of marketing of fish products in the States along Nigeria-Niger border and Lake Kainji-inland fisheries. The highest average operational cost was incurred on fresh fish $\text{₦}32,190.99 \pm 31,824.59$ while the least was incurred on fried fish

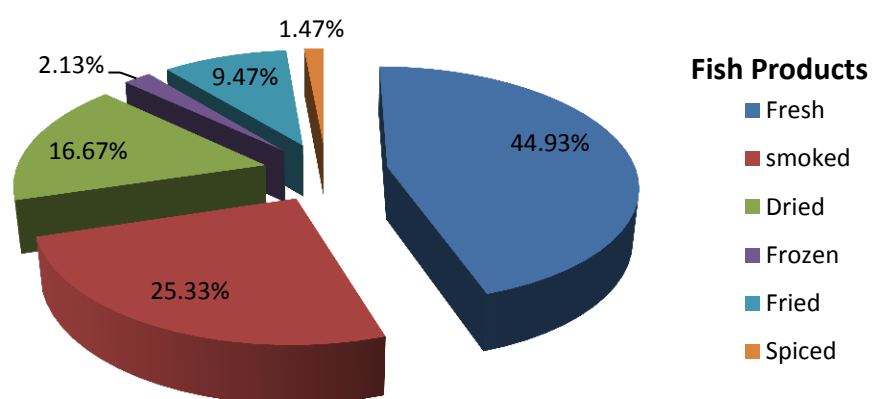


Figure 4.8: Percentage of forms of fish products marketed in Nigeria-Niger border and Lake Kainji-inland fisheries.

Table 4.6: Average monthly quantities, profitability and marketing efficiency indices of fish products marketed in the States along Nigeria-Niger border and in Lake Kainji-inland fisheries

Variables		Fresh		Smoked		Dried		Frozen		Fried		Spiced	
		Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D
Total Quantity Sold (Kg)		1701.89 ^a	973.37	1571.92 ^{ab}	522.52	1287.27 ^{bc}	459.06	1064.49 ^{cd}	282.91	877.98 ^d	336.93	1408.14 ^{abc}	178.02
Buying Price (₦)		358.42 ^d	434.09	1043.04 ^{ab}	607.99	1124.43 ^a	711.48	770.00 ^{bc}	184.25	671.17 ^c	267.07	769.09 ^{bc}	264.29
Selling Price (₦)		786.88 ^d	376.05	1957.91 ^a	652.28	1976.28 ^a	651.57	1157.81 ^c	319.6	1278.03 ^{bc}	346.54	1419.09 ^b	271.64
Total Marketing Cost (₦)		41063.32 ^a	39766.87	34620.05 ^a	32617.18	31739.58 ^a	24910.78	40461.4 ^a	20465.34	24054.45 ^a	14950.29	30699.85 ^a	27990.15
Total Purchase Cost (₦)		667920.95 ^c	859686.96	1732346.4 ^a	1369096.9	1446065 ^{ab}	1171846.2	790380.5 ^c	190596.5	638415.01 ^c	463529.04	1076404.10 ^{bc}	355202.10
Other Operational Cost (₦)		32190.99 ^a	31824.59	28668.06 ^a	24329.11	29248.33 ^a	26797.58	27145.31 ^a	18486.02	17841.07 ^a	15323.45	24790.91 ^a	18175.08
Total Variable Cost (₦)		452549.08 ^d	725911.1	1795498 ^a	1366408.3	1507052.9 ^{ab}	1165842.9	857987.21 ^{cd}	202437.83	680059.25 ^{cd}	458707.56	1131894.8 ^{bc}	355727.8
Total Fixed Cost(₦)		1449.33 ^{ab}	1493.51	1091.89 ^{ab}	1632.08	1084.85 ^{ab}	1087.09	704.83 ^b	456.82	1463.49 ^{ab}	1130.27	1609.10 ^a	1562.18
Total Production Cost (₦)		453998.41 ^d	725744.35	1796589.90 ^a	1366295.20	1508137.80 ^{ab}	1165803.80	858692.04 ^{cd}	202612.76	681522.74 ^{cd}	458356.47	1133503.9 ^{bc}	355700.65
Total Revenue (₦)		1353811.20 ^b	925268.93	3128996.20 ^a	1578403.10	2543832.90 ^b	1402566.9	1203125.20 ^c	331944.67	1151856.40 ^c	612027.79	2004180.80 ^b	462445.02
Gross Margin (₦)		901262.16 ^b	599608.83	1333498.20 ^a	978034.23	1036780 ^{ab}	761478.79	374680.47 ^c	355847.82	471797.15 ^c	308516.96	872285.96 ^b	381501.33
Gross Margin (₦/kg)		534.46 ^{cd}	232.34	866.70 ^a	554.10	792.96 ^{ab}	519.91	355.25 ^d	359.06	550.68 ^{cd}	351.76	611.82 ^{bc}	228.11
Net Return (₦)		899812.84 ^b	599654.55	1332406.31 ^a	978144.44	1035695.11 ^{ab}	761423.95	356722.62 ^c	350835.33	470333.66 ^c	308788.14	870676.86 ^b	381222.43
Net Return ((₦/Kg)		533.03 ^{cd}	232.43	865.94 ^a	554.13	792.07 ^{ab}	519.84	343.17 ^c	350.04	548.69 ^{cd}	352.07	610.72 ^{bc}	227.98
Marketing Efficiency		330.86 ^a	267.38	109.98 ^b	76.96	111.28 ^b	110.96	52.58 ^b	60.46	89.40 ^b	79.68	83.20 ^b	39.35
Marketing M(₦)		973274.68 ^b	617063.37	1396649.80 ^a	971281.56	1097767.87 ^{ab}	760937.61	412744.66 ^c	357746.41	513441.39 ^c	322786.44	927776.72 ^c	407122.94
Marketing M ((₦/kg)		582.68 ^{bc}	224.46	910.52 ^a	549.96	851.85 ^a	526.71	387.81 ^c	365.86	606.86 ^b	376.87	650.00 ^b	240

Note: Mean valued with the same alphabet superscripts are not significantly different

$\text{₦}17,841 \pm 15,323.45$. The least average monthly total purchase cost was incurred on fried fish $\text{₦}638,415.01 \pm 463,415.01$ while the highest average total purchase cost was incurred on Smoked fish $\text{₦}1,751,713.11 \pm 1,431,767.80$. The highest average monthly total variable cost was incurred on Smoked fish $\text{₦}1,817,776.69 \pm 1,428,514.03$ while the least average total variable cost was $\text{₦}452,549.08 \pm 725,911.10$. The highest average monthly total fixed cost was incurred on spiced fish $\text{₦}1609.10 \pm 1,562.18$ while least average monthly total fixed cost was incurred on $\text{₦}704.83 \pm 456.82$. The least average total production cost was incurred on fresh fish $\text{₦}453,998.41 \pm 725,744.35$ while the highest average monthly total production cost was incurred on smoked fish $\text{₦}1,818,918.45 \pm 1,428,380.80$. There was significant difference ($P < 0.05$) in the average monthly total purchase, other operational, total variable, total fixed and total production costs of the fish products marketed States along Nigeria-Niger border and Lake Kainji-Inland Fisheries.

The profitability indices results (Table 4.6) revealed that there was significant difference ($P < 0.05$) in the average monthly revenue realized from the fish products marketed in the States along Nigeria-Niger border and Lake Kainji-inland fisheries (Table 4.6). Highest average monthly revenue of $\text{₦}3,128,996.20 \pm 1,578,403.10$ was recorded in smoked fish products while frozen fish had the least monthly revenue of $\text{₦}1,203,125.20 \pm 331,944.67$. Smoked fish had the highest average monthly gross margin of $\text{₦}1,333,498.20 \pm 978,034.23$ was significantly ($P < 0.05$) higher than that of frozen fish with least average margin of $\text{₦}374,680.47 \pm 355,847.82$. Dried fish had the highest average net return per kg of $\text{₦}945.46 \pm 596.04$ while frozen fish had the least average net return per kg of $\text{₦}321.61 \pm 371.23$. Fresh fish had the highest average marketing efficiency of 330.86 ± 267.38 while frozen fish had the least efficiency of 52.58 ± 60.46 . There was also significant difference ($P < 0.05$) in the marketing efficiency fish products sold in the study area.

The profitability indices results indicated that there was significant difference ($P < 0.05$) in the buying and selling prices of the fish products. The highest average buying prices $\text{₦}955.48 \pm 269.62/\text{kg}$ and $\text{₦}1,373.07 \pm 813.0/\text{kg}$ of fresh and smoked were recorded in Niger State, as the highest average buying prices of $\text{₦}870.00 \pm 169.71/\text{kg}$, $\text{₦}883.33 \pm 330.02/\text{kg}$ and $\text{₦}840.00 \pm 404.31/\text{kg}$ for frozen, fried and spiced fish products respectively were recorded in Yobe State while Sokoto State had the highest average buying price of $\text{₦}1,067.76 \pm 743.81/\text{kg}$ for

dried fish. The respondents in Niger State also recorded the highest average selling prices of ₦1,070.27±419.62/kg, ₦2,1379.77±343.48/kg, ₦2,991.00±691.47/kg of fresh, smoked and dried fish products respectively while frozen and fried fish had the highest average selling prices of ₦1,725.00±671.75/kg and ₦1,931.25±70.39/kg in Yobe State with Jigawa State recording the highest selling price of spiced of ₦1,451.43±168.76/kg.

There was no significant difference ($P>0.05$) in the average monthly revenue of respondents in Sokoto, Katsina, Jigawa and Yobe States marketing fresh fish, smoked, dried, frozen and spiced along Nigeria-Niger border except for respondents Niger State (Lake Kainji-Inland Fisheries) with the highest average revenue of ₦1,702,192.46±1,068,869.06, ₦4,961,731.30±1,300,345.84 and ₦4,876,183.22±1,396,562.31 for fresh fish, smoked fish and dried fish products respectively. The results are presented in Tables 4.7-4.12.

The results presented in Tables 4.7-4.12 also indicated there was also no significant difference ($P>0.05$) in the marketing efficiency of dried, smoked, frozen and spiced fish products marketed in the States along Nigeria-Niger border and Lake Kainji-inland fisheries except for fresh and smoked fish marketed in Niger State with the highest marketing efficiency of 490.94±361.09% and 151.63±84.40% respectively. For fried fish product, Sokoto State had the highest marketing efficiency of 288.30±69.36% with Yobe State recording the least average value of 47.71±31.36% with significant difference ($P<0.05$).

4.8.3 Profitability and Efficiency of Fresh Fish Marketed in the States along Nigeria-Niger Border and Lake Kainji-Inland Fisheries

The results presented in Table 4.7 indicated that the highest average monthly quantity (2,066.76±1,263.70kg) of fresh fish sold in the States along the Nigeria-Niger border and in the Lake Kainji-Inland fisheries was in Sokoto State while Niger State had the least 1,518.52±472.40kg. There was significant difference ($P<0.05$) in the average monthly quantities of fresh fish marketed among the sampled States.

Table 4.7: Profitability and efficiency of fresh fish marketed in the States along Nigeria-Niger border and in Lake Kainji-inland fisheries

Variables	Sokoto		Katsina		Jigawa		Yobe		Niger	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Total Quantity Sold (Kg)	2066.76 ^a	1263.70	1624.09 ^b	1037.83	1661.56 ^b	953.29	1640.74 ^b	899.09	1518.52 ^b	472.40
Buying Price (₦)	214.35 ^b	234.22	278.00 ^b	334.15	316.67 ^b	470.92	337.76 ^b	491.02	955.48 ^a	269.62
Selling Price (₦)	532.72 ^c	210.76	794.73 ^b	338.92	768.17 ^b	377.85	756.61 ^b	285.42	1070.27 ^a	419.62
Total Marketing Cost (₦)	59470.03 ^a	51250.35	30693.37 ^c	30175.41	46908.46 ^{ab}	39970.40	37527.03 ^{bc}	37022.24	31321.61 ^c	30414.52
Total Purchase Cost (₦)	392071.86 ^b	393944.58	435563.12 ^b	469275.71	603827.28 ^b	1027011.75	696341.83 ^b	1040276.19	1828997.84 ^a	504233.17
Other Operational Cost (₦)	59786.58 ^a	45466.13	26143.66 ^b	23932.12	29324.12 ^b	27916.49	25262.24 ^b	20597.38	19070.71 ^b	10900.38
Total Variable Cost (₦)	367184.40 ^a	343849.96 ^a	339032.85	423563.14 ^a	487932.99	896902.36 ^a	473051.19	886645.22 ^a	599091.67	878974.13 ^a
Total Fixed Cost (Depreciated) (₦)	942.77 ^c	922.42	1626.19 ^b	1796.51	2337.74 ^a	1905.66	1070.08 ^c	1032.69	1260.28 ^{bc}	1091.83
Total Production Cost (₦)	368127.17 ^a	343536.26	340659.04 ^a	422731.91	490270.73 ^a	896515.84	474121.27 ^a	886534.90	600351.96 ^a	879278.50
Total Revenue (₦)	1096212.78 ^b	649833.05	1290223.90 ^b	815985.54	1343880.82 ^b	1005351.05	1326393.83 ^b	948501.34	1702192.46 ^a	1068869.06
Gross Margin (₦)	729028.37 ^c	510248.74	951191.05 ^{ab}	620137.73	855947.83 ^{bc}	633700.12	853342.64 ^{bc}	618834.23	1103100.79 ^a	560177.86
Gross Margin (₦/kg)	326.69 ^d	74.15	571.83 ^b	135.09	500.73 ^c	190.32	514.60 ^{bc}	171.17	747.76 ^a	295.64
Net Return (₦)	728085.61 ^c	510195.81	949564.86 ^{ab}	620914.62	853610.10 ^{bc}	633521.86	852272.56 ^{bc}	618679.90	1101840.50 ^a	559990.48
Net Return ((₦/Kg)	326.00 ^d	74.51	569.36 ^b	135.97	498.57 ^c	190.50	513.71 ^{bc}	171.11	746.92 ^a	295.59
Marketing Efficiency	158.18 ^c	122.09	266.46 ^b	157.51	276.68 ^b	151.93	470.94 ^a	293.75	490.94 ^a	361.09
Marketing Margin (₦)	848284.99 ^b	560272.56	1008028.07 ^{ab}	646370.68	932180.4 ^b	655551.25	910835 ^b	629625.03	1153493.11 ^a	561700.75
Marketing Margin ((₦/kg)	397.18 ^c	52.61	614.62 ^b	128.35	552.26 ^b	190.25	555.05 ^b	170.06	783.63 ^a	297.95

Note: Mean values with the same alphabet superscripts are not significantly different (P<0.05)

Table 4.8: Profitability and efficiency indices of smoked fish marketed in the States along Nigeria-Niger border and in Lake Kainji-inland fisheries

Variables	Sokoto		Katsina		Jigawa		Yobe		Niger	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Total Quantity Sold (Kg)	1520.77 ^{bc}	734.27	1338.83 ^c	476.58	1833.78 ^a	619.33	1358.66 ^c	153.95	1721.33 ^{ab}	346.59
Buying Price (₦)	813.78 ^b	446.37	917.19 ^b	409.67	952.00 ^b	465.19	967.14 ^b	420.56	1373.07 ^a	813.01
Selling Price (₦)	1499.02 ^b	184.71	1630.97 ^b	357.35	1593.14 ^b	147.66	1607.86 ^b	251.94	2875.31 ^a	343.48
Total Marketing Cost (₦)	56747.76 ^a	42172.09	24565.25 ^b	8885.00	53968.00 ^a	48916.55	23547.24 ^b	8655.74	21379.77 ^b	14295.16
Total Purchase Cost (₦)	1320382.30 ^b	1236846.32	1281006.69 ^b	906720.57	1925298.95 ^a	1410033.54	1315282.31 ^b	598832.99	2415057.94 ^a	1699433.06
Other Operational Cost (₦)	43500.00 ^a	28210.16	19629.84 ^c	9916.87	36045.59 ^{ab}	26908.40	18206.55 ^c	7463.81	26383.20 ^{bc}	27030.23
Total Variable Cost (₦)	1420630.06 ^b	1220257.75	1325201.78 ^b	903937.31	2014282.66 ^a	1428659.65	1357036.10 ^b	599394.75	2462820.91 ^a	1695507.68
Total Fixed Cost (₦)	796.17 ^b	744.73	1056.95 ^b	1336.21	2301.79 ^a	3188.07 ^b	865.26 ^b	999.45	770.26 ^b	720.06
Total Production Cost (₦)	1421426.23 ^b	1220039.60	1326258.73 ^b	903492.79	2016584.45 ^a	1428547.61	1357901.36 ^b	599291.53	2463591.17 ^a	1695438.24
Total Revenue (₦)	2288605.85 ^c	1230405.83	2175395.68 ^c	828549.20	2892214.61 ^b	909151.46	2188713.53 ^c	464589.42	4961731.30 ^a	1300345.84
Gross Margin (₦)	867975.80 ^b	424192.61	850193.91 ^b	392483.09	877931.95 ^b	650296.25	831677.43 ^b	368317.95	2498910.39 ^a	925059.67
Gross Margin (₦/kg)	607.61 ^b	260.99	676.54 ^b	278.75	589.87 ^b	452.25	609.67 ^b	258.90	1473.30 ^a	542.13
Net Return (₦)	867179.63 ^b	424066.65	849136.96 ^b	392101.97	875630.16 ^b	650171.43	830812.17 ^b	368333.32	2498140.13 ^a	925067.49
Net Return ((₦/Kg)	606.96 ^b	260.79	675.61 ^b	278.24	588.50 ^b	451.90	609.02 ^b	258.92	1472.83 ^a	542.14
Marketing Efficiency	96.94 ^b	67.54	91.76 ^b	54.22	101.54 ^b	86.95	82.70 ^b	55.47	151.63 ^a	84.40
M. M (₦)	968223.56 ^b	440349.47	894388.99 ^b	391089.42	966915.66 ^b	627728.4	873431.22 ^b	368309.09	2546673.35 ^a	929885.05
M. M ((₦/kg)	685.24 ^b	277.70	713.77 ^b	280.89	641.14 ^b	449.28	640.71 ^b	257.85	1502.25 ^a	546.75

Note: Mean values with the same alphabet superscripts are not significantly different (P<0.05)

Table 4.9: Profitability and efficiency indices of dried fish marketed in the States along Nigeria-Niger border and in Lake Kainji-inland fisheries

Variables	Sokoto		Katsina		Jigawa		Yobe		Niger	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Total Quantity Sold (Kg)	806.38 ^b	352.68	1450.00 ^a	70.71	1353.20 ^a	243.07	1461.77 ^a	394.78	1653.27 ^a	365.89
Buying Price (₦)	1067.76 ^b	743.81	530.00 ^b	84.85	967.41 ^b	431.04	904.64 ^b	406.41	1820.53 ^a	937.86
Selling Price (₦)	2174.83 ^b	147.42	1475.00 ^c	106.07	1552.96 ^c	251.73	1526.07 ^c	240.07	2991.00 ^a	691.47
Total Marketing Cost (₦)	44349.17 ^a	37326.98	11240.00 ^b	339.41	33690.74 ^{ab}	16592.51	25259.76 ^{ab}	18065.57	21427.73 ^{ab}	6683.39
Total Purchase Cost (₦)	687334.48 ^b	467818.58	765500.00 ^b	85559.92	1348551.52 ^b	723545.29	1366051.50 ^b	819418.90	2932252.09 ^a	1579668.55
Other Operational Cost (₦)	41124.14 ^a	36633.38	12875.00 ^a	2368.81	30748.15 ^a	24779.26	24685.71 ^a	21268.89	17438.16 ^a	7467.11
Total Variable Cost (₦)	772807.80 ^b	452122.45	789615.00 ^b	87589.32	1412990.41 ^b	739824.36	1415996.97 ^b	828650.90	2971117.98 ^a	1581009.51
Total Fixed Cost (Depreciated) (₦)	899.02 ^a	781.69	1925.96 ^a	0.00	1467.68 ^a	1130.00	829.21 ^a	1097.38	1112.66 ^a	1330.45
Total Production Cost (₦)	773706.82 ^a	451971.97	791540.96 ^a	87589.32	1414458.09 ^b	739782.35	1416826.18 ^b	828397.39	2972230.63 ^a	1581024.73
Total Revenue (₦)	1733824.14 ^b	735891.83	2142500.00 ^b	258093.98	2117356.52 ^b	568121.80	2240015.79 ^b	761519.93	4876183.22 ^a	1396562.31
Gross Margin (₦)	961016.34 ^b	822131.46	1352885.00 ^{ab}	345683.29	704366.11 ^b	309347.11	824018.81 ^b	284421.49	1905065.24 ^a	990109.26
Gross Margin (₦/kg)	988.79 ^{ab}	691.97	928.32 ^{ab}	193.13	538.16 ^b	251.05	587.18 ^b	228.70	1145.16 ^a	536.05
Net Return (₦)	960117.32 ^b	821762.25	1350959.04 ^{ab}	345683.29	702898.43 ^b	308938.52	823189.60 ^b	284413.31	1903952.59 ^a	990500.97
Net Return (₦/Kg)	987.68 ^{ab}	691.76	926.99 ^{ab}	193.20	537.08 ^b	250.78	586.57 ^b	228.60	1144.50 ^a	536.36
Marketing Efficiency	178.86 ^a	167.46	174.84 ^a	63.91	73.89 ^a	57.44	82.93 ^a	52.24	96.36 ^a	83.89
Marketing Margin (₦)	1046489.66 ^b	840636.98	1377000.00 ^{ab}	343653.90	768805.00 ^b	304014.69	873964.29 ^b	286906.87	1943931.13 ^a	986799.16
Marketing Margin (₦/kg)	1107.07 ^{ab}	692.34	945.12 ^{abc}	190.92	585.56 ^c	247.94	621.43 ^{bc}	230.04	1170.47 ^{ab}	533.88

Note: Mean values with the same alphabet superscripts are not significantly different (P<0.05)

Table 4.10: Profitability and efficiency indices of frozen fish marketed in the States along Nigeria-Niger border and in Lake Kainji-inland fisheries

Variables	Sokoto		Katsina		Jigawa		Yobe	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Total Quantity Sold (Kg)	1337.50 ^a	165.20	1290.62 ^a	231.00	880.00 ^b	180.83	825.00 ^b	106.07
Buying Price (₦)	670.00 ^a	43.97	640.00 ^a	250.60	854.29 ^a	177.28	870.00 ^a	169.71
Selling Price(₦)	925.00 ^b	28.87	1108.33 ^b	150.69	1150.00 ^b	165.83	1725.00 ^a	671.75
Total Marketing Cost (₦)	50171.01 ^a	23701.41	25800.00 ^a	19617.34	45071.43 ^a	19531.57	26899.17 ^a	0.00
Total Purchase Cost (₦)	901500.00 ^a	168440.39	790696.00 ^a	196964.18	744928.57 ^a	206677.57 ^a	726750.00 ^a	232284.58
Other Operational Cost(₦)	31312.50 ^a	17189.26	16200.00 ^a	11971.63	34642.86 ^a	20229.34	8987.50 ^a	3977.48
Total Variable Cost(₦)	982983.51 ^a	196011.81	832696.00 ^a	189794.18	824642.86 ^a	216490.66	762636.67 ^a	236262.05
Total Fixed Cost (Depreciated)(₦)	832.24 ^a	189.87	355.91 ^a	184.55	836.88 ^a	615.47	511.20 ^a	232.22
Total Production Cost(₦)	983815.75 ^a	195829.80	833051.91 ^a	189973.82	825479.74 ^a	216812.73	763147.87 ^a	236494.27
Total Revenue (₦)	1236875.00 ^a	156409.92	1446667.50 ^a	432604.41	1026785.71 ^a	316006.05	1387500.00 ^a	371231.06
Gross Margin(₦)	253891.49 ^a	58063.73	613971.50 ^a	589676.15	252166.67 ^a	224859.16	624863.33 ^a	607493.11
Gross Margin (₦/kg)	195.28 ^a	68.50	434.63 ^a	345.80	270.14 ^a	229.77	811.45 ^a	840.68
Net Return(₦)	253059.25 ^a	57890.40	613615.59 ^a	589813.72	201305.98 ^a	244310.39	624352.13 ^a	607725.33
Net Return ((₦/Kg)	194.64 ^a	68.28	434.34 ^a	345.95	206.06 ^a	268.33	810.84 ^a	840.88
Marketing Efficiency	27.33 ^a	12.10	90.55 ^a	99.18	34.79 ^a	34.37	99.49 ^a	109.45
Marketing Margin(₦)	335375.00 ^a	34235.40	655971.50 ^a	579755.54	281857.14 ^a	269382.27	660750 ^a	603515.64
Marketing Margin ((₦/kg)	255.00 ^a	52.60	468.33 ^a	334.68	295.71 ^a	283.31	855.00 ^a	841.46

Note: Mean values with the same alphabet superscripts are not significantly different (P<0.05)

Table 4.11: Profitability and efficiency indices of fried fish marketed in the States along Nigeria-Niger border and in Lake Kainji-inland fisheries

Variables	Sokoto		Katsina		Jigawa		Yobe	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Total Quantity Sold (Kg)	703.75 ^b	106.09	819.46 ^b	376.73	943.12 ^{ab}	253.51	1160.44 ^a	82.81
Buying Price (₦)	375.00 ^c	51.55	695.19 ^{ab}	232.55	520.00 ^{bc}	88.80	883.33 ^a	330.02
Selling Price(₦)	1931.25 ^a	70.39	1206.28 ^{bc}	277.20	1010.00 ^c	128.95	1278.33 ^b	272.79
Total Marketing Cost (₦)	54234.00 ^a	23862.91	20088.35 ^b	7969.75	16325.00	4178.09 ^b	23299.58 ^b	6195.19
Total Purchase Cost (₦)	260612.50 ^b	31352.17	623052.76 ^b	475421.98	508710.33 ^b	238795.97	1031801.22 ^a	426119.64
Other Operational Cost(₦)	47628.57 ^a	28883.08	16232.56 ^b	6200.59	8812.50 ^b	6035.24	12247.92 ^b	13405.44
Total Variable Cost(₦)	356521.50 ^b	74160.76	659373.67 ^b	476514.35	533847.83 ^b	240879.91	1067348.72 ^a	417862.66
Total Fixed Cost (Depreciated)(₦)	646.48 ^b	368.34	1728.03 ^a	1250.11	1825.68 ^a	1024.20	818.75 ^b	317.48
Total Production Cost(₦)	357167.99 ^b	74037.49	661101.70 ^b	476119.22	535673.50 ^b	240454.51	1068167.47 ^a	417634.18
Total Revenue (₦)	1356500.00 ^a	190126.27	1051007.86 ^a	701293.10	975572.73 ^a	399024.21	1494323.77 ^a	400953.85
Gross Margin(₦)	999978.50 ^a	156724.57	391634.19 ^b	280119.43	441724.90 ^b	173172.22	426975.05 ^b	201325.66
Gross Margin (₦/kg)	1420.77 ^a	73.01	457.24 ^b	180.63	462.64 ^b	89.94	364.16 ^b	161.15
Net Return(₦)	999332.01 ^a	156689.93	389906.16 ^b	280248.55	439899.22 ^b	173389.03	426156.30 ^b	201327.04
Net Return ((₦/Kg)	1419.82 ^a	72.89	454.73 ^a	180.81	460.49 ^b	89.75	363.44 ^b	161.14
Marketing Efficiency	288.30 ^a	69.36	64.78 ^{bc}	28.26	85.38 ^b	20.33	47.71 ^c	31.36
Marketing Margin(₦)	1095887.5 ^a	169649.14	427955.10 ^b	280864.19	466862.40 ^b	174202.99	462522.55 ^b	210986.68
Marketing Margin ((₦/kg)	1556.25 ^a	47.49	511.09 ^b	176.37	490.00 ^b	87.18	395.00 ^b	168.87

Note: Mean values with the same alphabet superscripts are not significantly different (P<0.05)

Table 4.12: Profitability and efficiency indices of spiced fish marketed in the States along Nigeria-Niger border and in Lake Kainji-inland fisheries

Variables	Jigawa		Yobe	
	Mean	SD	Mean	SD
Total Quantity Sold (Kg)	1508.93 ^a	141.31	1231.75 ^a	22.56
Buying Price (₦)	728.57 ^a	171.51	840.00 ^a	404.31
Selling Price(₦)	1451.43 ^a	168.76	1362.50 ^a	426.96
Total Marketing Cost (₦)	37021.43 ^a	33798.54	19637.08 ^a	8389.73
Total Purchase Cost (₦)	1101909.26 ^a	297778.85	1031770.00 ^a	488920.39
Other Operational Cost(₦)	30928.57 ^a	20632.56	14050.00 ^a	2825.77
Total Variable Cost(₦)	1169859.26 ^a	299124.09	1065457.09 ^a	483330.93
Total Fixed Cost (Depreciated)(₦)	1971.46 ^a	1850.99	974.95 ^a	663.20
Total Production Cost(₦)	1171830.72 ^a	299102.47	1066432.04 ^a	483107.53
Total Revenue (₦)	2191534.10 ^a	333262.47	1676312.50 ^a	515257.68
Gross Margin(₦)	1021674.84 ^a	404861.19	610855.42 ^a	118819.38
Gross Margin (₦/kg)	678.52 ^a	261.44	495.10 ^a	90.54
Net Return(₦)	1019703.38 ^a	404896.62	609880.47 ^a	118513.61
Net Return ((₦/Kg)	677.24 ^a	261.44	494.31 ^a	90.29
Marketing Efficiency	94.08 ^a	42.98	64.16 ^a	26.58
Marketing Margin(₦)	1089624.84 ^a	431252.13	644542.50 ^a	111609.88
Marketing Margin ((₦/kg)	722.86 ^a	274.63	522.50 ^a	84.21

Note: Mean values with the same alphabet superscripts are not significantly different (P<0.05)

Niger State the highest average buying price for fresh fish at ₦ 955.48±269.62/kg was recorded while Sokoto State had the least average buying price of ₦214.35± 209.22/kg. Niger State had the highest average selling price of ₦1,070.27±419.62/kg while Sokoto State had the least average selling price of ₦532.72±210.76/kg. There was significant difference ($P<0.05$) in the average buying and selling prices of fresh fish marketed among the States in the sampled region.

The average monthly total marketing cost incurred on fresh fish was highest in Sokoto State ₦59,470.03±51,250.35 while the least average total marketing cost of ₦30,693.37±30,175.41 was recorded in markets in Katsina State. The highest average operational cost of ₦59,786.58±45,466.13 incurred on fresh fish was in Sokoto State while the least average value of ₦19,070.71±10,900.38 was incurred in Niger State. The respondents with the least average total purchase cost of ₦392,071.86±391,944.58 fresh fish was observed in Sokoto State while the highest average total purchase cost of ₦1,828,997.84±504,233.17 for fresh fish was incurred in Niger State. The highest average total variable cost (₦599,091.67±378,974.13) was incurred on fresh fish was in Niger State while the least average total variable cost of ₦399,032.85±223,563.14 observed in Katsina State. The highest average total fixed cost of ₦2,337.74±1,905.66 incurred on fresh fish was in Jigawa State while least average monthly total fixed cost of ₦942.77±922.42 was incurred in Sokoto State. The least average total production cost incurred on fresh fish was in Katsina State ₦600,351.96±579,278.50 while the highest average total production cost incurred on fresh fish was in Katsina State ₦340,659.04±222,731.91. There was significant difference ($P<0.05$) in the total marketing, purchase, other operational and fixed costs while no significant difference ($P>0.05$) was recorded in the total production costs of fresh fish in the States along the Nigeria-Niger border and in the Lake Kainji-Inland fisheries.

There was no significant difference ($P>0.05$) in the average monthly revenue of respondents in Sokoto, Katsina, Jigawa and Yobe States marketing fresh fish along Nigeria-Niger border except for respondents Niger State (Lake Kainji-Inland Fisheries) with the highest average revenue of ₦1,702,192.46±1,068,869.06 while the least revenue of ₦109,621.78±64,983.05 was recorded in Sokoto State. The highest average gross margin per kg was incurred in Niger State ₦747.76±295.64 while the least average gross margin per kg was in Sokoto State ₦326.69±74.15. The

highest average net returns was in Niger State ₦1101840.50±559990.48 while the least average net returns was in Sokoto State ₦728085.61±510195.81. Niger State had the highest average net return per kg for fresh fish ₦746.92±295.59 while Sokoto State had the least average net return per kg ₦326.00±74.51. Niger State had the highest marketing efficiency for fresh fish 490.94±361.09 while Sokoto State had the least marketing efficiency 158.18 ±122.09. Jigawa State had the highest average marketing margin ₦1,320.70±1296.20 while Sokoto State had the least average marketing margin 1,018.85±992.65.

4.8.4 Profitability and Efficiency of Smoked Fish Marketed in the States along Nigeria-Niger Border and Lake Kainji-Inland Fisheries

The results on Table 4.8 shows that the highest average monthly quantity of smoked fish sold marketed in the States along the Nigeria-Niger border and the Lake Kainji-Inland fisheries was in Jigawa State with average quantity of 1,833.78±619.33kg, while Yobe State was the least 1,358.66±153.95kg. There was significant difference ($P<0.05$) in the average monthly quantity of smoked fish marketed.

Respondents in Sokoto State had the least average buying price of smoked fish at ₦813.78±446.37/kg while respondents in Niger State had the highest average buying price for smoked fish at ₦1,373.07±813.01. Niger State had the highest average selling price of ₦2,875.31±343.48 while Sokoto State had the least average selling price of ₦1,499.02±184.71. There was no significant difference ($P>0.05$) in the buying and selling prices of smoked fish in the sampled States except in Niger State. Average total marketing cost incurred on smoked fish was the highest in Sokoto State ₦56,747.76±184.71 while the least average total marketing cost incurred on smoked fish was in Niger State ₦21,379.77±14,295.16. The highest average operational cost of ₦43,500.00±28,210.16 incurred on smoked fish was in Sokoto State while the least average value of ₦18,206.55±7,463.81 was incurred in Niger State. The least average total purchase cost of ₦1,281,006.69±906,720.57 was incurred in Katsina State while the highest average total purchase cost for fresh fish was incurred in Niger State ₦2,415,057.94±906,720.57. The highest average total variable cost of ₦2,462,820.91±903,937.31 was incurred on smoked fish was in Niger State while the least average total variable cost of ₦1,325,201.78±903,937.31 was in

Katsina State. The highest average total fixed cost of ₦2,301.79±1,188.07 was incurred on smoked fish in Jigawa State while least average total fixed cost of ₦770.26±720.06 was incurred in Niger State. The highest average total production cost of ₦2,463,591.11±903,492.79 incurred on fresh fish was observed in Niger State while the least average total production cost of ₦1,326,258.73±903,492.79 was incurred on smoked fish in Katsina State. There was no significant difference ($P<0.05$) in the average buying and selling prices of smoked fish marketed in the sampled States along the Nigeria-Niger border except Niger State in Lake Kainji-Inland fisheries.

The highest average total revenue of ₦4,961,731.30±1,300,345.84 obtained from marketed smoked fish was in Niger State while the least value of ₦2,175,395.73± 903,492.79 was recorded in Katsina State. The highest average gross margin (₦2,498,910.39±925,059.67) from market smoked fish was recorded in Niger State while the least average gross margin of ₦831,677.43±368,317.43 was recorded in Yobe State. The highest average gross margin per kg (₦1,473.30± 542.13/kg) was incurred in Niger State while the least average gross margin per kg (₦589.87±453.25) was recorded Jigawa State. The highest average net returns (₦2,498,140.13±925,067.49) was in Niger State while the least average net returns (₦849,136.96±392,101.97) was in Katsina State. Niger State had the highest marketing efficiency for smoked fish 151.63±84.40 while Yobe State had the least marketing efficiency of 82.70±55.47. Niger State had the highest average marketing margin of ₦2,546,673.35±929,885.05 while Yobe State had the least average marketing margin of ₦873,431.22±368,309.09. Sokoto State had the highest average marketing margin per kg ₦1502.25±546.75 while Yobe State had the least marketing margin per kg ₦640.71±257.85.

4.8.5 Profitability and Efficiency of Dried Fish Marketed in the States along Nigeria-Niger Border and Lake Kainji-Inland Fisheries

Presented results in Table 4.9 indicated that the highest average monthly quantity 1,653.27±365.89kg of dried fish sold in the study area was in Niger State while Sokoto State had the least quantity of 806.38±352.68kg. There was no significant difference ($P>0.05$) in the average monthly quantity of dried fish marketed in the sampled States except for Sokoto State.

The highest average buying ($\text{₦}1,820.53 \pm 937.86/\text{kg}$) and selling prices ($\text{₦}2,991.00 \pm 691.47/\text{kg}$) of dried fish were recorded in Niger State while Katsina State had the least buying and selling prices of $\text{₦}530.00 \pm 84.85/\text{kg}$ and $\text{₦}1475.00 \pm 106.07/\text{kg}$ respectively. There was no significant difference ($P > 0.05$) in prices of dried fish in the States along Nigeria-Niger border.

Respondents marketing dried fish in Niger State had the highest average purchase cost ($\text{₦}2,932,252.09 \pm 1579,668.55$), variable cost ($\text{₦}2,971,117.98 \pm 1,581,009.51$) and production cost ($\text{₦}2,972,230.63 \pm 1,581,024.73$) while the highest average cost of marketing of $\text{₦}44,349.17 \pm 37,326.98$ was recorded in Sokoto State. The least average total cost of production ($\text{₦}1,414,458.09 \pm 739,782.35$) and marketing cost ($\text{₦}11,240.00 \pm 339.41$) of dried fish were recorded in Jigawa and Katsina respectively. There was significant difference ($P < 0.05$) in the costs associated with dried fish in the sampled States.

The profitability indices presented in Table 4.9 indicated that highest average monthly revenue of $\text{₦}4,876,183.22 \pm 1,396,562.31$; gross margin of $\text{₦}1,905,065.24 \pm 990,109.26$; net return per kg of $\text{₦}1,144.50 \pm 536.36/\text{kg}$ and marketing margin $\text{₦}1,943,931.13 \pm 986,799.16$ were recorded in Niger State while the least average monthly revenue of $\text{₦}1,733,824.14 \pm 735,891.83$; average gross margin of $\text{₦}704,366.11 \pm 309,347.11$ in Sokoto and Jigawa State respectively.

There was no significant difference ($P > 0.05$) in the marketing efficiency of dried fish marketing in the States along Nigeria-Niger border and Lake Kainji-Inland Fisheries.

4.8.6 Profitability Indices and Efficiency of Frozen Fish Marketed in the States along Nigeria-Niger Border and Lake Kainji-Inland Fisheries

Presented results in Table 4.10 indicated that the highest average monthly quantity $1,337.50 \pm 165.20\text{kg}$ of frozen fish sold in the study area was in Sokoto State while Yobe State had the least quantity of $825.00 \pm 106.07\text{kg}$. There was no significant difference ($P > 0.05$) in the average monthly quantity of dried fish marketed in the sampled States except for Sokoto State.

Yobe State frozen fish had the least average buying price at $\text{₦}870.00 \pm 169.71/\text{kg}$ while Katsina State had the highest average buying price for frozen fish at $\text{₦}640.00 \pm 250.60/\text{kg}$. Yobe State

had the highest average selling price of ₦1725.00±671.75/kg while Sokoto State had the least average selling price of ₦925.00±28.87/kg. There was no significant difference ($P>0.05$) in the average buying price of frozen fish marketed in the sampled States.

Average total marketing cost incurred on frozen fish was the highest in Sokoto State ₦50171.02±23701.41 while the least average total marketing cost incurred on frozen fish was in Katsina State ₦25,800.00±19,617.34. The highest average total variable cost of ₦982,983.51±196,011.81 was incurred on frozen fish was in Sokoto State while the least average total variable cost of ₦762,636.67±236,262.05 was in Yobe State. The highest average total fixed cost of ₦836.88±615.47 incurred on frozen fish in Jigawa State was while least average total fixed cost of ₦355.91±184.55 on frozen fried was incurred by respondents in Katsina State. The highest average total revenue of ₦1,446,667.50±432,604.41 on frozen fish was recorded in Katsina State while the least average monthly revenue of in Jigawa State ₦1,026,785.71±316,006.05. The highest average gross margin per kg (₦811.45±800.68) was incurred in Yobe State while the least average gross margin per kg of ₦195.28±68.50/kg was in Sokoto State. The highest average net return per kg of ₦810.84±740.88 was recorded in Yobe State while the least average net returns per kg of ₦194.64±68.28 was observed in Sokoto State. Yobe State had the highest marketing efficiency of 99.49±90.45 for frozen fish while Sokoto State had the least marketing efficiency of 27.33±12.10. Yobe State had the highest average marketing margin per kg of ₦855.00±841.46 while Sokoto State had the least marketing margin per kg of ₦255.00±52.60.

The statistical analysis indicated that there was no significant difference ($P>0.05$) in costs, revenues profitability indices and marketing efficiency of frozen fish with respect to the States along Nigeria-Niger border and Lake Kainji-inland fisheries.

4.8.7 Profitability and Efficiency of Fried Fish Marketed in the States along Nigeria-Niger Border and Lake Kainji-Inland Fisheries

The results presented in Table 4.11 indicated that the highest average monthly quantity of fried fish marketed in the States along the Nigeria-Niger border and in the Lake Kainji inland fisheries was in Yobe State with average monthly quantity of 1,160.44±82.81kg, while Yobe State had the

least average values of 703.75 ± 106.07 kg as there was significant difference ($P < 0.05$) in the average monthly quantity of fried fish.

In Yobe State fried fish had the least average buying price of $\text{₦}883.33 \pm 330.02/\text{kg}$ while Sokoto State had the highest average buying price for fried fish of $\text{₦}375.00 \pm 51.55/\text{kg}$. Sokoto State had the highest average selling price of $\text{₦}1,931.25 \pm 70.39/\text{kg}$ while Jigawa State had the least average selling price of $\text{₦}1,010.00 \pm 128.95/\text{kg}$. Average total marketing cost of $\text{₦}54,234.00 \pm 23,862.66$ incurred on fried fish was the highest in Sokoto State while the least average total marketing cost of $\text{₦}16,325.00 \pm 4,178.09$ incurred on fried fish was in Jigawa State. The highest average total variable cost ($\text{₦}1,067,348.72 \pm 417,862.66$) was incurred on fried fish was in Yobe State while the least average total variable cost ($\text{₦}356,521.50 \pm 74,160.76$) was in Sokoto State. The highest average total fixed cost incurred on fried fish was in Jigawa State $\text{₦}1,825.68 \pm 1,024.20$ while least average total fixed cost of $\text{₦}646.48 \pm 368.24$ was incurred in Sokoto State. There was significant difference ($P < 0.05$) in the average monthly costs by respondents marketing fried fish in the States along Nigeria-Niger border and in Lake Kainiji-inland fisheries

The highest average total revenue of $\text{₦}1,494,323.77 \pm 400,953.85$ on fried fish was recorded by respondents in Yobe State while in Jigawa State the least average monthly revenue of $\text{₦}975,572.73 \pm 399,024.21$ was recorded. The highest average gross margin per kg of $\text{₦}1420.77 \pm 73.01/\text{kg}$ was incurred in Sokoto State while the least average gross margin per kg ($\text{₦}364.16 \pm 161.15/\text{kg}$) was observed in Yobe State. Sokoto State had the highest average marketing margin per kg $\text{₦}1556.25 \pm 47.49$ while Yobe State had the least marketing margin per kg $\text{₦}395.00 \pm 168.87/\text{kg}$. Sokoto State had the highest marketing efficiency of 288.30 ± 69.36 for fried fish while Yobe State had the least marketing efficiency of 47.71 ± 31.36 . The statistical analysis indicated that there was significant difference ($P < 0.05$) in the average monthly revenue, profitability indices and marketing efficiency of fried fish among the States along Nigeria-Niger border and in Lake Kainiji-inland fisheries.

4.8.8 Profitability and Efficiency of Spiced Fish Marketed in the States along Nigeria-Niger Border and Lake Kainji-Inland Fisheries

The results obtained from this study indicated that spiced fish were majorly marketed in Jigawa and Yobe States (see Table 4.12). The highest average quantity of spiced fish sold within the month in Jigawa and Yobe States was in Jigawa State with average quantity in kg of $1,508.93 \pm 141.31$ kg, while Yobe State was the least $1,231.75 \pm 22.56$ kg.

In Jigawa State spiced fish had the least average buying price of ₦728.57 \pm 171.51/kg while Yobe State had the highest average buying price for spiced fish at the rate ₦840.00 \pm 404.31/kg. Jigawa State had the highest average selling price of ₦1,451.43 \pm 168.76 while Yobe State had the least average selling price of ₦1,362.50 \pm 426.96. The average total marketing cost incurred on spiced fish was the highest in Jigawa State ₦37,021.43 \pm 33,798.54 while the least average total marketing cost (₦19,637.08 \pm 8,389.73) incurred on spiced fish was in Yobe State. The highest average operational cost (₦30,928.57 \pm 20,632.56) incurred on spiced fish was in Jigawa State while the least (₦14,050.00 \pm 2,825.77) was incurred in Yobe State. The highest average monthly revenue of ₦2,191,534.10 \pm 333,262.47 from spiced fish was in Jigawa State while the least average monthly revenue of ₦1,676,312.50 \pm 515,257.68 was recorded in Yobe State.

The results presents presented in Table 4.12 indicated that there was no significant difference ($P > 0.05$) in the average monthly quantity, profitability indices, cost variables and marketing efficiency of spiced fish product marketed in the States along Nigeria-Niger border and in Lake Kainji-Inland Fisheries.

4.9 PROFITABILITY INDICES AND EFFICIENCY OF FISH PRODUCTS ACCORDING TO MARKET LEVEL OPERATED ALONG NIGERIA-NIGER BORDER AND LAKE KAINJI-INLAND FISHERIES

4.9.1 Profitability and Efficiency of Fresh Fish According to Market Level Operated along Nigeria-Niger Border and Lake Kainji-Inland Fisheries

Reported in Table 4.13 are the results of average monthly quantities, costs, profitability and marketing efficiency indices of fresh fish marketed by the respondents at various levels of operation in fish markets in the States along Nigeria-Niger border and Lake Kainji-inland fisheries.

Table 4.13: Profitability and efficiency indices of fresh fish marketed by the respondents at various level of operation in fish markets in the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Variables	Levels of Market Operated							
	Producer (Capture)		Producer (Culture)		Wholesaler		Retailers	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Total Quantity Sold (Kg)	890.00 ^d	388.21	2729.62 ^a	782.48	2034.95 ^b	567.53	1650.48 ^c	520.59
Buying Price (₦)	0.00	0.00	25.38 ^c	6.24	670.44 ^b	333.73	803.39 ^a	357.50
Selling Price (₦)	625.85 ^c	201.73	605.82 ^c	112.80	1167.78 ^b	449.61	1308.11 ^a	345.82
Total Marketing Cost (₦)	29801.18 ^b	24706.30	63244.96 ^a	50664.15	35680.24 ^b	41306.59	31755.63 ^b	29313.15
Total Purchase Cost (₦)	0.00	0.00	67962.64 ^c	22291.73	1445716.03 ^a	923375.69	1333673.40 ^b	765225.49
Other Operational Cost (₦)	21138.08 ^b	15605.46	53425.40 ^a	42891.30	28571.18 ^b	26239.41	20317.13 ^b	14586.79
Total Variable Cost (₦)	49017.61 ^b	34247.68	184633.00 ^b	92200.29	1429649.89 ^a	965653.43	1385746.17 ^a	767595.95
Total Fixed Cost (₦)	1533.83 ^a	1476.14	1756.61 ^a	1737.36	977.78 ^b	1123.85	948.11 ^b	995.60
Total Production Cost (₦)	50551.44 ^b	33911.95	186389.61 ^b	92038.15	1430627.67 ^a	965967.27	1386694.28 ^a	767771.76
Total Revenue (₦)	608427.22 ^d	430644.96	1591520.57 ^c	354178.85	2473387.92 ^a	1242361.51	2123503.56 ^b	776281.66
Gross Margin (₦)	559409.61 ^d	426220.83	1406887.56 ^a	344840.54	1043738.03 ^b	879620.62	737757.39 ^b	438758.25
Gross Margin (₦/kg)	566.03 ^a	221.33	536.37 ^{ab}	115.49	497.51 ^{ab}	374.03	471.79 ^b	291.61
Net Return (₦)	557875.78 ^d	426507.52	1405130.95 ^d	345205.73	1042760.25 ^b	879499.25	736809.28 ^c	438613.31
Net Return ((₦/Kg)	563.61 ^a	221.95	535.60 ^{ab}	115.27	496.95 ^{ab}	374.06	471.16 ^b	291.47
Marketing Efficiency	478.22 ^a	292.01	324.34 ^b	184.97	124.11 ^c	91.29	91.04 ^c	80.53
Marketing Margin (₦)	608427.22 ^d	430645.32	1523557.93 ^a	340749.76	1107989.51 ^b	865085.32	789830.23 ^c	444092.3
Marketing Margin ((₦/kg)	625.85 ^a	201.73	580.44 ^{ab}	110.68	534.58 ^b	362.26	504.72 ^b	295.13

Note: Mean values with the same alphabet superscripts are not significantly different (P<0.05)

The highest average monthly quantity of $2,729.62 \pm 782.48$ kg of fresh fish was marketed by the fish farmers followed by wholesalers with $2,034.95 \pm 567.53$ kg while the artisanal fishermen had the least average values of 890.00 ± 388.21 kg of fresh fish marketed in the study area. There was significant difference ($P < 0.05$) in the average monthly quantities of fresh fish marketed by the actors in the market channels in States along Nigeria-Niger border and Lake Kainji-Inland Fisheries.

Fresh fish retailers had the highest average buying and selling prices of $\text{₦}803.39 \pm 357.50/\text{kg}$ and $\text{₦}1,308.11 \pm 345.82/\text{kg}$ while artisanal fishermen had no buying price while fish farmers had the least average buying price of $\text{₦}25.38 \pm 6.24$. There was significant difference ($P < 0.05$) in the average buying and selling price of fresh fish at different market levels of operation of the respondents in the sampled area.

Fish farmers had the highest average total marketing cost, other operational cost and fixed cost of $\text{₦}35,680.24 \pm 41,306.56$, $\text{₦}53,425.40 \pm 42,891.30$ and $\text{₦}1,756.61 \pm 1,737.36$ respectively while the artisanal fishermen had the least total production, total variable and purchase cost of $\text{₦}50,551.44 \pm 33,911.95$, $\text{₦}49,017.61 \pm 34,247.68$ and $\text{₦}0.00 \pm 0.00$. There was also significant difference ($P < 0.05$) in the costs incurred among the actors along the fresh fish channels.

With respect to revenue, the wholesalers had the highest average monthly revenue of $\text{₦}2,473,387.92 \pm 1,242,361.51$ while artisanal fishermen had the least average monthly revenue of $\text{₦}608,427.22 \pm 430,644.96$. Fish farmers had the highest average gross margin $\text{₦}1,406,887.56 \pm 344,840.54$ while fishermen had the highest average gross margin per kg and the least marketing margin of $\text{₦}566.03 \pm 221.33/\text{kg}$ and $\text{₦}608,427.22 \pm 430,645.32$ respectively. The highest average marketing efficiency of 478.22 ± 292.01 and least efficiency of 91.04 ± 80.53 were recorded among artisanal fishermen and retailers respectively. There was significant difference ($P < 0.05$) in the profitability indices and marketing efficiency of fresh fish among the actors along the fresh fish channels.

4.9.2 Profitability and Efficiency of Smoked Fish Products According to Market Level Operated along Nigeria-Niger Border and Lake Kainji-Inland Fisheries

Presented in Table 4.14 are the results of average monthly quantities, costs, profitability and marketing efficiency indices of smoked fish marketed by the respondents at various levels of operation in fish markets in the States along Nigeria-Niger border and Lake Kainji-inland fisheries. Wholesalers had the highest average monthly quantity of $2,383.12 \pm 603.76$ kg of smoked fish while the retailers had the least average quantity of 1280.33 ± 294.58 kg smoked fish marketed in the study area.

There was significant difference ($P < 0.05$) in the average monthly quantities of smoked fish marketed by the actors in the market channels in States along Nigeria-Niger border and Lake Kainji-Inland Fisheries.

The highest average buying and selling prices of $\text{₦}1,694.11 \pm 596.75/\text{kg}$ and $\text{₦}2,114.72 \pm 813.72/\text{kg}$ was recorded among the wholesalers of smoked fish while processor had the least average buying and selling prices of $\text{₦}663.05 \pm 178.05$ and $\text{₦}1869.63 \pm 620.58$. There was significant difference ($P < 0.05$) in the average buying and selling price of smoked fish at different market levels of operation of the respondents in the sampled area.

Smoked fish wholesalers had the highest average total marketing cost, total production and fixed total variable of $\text{₦}45,619.75 \pm 49,387.28$, $\text{₦}4,072,826.84 \pm 1,519,288.65$ and $\text{₦}1,054.80 \pm 1,289.90$ respectively while the retailers had the least average marketing cost and purchase cost of $\text{₦}29,242.32 \pm 19,861.66$ and $\text{₦}1,951,687.48 \pm 838,406.00$. There was also significant difference ($P < 0.05$) in the costs except average fixed cost incurred among the actors along the smoked fish marketing channels.

The results of the profitability analysis of the marketers of smoked fish indicated that the wholesalers had the highest average monthly revenue of $\text{₦}4,941,129.14 \pm 1,945,005.45$ while retailers had the least average monthly revenue of $\text{₦}2,615,505.96 \pm 846,410.58$. Processors had the highest average gross margin and net return of $\text{₦}1,758,680.11 \pm 962,316.35$ and $\text{₦}1,158.03 \pm 492.55$ while retailers had the least average marketing margin of $\text{₦}663,818.49 \pm 361,119.60$.

Table 4.14: Profitability and Efficiency indices of smoked fish marketed by the respondents at various level of operation in fish markets in the States along Nigeria-Niger border and in Lake Kainji-inland fisheries

Variables	Level of Market Operated					
	Wholesaler		Retailers		Processor	
	Mean	SD	Mean	SD	Mean	SD
Total Quantity Sold (Kg)	2383.12 ^a	603.76	1280.33 ^c	293.58	1453.98 ^b	291.02
Buying Price (₦)	1694.11 ^a	596.75	1525.78 ^b	569.91	663.05 ^c	178.05
Selling Price(₦)	2114.72 ^a	813.72	2054.80 ^a	568.59	1869.63 ^a	620.58
Total Marketing Cost (₦)	45619.75 ^a	49387.28	29242.32 ^b	19861.66	33595.03 ^{ab}	30137.97
Total Purchase Cost (₦)	3998600.91 ^a	1530765.72	1951687.48 ^b	838406.00	985957.50 ^c	392201.03
Other Operational Cost(₦)	27551.39 ^{ab}	22608.01	21347.50 ^b	15091.96	31970.73 ^a	27160.79
Total Variable Cost(₦)	4071772.05 ^a	1519347.02	2002277.29 ^b	833222.72	1051265.44 ^c	383121.34
Total Fixed Cost (₦)	1054.80 ^a	1289.90	774.71 ^a	903.18	1230.56 ^a	1914.93
Total Production Cost(₦)	4072826.84 ^a	1519288.65	2003052.00 ^b	833281.41	1052496.00 ^c	382856.22
Total Revenue (₦)	4941129.14 ^a	1945005.45	2615505.96 ^b	846410.58	2809945.55 ^b	1304024.48
Gross Margin(₦)	869357.09 ^b	820180.06	613228.67 ^b	360239.90	1758680.11 ^a	962316.35
Gross Margin (₦/kg)	387.94 ^b	363.87	486.66 ^b	273.50	1158.94 ^a	492.26
Net Return(₦)	868302.29 ^b	820466.63	612453.96 ^b	360228.83	1757449.55 ^a	962602.25
Net Return (₦/Kg)	387.49 ^b	363.94	486.06 ^b	273.47	1158.03 ^b	492.55
Marketing Efficiency	29.08 ^b	35.30	40.34 ^b	40.59	161.55 ^b	49.87
Marketing Margin(₦)	942528.23 ^b	794446.40	663818.49 ^b	361119.60	1823988.05 ^a	953245.23
Marketing Margin ((₦/kg)	420.61 ^b	352.81	529.02 ^b	274.59	1206.58 ^a	480.31

Note: Mean values with the same alphabet superscripts are not significantly different (P<0.05)

The highest average marketing efficiency of 161.55 ± 49.87 and least efficiency of 29.08 ± 35.30 were recorded among processors and wholesalers respectively. There was significant difference ($P < 0.05$) in the profitability indices and marketing efficiency of smoked fish among the actors along the fresh fish channel.

4.9.3 Profitability Indices and Efficiency of Dried Fish Products According to Market Level Operated along Nigeria-Niger Border and Lake Kainji-Inland Fisheries

Table 4.15 includes the results of average monthly quantities, costs, profitability and marketing efficiency indices of dried fish marketed by the respondents at various levels of operation in fish markets in the States along Nigeria-Niger border and Lake Kainji-inland fisheries. Wholesalers had the highest average monthly quantity of $2,053.45 \pm 490.32$ kg of dried fish while the retailers had the least average quantity of 1071.69 ± 466.50 kg which was not statistically different ($P > 0.05$) from the average quantity marketed by the processors.

The highest average buying and selling prices of $\text{₦}1,840.83 \pm 530.75/\text{kg}$ and $\text{₦}2,315.00 \pm 693.27/\text{kg}$ respectively of smoked fish was observed among the retailers of smoked fish while processor had the least average buying and selling prices of $\text{₦}584.40 \pm 158.50$ and $\text{₦}1743.43 \pm 501.56$. There was significant difference ($P < 0.05$) in the average buying and selling price of dried fish at different market levels of operation of the respondents in the sampled area.

The cost analysis results presented in Table 4.15 indicated that dried fish processors had the highest average total marketing cost and least average purchase cost of $\text{₦}33,951.87 \pm 29,988.72$ and $\text{₦}777,677.46 \pm 348,451.68$ respectively while wholesalers had the highest average total production and variable costs of $\text{₦}3,379,420.32 \pm 1,415,692.17$ and $\text{₦}3,378,185.67 \pm 1,415,633.17$ respectively while there was no significant difference ($P > 0.05$) in the average fixed, other operational and marketing costs incurred among the actors along the dried fish marketing channels in fish markets along Nigeria-Niger border and Lake Kainji-inland fisheries.

Table 4.15: Profitability and Efficiency indices of dried fish marketed by the respondents at various level of operation in fish markets in the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Variables	Level of Market Operated					
	Wholesaler		Retailers		Processor	
	Mean	SD	Mean	SD	Mean	SD
Total Quantity Sold (Kg)	2052.45 ^a	490.32	1071.69 ^b	466.50	1275.95 ^b	257.32
Buying Price (₦)	1627.27 ^a	564.04	1840.83 ^a	530.75	584.40 ^b	158.50
Selling Price(₦)	2095.45 ^{ab}	745.71	2315.00 ^a	693.27	1743.43 ^b	501.56
Total Marketing Cost (₦)	30353.67 ^a	20009.05	28598.82 ^a	15685.99	33951.87 ^a	29988.72
Total Purchase Cost (₦)	3316204.73 ^a	1430651.86	1951479.94 ^b	1093461.92	777677.46 ^c	348451.68
Other Operational Cost(₦)	31627.27 ^a	23263.71	24262.50 ^a	20961.25	31891.81 ^a	30357.79
Total Variable Cost(₦)	3378185.67 ^a	1415633.17	2004341.27 ^b	1098125.02	843521.14 ^c	328706.37
Total Fixed Cost (₦)	1234.65 ^a	1352.73	791.41 ^a	889.71	1238.58 ^a	1125.32
Total Production Cost(₦)	3379420.32 ^a	1415692.17	2005132.67 ^b	1098249.60	844759.72	328584.50 ^c
Total Revenue (₦)	4314094.00 ^a	1985515.65	2486190.83 ^b	1433360.10	2243871.47 ^b	968330.59
Gross Margin(₦)	935908.33 ^b	624035.68	481849.57 ^c	384599.26	1400350.33 ^a	753569.59
Gross Margin (₦/kg)	434.35 ^b	247.01	410.95 ^b	238.67	1098.08 ^a	485.58
Net Return(₦)	934673.68 ^b	623830.07	481058.16 ^c	384265.09	1399111.75 ^a	753811.00
Net Return ((₦/Kg)	433.71 ^b	247.00	410.21 ^b	238.64	1097.05 ^a	485.66
Marketing Efficiency	26.93 ^b	13.37	22.35 ^b	12.69	182.48 ^a	103.96
Marketing Margin(₦)	997889.27 ^b	601708.68	534710.89 ^c	385383.02	1466194.01 ^a	749318.42
Marketing Margin ((₦/kg)	468.18 ^b	231.42	474.17 ^b	221.31	1159.03 ^a	502.18

Note: Mean values with the same alphabet superscripts are not significantly different (P<0.05)

The results of the profitability analysis of the marketers of dried fish indicated that the wholesalers had the highest average monthly revenue of ₦4,314,094.00±1,985,515.65 while processors had the least average monthly revenue of ₦2,243,871.47±968,330.59. Processors had the highest average gross margin and net return per kg of ₦1,400,350.33± 753,569.59 and ₦1097.05±485.66/kg while wholesalers had the least average marketing margin per kg of ₦468.18±231.42.

The highest average marketing efficiency of 182.48±103.96 and least efficiency of 22.35±12.69 were recorded among processors and retailers respectively. There was significant difference ($P<0.05$) in the profitability indices and marketing efficiency of dried fish among the actors along the fresh fish channels.

4.9.4 Profitability and Efficiency of Fried Fish Products According to Market Level Operated along Nigeria-Niger Border and Lake Kainji-Inland Fisheries

Reported in Table 4.16 are the results of average monthly quantities, costs, profitability and marketing efficiency indices of fried fish marketed by the respondents at various levels of operation in fish markets in the States along Nigeria-Niger border and Lake Kainji-inland fisheries. Wholesalers had the highest average monthly quantity of 2,523.87±152.20kg of fried fish while processors had the least average quantity of 771.43±253.01kg which was statistically less than ($P<0.05$) the average quantity marketed by the retailers.

Wholesalers had the highest average buying and selling prices of ₦1,354.87±123.50/kg and ₦1,632.98±356.76/kg respectively while processor had the least average buying and selling prices of ₦546.17±112.19 and ₦1,203.89±347.74. There was significant difference ($P<0.05$) in the average buying and selling price of fried fish at different market levels of operation of the respondents in the sampled area.

Table 4.16: Profitability and Efficiency indices of fried fish marketed by the respondents at various levels of operation in fish markets in the States along Nigeria-Niger border and in Lake Kainji-inland fisheries

Variables	Levels of Market Operated					
	Wholesaler		Retailers		Processor	
	Mean	SD	Mean	SD	Mean	SD
Total Quantity Sold (Kg)	2523.87 ^a	152.20	1136.25 ^b	127.13	771.43 ^c	253.01
Buying Price (₦)	1354.87 ^a	123.50	1072.50 ^b	230.46	546.17 ^c	112.19
Selling Price(₦)	1632.98 ^a	356.76	1508.13 ^b	223.58	1203.89 ^c	347.74
Total Marketing Cost (₦)	26543.12 ^a	32125.34	18354.64 ^a	7284.49	25707.26 ^a	16356.13
Total Purchase Cost (₦)	2510864.23 ^a	454292.34	1229456.00 ^b	325764.52	428817.96 ^c	195287.14
Other Operational Cost(₦)	25076.12 ^a	27659.78	13437.50 ^a	8341.45	19035.38 ^a	16825.43
Total Variable Cost(₦)	2551012.78 ^a	452462.09	1261248.14 ^b	325817.59	473208.09 ^c	190386.88
Total Fixed Cost (Depreciated)(₦)	9198.89 ^a	2431.98	957.48 ^a	891.94	1638.66 ^a	1148.25
Total Production Cost(₦)	2551103.12 ^a	452376.87	1262205.62 ^b	325417.47	474846.75 ^c	190376.45
Total Revenue (₦)	4054546.98 ^a	212324.65	1731123.61 ^b	402500.48	927478.28 ^c	378451.97
Gross Margin(₦)	1449654.90 ^a	352545.12	469875.48 ^b	286492.33	454270.19 ^c	290089.42
Gross Margin (₦/kg)	579.60 ^a	421.76	407.23 ^a	229.75	592.65 ^a	374.78
Net Return(₦)	1448954.65 ^a	358759.21	468918.0 ^b	286393.13	452631.52 ^b	290401.38
Net Return ((₦/Kg)	579.56 ^a	435.45	406.36 ^a	229.63	590.29 ^a	375.36
Marketing Efficiency	56.80 ^b	13.64	41.30 ^b	28.79	104.26 ^a	84.90
Marketing Margin(₦)	1543683.56 ^a	363450.53	501667.61 ^b	289604.42	498660.32 ^c	308618.39
Marketing Margin ((₦/kg)	633.21 ^a	345.61	435.63 ^a	231.31	657.72 ^a	401.19

The cost analysis results presented in Table 4.16 indicated that wholesalers had the highest average total marketing, purchase and production costs of ₦26,543.12±32,125.34, ₦2,510,864.23±454,292.34 and ₦2,551,103.12±452,376.87 respectively while retailers had the least average monthly variable and fixed costs of ₦13,437.50±8,341.45 and ₦957.48±891.94 respectively while there was no significant difference ($P>0.05$) in the average total and fixed costs incurred among the actors along the fried fish marketing channels in fish markets along Nigeria-Niger border and Lake Kainji-inland fisheries.

The results of the profitability analysis of the marketers of fried fish indicated that the wholesalers had the highest average monthly revenue of ₦2,551,103.12±452,376.87 while processors had the least average monthly revenue of ₦927,478.28±378,451.97. Wholesalers had the highest average gross margin, net return and marketing margin of ₦1,449,654.90±352,545.12, ₦1,448,954.65±358,759.21 and ₦1,543,683.56±363,450.53 while retailers had the least average marketing margin per kg of ₦435.63±231.31. The highest average marketing efficiency of 104.26±84.90 and least efficiency of 41.3±28.79 were recorded among processors and retailers respectively. There was significant difference ($P<0.05$) in the profitability indices and marketing efficiency of fried fish among the actors along the fresh fish channels.

4.9.5 Profitability and Efficiency of Spiced Fish Products According to Market Level Operated along Nigeria-Niger Border and Lake Kainji-Inland Fisheries

According to the results presented in Table 4.17 processors and retailers were involved in marketing of spiced fish in the States along Nigeria-Niger border and Lake Kainji-inland fisheries. Processors had the highest average monthly quantity of 1,410.83±178.88kg of spiced fish while retailers had the least average quantity of 1,396.00±246.07kg.

Retailers had the highest average buying and selling prices of ₦1,270.00±240.42/kg and ₦1700.00±424.26/kg respectively while processor had the least average buying and selling prices of ₦657.78±58.48 and ₦1,356.67±213.60. There was significant difference ($P<0.05$) in the average buying price while there no difference ($P>0.05$) in selling price of processor and retailers of spiced fish in the sampled area.

Table 4.17: Profitability and efficiency of spiced fish marketed by the actors at various levels of operation in fish markets in the States along Nigeria-Niger border and in Lake Kainji-inland fisheries

Variables	Levels of Market Operated			
	Retailers		Processor	
	Mean	SD	Mean	SD
Total Quantity Sold (Kg)	1396.00 ^a	246.07	1410.83 ^a	178.88
Buying Price (₦)	1270.00 ^a	240.42	657.78 ^b	58.48
Selling Price(₦)	1700.00 ^a	424.26	1356.67 ^a	213.60
Total Marketing Cost (₦)	21475.00 ^a	13328.96	32749.81 ^a	30513.95
Total Purchase Cost (₦)	1743340.00 ^a	23108.25	928196.09 ^b	147416.84
Other Operational Cost(₦)	21000.00 ^a	12727.92	25633.33 ^a	19704.71
Total Variable Cost(₦)	1785815.00 ^a	2948.64	986579.24 ^b	165884.45
Total Fixed Cost (₦)	817.50 ^a	212.84	1785.01 ^a	1689.20
Total Production Cost(₦)	1786632.50 ^a	3161.47	988364.24 ^b	166761.77
Total Revenue (₦)	2321000.00 ^a	173948.27	1933776.52 ^a	482562.99
Gross Margin(₦)	535185.00 ^a	176896.90	947197.28 ^a	378543.37
Gross Margin (₦/kg)	400.76 ^a	197.36	658.73 ^a	215.78
Net Return(₦)	534367.50 ^a	177109.74	945412.28 ^a	378394.82
Net Return ((₦/Kg)	400.18 ^a	197.41	657.50 ^a	215.76
Marketing Efficiency	29.92 ^b	9.97	95.04 ^a	32.48
Marketing Margin(₦)	577660.00 ^a	150840.02	1005580.43 ^a	408517.74
Marketing Margin ((₦/kg)	430.00 ^a	183.85	698.89 ^a	230.19

The average total purchase, variable and production costs of ₦1,743,340.00±23,108.25, ₦1,785,815.00±2,948.64 and ₦1,786,632.50±3,161.47 respectively of the retailers was significantly ($P<0.05$) higher than that incurred by the processors that had higher average total marketing and fixed cost of ₦32,749.81±30,513.95 and ₦17,85.01±1,689.20.

The results of the profitability analysis of the marketers of spiced fish indicated that the retailers had the higher average monthly revenue of ₦2,321,000.00±173,948.27 while processors had higher gross margin, marketing margin per kg and marketing efficiency of ₦947,197.28±378,543.37, ₦698.89±230.19/kg and 95.04±32.48 respectively.

4.9.6 Profitability and Marketing Efficiency of Frozen Fish Products According to Market Level Operated along Nigeria-Niger Border and Lake Kainji-Inland Fisheries

The results presented in Table 4.18 wholesalers and retailers were involved in marketing of frozen fish in the States along Nigeria-Niger border and Lake Kainji-inland fisheries. Wholesalers had the highest average monthly quantity of 1,221.65±312.91kg of frozen fish while retailers had the least average quantity of 907.34±130.93kg. There was significant difference ($P<0.05$) in the highest average monthly quantity of frozen fish by the wholesalers and retailers along Nigeria-Niger border and Lake Kainji-inland fisheries. Retailers had the highest average buying and selling prices of ₦816.25±136.06/kg and ₦1,315.63±384.28/kg respectively while wholesalers had the least average buying and selling prices of ₦723.75±222.13 and ₦1,000.00±119.52. There was no significant difference ($P>0.05$) in the average buying price while there was significant difference ($P<0.05$) in selling price of processor and retailers of spiced fish in the sampled area. The average total purchase, marketing, variable and production costs of ₦835,909.50±194,399.38, ₦40,535.50±20,296.84, ₦901,801.26±215,635.04 and ₦902,404.63±215,752.44 respectively of the wholesalers was not significantly ($P>0.05$) higher than that incurred by the retailers.

Table 4.18: Profitability and Efficiency indices of frozen fish marketed by the actors at various levels of operation in fish markets in the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Variables	Levels of Market Operated			
	Wholesalers		Retailers	
	Mean	SD	Mean	SD
Total Quantity Sold (Kg)	1221.65 ^a	312.91	907.34 ^b	130.93
Buying Price (₦)	723.75 ^a	222.13	816.25 ^a	136.06
Selling Price(₦)	1000.00 ^b	119.52	1315.63 ^a	384.28
Total Marketing Cost (₦)	40535.50 ^a	20296.84	40387.29 ^a	22034.50
Total Purchase Cost (₦)	835909.50 ^a	194399.38	744851.50 ^a	187921.47
Other Operational Cost(₦)	25356.25 ^a	14558.98	28934.38 ^a	22649.62
Total Variable Cost(₦)	901801.26 ^a	215635.04	814173.17 ^a	192172.59
Total Fixed Cost (Depreciated)(₦)	603.37 ^a	306.10	806.29 ^a	574.42
Total Production Cost(₦)	902404.63 ^a	215752.44	814979.46 ^a	192488.40
Total Revenue (₦)	1226123.44 ^a	382431.22	1180126.88 ^a	297746.47
Gross Margin(₦)	384653.92 ^a	410204.42	365953.71 ^a	329908.19
Gross Margin (₦/kg)	276.95 ^a	257.10	423.77 ^a	415.54
Net Return(₦)	323718.81 ^a	416459.24	365147.42 ^a	330198.58
Net Return ((₦/Kg)	220.32 ^a	286.20	422.89 ^a	435.84
Marketing Efficiency	52.04	48.64	53.05 ^a	47.19
Marketing Margin(₦)	390213.94 ^a	405841.42	435275.37 ^a	329212.14
Marketing Margin ((₦/kg)	276.25 ^a	270.29	499.38 ^a	430.50

Note: Mean values with the same alphabet superscripts are not significantly different (P<0.05)

The results of the profitability analysis of the marketers of frozen fish indicated that the wholesalers had the higher average monthly revenue and gross margin of ₦1,226,123.44±382,431.22 and ₦384,653.92±410,204.42 while retailers had higher net return per kg, marketing margin per kg and marketing efficiency of ₦422.89±435.84/kg, ₦499.38±430.50/kg and 53.05±57.19.

4.9.7 ESTIMATED TECHNICAL EFFICIENCY USING THE STOCHASTIC FRONTIER MODEL

The Maximum likelihood estimate (MLE) of the parameters of the stochastic frontier model of the fish farmers is presented in Table 4.19. The table contained the estimates of the parameters of the stochastic frontier model, the efficiency model and the variance parameters. The variance parameters of the Stochastic production function are represented by sigma squared (σ^2) and gamma (γ). From the table, the estimated sigma (σ^2) parameter shows that 20% of the variation in fish marketing among the producers, marketers and processors was attributed to the differences in the technical efficiencies of the fish marketers. There was a positive relationship between total marketing cost, total purchase cost, other operating cost and the revenue of the fish marketers and there was a negative relationship between fixed cost and revenue.

Table 4.20 represents the estimates of the inefficiency model for capture producers, it shows the relationship between the socio economic characteristics and the profitability parameters. The result shows that there is a positive relationship between marital status ($r= 0.14$, $p<0.05$) household size ($r=0.01$, $p<0.05$) and marketing experience ($r=0.08$, $p<0.05$) and profitability while age ($r= -0.01$, $p<0.05$) and sex ($r= -0.67$, $p<0.05$) have negative relationships

Table 4.21 represents the estimates of the inefficiency model for culture producers. It shows the relationship between the socio economic characteristics and the profitability parameters. The result shows that there is a positive relationship between age ($r = 0.00$, $p<0.05$), Marital status ($r= 0.00$, $p<0.05$), household size ($r=0.00$, $p<0.05$), marketing experience ($r=0.01$, $p<0.05$) and profitability, however sex ($r = -0.06$, $p<0.05$), had a negative relationship with profitability.

Table 4.22 represents the estimates of the inefficiency model for marketers, it shows the relationship between the socio economic characteristics and the profitability parameters.

Table 4.19: Estimated Maximum Likelihood Function Using Stochastic Production Frontier Model

Variable	Parameter	Coefficients	Standard error	t-ratio
(Constant)	β_0	0.13	0.51	0.25
Total Marketing Cost	β_1	0.37	0.28	0.13
Total Purchase cost	β_2	0.11	0.37	0.30
Other Operating Cost	β_3	0.12	0.13	0.96
Fixed Cost	β_4	-0.67	0.18	-0.38
Gamma	Γ	0.27	0.13	0.21
Sigma square	σ^2	0.20	0.22	0.93
Likelihood Ratio of the one sided error	Λ	-0.57		

Table 4.20: Linear regression showing the relationship between socio-economic characteristics and profitability for capture producers

Parameters	Coefficient	Std Error	T-ratio	Sig value
Estimates of the Inefficiency Model				
(Constant)	0.77	0.54	1.42	0.16
Age of respondents	-0.01	0.01	-1.59	0.11
Sex of respondents	-0.67	0.30	-2.23	0.03
Marital Status	0.14	0.22	0.61	0.54
Household size	0.01	0.01	0.83	0.41
Marketing Experience	0.08	0.08	0.95	0.34
Significant at 5% probability level				

Table 4.21: Linear regression showing the relationship between socio-economic characteristics and profitability for Culture producers

Parameters	Coefficient	Std Error	T-ratio	Sig value
Estimates of the Inefficiency Model				
(Constant)	-0.01	0.22	-0.04	0.97
Age of respondents	0.00	0.00	0.17	0.86
Sex of respondents	-0.06	0.10	-0.56	0.58
Marital Status	0.00	0.08	0.05	0.96
Household size	0.00	0.00	0.61	0.54
Marketing Experience	0.01	0.03	0.17	0.87
Significant at 5% probability level				

Table 4.22: Linear regression showing the relationship between socio-economic characteristics and profitability for Marketers

Parameters	Coefficient	Std Error	T-ratio	Sig Value
Estimates of the Inefficiency Model				
(Constant)	0.28	0.26	1.10	0.27
Age of respondents	-0.01	0.00	-1.44	0.15
Sex of respondents	-0.06	0.11	-0.57	0.57
Marital Status	-0.02	0.10	-0.20	0.84
Household size	0.00	0.00	1.06	0.29
Marketing Experience	0.05	0.05	1.06	0.29

Significant at 5% probability level

Table 4.23: Linear regression showing the relationship between socio-economic characteristics and profitability for processors

Parameters	Coefficient	Std Error	T-ratio	Sig Value
Estimates of the inefficiency Model				
(Constant)	-0.17	0.26	-0.66	0.27
Age of respondents	0.00	0.00	0.50	0.15
Sex of respondents	0.08	0.11	0.72	0.57
Marital Status	-0.09	0.10	-1.04	0.84
Household size	0.00	0.00	-0.55	0.29
Marketing Experience	0.10	0.05	1.81	0.29
Significant at 5% probability level				

The result shows that there are positive relationships between household size ($r = 0.00$, $p < 0.05$), marketing experience ($r = 0.05$, $p < 0.05$) and profitability. There is a negative relationship between age ($r = -0.01$, $p < 0.05$), sex ($r = -0.06$, $p < 0.05$), marital status ($r = -0.05$, $p < 0.05$) and profitability.

4.10 MARKETING CHANNELS

This study revealed that there are eight (8) major channels of marketing fish products from the producers to the consumers in the States along Nigeria-Niger border and Lake Kainji-inland fisheries (Table 4.24). These fish marketing channels start with the producers (fishermen/fish farmers) and ends with the consumers with a number of intermediaries in between. A channel of distribution for fresh fish from capture and culture sources and processed fish were identified in the study area as shown in Figure 4.9.

4.10.1 Marketing channels of fish products along Nigeria-Niger border and Lake Kainji-Inland Fisheries fish market

It was observed that fresh fish products in the study area were majorly (61.84%) marketed directly by the producers (Capture/Culture) to the consumers (Channel I) while 56.32%, 51.19%, 70.31% and 50.00% of smoked, dried, fried and spiced fish products respectively were marketed through Channel II (Producer (Capture/Culture) → Processor → Consumers). Frozen fish were majorly (40.00%) channeled from the producers through the wholesalers to the consumers as indicated in Tables 4.25 – 4.30.

Reported in Tables 4.31-4.36 are economic characteristics and marketing efficiency of marketing channels of different fish products in the fish markets along Nigeria-Niger border and Lake Kainji-inland fisheries. The highest marketing efficiency and gross margin per kg for fresh fish was observed in direct marketing from the producer to consumer, while that of smoked fish and fried fish products were in producers through wholesalers to processors and consumers; that of spiced and dried fish were observed in Channel II (producer to processors to consumers) and frozen fish from wholesalers (frozen fish) through processors and wholesaler (processed fish) to the final consumers.

Table 4.24: Major channels of marketing fish products from the producers to the consumers in the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Marketing Channels of Fish Products
<u>Fresh Fish Product</u>
Channel 1: Producer (Capture/Culture) → Consumers
Channel 2: Producer (Capture/Culture) → Wholesaler → Consumers
Channel 3: Producer (Capture/Culture) → Retailers → Consumers
Channel 4: Producer (Capture/Culture) → Wholesaler → Retailers → Consumers
<u>Processed Fish Products</u>
Channel 1: Producer (Capture/Culture) → Processor → Consumers
Channel 2: Processor → Wholesaler → Consumers
Channel 3: Processor → Retailers → Consumers
Channel 4: Processor → Wholesaler → Processor → Consumers

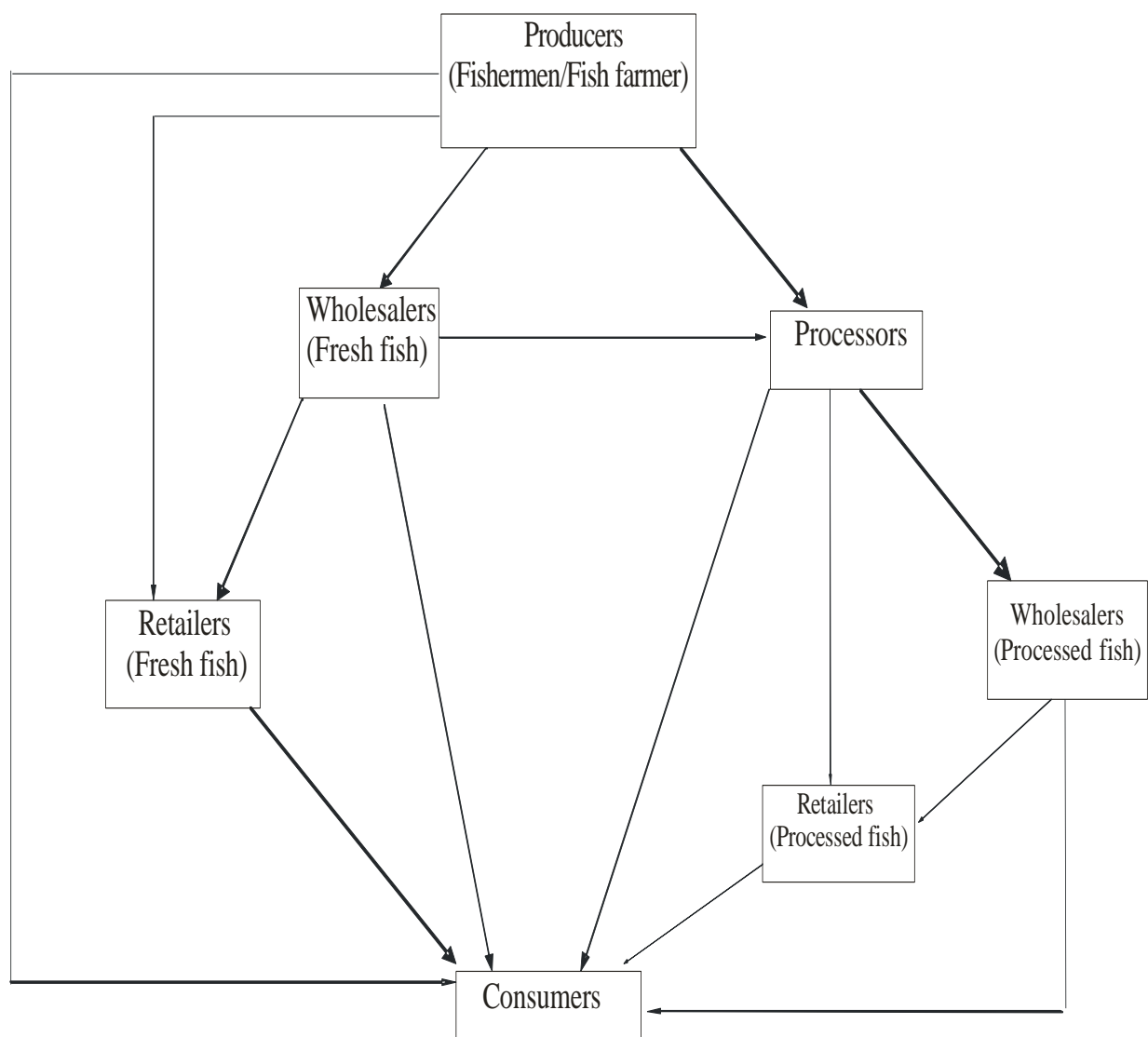


Figure 4.9: Marketing channels for fresh and processed fish typical in the fish markets in States along Nigeria-Niger border and Lake Kainji-Inland Fisheries

Table 4.25: Fish marketing channels and market share (%) of fresh fish in the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Marketing Channels of Fish Products	Total Volume of Transactions		
	Mean	SD	%
Channel I: Producer (Capture/Culture) → Consumers	1897.98	1042.29	61.84
Channel II: Producer (Capture/Culture) → Wholesaler → Consumers	2012.16	641.79	13.16
Channel III: Producer (Capture/Culture) → Retailers → Consumers	1701.88	536.76	21.05
Channel IV: Producer (Capture/Culture) → Wholesaler → Retailers → Consumers	1841.29	659.95	3.95

Table 4.26: Marketing channels and market share (%) of smoked fish in the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Marketing Channels of Fish Products	Total Transactions	Volume	of
	Mean	SD	%
Channel I: Producer (Capture/Culture) → Wholesaler → Processor → Consumers	1459.09	425.05	5.26
Channel II: Producer (Capture/Culture) → Processor → Consumers	1467.2	290.22	56.32
Channel III: Producer (Capture/Culture) → Processors → Retailers → Consumers	1253.44	348.81	16.32
Channel IV: Producer (Capture/Culture) → Processors → Wholesaler → Consumers	2125.19	482.41	12.63
Channel V: Producer (Capture/Culture) → Processors →Wholesaler → Retailers → Consumers	1353.9	198.75	9.47

Table 4.27: Marketing channels and market share (%) of dried fish in the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Marketing Channels of Fish Products	Total Volume of Transactions		
	Mean	SD	%
Channel I: Producer (Capture/Culture) → Wholesaler → Processor → Consumers	1253.62	57.44	7.14
Channel II: Producer (Capture/Culture) → Processor → Consumers	1311.03	253.29	51.19
Channel III: Producer (Capture/Culture) → Processors → Retailers → Consumers	1323.64	207.58	15.48
Channel IV: Producer (Capture/Culture) → Processors → Wholesaler → Consumers	1186.90	445.49	17.86
Channel V: Producer (Capture/Culture) → Processors → Wholesaler → Retailers → Consumers	1195.71	740.47	8.33

Table 4.28: Marketing channels and market share (%) of fried fish in the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Marketing Channels of Fish Products	Total Transactions	Volume	of
	Mean	SD	%
Channel I: Producer (Capture/Culture) → Wholesaler → Processor → Consumers	712.08	131.95	4.69
Channel II: Producer (Capture/Culture) → Processor → Consumers	748.06	245.82	70.31
Channel III: Producer (Capture/Culture) → Processors → Retailers → Consumers	1116.41	133.67	18.75
Channel IV: Producer (Capture/Culture) → Processors → Wholesaler → Consumers	2500	242.89	1.56
Channel V: Producer (Capture/Culture) → Processors → Wholesaler → Retailers → Consumers	1156.5	79.9	4.69

Table 4.29: Marketing channels and market share (%) of spiced fish in the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Marketing Channels of Fish Products	Total Transactions	Volume	of
	Mean	SD	%
Channel I: Producer (Capture/Culture) → Wholesaler → Processor → Consumers	1359.63	241.90	30.00
Channel II: Producer (Capture/Culture) → Processor → Consumers	1470.72	151.57	50.00
Channel III: Producer (Capture/Culture) → Processors → Retailers → Consumers	1396.00	246.07	20.00

Table 4.30: Marketing channels and market share (%)of frozen fish in the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Marketing Channels of Fish Products	Total Volume of Transactions		
	Mean	SD	%
Channel I: Wholesaler → Consumers	1186.67	332.67	40.00
Channel II: : Retailers → Consumers	898.00	111.89	33.33
Channel III: Wholesalers → Processor → Consumers	1100.00	0.00	6.67
Channel IV: Wholesalers (frozen fish) → Processors → Wholesaler → Consumers	922.89	185.40	20.00

Table 4.31: Economic characteristics and marketing efficiency of marketing channels of fresh fish in the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Variables	Marketing Channels							
	Channel I		Channel II		Channel III		Channel IV	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Buying Price (₦)	58.45 ^a	161.54	623.33 ^b	329.46	897.97 ^c	391.78	655.83 ^b	373.93
Selling Price (₦)	648.94 ^a	218.48	1166.50 ^b	574.14	1333.72 ^b	387.08	1224.83 ^b	354.57
Other Operational Cost (₦)	42487.76 ^b	33257.56	33193.13 ^{ab}	29683.63	18910.94 ^a	11143.77	25112.50 ^{ab}	28003.77
Total Purchase Cost ((₦))	137939.56 ^a	348266.89	1282423.91 ^b	637916.42	1524418.68 ^b	785359.24	1217800.03 ^b	1066229.52
Total Marketing Cost ((₦))	49597.24 ^a	39352.29	34671.70 ^a	22880.54	29057.33 ^a	25967.93	47946.53 ^a	39083.29
Total Marketing Cost/Kg	31.90 ^a	23.69	23.07 ^a	26.79	17.83 ^a	12.96	27.68 ^a	27.48
Total Variable Cost (₦)	163537.66 ^a	263152.37	1222046.34 ^b	714846.46	1572386.95 ^b	782172.92	1290859.06 ^b	1076271.22
Total Fixed Cost (₦)	1624.81 ^a	1719.93	1054.05 ^a	1234.53	1106.94 ^a	1183.03	1131.02 ^a	565.54
Total Production Cost (₦)	165162.47 ^a	263348.76	1223100.39 ^b	715135.99	1573493.89 ^b	782255.14	1291990.08 ^b	1076441.50
Total Revenue ((₦))	1206073.20 ^a	611809.19	2445013.52 ^b	1407030.20	2239508.32 ^b	852721.87	2130133.23 ^b	599648.01
Gross Margin (₦)	1042535.54 ^{ab}	546816.06	1222967.17 ^b	1052479.30	667121.37 ^a	443295.98	839274.17 ^{ab}	554115.36
Gross Margin (₦/kg)	559.97 ^a	232.10	561.44 ^a	432.96	405.84 ^a	296.41	524.38 ^a	307.68
Net Return (₦)	1040910.73 ^{ab}	546691.72	1221913.13 ^b	1052188.88	666014.43 ^a	443057.81	838143.15 ^{ab}	554354.88
Net Return (₦/kg)	558.88 ^a	232.27	560.76 ^a	432.98	405.12 ^a	296.19	523.66 ^a	307.52
Marketing Margin (₦/kg)	1542.47 ^b	984.83	301.92 ^a	342.55	159.80 ^a	39.94	485.67 ^a	743.52
Marketing Margin (₦)	1134168.54 ^{ab}	557500.43	1290832.00 ^b	1040327.35	715089.64 ^b	451162.42	912333.20 ^{ab}	530253.35
Marketing Efficiency	618.47 ^b	211.66	605.50 ^a	415.93	435.75 ^a	300.06	569.00 ^a	309.30

Mean values with the same alphabet superscripts are not significantly different (p<0.05)

Table 4.32: Economic characteristics and marketing efficiency of marketing channels of smoked fish in the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Variables	Marketing Channels									
	Channel I		Channel II		Channel III		Channel IV		Channel V	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Buying Price (₦)	503.50 ^a	78.74	693.07 ^a	204.70	1316.10 ^b	527.05	1813.04 ^c	717.52	1774.44 ^c	632.14
Selling Price (₦)	1433.00 ^a	122.75	1927.99 ^b	629.82	1949.68 ^b	503.68	2479.54 ^c	830.56	2187.22 ^{bc}	694.03
Other Operational Cost (₦)	26777.78 ^a	20361.36	33088.32 ^a	28622.62	25118.55 ^a	17740.51	27297.92 ^a	23613.97	17511.11 ^a	11970.99
Total Purchase Cost (₦)	723400.31 ^a	173281.68	1045946.56 ^a	473631.57	1622785.21 ^b	750630.94	3916449.26 ^d	1869046.58	2368900.03 ^c	830546.54
Total Marketing Cost (₦)	26280.69 ^a	18899.43	35175.96 ^a	32604.69	32155.64 ^a	23940.39	36267.79 ^a	50876.02	28332.82 ^a	15374.25
Total Marketing Cost/Kg	17.17 ^a	9.42	25.96 ^a	26.68	27.85 ^a	24.07	16.05 ^a	20.79	20.99 ^a	11.06
Total Variable Cost (₦)	773781.00 ^a	187632.64	1114210.84 ^a	463479.69	1680059.40 ^b	749006.63	3980014.97 ^d	1869713.60	2414743.97 ^c	824764.02
Total Fixed Cost (Depreciated) (₦)	1423.87 ^a	2714.41	1161.45 ^a	1818.70	717.46 ^a	720.44	903.84 ^a	1144.41	917.90 ^a	1170.69
Total Production Cost (₦)	775204.87 ^a	187203.61	1115372.29 ^a	463227.58	1680776.86 ^b	748996.76	3980918.81 ^d	1869772.65	2415661.87 ^c	824932.82
Total Revenue ((₦))	2075658.33 ^a	531142.92	2923764.93 ^a	1335193.61	2413573.68 ^a	770920.41	5282911.71 ^b	2167938.87	2921268.43 ^a	868150.72
Gross Margin (₦)	1301877.33 ^b	384707.78	1809554.09 ^b	1009431.58	733514.28 ^a	437373.20	1302896.74 ^b	900730.32	506524.46 ^a	248388.66
Gross Margin (₦/kg)	895.73 ^b	130.49	1185.20 ^c	523.92	584.53 ^a	309.89	637.95 ^b	451.25	378.74 ^a	179.89
Net Return (₦)	1300453.46 ^b	384229.82	1808392.64 ^b	1009650.97	732796.82 ^a	437378.61	1301992.90 ^b	901067.49	505606.56 ^a	248462.36
Net Return (₦/kg)	894.75 ^b	130.03	1184.35 ^c	524.12	583.93 ^a	309.86	637.54 ^b	451.36	378.08 ^a	179.94
Marketing Margin (₦)	1352258.02 ^b	401111.95	1877818.36 ^b	997274.24	790788.47 ^a	439215.23	1366462.45 ^b	870026.08	552368.40 ^a	246973.40
Marketing Margin (₦/kg)	929.50 ^b	125.31	1234.93 ^c	510.56	633.58 ^a	306.54	666.50 ^a	438.30	412.78 ^a	178.22
Marketing Efficiency	170.32 ^c	40.08	160.89 ^c	54.51	58.52 ^b	53.10	45.20 ^b	53.38	22.89 ^a	11.97

Mean values with the same alphabet superscripts are not significantly different (p<0.05)

Table 4.33: Economic characteristics and marketing efficiency of marketing channels of dried fish in the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Variables	Marketing Channels									
	Channel I		Channel II		Channel III		Channel IV		Channel V	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Buying Price (₦)	631.67 ^a	71.11	592.21 ^a	171.28	1435.38 ^b	175.48	2172.67 ^d	636.11	1744.29 ^c	457.12
Selling Price (₦)	1328.33 ^a	80.85	1804.16 ^a	523.99	1839.23 ^b	125.73	2764.00 ^c	869.02	2141.43 ^b	517.86
Other Operational Cost (₦)	12983.33 ^a	7599.06	28870.93 ^a	22835.69	30463.46 ^a	33201.7	22788.33 ^a	8773.42	19528.57 ^a	15447.51
Total Purchase Cost ((₦))	788596.83 ^a	53424.55	811842.72 ^a	375906.67	1884025.85 ^b	280198.05	2605796.13 ^c	1306293.59	2068357.1 ^{bc}	1652288
Total Marketing Cost ((₦))	15341.67 ^a	1904.32	30986.26 ^a	22665.46	32426.67 ^a	16028.28	31474.06 ^a	16948.19	21520.29 ^a	19051.80
Total Marketing Cost/Kg	12.21	1.12	25.67	22.44	24.96	12.89	40.76	52.78	22.68	18.09
Total Variable Cost (₦)	816921.83 ^a	56514.13	871699.91 ^a	362707.22	1946915.98 ^b	309245.57	2660058.53 ^c	1300990.65	2109406.00 ^{bc}	1650515.00
Total Fixed Cost (Depreciated) (₦)	923.08 ^a	994.33	1360.73 ^a	1208.84	961.83 ^a	1168.05	869.25 ^a	790.52	1566.80 ^a	1533.34
Total Production Cost (₦)	817844.91 ^a	57371.79	873060.65 ^a	362541.17	1947877.80 ^b	308964.66	2660927.77 ^c	1301060.96	2110972.80 ^b	1651601.00
Total Revenue ((₦))	1665375.53 ^a	125711.45	2405019.56 ^{ab}	1062305.51	2425138.71 ^{ab}	344904.53	3335111.12 ^b	1713849.26	2627285.70 ^{ab}	2215445.00
Gross Margin (₦)	848453.70 ^a	174787.38	1533319.65 ^b	808210.45	478222.73 ^a	243121.61	675052.59 ^a	453523.18	517879.71 ^a	613903.4
Gross Margin (₦/kg)	673.90 ^a	122.95	1162.19 ^b	493.20	356.81 ^a	157.31	526.42 ^a	305.63	352.96 ^a	186.13
Net Return (₦)	847530.62 ^a	175659.03	1531958.91 ^b	808585.98	477260.91 ^a	242431.1	674183.35 ^a	453360.71	516312.91 ^a	612482.7
Net Return (₦/kg)	673.13 ^a	123.65	1161.09 ^b	493.39	356.11 ^a	156.89	525.68 ^a	305.75	351.84	185.75
Marketing Margin (₦)	876778.70 ^a	170953.63	1593176.84 ^b	806390.57	541112.86 ^a	239126.77	729314.99 ^a	447707.84	558928.57 ^a	605500.24
Marketing Margin (₦/kg)	696.67 ^a	119.28	1211.95 ^b	502.04	403.85 ^a	150.47	591.33 ^a	275.55	397.14 ^a	168.10
Marketing Efficiency	105.35 ^b	27.10	193.99 ^c	103.73	26.36 ^a	16.81	22.84 ^a	10.50	22.43 ^a	16.05

Mean values with the same alphabet superscripts are not significantly different (p<0.05)

Table 4.34: Economic characteristics and marketing efficiency of marketing channels of frozen fish in the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Variables	Marketing Channels							
	Channel I		Channel II		Channel III		Channel IV	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Buying Price (₦)	733.33	183.92	778.00	142.02	990.00	121.23	880.00	121.24
Selling Price (₦)	941.67	37.64	1190.00	181.66	1101.01	12.21	1525.00	587.90
Other Operational Cost (₦)	28041.67	15226.90	40700.00	20789.42	264983.00	2344.23	9325.00	2872.61
Total Purchase Cost ((₦))	829500.00	175595.56	699700.00	168651.49	1089012.21	16263.21	820104.00	230484.21
Total Marketing Cost ((₦))	46114.01	20409.71	51700.00	19490.25	29040.00	1322.23	21532.78	9294.86
Total Marketing Cost/Kg	39.34	13.87	56.20	17.59	26.36	4.34	25.14	13.74
Total Variable Cost (₦)	903655.67	201313.07	792100.00	193253.77	1144120.00	17263.21	850961.78	226525.61
Total Fixed Cost (₦)	657.00	308.83	973.03	686.16	677.00	212.12	528.38	166.88
Total Production Cost (₦)	904312.67	201371.25	793073.03	193783.55	1144677.00	17285.21	851490.16	226666.82
Total Revenue ((₦))	1109583.33	293353.10	1081500.00	292391.01	1210200.00	22123.33	1344505.00	272858.86
Gross Margin (₦)	266713.19	57883.75	289400.00	229792.61	66010.00	4322.34	493543.22	486064.66
Gross Margin (₦/kg)	209.23	67.02	312.17	229.67	60.00	5.32	609.77	689.49
Net Return (₦)	205270.67	157476.84	288426.97	230168.61	65323.00	13704.23	493014.84	486223.70
Net Return (₦/kg)	145.14	166.72	311.10	230.23	59.38	112.23	609.20	689.58
Marketing Margin (₦)	280083.33	169001.01	381800.00	247365.52	121000.00	143020.32	524401.00	487738.36
Marketing Margin (₦/kg)	208.33	159.30	412.00	236.05	110.00	234.00	645.00	697.37
Marketing Efficiency	30.85	13.10	40.60	34.97	5.71	0.23	73.80	89.28

Table 4.35: Economic characteristics and marketing efficiency of marketing channels of fried fish in the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Variables	Marketing Channels											
	Channel I		Channel II		Channel III		Channel IV		Channel V		Channel VI	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Buying Price (₦)	470.00	108.17	548.73	114.54	1500.00	50.20	1030.00	227.64	1000.00	10.20	1050.00	70.71
Selling Price (₦)	1250.00	563.47	1216.22	353.87	1900.00	150.00	1486.67	227.97	1600.00	150.34	1470.00	113.14
Total Purchase Cost (₦)	325713.73	27274.24	417869.60	193310.76	1980000.00	8769.45	1156416.33	288269.04	2500000.00	2534.98	1217150.00	165675.12
Total Marketing Cost (₦)	33933.33	17000.39	25586.51	17320.19	13200.00	423.34	20168.68	7042.65	26000.00	275.72	16625.00	2298.10
Total Marketing Cost/Kg	49.03	24.10	38.56	29.29	10.00	5.72	18.23	6.62	10.40	8.45	14.48	2.99
Total Variable Cost (₦)	387580.40	12210.54	461678.33	186088.42	1996400.00	90837.32	1191885.01	294388.66	2551000.00	2435.56	1245375.00	154043.21
Total Fixed Cost (₦)	1597.33	1511.89	1601.32	1115.47	424.00	275.34	1082.55	1006.40	100.00	421.66	619.07	79.68
Total Production Cost (₦)	389177.73	12400.52	463279.65	186165.84	1996824.00	90912.49	1192967.56	293942.42	2551100.00	2489.90	1245994.07	154122.89
Total Revenue (₦)	910202.33	503720.52	906417.12	366723.48	2508000.00	104234.84	1677617.32	402881.36	4000000.00	1653.43	1695535.00	13385.53
Gross Margin (₦)	522621.93	496033.16	444738.79	287954.04	511600.00	98234.58	485732.30	324809.66	1449000.00	1344.20	450160.00	167428.74
Gross Margin (₦/kg)	690.89	611.17	600.65	383.83	387.58	235.01	424.72	257.65	579.60	143.45	395.19	172.08
Net Return (₦)	521024.60	497154.50	443137.48	288194.64	511176.00	98078.45	484649.75	324706.33	1448900.00	1303.38	449540.93	167508.42
Marketing Margin (₦/kg)	780.00	642.81	667.49	410.93	400.00	543.43	456.67	257.13	600.00	23.34	420.00	183.85
Marketing Efficiency	132.56	123.47	105.45	88.17	25.60	72.11	45.07	31.91	56.80	11.25	37.19	18.04

Table 4.36: Economic characteristics and marketing efficiency of marketing channels of spiced fish in the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Variables	Marketing Channels					
	Channel I		Channel II		Channel III	
	Mean	SD	Mean	SD	Mean	SD
Buying Price (₦)	663.33 ^a	35.12	674.00 ^a	58.99	1270.00 ^b	240.42
Selling Price (₦)	1303.33 ^a	270.25	1430.00 ^a	187.62	1700.00 ^a	424.26
Other Operational Cost (₦)	22666.67 ^a	15260.93	29300.00 ^a	24788.10	21000.00 ^a	12727.92
Total Purchase Cost ((₦)	897166.90 ^a	119069.01	990772.82 ^a	136675.66	1743340 ^b	23108.25
Total Marketing Cost ((₦)	37199.44 ^a	17840.6	34090.00 ^a	39817.9	21475.00 ^a	13328.96
Total Marketing Cost/Kg	26.46	7.63	22.47	25.25	14.77	6.94
Total Variable Cost (₦)	957033.01 ^a	151922.12	1054162.82 ^a	146955.57	1785815.00 ^b	2948.64
Total Fixed Cost (₦)	1224.89 ^a	798.93	2273.12 ^a	2170.26	817.50 ^a	212.84
Total Production Cost (₦)	958257.90 ^a	152010.48	1056435.94 ^a	148200.75	1786632.5 ^b	3161.47
Total Revenue ((₦))	1815037.63 ^a	716353.77	2100825.16 ^a	326083.35	2321000.00 ^a	173948.27
Gross Margin (₦)	858004.62 ^a	570407.93	1046662.34 ^a	303938.28	535185.00 ^a	176896.90
Gross Margin (₦/kg)	597.75 ^a	288.58	713.62 ^a	206.95	400.76 ^a	197.36
Net Return (₦)	856779.73 ^a	570079.34	1044389.22 ^a	304341.82	534367.50 ^a	177109.74
Net Return (₦/kg)	596.85 ^a	288.43	712.13 ^a	207.23	400.18 ^a	197.41
Marketing Margin (₦)	917870.73 ^a	602459.38	1110052.34 ^a	340708.12	577660.00 ^a	150840.02
Marketing Margin (₦/kg)	640.00 ^a	302.65	756.00 ^a	224.79	430.00 ^a	183.85
Marketing Efficiency	85.27 ^{ab}	43.14	100.51 ^c	32.71	29.92 ^a	9.97

Mean values with the same alphabet superscripts are not significantly different (p<0.05)

4.10.2 Marketing channels of fish products in the States along Nigeria-Niger border and Lake Kainji-Inland Fisheries fish market

The distribution channel for fresh fish from capture fisheries in Sokoto, Katsina, Jigawa and Yobe and Niger States were similar. In Sokoto, Katsina, Jigawa and Yobe and Niger States fishermen sold fresh fish directly to wholesalers, retailers and processors at the landing site or on rare occasions at the markets while the wholesalers sold to retailers or processors who then sell directly to the final consumers. In addition, fishermen rarely sold fresh fish directly to consumers and in addition most fishermen in Niger State carry out processing within their household (done by themselves or their wives), these fishermen sell processed fish to both marketers and consumers. The channel for processed fish in all the States were similar, the processor bought fresh fish directly from other actors (fishermen /fish farmers, wholesalers and retailers) in the marketing channel, added value to the fish through different processing methods and then marketed the processed products to the wholesalers or retailers or directly to the final consumers.

4.11 FISH TRADE FLOW

In this study, trade flow was reported according to Intra-border (marketing of fish within the studied States (Intra-State Trade) and to other States in the region (Inter-State Trade)) and Inter-border trades (marketing of fish products across the border in States along Nigeria-Niger border and Lake Kainji-Inland fisheries). Figure 4.10 indicates the trade flow of fresh and processed fish products in the study area.

4.11.1 Average monthly quantity and percentage trade flow of fish products traded within and outside the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Table 4.37 shows that 98.83% of the fresh fish sold within the study area were produced within the States in the study area (Intra-State trade) while 1.17% were produced from other States with average monthly quantity (kg) of $1,702.23 \pm 978.32$ kg and $1,673.20 \pm 439.88$ kg respectively.

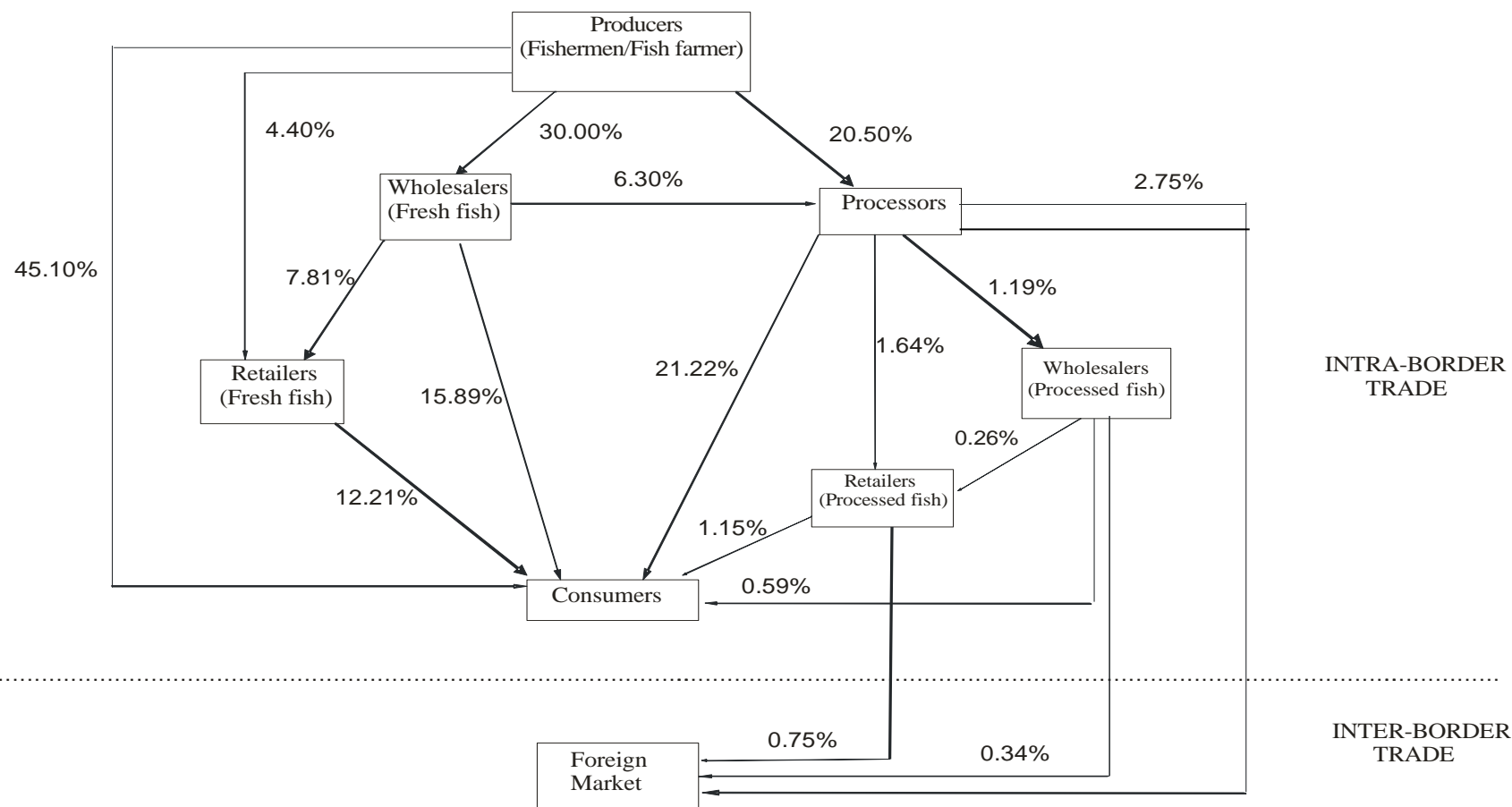


Figure 4.10: Trade flow of fresh and processed fish products and percentage of products along the marketing channels in in States along Nigeria-Niger border and Lake Kainji-Inland fisheries

Table 4.37: Average monthly quantity and percentage trade flow of supply of fish products fish markets from within and outside the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Forms of Fish Products	Trade Flow (Supply of Marketed Fish Products)											
	Intra State Trade			Inter State Trade			Regional Trade			Total		
	Mean	SD	%	Mean	SD	%	Mean	SD	%	Mean	SD	%
Fresh (kg)	1702.23	978.32	98.83	1673.20	439.88	1.17	NS	NS	0.00	1701.89	973.37	100.00
Smoked (kg)	1571.40	530.36	94.25	1580.50	387.23	5.75	NS	NS	0.00	1571.92	522.52	100.00
Dried (kg)	1266.69	476.77	85.28	1426.74	322.03	12.67	1386.46	160.57	2.05	1287.27	459.06	100.00
Frozen (kg)	1112.28	262.18	91.43	730.00	226.27	8.57	NS	NS	0.00	1064.49	282.91	100.00
Fried (kg)	882.25	339.15	97.66	730.72	283.39	2.34	NS	NS	0.00	877.98	336.93	100.00
Spiced (kg)	1378.41	174.46	71.19	1487.41	197.37	28.81	NS	NS	0.00	1408.14	178.02	100.00

Note: NS-No Information Supplied

94.25% of smoked fish sold within the study area were produced within the study area while 5.75% were sourced from other States with mean monthly quantity of $1,571.40 \pm 530.36\text{kg}$ and $1,580.50 \pm 387.23\text{kg}$ respectively. About 85.28% of dried fish sold within the study area were produced from within the study area while 12.67% were sourced from other States while 2.05% were sourced from across the border with mean monthly quantity (kg) of $1,266.69 \pm 476.77\text{kg}$, $1,426.74 \pm 322.03\text{kg}$ and $1,386.46 \pm 160.46\text{kg}$ respectively. 97.66% of fried fish sold in the study area were sourced from within the study area while 2.34% were sourced from other States with mean monthly quantity (kg) of $882.25 \pm 339.15\text{kg}$ and $730.72 \pm 283.39\text{kg}$ respectively. About 71.19% of spiced fish sold in the study area were sourced from within the study area while 28.81% were sourced from other States with mean monthly quantity (kg) of $1,378.41 \pm 174.46\text{kg}$ and $1,487.41 \pm 197.37\text{kg}$ respectively.

4.11.2 Average monthly revenue of fish products from the States along Nigeria-Niger border and Lake Kainji-inland fisheries traded within and outside the region

Table 4.38 shows the total revenue made from sale of different types of fish trade, 91.56% of the total revenue of fresh fish was made from sales within the State while 8.44% of the total revenue was made from sales to other States with average monthly revenue of $\text{₦}1,334,567.54 \pm 936,008.82$ and $\text{₦}1,604,781.24 \pm 742,572.28$ respectively. About 71.98% of the total revenue of smoked fish was made from sales within the State, 26.04% was made from sales to other States while 1.98% was made from Inter-border trade with average monthly revenue of $\text{₦}2,956,037.71 \pm 1,618,710.71$, $\text{₦}3,719,196.72 \pm 1,321,385.23$ and $\text{₦}3,260,028.25 \pm 1,241,860.25$ respectively.

About 44.68% of the total revenue for dried fish was made from sales within the State (Intra-border trade), 51.94% from sales to other States while 3.38% is made from Inter-border trade with average monthly revenue of $\text{₦}2,022,611.82 \pm 862,438.66$, $\text{₦}3,153,117.10 \pm 1,679,513.87$ and $\text{₦}4,215,600.00 \pm 128,127.75$ respectively.

Table 4.38: Average monthly revenue and percentage of fish products traded within and outside the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Fish Products	Trade Flow (Sales of Fish Products)											
	Intra State Trade			Inter State Trade			Regional Trade			Total		
	Mean	SD	%	Mean	SD	%	Mean	SD	%	Mean	SD	%
Fresh(₦)	1334567.54	936008.82	91.56	1604781.24	742572.28	8.44	NS	NS	0.00	1353811.24	925268.93	100.00
Smoked(₦)	2956037.71	1618710.71	71.98	3719196.72	1321385.23	26.04	3260028.25	1241860.25	1.98	3128996.17	1578403.11	100.00
Dried(₦)	2022611.82	862438.66	44.68	3153117.10	1679513.87	51.94	4515600.00	128127.75	3.38	2543832.85	1402566.88	100.00
Frozen(₦)	1199601.50	276607.16	62.32	1043125.00	322757.49	21.68	1540743.75	566737.25	16.01	1203125.16	331944.67	100.00
Fried(₦)	1187374.41	530504.30	74.05	853640.97	239919.50	17.74	2237937.83	1748260.68	8.21	1151856.41	612027.79	100.00
Spiced(₦)	2004485.87	536030.82	63.65	2003646.90	371742.71	36.35	NS	NS	0.00	2004180.79	462445.02	100.00

Note: NS-No Information Supplied

For fried fish, about 74.05%, 17.74%, and 8.21% of the total revenue of fried fish was made from sales within the States, to other States and from regional (Inter-border) sales respectively with average monthly revenue of ₦1,187,374.41±530,504.30, ₦853,640.97±239,919.50 and ₦2,237,937.83±1,748,260.68. About 63.65% of the revenue of spiced fish was made from sales within the State while 36.55% was made from sales to other States with average monthly revenue of ₦204,485.87±536,030.82 and ₦2,003,646.90±371,742.71 respectively.

Reported in tables 4.39 – 4.45 are the average prices and marketing efficiency of fish products traded within the states, outside the states and across the borders.

Fish Trade Flow in Sokoto State

4.12.1 Trade flow (inflow) of fish products entering fish in Sokoto State from within and outside the States

Table 4.39 indicated that 100.00% of fresh, smoked, dried and fried fish produced within the States were marketed within the State with average monthly quantity of 2,066.76±1,263.70kg, 1,520.77±734.27kg, 1,004.69±259.48kg and 703.75±106.09kg respectively.

4.12.2 Trade flow (outflow) of fish products from Sokoto State traded in within and outside the State

Table 4.47 shows that the average quantity of fresh, smoked and fried fish produced within the State are sold within the State while dried fish is sold both within and outside the State. The average monthly quantity (kg) of fresh fish produced and traded within Sokoto State in a month was 2,066.76±1,263.70kg while for smoked fish was 1,520.77±734.27kg, majority (68.74%) of the dried fish produced within Sokoto State were traded outside the State with average quantity (kg) of 1,004.69±259.48kg while 31.26% of the dried fish produced within the State was marketed within the State with average quantity (kg) of 562.31± 298.47kg. The average quantity (kg) of fried fish produced and traded within the State was 703.75±106.09kg. The average quantity of frozen fish traded within the month in Sokoto State 1,337.50±165.20kg.

Table 4.39: Average monthly quantity and percentage trade flow of fish products fish markets from within and outside the States along Nigeria-Niger border and Lake Kainji-inland fisheries

Fish	Trade Flow (Sales of Fish Products)								
Products	Intra-State Trade			Intra-Regional Trade			Total		
	Mean	SD	%	Mean	SD	%	Mean	SD	%
Fresh	1701.89	973.37	100.00	NS	NS	0.00	1701.89	973.37	100.00
Smoked	1563.44	513.65	97.57	2008.22	856.51	2.43	1571.92	522.52	100.00
Dried	1270.51	444.50	96.82	2150.00	494.97	3.18	1287.27	459.06	100.00
Frozen	1064.49	282.91	100.00	NS	NS	0.00	1064.49	282.91	100.00
Fried	847.86	271.13	91.13	1382.58	819.58	8.87	877.98	336.93	100.00
Spiced	1408.14	178.02	100.00	NS	NS	0.00	1408.14	178.02	100.00

Note: NS-No Information Supplied

Table 4.40: Average prices and marketing efficiency of fresh fish products traded within and outside the state

Variables	Trade Flow (Supply of Marketed Fish Products)				Trade Flow (Sales of Fish Products)			
	Intra State Trade		Inter State Trade		Intra State Trade		Inter State Trade	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Buying Price (₦/kg)	349.51	430.61	777.50	446.64	370.62	447.29	247.37	270.61
Selling Price(₦/kg)	779.22	371.39	1425.00	155.46	784.37	382.60	819.58	281.01
Marketing Efficiency	333.45	267.83	115.59	80.24	332.31	271.95	311.93	201.87

Table 4.41: Average prices and marketing efficiency of smoked fish products traded within and outside the state and across the border

	Trade Flow (Supply of Marketed Fish Products)				Trade Flow (Sales of Fish Products)					
	Intra State Trade		Inter State Trade		Intra State Trade		Inter State Trade		Regional Trade	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Buying Price (₹/kg)	1060.38	615.56	758.33	379.80	1069.63	666.50	919.00	329.66	1375.00	275.38
Selling Price(₹/kg)	1981.70	663.29	1567.50	172.53	1900.97	656.88	2187.76	609.40	1650.00	302.77
Marketing Efficiency	109.27	76.82	121.63	81.92	101.43	74.53	146.12	76.02	36.49	21.98

Table 4.42: Average prices and marketing efficiency of dried fish products traded within and outside the States and across the border

Variables	Trade Flow (Supply of Marketed Fish Products)						Trade Flow (Sales of Fish Products)					
	Intra State Trade		Inter State Trade		Regional Trade		Intra State Trade		Inter State Trade		Regional Trade	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Buying Price (₹/kg)	1127.09	748.25	1101.67	407.38	1140.00	650.54	1100.68	610.60	1159.89	846.59	1045.00	318.20
Selling Price(₹/kg)	2036.03	671.93	1574.17	287.51	1670.00	395.98	1770.85	512.76	2243.18	729.71	2164.50	557.91
Marketing Efficiency	120.78	115.38	49.09	40.94	52.32	47.44	81.31	77.61	151.06	135.98	120.04	115.03

Table 4.43: Average prices and marketing efficiency of frozen fish products traded within and outside the state and across the border

Variables	Trade Flow (Supply of Marketed Fish Products)				Trade Flow (Sales of Fish Products)					
	Intra State Trade		Inter State Trade		Intra State Trade		Inter State Trade		Regional Trade	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Buying Price (₦/kg)	744.29	173.24	950.00	212.13	796.00	185.72	835.00	72.34	510.00	155.56
Selling Price(₦/kg)	1180.36	336.87	1000.00	0.00	1167.50	389.10	1162.50	197.38	1100.00	212.13
Marketing Efficiency	55.69	61.48	8.94	2.03	47.85	54.79	27.18	20.73	124.62	112.73

Table 4.44: Average prices and marketing efficiency of fried fish products traded within and outside the state and across the border.

Variables		Trade Flow (Supply of Marketed Fish Products)				Trade Flow (Sales of Fish Products)					
		Intra State Trade		Inter State Trade		Intra State Trade		Inter State Trade		Regional Trade	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Buying Price	(₦/kg)	676.42	269.12	490.00	14.14	694.90	300.76	578.41	78.18	793.33	275.92
Selling Price	(₦/kg)	1284.64	348.94	1050.00	141.42	1334.12	365.96	1085.29	181.80	1416.67	407.23
Marketing Efficiency		89.14	80.75	98.40	30.13	95.55	92.44	73.96	24.98	72.35	13.81

Table 4.45: Average prices and marketing efficiency of spiced fish products traded within and outside the state

Variables	Trade Flow (Supply of Marketed Fish Products)				Trade Flow (Sales of Fish Products)			
	Intra State Trade		Inter State Trade		Intra State Trade		Inter State Trade	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Buying Price (₦/kg)	816.25	296.26	643.33	97.13	770.00	298.05	767.50	234.86
Selling Price(₦/kg)	1445.00	292.87	1350.00	242.69	1447.14	312.77	1370.00	212.76
Marketing Efficiency	79.09	43.70	94.18	28.42	84.12	36.13	81.59	50.45

Table 4.46: Average monthly quantity and percentage trade flow (inflow) of fish products entering fish markets in Sokoto State from within and outside the States

Fish Products	Trade Flow (Source of Marketed Fish Products)		
	Intra State Trade		
	Mean	SD	%
Fresh (kg)	2066.76	1263.70	100.00
Smoked (kg)	1520.77	734.27	100.00
Dried (kg)	806.38	352.68	100.00
Frozen (kg)	1337.50	165.20	100.00
Fried (kg)	703.75	106.09	100.00

Table 4.47: Average monthly quantity and percentage trade flow (outflow) of fish products from Sokoto State traded in within and outside the State

Fish products	Trade Flow (Sales of Fish Products)								
	Intra State Trade			Inter State Trade			Total		
	Mean	SD	%	Mean	SD	%	Mean	SD	%
Fresh (kg)	2066.76	1263.70	100.00	NS	NS	0.00	2066.76	1263.70	100.00
Smoked (kg)	1520.77	734.27	100.00	NS	NS	0.00	1520.77	734.27	100.00
Dried (kg)	562.31	298.47	31.26	1004.69	259.48	68.74	806.38	352.68	100.00
Frozen (kg)	1337.50	165.20	100.00	NS	NS	0.00	1337.50	165.20	100.00
Fried (kg)	703.75	106.09	100.00	NS	NS	0.00	703.75	106.09	100.00

Note: NS-No Information Supplied

4.12. Fish Trade Flow according to States along Nigeria-Niger border and Lake Kainji-inland fisheries

Fish Trade Flow in Katsina State

4.12.3 Trade flow (inflow) of fish products entering fish markets in Katsina State from within and outside the States

Table 4.48 shows that in Katsina 100.00% of fresh, smoked and dried fish traded are produced within the State while 2.33% of the dried fish traded within the State were procured from other States and cross border trade respectively. There was importation of fried fish from Niger Republic. The average monthly quantity (kg) of fresh, smoked, dried and fried fish produced within the State were $1,624.09 \pm 1,037.83\text{kg}$, $1,338.83 \pm 476.58\text{kg}$, $1,450.00 \pm 1,071\text{kg}$ and $817.23 \pm 378.55\text{kg}$ respectively. The average monthly quantity (kg) of cross border trade was $1,200.00 \pm 0.00\text{kg}$.

4.12.4 Trade flow (outflow) of fish products from Katsina State traded in within and outside the State

Table 4.49 shows the average quantity and percentage of fish products traded within and outside Katsina State. There is exportation of smoked and fried fish from Sokoto State to Niger republic. 94.37% of fresh fish produced is traded within the State while 5.63%. The average quantity (kg) of fresh fish sold within and outside the State were $1,559.70 \pm 1,021.98\text{kg}$ and $2,702.56 \pm 715.09\text{kg}$ respectively. 74.19% of the smoked fish produced within the State was sold within the State while 12.90% was sold outside the State while 12.90% of the smoked fish produced within the State was sold across the border with average quantity (kg) of 119.83 ± 286.68 , 1508.89 ± 368.21 and 2008.22 ± 856.51 respectively.

70.71% of the dried fish produced within the State was sold within the State, while there was no information supplied on dried fish sold outside the State and across the border. The average quantity (kg) of frozen fish sold within the State was 1290.62 ± 231.00 . 58.14% of fried fish is sold within the State, 32.56% of fried fish is sold outside the State while 9.30% of the fried fish from within the State is sold across the border.

Table 4.48: Average monthly quantity and percentage trade flow (inflow) of fish products entering fish markets in Katsina State from within and outside the States

Fish products	Trade Flow (Source of Marketed Fish Products)											
	Intra State Trade			Inter State Trade			Regional Trade			Total		
	Mean	SD	%	Mean	SD	%	Mean	SD	%	Mean	SD	%
Fresh (kg)	1624.09	1037.83	100.00	NS	NS	0.00	NS	NS	0.00	1624.09	1037.83	100.00
Smoked (kg)	1338.83	476.58	100.00	NS	NS	0.00	NS	NS	0.00	1338.83	476.58	100.00
Dried (kg)	1450.00	70.71	100.00	NS	NS	0.00	NS	NS	0.00	1450.00	70.71	100.00
Frozen (kg)	1118.68	0.00	33.33	NS	NS	0.00	1376.60	249.74	66.67	1290.62	231.00	100.00
Fried (kg)	817.23	378.55	95.35	530.33	135.09	2.33	1200.00	0.00	2.33	819.46	376.73	100.00

Note: NS-No Information Supplied

Table 4.49: Average monthly quantity and percentage trade flow (outflow) of fish products from Katsina State traded in within and outside the State

Fish products	Trade Flow (Sales of Fish Products)											
	Intra State Trade			Inter State Trade			Regional Trade			Total		
	Mean	SD	%	Mean	SD	%	Mean	SD	%	Mean	SD	%
Fresh (kg)	1559.70	1021.98	94.37	2702.56	715.09	5.63	NS	NS	0.00	1624.09	1037.83	100.00
Smoked (kg)	1192.83	286.68	74.19	1508.89	368.21	12.90	2008.22	856.51	12.90	1338.83	476.58	100.00
Dried (kg)	1450.00	70.71	100.00	NS	NS	0.00	NS	NS	0.00	1450.00	70.71	100.00
Frozen (kg)	1290.62	231.00	100.00	NS	NS	0.00	NS	NS	0.00	1290.62	231.00	100.00
Fried (kg)	755.88	289.20	58.14	772.10	203.32	32.56	1382.58	819.58	9.30	819.46	376.73	100.00

Note: NS-No Information Supplied

The average quantity (kg) of fried fish sold within the State, outside the State and across the border were 755.88 ± 289.20 , 772.10 ± 32.56 and 1382.58 ± 819.58 respectively.

Fish Trade Flow in Jigawa State

4.12.5 Trade flow (inflow) of fish products entering fish markets in Jigawa State from within and outside the States

Table 4.50 shows the average monthly quantity (kg) and percentage of fish inflow in Jigawa State. There is importation of dried fish from Niger republic into Jigawa State. 93.94% of the fish traded in Jigawa State were produced within the State while 6.06% were sourced from outside the State with average monthly quantity of 1660.81 ± 681.60 and 1673.20 ± 439.88 respectively. 65.71% of smoked fish produced within the State was traded in Jigawa State while 34.29% was sourced from outside the State with average monthly quantity of 1965.93 ± 681.60 and 1580.50 ± 387.23 respectively. 48.15% of dried fish traded within the State was sourced from outside the State while 7.41% was sourced from across the border with average monthly quantity of 1280.20 ± 139.41 , 1426.74 ± 322.03 and 1386.46 ± 160.57 respectively. 87.50% of fried fish was produced within the State while 12.50% was sourced from outside the State. 71.43% of spiced fish was produced within the State while 28.57% was sourced from outside the State with average monthly quantity of 1473.05 ± 152.95 and 1598.61 ± 60.89 respectively

4.12.6 Trade flow (outflow) of fish products from Jigawa State traded within and outside the State

Table 4.51 shows the average monthly quantity and percentage of fish outflow from Jigawa State. There is no export of fish from Jigawa State across the border, however, there is sales of fish to other States. 72.73% of fresh fish from the State was sold within the State while 27.27% was traded to other States with average monthly quantity (kg) of fresh fish sold within and outside the State of 1582.50 ± 977.47 and 1876.61 ± 876.61 respectively.

Table 4.50: Average monthly quantity and percentage trade flow (inflow) of fish products entering fish markets in Jigawa State from within and outside the States

Fish products	Trade Flow (Source of Marketed Fish Products)											
	Intra State Trade			Inter State Trade			Regional Trade			Total		
	Mean	SD	%	Mean	SD	%	Mean	SD	%	Mean	SD	%
Fresh (kg)	1660.81	979.20	93.94	1673.20	439.88	6.06	NS	NS	0.00	1661.56	953.29	100.00
Smoked (kg)	1965.93	681.60	65.71	1580.50	387.23	34.29	NS	NS	0.00	1833.78	619.33	100.00
Dried (kg)	1280.20	139.41	48.15	1426.74	322.03	44.44	1386.46	160.57	7.41	1353.20	243.07	100.00
Frozen (kg)	940.00	143.18	71.43	730.00	226.27	28.57	NS	NS	0.00	880.00	180.83	100.00
Fried (kg)	944.84	273.78	87.50	931.11	43.20	12.50	NS	NS	0.00	943.12	253.51	100.00
Spiced (kg)	1473.05	152.95	71.43	1598.61	60.89	28.57	NS	NS	0.00	1508.93	141.31	100.00

Note: NS-No Information Supplied

Table 4.51: Average monthly quantity and percentage trade flow (outflow) of fish products from Jigawa State traded within and outside the State

Fish products	Trade Flow (Sales of Fish Products)								
	Intra State Trade			Inter State Trade			Total		
	Mean	SD	%	Mean	SD	%	Mean	SD	%
Fresh (kg)	1582.50	977.47	72.73	1872.4	876.61	27.27	1661.56	953.29	100
Smoked (kg)	1863.31	629.55	62.86	1783.82	623.62	37.14	1833.78	619.33	100
Dried (kg)	1348.72	304.41	55.56	1358.8	147.14	44.44	1353.2	243.07	100
Frozen (kg)	873.33	273.19	42.86	885	124.77	57.14	880	180.83	100
Fried (kg)	981.33	320.65	62.50	879.45	97.84	37.50	943.12	253.51	100
Spiced (kg)	1495.21	161.66	57.14	1527.22	140.8	42.86	1508.93	141.31	100

62.86% of smoked fish produced within the State was sold within the State while 37.14% of smoked fish produced within the State was traded outside the State with average monthly quantity (kg) of 1863.31 ± 629.55 and 1783.82 ± 623.62 respectively. 55.56% of dried fish from the State is traded within the State while 44.44% of dried fish is traded outside the State with average monthly quantity (kg) of 1348.72 ± 304.41 and 1358.8 ± 147.14 respectively. About 62.50% of fried fish produced within the State is sold within the State while 37.50% is traded outside the State with average monthly quantity (kg) of 981.33 ± 320.65 and 879.45 ± 97.84 respectively. 57.14% of spiced fish was traded within the State while 42.86% was traded outside the State with average monthly quantity (kg) was 1495.21 ± 161.66 and 1527.22 ± 140.8 respectively.

4.12.7 Trade flow (inflow) of fish products entering fish markets in Yobe State from within and outside the States

Table 4.52 shows that 100% of fresh, smoked, dried, and fried fish products traded within the State were produced within the State with average monthly quantity (kg) sold of 1640.74 ± 899.09 , 1358.66 ± 153.95 , 1461.77 ± 394.78 , and 1160.44 ± 82.81 respectively. 75.00% of the spiced fish traded within the State were produced with the State while 25.00% were sourced from other States with average monthly quantity (kg) sold of 1220.67 ± 5.13 and 1265.00 ± 24.23 respectively.

4.12.8 Trade flow (outflow) of fish products from Yobe State traded within and outside the State

Table 4.53 shows that 100.00% of the fresh fish produced in Yobe State was traded within the State with average monthly quantity of 1640.74 ± 899.09 . 83.33% of smoked fish was sold within the State while 16.67% was traded to other States with an average monthly quantity (kg) of 1328.55 ± 137.09 and 1509.21 ± 154.01 respectively. 85.71% of dried fish was traded within the State, 10.71% was traded to other States while 3.57% was traded across the border with average monthly quantity (kg) of 1355.73 ± 261.18 , 1964.00 ± 517.04 and 2500.00 ± 142.20 respectively.

Table 4.52: Average monthly quantity and percentage trade flow (inflow) of fish products entering fish markets in Yobe State from within and outside the States

Fish products	Trade Flow (Source of Marketed Fish Products)								
	Intra State Trade			Inter State Trade			Total		
	Mean	SD	%	Mean	SD	%	Mean	SD	%
Fresh (kg)	1640.74	899.09	100.00	NS	NS	0.00	1640.74	899.09	100
Smoked (kg)	1358.66	153.95	100.00	NS	NS	0.00	1358.66	153.95	100
Dried (kg)	1461.77	394.78	100.00	NS	NS	0.00	1461.77	394.78	100
Frozen (kg)	825.00	106.07	100.00	NS	NS	0.00	825.00	106.07	100
Fried (kg)	1160.44	82.81	100.00	NS	NS	0.00	1160.44	82.81	100
Spiced (kg)	1220.67	5.13	75.00	1265.00	24.23	25.00	1231.75	22.56	100

Note: NS-No Information Supplied

Table 4.53: Average monthly quantity and percentage trade flow (outflow) of fish products from Yobe State traded within and outside the State

Fish products	Trade Flow (Sales of Fish Products)											
	Intra State Trade			Inter State Trade			Regional Trade			Total		
	Mean	SD	%	Mean	SD	%	Mean	SD	%	Mean	SD	%
Fresh (kg)	1640.74	899.09	100.00	NS	NS	0.00	NS	NS	0.00	1640.74	899.09	100.00
Smoked (kg)	1328.55	137.09	83.33	1509.21	154.01	16.67	NS	NS	0.00	1358.66	153.95	100.00
Dried (kg)	1355.73	261.18	85.71	1964.00	517.04	10.71	2500.00	142.20	3.57	1461.77	394.78	100.00
Frozen (kg)	825.00	106.07	100.00	NS	NS	0.00	NS	NS	0.00	825.00	106.07	100.00
Fried (kg)	1160.44	82.81	100.00	NS	NS	0.00	NS	NS	0.00	1160.44	82.81	100.00
Spiced (kg)	1220.67	5.13	75.00	1265.00	35.12	25.00	NS	NS	0.00	1231.75	22.56	100.00

NS-No information supplied

100% of the fried fish produced in the State was sold within the State with an average monthly quantity (kg) of 1160.44 ± 82.81 . 75.00% of the spiced fish was sold within the State while 25.00% was sold outside the State with average monthly quantity of 1220.67 ± 5.13 and 1265.00 ± 35.12 respectively.

Fish Trade Flow in Niger State

4.12.9 Trade flow (inflow) of fish products entering fish markets in Niger State from within and outside the States

Table 4.54 shows that 100% of fresh, smoked and dried fish traded in Niger State was produced from Niger State with average mean quantity (kg) of 1518.52 ± 472.40 , 1721.33 ± 346.59 and 1653.27 ± 365.89 respectively.

4.12.10 Trade flow (outflow) of fish products from Niger State traded within and outside the State

Table 4.55 shows that 97.14% of fresh fish produced within the State was traded within the State while 2.86% was traded to other States with mean monthly quantity of $1,517.52 \pm 478.08\text{kg}$ and $1,552.5 \pm 286.38\text{ky}$ respectively. About 63.33% of smoked fish produced within the State was traded within the State while 36.07% was traded to other States with mean monthly quantity (kg) of 1706.56 ± 412.07 and 1747.52 ± 186.6 respectively. 26.32% of the dried fish produced within the State was traded within the State, 68.42% was traded to other States while 5.26% was traded across the border with mean monthly quantity (kg) of 1419.06 ± 164.11 , 1732.06 ± 400.57 and 1800.00 ± 112.10 respectively.

Table 4.54: Average monthly quantity and percentage trade flow (inflow) of fish products entering fish markets in Niger State from within and outside the States

Fish products	Trade Flow (Source of Marketed Fish Products)					
	Intra State Trade			Total		
	Mean	SD	%	Mean	SD	%
Fresh (kg)	1518.52	472.40	100.00	1518.52	472.40	100.00
Smoked (kg)	1721.33	346.59	100.00	1721.33	346.59	100.00
Dried (kg)	1653.27	365.89	100.00	1653.27	365.89	100.00

Table 4.55: Average monthly quantity and percentage trade flow (outflow) of fish products from Niger State traded within and outside the State

Fish products	Trade Flow (Sales of Fish Products)											
	Intra State Trade			Inter State Trade			Regional Trade			Total		
	Mean	SD	%	Mean	SD	%	Mean	SD	%	Mean	SD	%
Fresh (kg)	1517.52	478.08	97.14	1552.5	286.38	2.86	NS	NS	0.00	1518.52	472.40	100.00
Smoked (kg)	1706.56	412.07	63.93	1747.52	186.6	36.07	NS	NS	0.00	1721.33	346.59	100.00
Dried (kg)	1419.06	164.11	26.32	1732.06	400.57	68.42	1800.00	112.1	5.26	1653.27	365.89	100.00

4.13 GINI COEFFICIENT AND REVENUE DISTRIBUTION

The Gini coefficient (GI) was used to measure level of equality or inequality in revenue distribution of the respondents marketing different fish products in the study area.

4.13.1 PRODUCER Capture (Fresh fish)

Reported in Table 4.56 is the cumulative percentage of monthly revenue and sale of fresh fish marketed by the artisanal fishermen. Majority (42.00%) of the respondents had revenue within the range of ₦250,000.01 - ₦500,000.00. The GI value for fresh fish marketing was computed as 0.59. Figure 4.11 indicates Lorenz-curve of producer (capture) marketing fresh fish products along Nigeria-Niger border and Kainji Lake Fisheries.

4.13.2 PRODUCER Culture (Fresh fish)

Reported in Table 4.57 is the cumulative percentage of monthly revenue and sale of fresh fish marketed by fish farmers in the States along Nigeria-Niger border and Lake Kainji-Inland Fisheries. Majority (42.00%) of the respondents had revenue within the range of ₦150,000.01 - ₦1,750,000.00. The GI value for culture producers was computed as 0.40. Figure 4.12 indicates Lorenz-curve of fresh fish producer (culture) along Nigeria-Niger border and Kainji Lake Fisheries.

4.13.3 Wholesalers (Fresh fish)

The result in Table 4.58 indicates the computation of Gini coefficient for wholesalers of fresh fish, the table indicated that 16.70% of wholesalers earned between ₦2,250,000.01 – 25,00,000.00 monthly accounted for by 9.78% of monthly sales. The GI value for wholesalers of fresh fish was computed as follows 0.60. Figure 4.13 shows the Lorenz-curve of wholesalers marketing fresh fish products along Nigeria-Niger border and Kainji Lake Fisheries.

4.13.4 Retailers (Fresh Fish)

Table 4.59 shows that majority (22.2%) of the retailers of fresh fish in the States along the Nigeria-Niger border and the Lake Kainji Inland fisheries earn between ₦1500000.01 - 1750000.00. The value of the Gini coefficient computed was 0.55. Figure 4.14 shows Lorenz-

Table 4.56: Cumulative percentage of monthly revenue and sale of fresh fish marketed by the artisanal fishermen

Total Revenue (₦)	Frequency	% of Marketers (X)	Cumulative Percent	Total Value of Monthly Sales (₦)	% of Total Sales	Cumulative Percent (Y)	XY
250000.01 - 500000.00	26	18.20	18.20	5496712.68	6.32	6.32	0.01
250000.01 - 500000.00	60	42.00	60.10	20575334.90	23.65	29.97	0.13
500000.01 - 750000.00	7	4.90	65.00	3954822.50	4.55	34.52	0.02
750000.01 - 1000000.00	17	11.90	76.90	15226029.65	17.5	52.02	0.06
1000000.01 - 1250000.00	20	14.00	90.90	22178771.20	25.49	77.51	0.11
1250000.01 - 1500000.00	9	6.30	97.20	12511277.40	14.38	91.89	0.06
1500000.01 - 1750000.00	2	1.40	98.60	3077995.60	3.54	95.43	0.01
1750000.01 - 2000000.00	1	0.70	99.30	1965899.20	2.26	97.69	0.01
2000000.01 - 2250000.00	1	0.70	100.00	2018250.00	2.31	100.00	0.01
Total	143	100.00		87005093.13		$\sum xy$	0.41

GI = 0.59

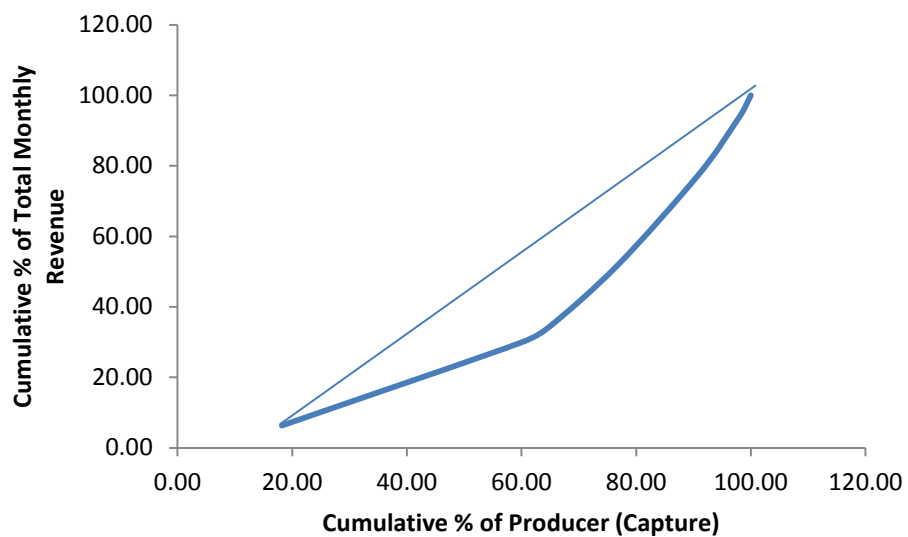


Figure 4.11: Lorenz-curve of producer (capture) marketing fresh fish products along Nigeria-Niger border and Kainji Lake Fisheries

Table 4.57: Cumulative percentage of monthly revenue and sale of fresh fish marketed by the fish farmers

Total Revenue (₦)	Frequency	% of Marketers (X)	Cumulative Percent	Total Value of Monthly Sales (₦)	% of Total Sales	Cumulative Percent (Y)	XY
750000.01 - 1000000.00	1	1	1	1000000	0.6	0.60	0.00
1000000.01 - 1250000.00	25	24	25	27416542.2	16.56	17.16	0.04
1250000.01 - 1500000.00	14	13.5	38.5	19123028.9	11.55	28.71	0.04
1500000.01 - 1750000.00	17	16.3	54.8	28113373.8	16.99	45.70	0.07
1750000.01 - 2000000.00	46	44.2	99	87319993.9	52.76	98.46	0.44
≥2000000.01	1	1	100	2545200	1.54	100.00	0.01
Total	104	100		165518139	100	Σxy	0.60

GI = 0.40

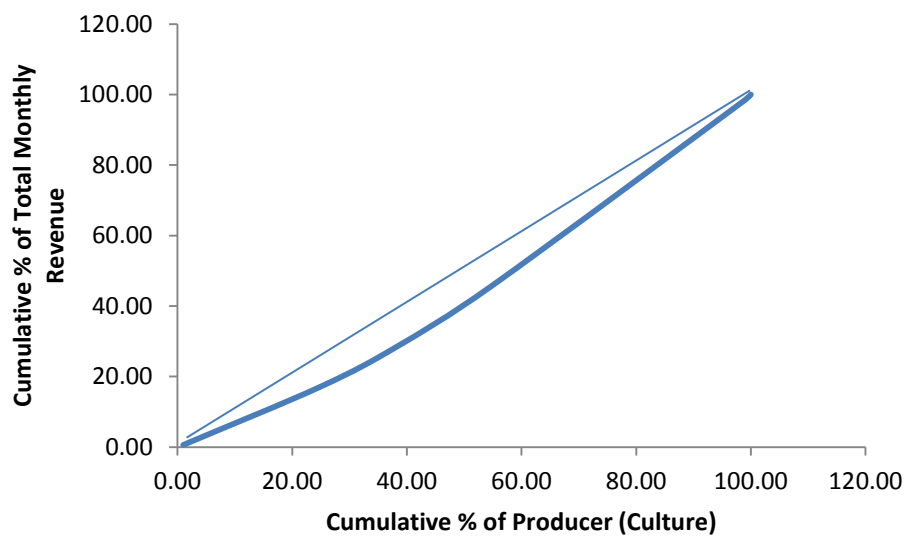


Figure 4.12: Lorenz-curve of fresh fish producer (culture) along Nigeria-Niger border and Kainji Lake Fisheries

Table 4.58: Cumulative percentage of monthly revenue and sale of fresh fish marketed by wholesalers

Total Revenue (₦)	Frequency	% of Wholesaler (X)	Cumulative Percent	Total Value of Monthly Sales (₦)	% of Total Sales	Cumulative (Y)	Percent	$\sum xy$
≤ 250000.00	2	5.60	5.60	454,788.00	0.52	0.52		0.0003
1000000.01 - 1250000.00	2	5.60	11.10	2,240,000.00	2.52	3.04		0.0017
1250000.01 - 1500000.00	3	8.30	19.40	3,960,800.90	4.45	7.49		0.0062
1500000.01 - 1750000.00	2	5.60	25.00	3,135,690.00	3.52	11.01		0.0062
1750000.01 - 2000000.00	3	8.30	33.30	5,591,500.00	6.28	17.29		0.0144
2000000.01 - 2250000.00	4	11.10	44.40	8,712,600.00	9.78	27.07		0.0300
2250000.01 - 2500000.00	6	16.70	61.10	14,177,060.00	15.92	42.99		0.0718
2500000.01 - 2750000.00	3	8.30	69.40	7,827,846.00	8.79	51.78		0.0430
2750000.01 - 3000000.00	1	2.80	72.20	2,835,000.00	3.18	54.96		0.0154
3000000.01 - 3250000.00	3	8.30	80.60	9,312,098.00	10.46	65.42		0.0543
3250000.01 - 3500000.00	1	2.80	83.30	3,267,379.50	3.67	69.09		0.0193
3500000.01 - 3750000.00	2	5.60	88.90	7,295,354.80	8.19	77.28		0.0433
≥ 4000000.01	4	11.10	100.00	20,231,848.00	22.72	100.00		0.1110
Total	36	100.00		89,041,965.20	100.00			$\sum xy = 0.4169$

Gini coefficient = 0.60

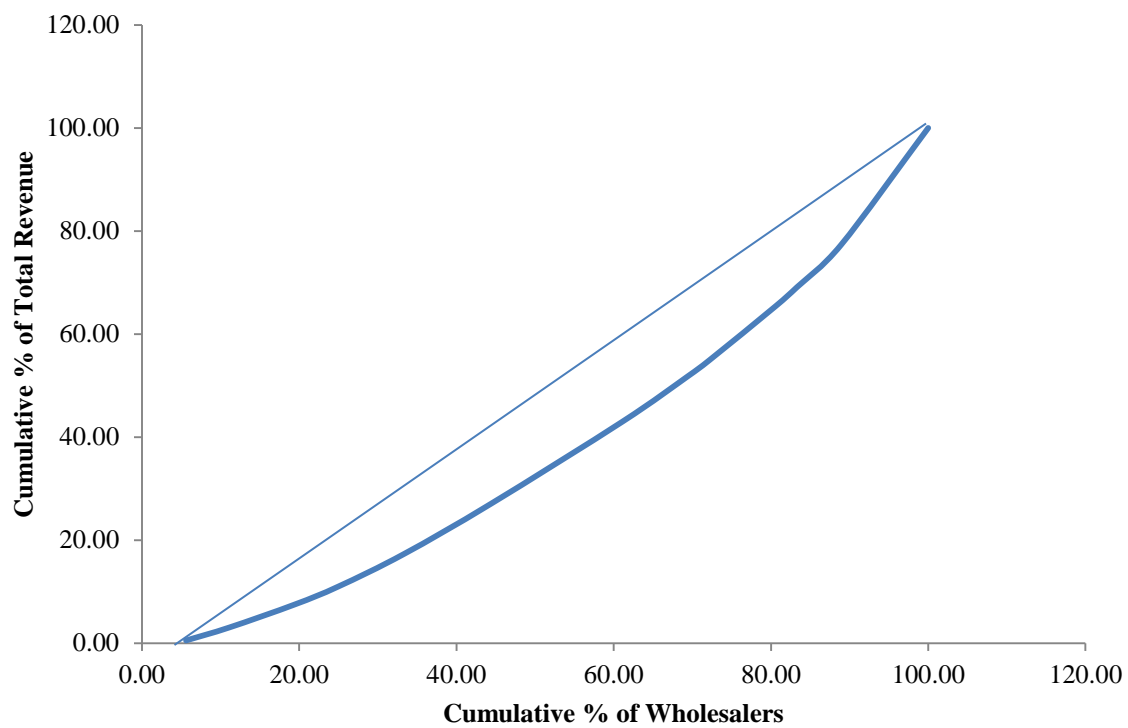


Figure 4.13: Lorenz-curve of wholesalers marketing fresh fish products along Nigeria-Niger border and Kainji Lake Fisheries

Table 4.59: Cumulative percentage of monthly revenue and sale of fresh fish marketed by the retailers

Total Revenue (₹)	Frequency	% of Retailers (X)	Cumulative Percent	Total Value of Monthly Sales (₹)	% of Total Sales	Cumulative Percent (Y)	ΣXY
1000000.01 - 1250000.00	4	7.4	7.4	4675940	4.09	4.09	0.00
1250000.01 - 1500000.00	8	14.8	22.2	11064046	9.65	13.74	0.02
1500000.01 - 1750000.00	12	22.2	44.4	19563013.95	17.06	30.80	0.07
1750000.01 - 2000000.00	5	9.3	53.7	9251417	8.07	38.87	0.04
2000000.01 - 2250000.00	6	11.1	64.8	12481407	10.88	49.75	0.06
2250000.01 - 2500000.00	4	7.4	72.2	9462680	8.25	58.00	0.04
2500000.01 - 2750000.00	2	3.7	75.9	5229000	4.56	62.56	0.02
2750000.01 - 3000000.00	4	7.4	83.3	11444824	9.98	72.54	0.05
3000000.01 - 3250000.00	3	5.6	88.9	9623860	8.39	80.93	0.05
3250000.01 - 3500000.00	1	1.9	90.7	3456000	3.01	83.94	0.02
3500000.01 - 3750000.00	4	7.4	98.1	14587004.4	12.72	96.66	0.07
3750000.01 - 4000000.00	1	1.9	100	3830000	3.34	100.00	0.02
Total	54	100		114669192.4	100		0.45

Gini coefficient = 0.55

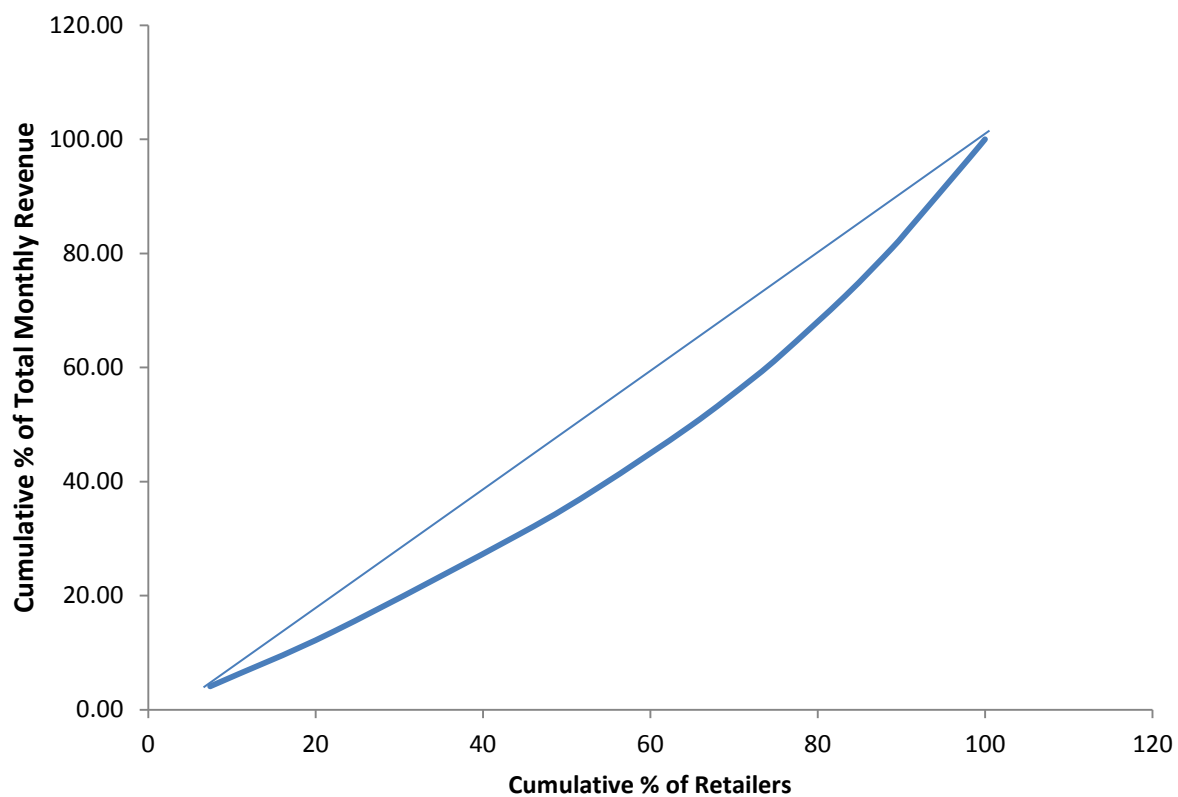


Figure 4,14: Lorenz-curve of retailers marketing fresh fish products along Nigeria-Niger border and Kainji Lake Fisheries

4.13.5 Processors (Smoked fish)

Table 4.60 shows that majority (14.5%) of smoked fish processors in the States along the Nigeria-Niger border and the Lake Kainji Inland fisheries earn between ₦1,750,000.01 – 2,000,000.00. The value of the Gini coefficient computed was 0.54. Figure 4.15 shows the Lorenz curve of smoked fish processor in fish markets along Nigeria-Niger border and Kainji Lake Fisheries

4.13.6 Wholesaler (Smoked fish)

Table 4.61 shows the computation of Gini coefficient for wholesalers of smoked fish. About 61.10% of the wholesalers of smoked fish had monthly revenue of less than equal ₦4000000.01. The Gini coefficient value of 0.34 tends toward zero. Figure 4.16 shows the Lorenz curve of smoked fish marketed by wholesalers along the Nigeria-Niger border and Lake Kainji inland fisheries.

4.13.7 Retailers (Smoked Fish)

Table 4.62 shows that the majority (20%) of the retailers of smoked fish in the States along the Nigeria-Niger border and Lake Kainji inland fisheries had a total monthly revenue of between ₦2,000,000.01 – 2,250,000.00. The value of the Gini coefficient 0.53 tends towards zero. Figure 4.17 shows the Lorenz curve of smoked fish retailers in the States along the Nigeria-Niger border and Lake Kainji inland fisheries.

Table 4.60: Cumulative percentage of monthly revenue and sale of smoked fish marketed by the processors

Total Revenue (₦)	Frequency	% of Marketers (X)	Cumulative Percent	Total Value of Monthly Sales (₦)	% of Total Sales	Cumulative Percent (Y)	XY
750000.01 - 1000000.00	1	0.80	0.80	800000.00	0.23	0.23	0.00
1000000.01 - 1250000.00	2	1.60	2.40	2358000.00	0.68	0.91	0.00
1250000.01 - 1500000.00	11	8.90	11.30	15325996.30	4.40	5.31	0.00
1500000.01 - 1750000.00	16	12.90	24.20	25891344.10	7.43	12.74	0.02
1750000.01 - 2000000.00	18	14.50	38.70	33449436.50	9.60	22.34	0.03
2000000.01 - 2250000.00	13	10.50	49.20	27347651.50	7.85	30.19	0.03
2250000.01 - 2500000.00	10	8.10	57.30	23565842.20	6.76	36.95	0.03
2500000.01 - 2750000.00	6	4.80	62.10	15675977.50	4.50	41.45	0.02
2750000.01 - 3000000.00	2	1.60	63.70	5632546.50	1.62	43.07	0.01
3000000.01 - 3250000.00	1	0.80	64.50	3250000.00	0.93	44.00	0.00
3250000.01 - 3500000.00	0	0.00	64.50	0.00	0.00	44.00	0.00
3500000.01 - 3750000.00	6	4.80	69.40	22185922.00	6.37	50.37	0.02
3750000.01 - 4000000.00	5	4.00	73.40	19233500.00	5.52	55.89	0.02
≥ 4000000.01	33	26.60	100.00	153717031.00	44.11	100.00	0.27
Total	124	100.00		348433248.00	100.00	Σxy	0.46

GI = 0.54

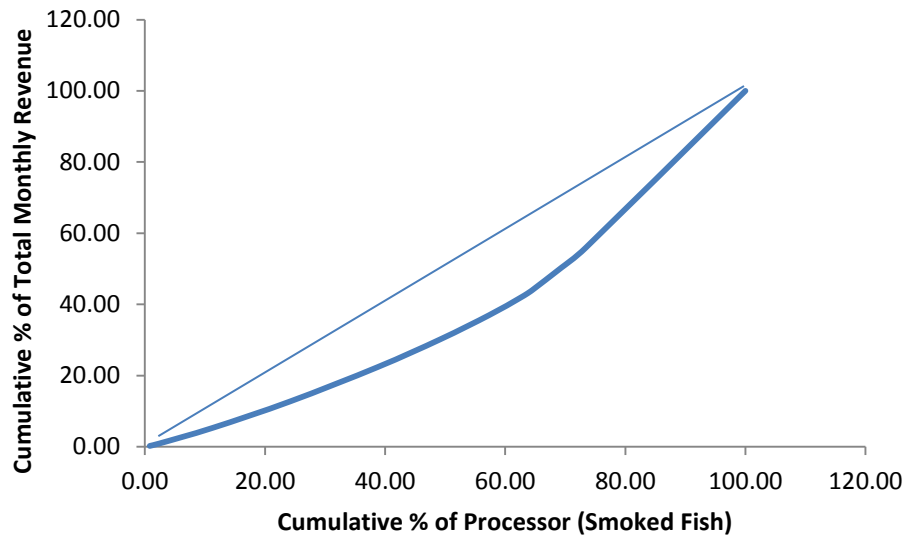


Figure 4.15: Lorenz-curve of smoked fish processor in fish markets along Nigeria-Niger border and Kainji Lake Fisheries

Table 4.61: Cumulative percentage of monthly revenue and sale of smoked fish marketed by the wholesalers

Total Revenue (₦)	Frequency	% of Wholesaler (X)	Cumulative Percent	Total Value of Monthly Sales (₦)	% of Total Sales	Cumulative Percent (Y)	Σxy
2000000.01 - 2250000.00	2	5.60	5.60	4313400.00	2.43	2.43	0.0014
2250000.01 - 2500000.00	2	5.60	11.10	4823000.00	2.71	5.14	0.0029
2500000.01 - 2750000.00	2	5.60	16.70	5348400.00	3.01	8.15	0.0046
3000000.01 - 3250000.00	3	8.30	25.00	9525000.00	5.35	13.50	0.0112
3250000.01 - 3500000.00	1	2.80	27.80	3333330.00	1.87	15.37	0.0043
3500000.01 - 3750000.00	3	8.30	36.10	10876111.50	6.11	21.48	0.0178
3750000.01 - 4000000.00	1	2.80	38.90	3840000.00	2.16	23.64	0.0066
≥4000000.01	22	61.10	100.00	135821407.40	76.36	100.00	0.6110
Total	36	100.00		177,880,648.90	100		0.6598
Gini coefficient	0.34						

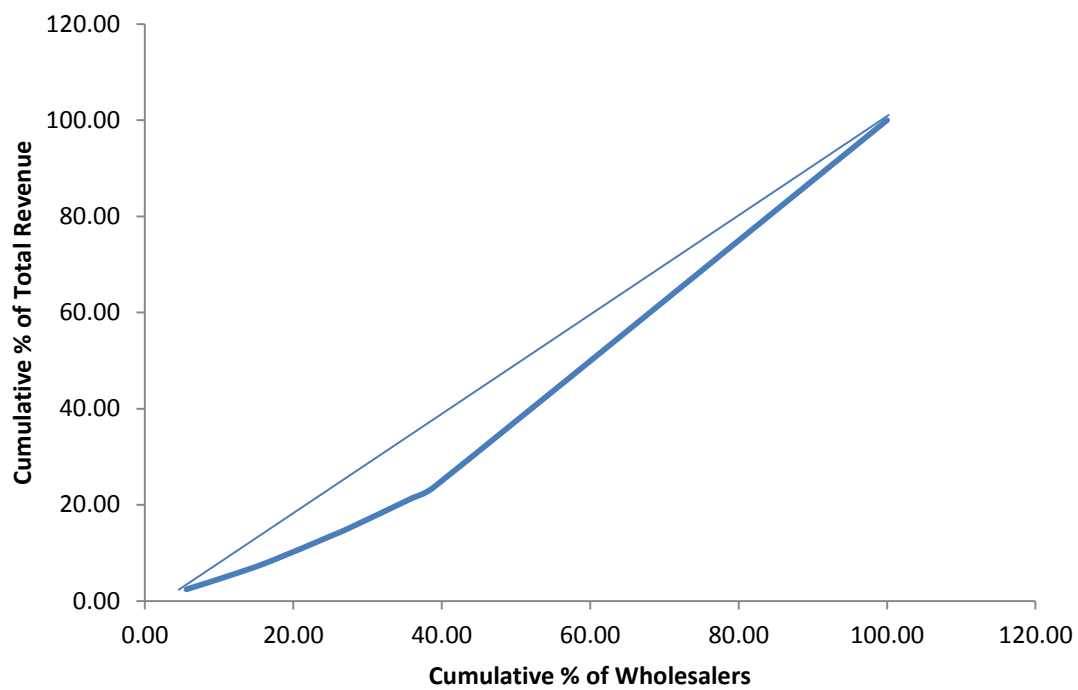


Figure 4.16: Lorenz-curve of wholesalers marketing smoked fish products along Nigeria-Niger border and Kainji Lake Fisheries

Table 4.62: Cumulative percentage of monthly revenue and sale of smoked fish marketed by the retailers

Total Revenue (₦)	Frequency	% of Retailers (X)	Cumulative Percent	Total Value of Monthly Sales (₦)	% of Total Sales	Cumulative Percent (Y)	Σxy
1000000.01 - 1250000.00	3	6	6.00	3129000.00	2.39	2.39	0.00
1500000.01 - 1750000.00	1	2	8.00	1630000.00	1.26	3.65	0.00
1750000.01 - 2000000.00	5	10	18.00	9350320.20	7.15	10.80	0.01
2000000.01 - 2250000.00	10	20	38.00	21490600.00	16.43	27.23	0.05
2250000.01 - 2500000.00	7	14	52.00	16771154.00	12.82	40.05	0.06
2500000.01 - 2750000.00	5	10	62.00	13039000.00	9.97	50.02	0.05
2750000.01 - 3000000.00	7	14	76.00	20015991.00	15.31	65.33	0.09
3000000.01 - 3250000.00	2	4	80.00	6139120.00	4.69	70.02	0.03
3250000.01 - 3500000.00	5	10	90.00	17166113.00	13.13	83.15	0.08
3750000.01 - 4000000.00	1	2	92.00	3850000.00	2.94	86.09	0.02
≥ 4000000.01	4	8	100.00	18194000.00	13.91	100.00	0.08
Total	50	100		130775298.2	100		0.47

Gini coefficient = 0.53

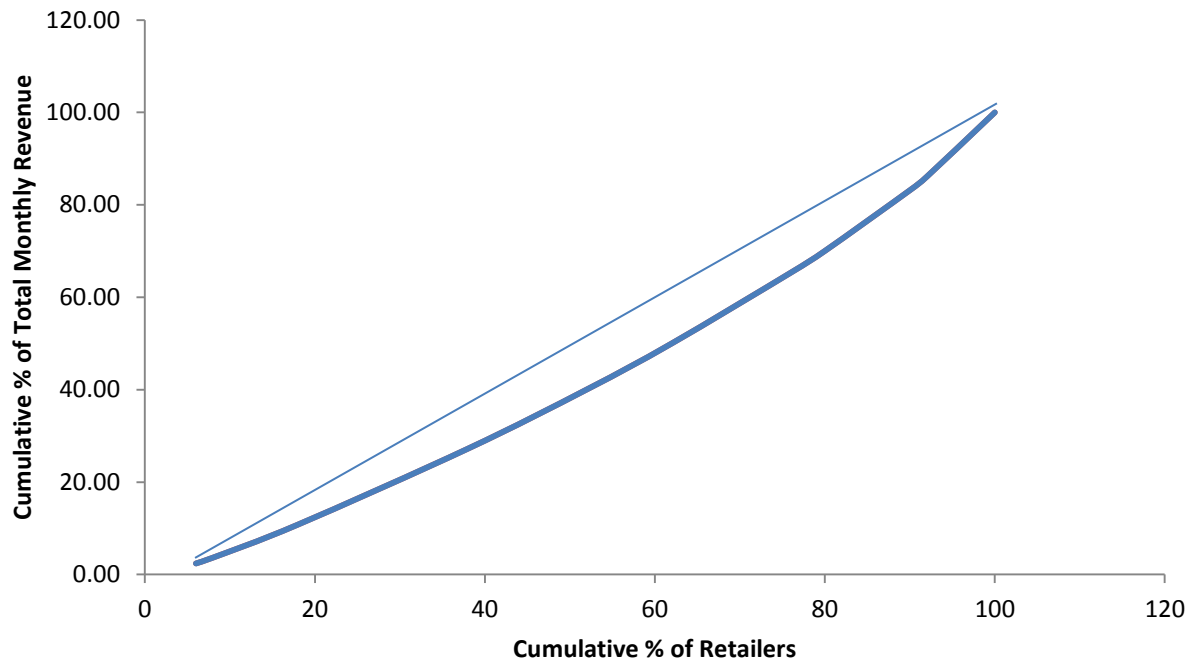


Figure 4.17: Lorenz-curve of retailers marketing smoked fish products along Nigeria-Niger border and Kainiji Lake Fisheries

4.13.8 PROCESSORS (Dried Fish)

Table 4.63 shows that majority (24.10%) of the processor of dried fish in the States along the Nigeria-Niger border and the Lake Kainji Inland fisheries earn between ₦1,750,000.01 – 2,000,000.00. The value of the Gini coefficient computed was 0.53. Figure 4.18 shows the Lorenz curve of dried fish processor in fish markets along Nigeria-Niger border and Kainji Lake Fisheries

4.13.9 Wholesaler (Dried)

Table 4.64 shows the computation of the Gini coefficient of wholesalers of dried fish. The table indicates that majority (45.50%) of the wholesalers earn greater than equal to ₦4,000,000.01. The value of the Gini coefficient computed was 0.43. Figure 4.19 shows the Lorenz curve of dried fish marketed by wholesalers along the Nigeria-Niger border and Lake Kainji inland fisheries.

4.13.10 RETAILER (Dried fish)

Table 4.65 shows that majority of the dried fish retailers in the States along the Nigeria-Niger border and Lake Kainji inland fisheries have monthly revenue of between ₦2,250,000.01 – 2,500,000.00. The value of the Gini coefficient computed was 0.57. Figure 4.20 shows the Lorenz curve of dried fish marketed by retailers in the States along the Nigeria-Niger border and Lake Kainji inland fisheries.

Table 4.63: Cumulative percentage of monthly revenue and sale of dried fish marketed by the processors

Total Revenue (₦)	Frequency	% of Marketers (X)	Cumulative Percent	Total Value of Monthly Sales (₦)	% of Total Sales	Cumulative Percent (Y)	XY
1000000.01 - 1250000.00	1	1.70	1.70	1147575.00	0.88	0.88	0.00
1250000.01 - 1500000.00	4	6.90	8.60	5492125.00	4.22	5.10	0.00
1500000.01 - 1750000.00	12	20.70	29.30	19431833.50	14.93	20.03	0.04
1750000.01 - 2000000.00	14	24.10	53.40	25614557.50	19.68	39.71	0.10
2000000.01 - 2250000.00	8	13.80	67.20	16683772.10	12.82	52.53	0.07
2250000.01 - 2500000.00	7	12.10	79.30	16250158.20	12.49	65.02	0.08
2500000.01 - 2750000.00	3	5.20	84.50	7581000.00	5.83	70.85	0.04
2750000.01 - 3000000.00	2	3.40	87.90	5712000.00	4.39	75.24	0.03
3750000.01 - 4000000.00	2	3.40	91.40	7888000.00	6.06	81.30	0.03
≥4000000.01	5	8.60	100.00	24343524.00	18.70	100.00	0.09
Total	58	100.00		130144545.30	100.00	$\sum xy$	0.47

GI = 0.53

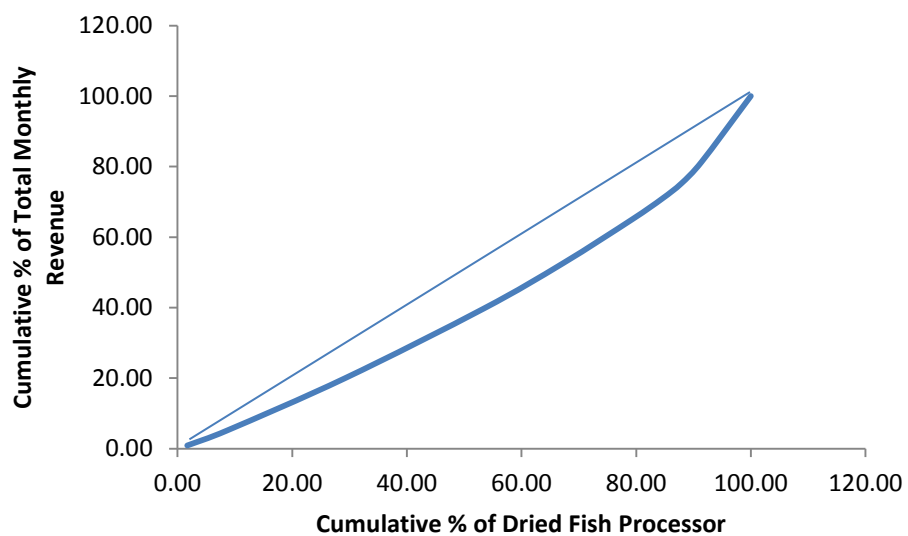


Figure 4.18: Lorenz-curve of dried fish processor in fish markets along Nigeria-Niger border and Kainji Lake Fisheries

Table 4.64: Cumulative percentage of monthly revenue and sale of dried fish marketed by the wholesalers

Total Revenue (₦)	Frequency	% of Wholesaler (X)	Cumulative Percent	Total Value of Monthly Sales (₦)	% of Total Sales	Cumulative Percent (Y)	Σxy
2250000.01 - 2500000.00	2	18.20	18.20	4740000	9.99	9.99	0.02
2500000.01 - 2750000.00	1	9.10	27.30	2520000	5.31	15.30	0.01
3000000.01 - 3250000.00	1	9.10	36.40	3234000	6.81	22.11	0.02
3250000.01 - 3500000.00	2	18.20	54.50	6690000	14.10	36.21	0.07
≥ 4000000.01	5	45.50	100.00	30271034	63.79	100.00	0.46
Total	11	100.00		47455034	100.00		0.57

Gini coefficient = 0.43

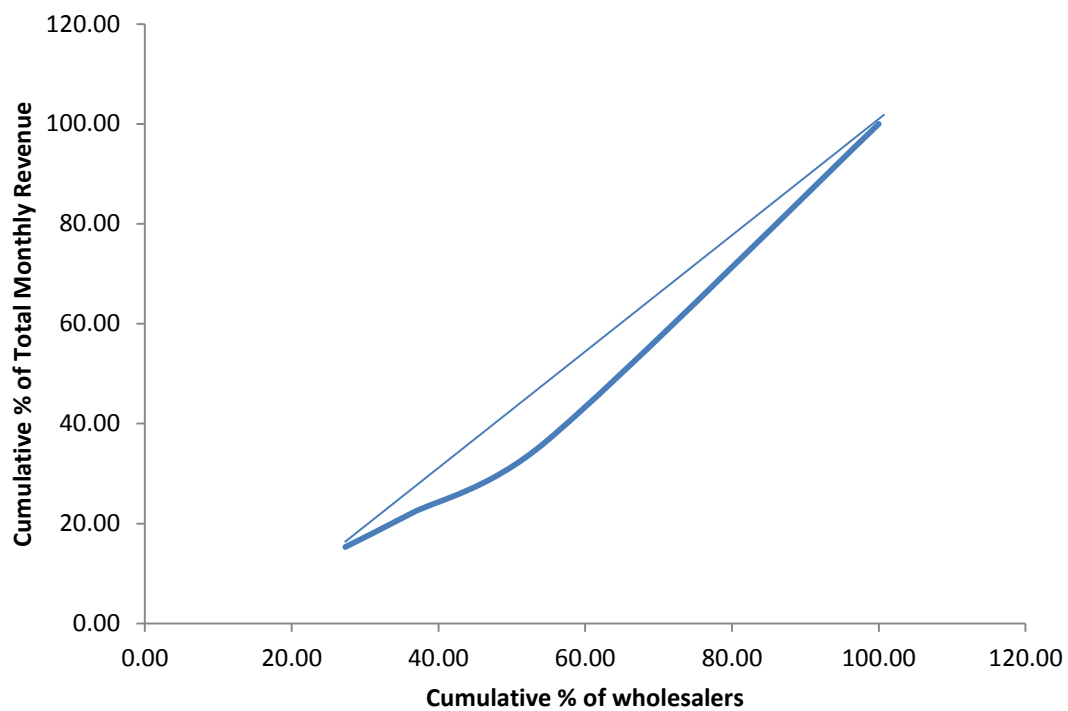


Figure 4.19: Lorenz-curve of wholesalers marketing dried fish products along Nigeria-Niger border and Kainji Lake Fisheries

Table 4.65: Cumulative percentage of monthly revenue and sale of dried fish marketed by the retailers

Total Revenue (₦)	Frequency	% of Retailers (X)	Cumulative Percent	Total Value of Monthly Sales (₦)	% of Total Sales	Cumulative Percent (Y)	Σxy
500000.01 - 750000.00	2	5.60	5.60	1271400.00	1.42	1.42	0.00
750000.01 - 1000000.00	6	16.70	22.20	5501000.00	6.15	7.57	0.01
1000000.01 - 1250000.00	2	5.60	27.80	2293000.00	2.56	10.13	0.01
1500000.01 - 1750000.00	1	2.80	30.60	1575000.00	1.76	11.89	0.00
2000000.01 - 2250000.00	4	11.10	41.70	8631266.80	9.64	21.53	0.02
2250000.01 - 2500000.00	8	22.20	63.90	18617523.20	20.80	42.33	0.09
2500000.01 - 2750000.00	2	5.60	69.40	5113000.00	5.71	48.04	0.03
2750000.01 - 3000000.00	1	2.80	72.20	2925000.00	3.27	51.31	0.01
3000000.01 - 3250000.00	3	8.30	80.60	9505280.00	10.62	61.93	0.05
≥ 4000000.01	7	19.40	100.00	34070400.00	38.07	100.00	0.19
Total	36	100.00		89502870.00	100.00		0.43

Gini coefficient = 0.57

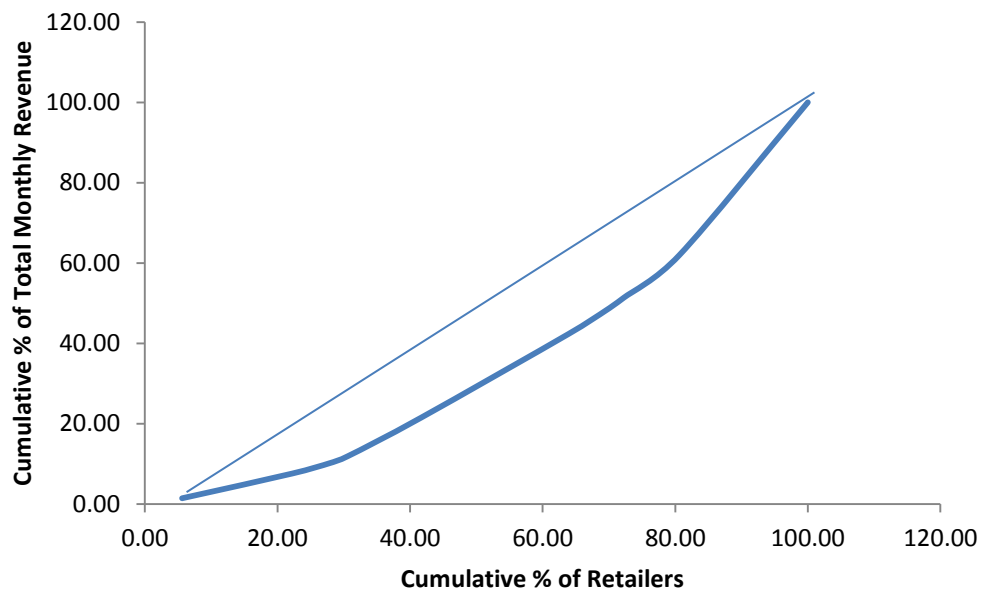


Figure 4.20: Lorenz-curve of retailer marketing dried fish products along Nigeria-Niger border and Kainji Lake Fisheries

4.13.11 PROCESSOR (Fried)

Table 4.66 shows that majority (27.80%) of the fried fish processors in the States along the Nigeria-Niger border and the Lake Kainji Inland fisheries earn between ₦500,000.01 – 750,000.00. The value of the Gini coefficient was computed as 0.52 Figure 4.21 shows the Lorenz curve of fried fish processors in fish markets along Nigeria-Niger border and Kainji Lake Fisheries

4.13.12 RETAILERS (Fried fish)

Table 4.67 shows that majority (31.3%) of retailers of fried fish earn between ₦1,250,000.01 – 1,500,000.00. The value of the Gini coefficient was computed as 0.45. Figure 4.22 shows the Lorenz curve of retailers of fried fish marketed in the States along the Nigeria-Niger border and the Lake Kainji-inland fisheries.

4.13.13 Processors (Spiced)

Table 4.68 shows that majority (33.30%) of the spiced fish processor in the States along the Nigeria-Niger border and the Lake Kainji Inland fisheries earn between ₦1,250,000.01 – 1,500,000.00. The value of the Gini coefficient was 0.47. Figure 4.23 shows the Lorenz curve of spiced fish processor in fish markets along Nigeria-Niger border and Kainji Lake Fisheries.

4.13.14 RETAILER (Spiced)

Table 4.69 indicates the distribution of monthly revenue of spiced fish retailers in the States along the Nigeria-Niger border and the Lake Kainji Inland fisheries. The value of the Gini coefficient was computed as 0.26.

4.13.15 Wholesalers (Frozen)

Table 4.70 shows that majority of the wholesalers (50%) of frozen fish had a total revenue of between ₦1,000,000.01-1,250,000.00. The value of the Gini coefficient 0.41 tends towards zero. Figure 4.24 shows the Lorenz curve for frozen fish marketed by wholesalers in the States along the Nigeria-Niger border and Lake Kainji inland fisheries.

Table 4.66: Cumulative percentage of monthly revenue and sale of fried fish products marketed by the processors

Total Revenue (₦)	Frequency	% of Marketers (X)	Cumulative Percent	Total Value of Monthly Sales (₦)	% of Total Sales	Cumulative Percent (Y)	XY
≤250000.00	1.00	1.90	1.90	240400.00	0.48	0.48	0.00
250000.01 - 500000.00	5.00	9.30	11.10	2285692.00	4.56	5.04	0.00
500000.01 - 750000.00	15.00	27.80	38.90	8816909.20	17.60	22.64	0.06
750000.01 - 1000000.00	12.00	22.20	61.10	10983174.10	21.93	44.57	0.10
1000000.01 - 1250000.00	11.00	20.40	81.50	12810176.50	25.58	70.15	0.14
1250000.01 - 1500000.00	7.00	13.00	94.40	9796450.00	19.56	89.71	0.12
1500000.01 - 1750000.00	2.00	3.70	98.10	3260225.20	6.51	96.22	0.04
1750000.01 - 2000000.00	1.00	1.90	100.00	1890800.00	3.78	100.00	0.02
Total	54.00	100.00		50083827.00	100.00	Σxy	0.48

GI = 0.52

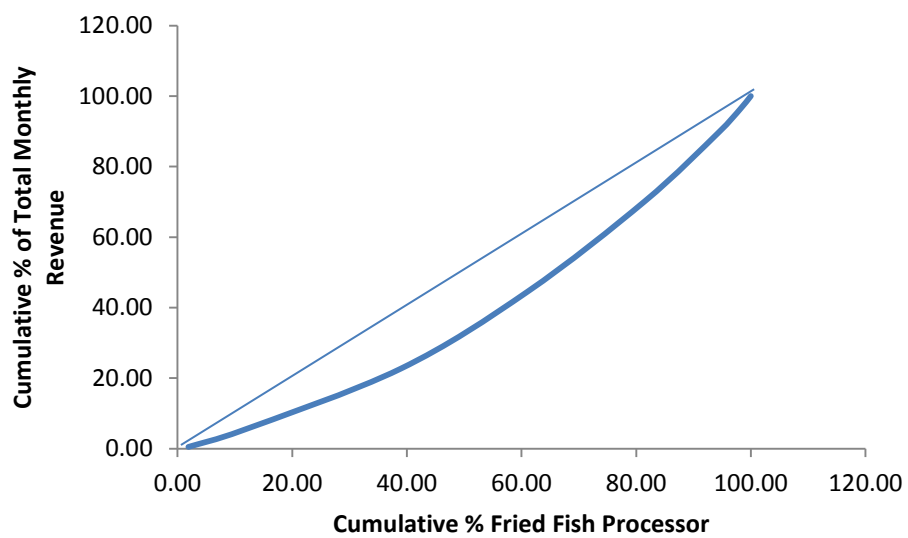


Figure 4.21: Lorenz-curve of fried fish processor in fish markets along Nigeria-Niger border and Kainiji Lake Fisheries

Table 4.67: Cumulative percentage of monthly revenue and sale of fried fish marketed by retailers

Total Revenue (₹)	Frequency	% of Retailers (X)	Cumulative Percent	Total Value of Monthly Sales (₹)	% of Total Sales	Cumulative Percent (Y)	$\sum xy$
750000.01 - 1000000.00	1	6.3	6.3	930000	3.37	3.37	0.00
1250000.01 - 1500000.00	5	31.3	37.5	7066800	25.51	28.88	0.09
1500000.01 - 1750000.00	3	18.8	56.3	5058570	18.26	47.14	0.09
1750000.01 - 2000000.00	4	25	81.3	7691940	27.77	74.91	0.19
2000000.01 - 2250000.00	2	12.5	93.8	4442667.8	16.04	90.95	0.11
2500000.01 - 2750000.00	1	6.3	100.0	2508000	9.05	100	0.06
Total	16	100.0		27697977.8	100.00		0.55

Gini coefficient = 0.45

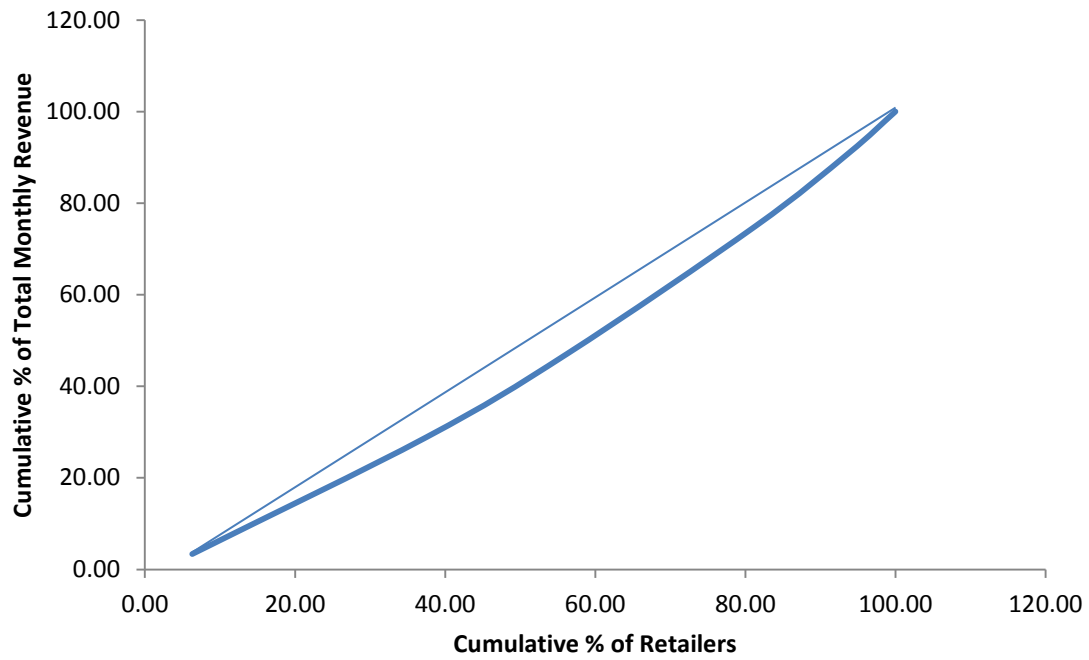


Figure 4.22: Lorenz-curve of retailer marketing fried fish products along Nigeria-Niger border and Kainji Lake Fisheries

Table 4.68: Cumulative percentage of monthly revenue and sale of spiced fish marketed by the processors

Total Revenue (₦)	Frequency	% of Marketers (X)	Cumulative Percent	Total Value of Monthly Sales (₦)	% of Total Sales	Cumulative Percent (Y)	XY
1250000.01 - 1500000.00	3	33.30	33.30	4261250.00	24.48	24.48	0.08
1500000.01 - 1750000.00	1	11.10	44.40	1643395.00	9.44	33.92	0.04
1750000.01 - 2000000.00	1	11.10	55.60	1978886.00	11.37	45.29	0.05
2000000.01 - 2250000.00	1	11.10	66.70	2101337.60	12.08	57.37	0.06
2250000.01 - 2500000.00	1	11.10	77.80	2260500.00	12.99	70.36	0.08
2500000.01 - 2750000.00	2	22.20	100.00	5158620.10	29.64	100.00	0.22
Total	9	100.00		17403988.70	100.00	$\sum xy$	0.53

GI = 0.47

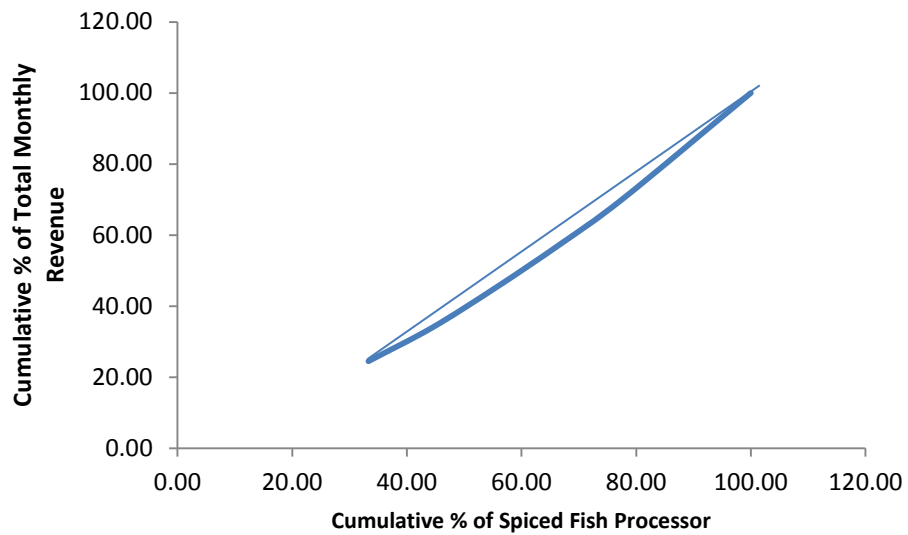


Figure 4.23: Lorenz-curve of spiced fish processor in fish markets along Nigeria-Niger border and Kainji Lake Fisheries

Table 4.69: Cumulative percentage of monthly revenue and sale of spiced fish marketed by retailer

Total Revenue (₦)	Frequency	% of Marketers (X)	Cumulative Percent	Total Value of Monthly Sales (₦)	% of Total Sales	Cumulative Percent (Y)	XY
2000000.01 - 2250000.00	1	50.00	50.00	2198000.00	47.35	47.35	0.24
2250000.01 - 2500000.00	1	50.00	100.00	2444000.00	52.65	100.00	0.50
Total	2	100.00		4642000.00	100.00	$\sum xy$	0.74

GI = 0.26

Table 4.70: Cumulative percentage of monthly revenue and sale of frozen fish marketed by the wholesalers

Total Revenue (₹)	Frequency	% of Wholesaler (X)	Cumulative Percent	Total Value of Monthly Sales (₹)	% of Total Sales	Cumulative Percent (Y)	Σxy
500000.01 - 750000.00	1	12.50	12.50	570000.00	5.82	5.82	0.01
1000000.01 - 1250000.00	4	50.00	62.50	4567500.00	46.56	52.38	0.26
1250000.01 - 1500000.00	2	25.00	87.50	2730000.00	27.83	80.21	0.20
1750000.01 - 2000000.00	1	12.50	100.00	1941487.50	19.79	100.00	0.13
Total	8	100.00		9808987.50	100.00		0.59

Gini coefficient = 0.41

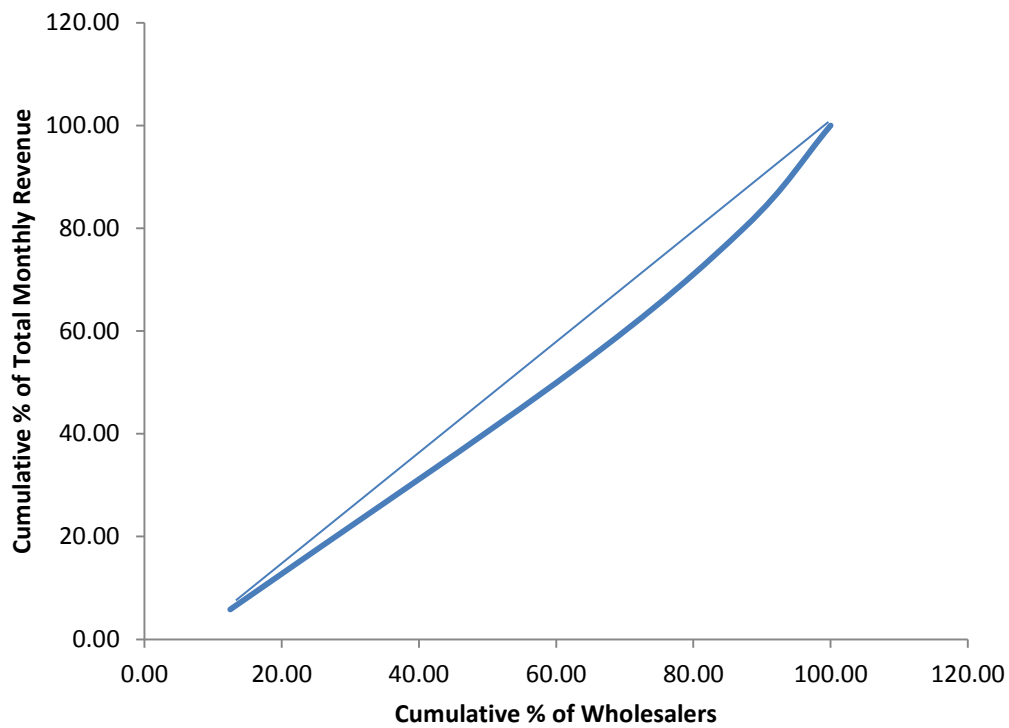


Figure 4.24: Lorenz-curve of wholesalers marketing frozen fish products along Nigeria-Niger border and Kainiji Lake Fisheries

4.13.15 RETAILERS (FROZEN)

Table 4.71 shows that majority (37.50%) of retailers of frozen fish earn between ₦750000.01 - 1000000.00. The value of the Gini coefficient was computed as 0.43. Figure 4.25 shows the Lorenz curve of retailers of frozen fish marketed in the States along the Nigeria-Niger border and the Lake Kainji-inland fisheries.

4.14 SCALE ECONOMIES

4.14.1 FRESH FISH

Figure 4.26 shows the relationship of total monthly marketing cost and total monthly quantity of fresh fish sold in the states along the Nigeria-Niger border and the Lake Kainji inland fisheries. The regression coefficient is value is positive (17.36). The regression model of fresh fish is given as $TMC = 11525.83 + 17.36Q_s$.

4.14.2 SMOKED FISH

Figure 4.27 shows the relationship of total monthly marketing cost and total monthly quantity of smoked fish sold in the states along the Nigeria-Niger border and the Lake Kainji inland fisheries. The regression coefficient is value is positive 6.03. The regression model for smoked fish is given as $TMC = 25135.77 + 6.03Q_s$.

4.14.3 DRIED FISH

Figure 4.28 shows the relationship of total monthly marketing cost and total monthly quantity of dried fish sold in the states along the Nigeria-Niger border and the Lake Kainji inland fisheries. The regression coefficient is value is negative -7.66. The regression model is shown as $TMC = 41605.06 - 7.66Q_s$.

Table 4.71: Cumulative percentage of monthly revenue and sale of frozen fish marketed by the retailers

Total Revenue (₹)	Frequency	% of Retailers (X)	Cumulative Percent	Total Value of Monthly Sales (₹)	% of Total Sales	Cumulative Percent (Y)	$\sum xy$
750000.01 - 1000000.00	3	37.50	37.5	2650000.00	28.07	28.07	0.11
1000000.01 - 1250000.00	2	25.00	62.5	2360000.00	25.00	53.07	0.13
1250000.01 - 1500000.00	1	12.50	75.00	1258515.00	13.33	66.40	0.08
1500000.01 - 1750000.00	2	25.00	100.00	3172500.00	33.60	100.00	0.25
Total	8	100.00		9441015.00	100.00		0.57

Gini coefficient = 0.43

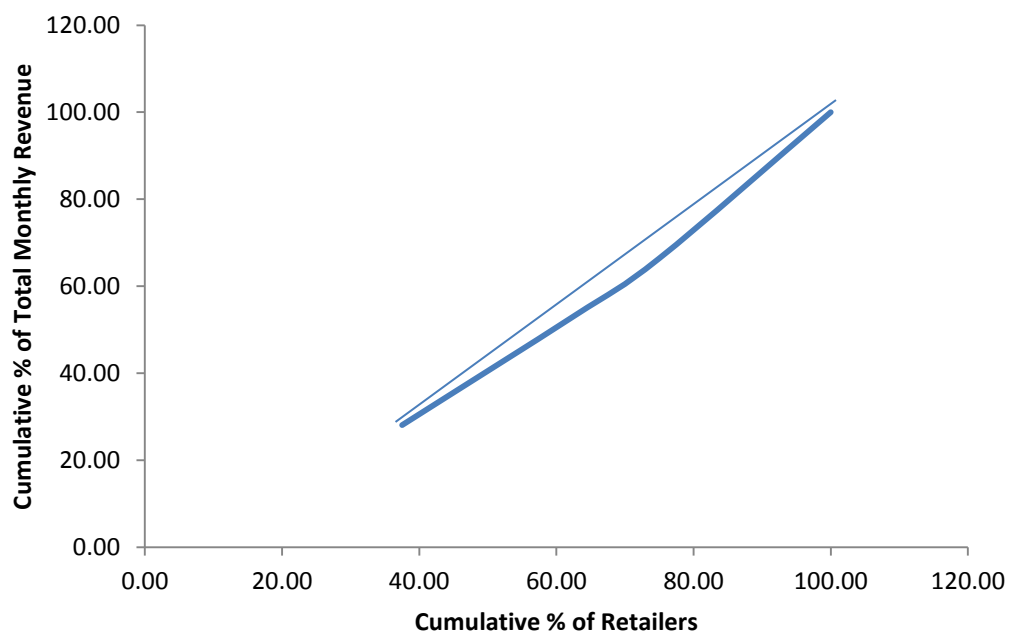


Figure 4.25: Lorenz-curve of retailer marketing frozen fish products along Nigeria-Niger border and Kainji Lake Fisheries

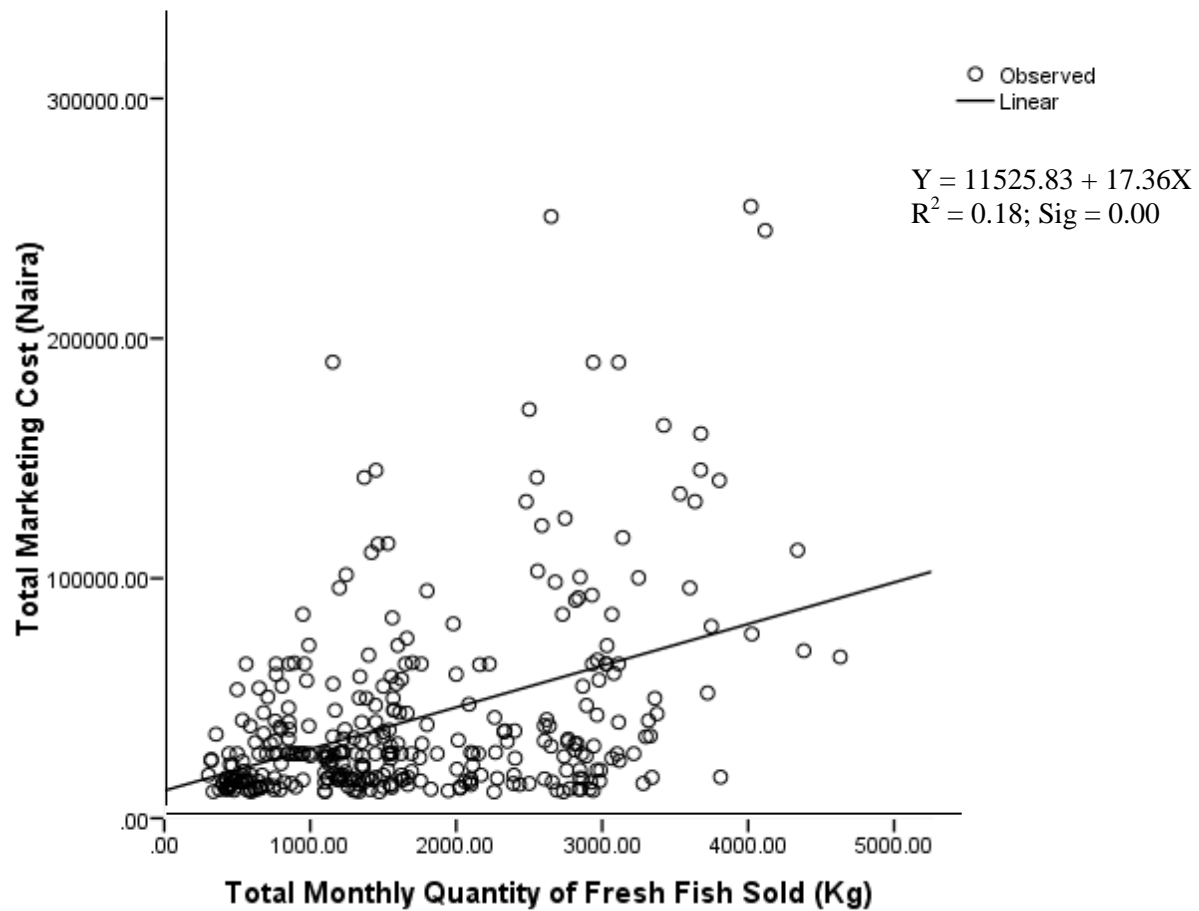


Figure 4.26: Relationship between total marketing cost and total monthly quantity of fresh fish sold

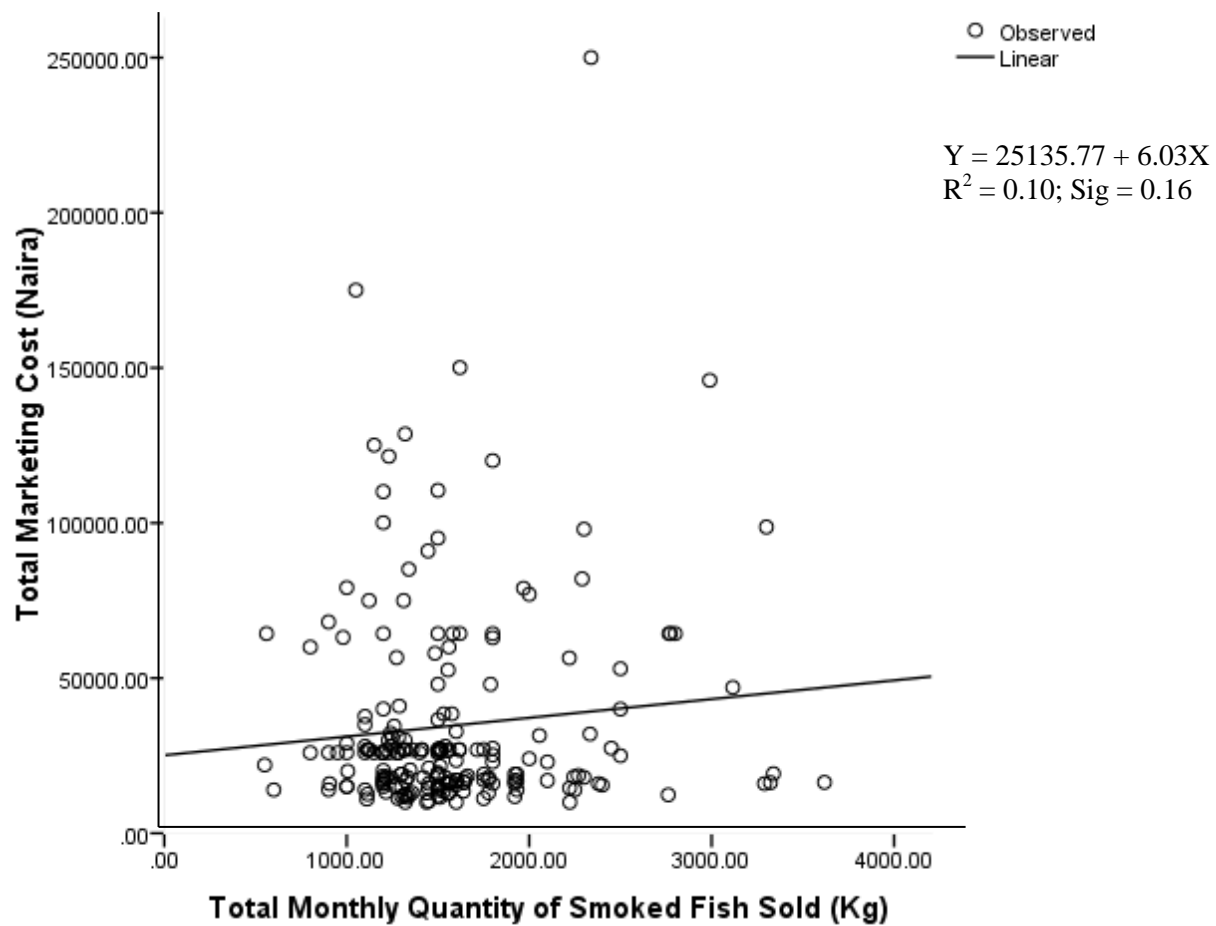


Figure 4.27: Relationship between total marketing cost and total monthly quantity of smoked fish sold

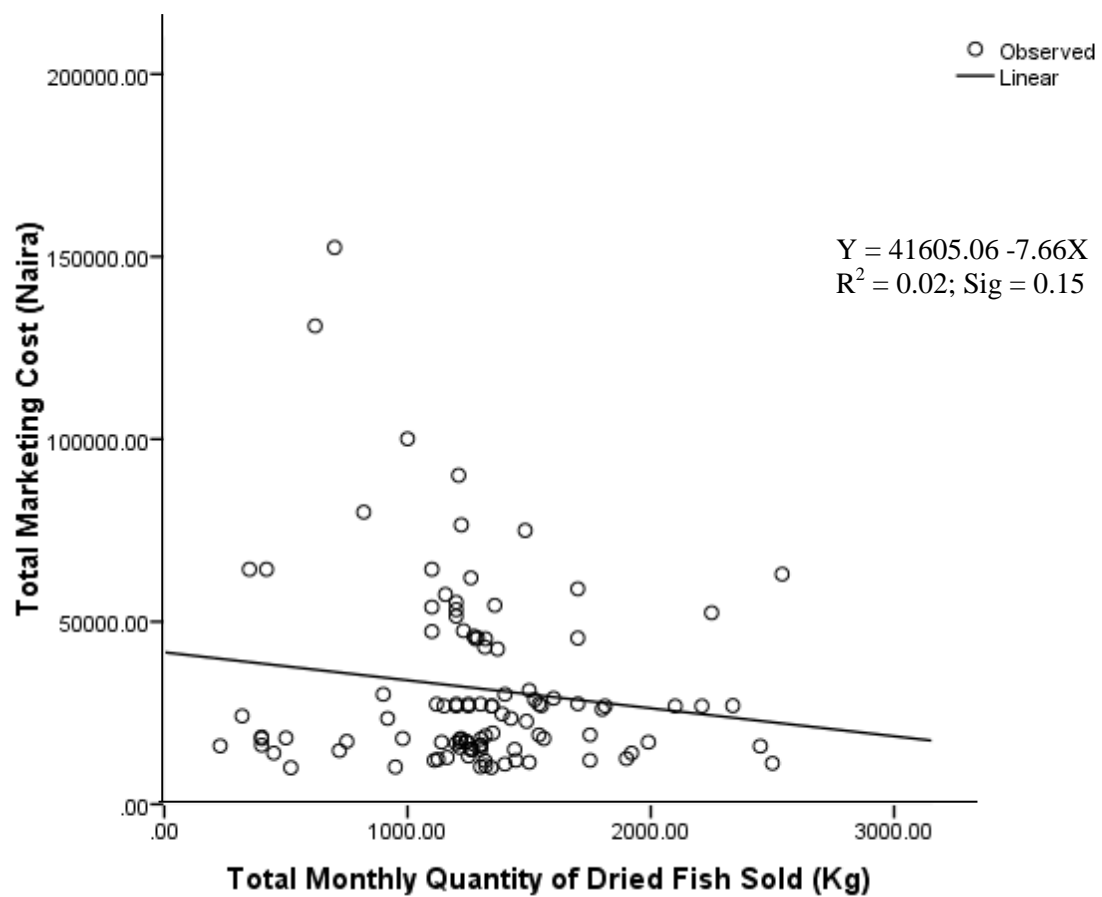


Figure 4.28: Relationship between total marketing cost and total monthly quantity of dried fish sold

4.14.4 FROZEN FISH

Figure 4.29 shows the relationship of total monthly marketing cost and total monthly quantity of frozen fish sold in the states along the Nigeria-Niger border and the Lake Kainji inland fisheries. The regression coefficient is value was positive 15.18. The regression model is given as $TMC = 24299.38 + 15.18Q_s$.

4.14.5 SPICED FISH

Figure 4.30 shows the relationship of total monthly marketing cost and total monthly quantity of spiced fish sold in the states along the Nigeria-Niger border and the Lake Kainji inland fisheries. The regression coefficient is value is positive 75.30. The regression model for spiced fish is given as $TMC = 75332.39 + 75.30Q_s$.

4.14.6 FRIED FISH

Figure 4.31 shows the relationship of total monthly marketing cost and total monthly quantity of fried fish sold in the states along the Nigeria-Niger border and the Lake Kainji inland fisheries. The regression coefficient is value is negative -5.15. The regression model is given as $TMC = 28579.69 - 5.15Q_s$.

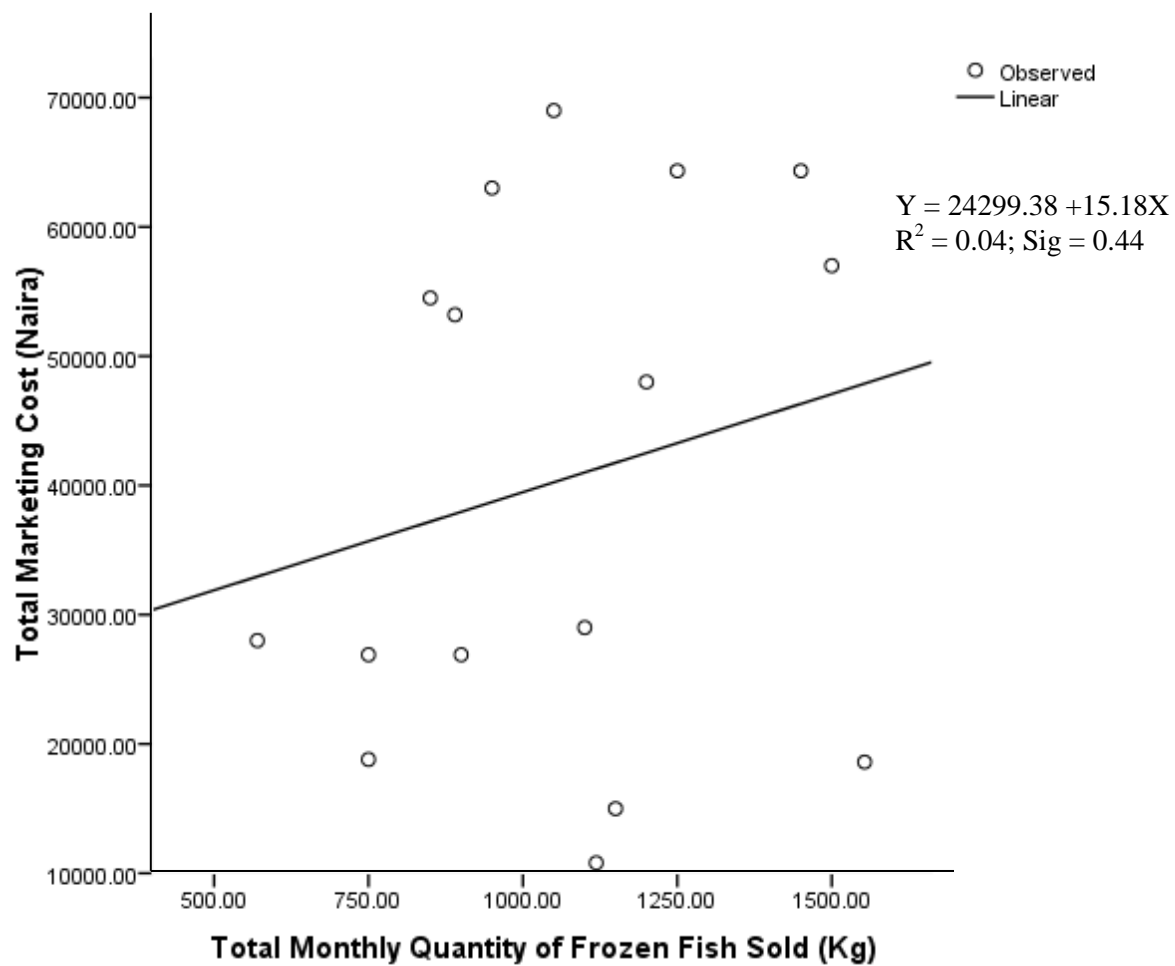


Figure 4.29: Relationship between total marketing cost and total monthly quantity of frozen fish sold

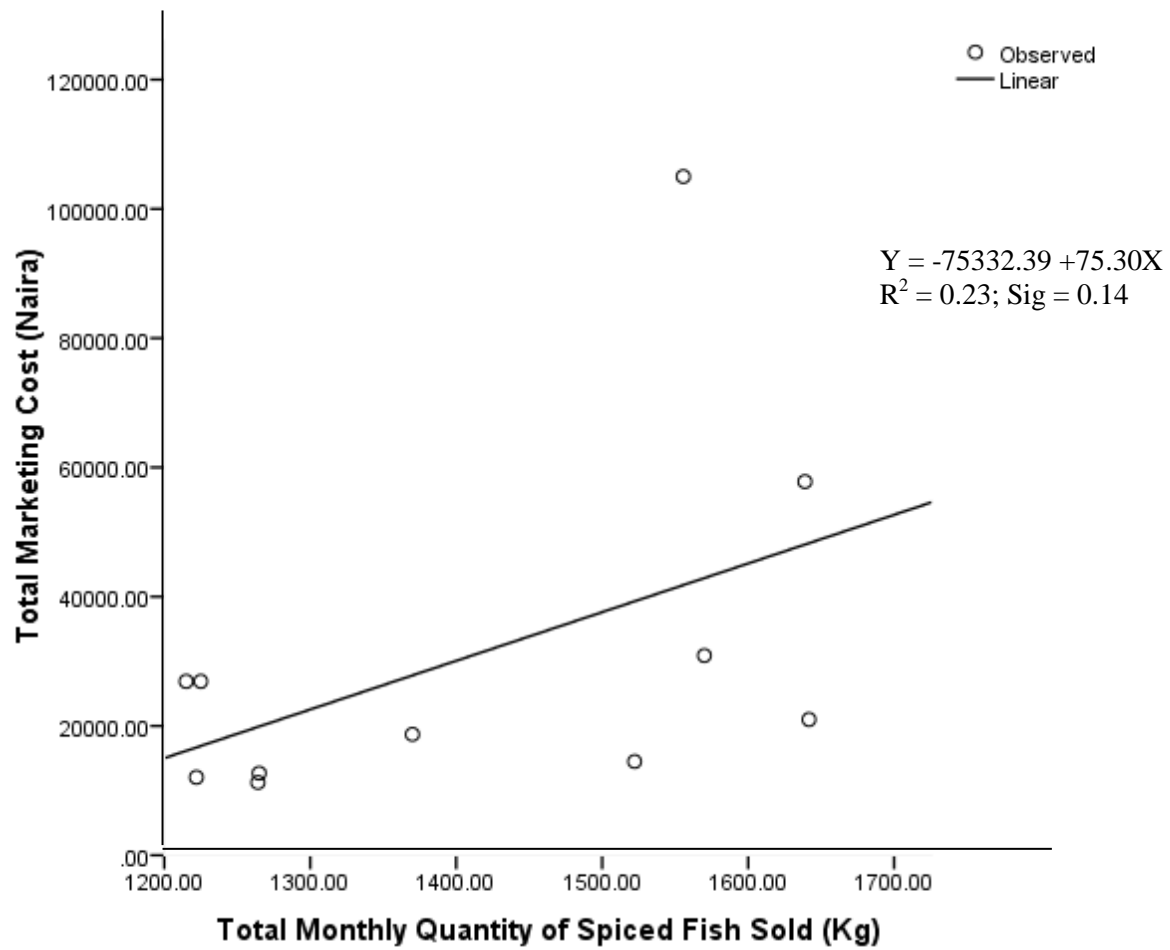


Figure 4.30: Relationship between total marketing cost and total monthly quantity of spiced fish sold

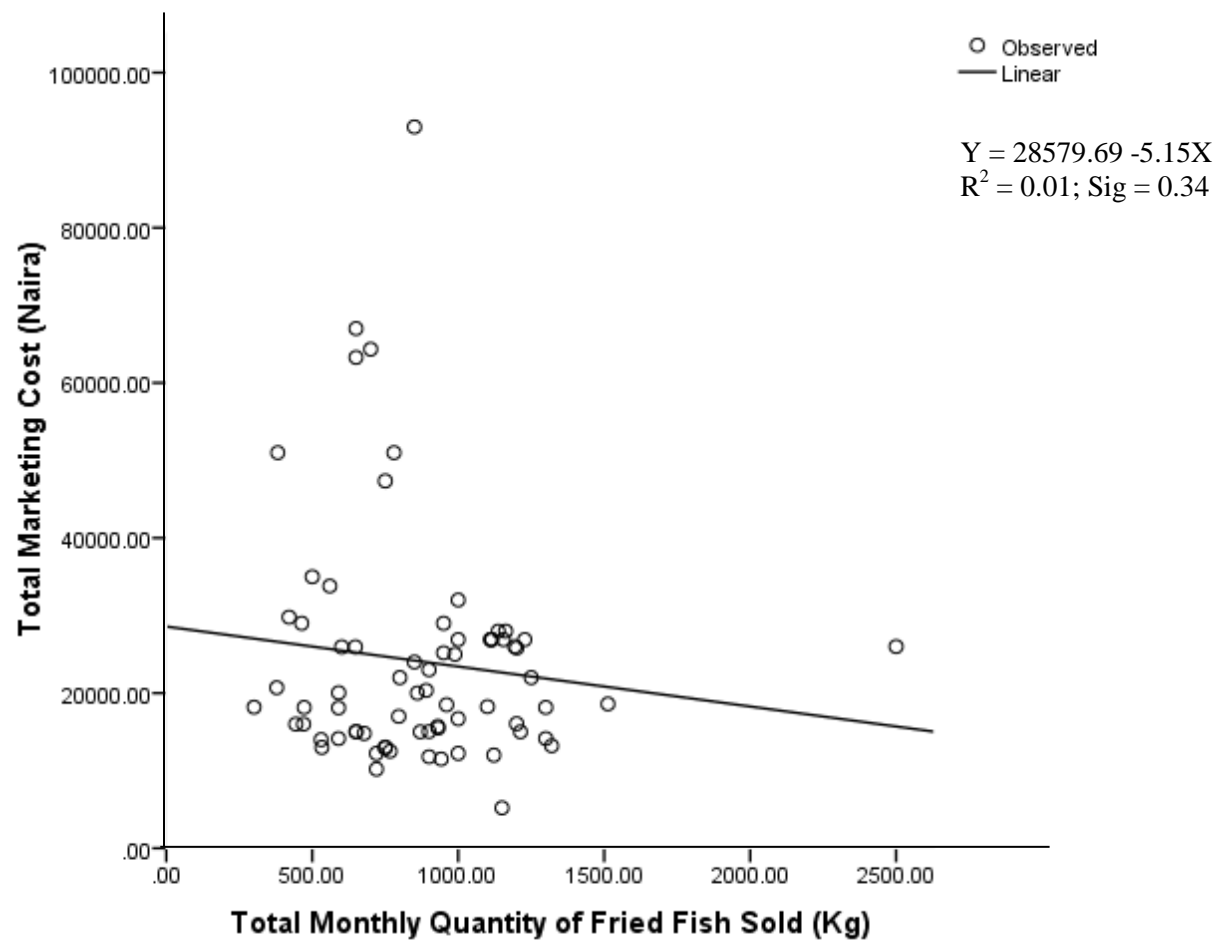


Figure 4.31: Relationship between total marketing cost and total monthly quantity of spiced fish sold

CHAPTER FIVE

5.0 DISCUSSION

5.1 Socioeconomic Characteristics in Sokoto state

The analysis of results in Table 4.1 shows that producers, marketers and processors in Sokoto state were dominated by males, producers were all males while there was a smaller percentage of female marketers and processors, this may be due to the culture and religion (Islam) dominant in this region which encourages isolation of women. This result is in line with Ali *et al.*, (2008), who reported a predominance of males involved in fish marketing in Borno state, Umoinyang (2014) who reported only male producers in Akwa Ibom state, this is also in compliance with Gwary *et al.*, (2014) who in an analysis of value chain of fish caught in Lake Alau in Borno state reported all producers and processors were male and a higher proportion of males were involved in the marketing process, Velu *et al.*, (2009) collaborated when he reported that women were not major players in agricultural production in the northern part of Nigeria.

The age of the respondents varied across occupations, Table 4.1 shows that majority of producers and processors in Sokoto state were within 31-40 years, while majority of the marketers were within 41-50 years, this implies that majority of fish producers, marketers and processors are within the age of 31-40 years, which is their economic active age, The finding was in agreement with those of Olaoye (2010), who found that most of the fisher folks are in their economic active ages to undertake strenuous task associated to the fishing enterprise and this agrees with Tiri *et al.*, (2014) who reported that majority of fish marketers in Dutsin-ma Katsina State were within the ages of 35-54 years and Oladimeji *et al.*, (2013) who reported that majority of the fishermen in Asa and Patigi Local Government Area of Kwara state were within the age bracket of 38-47 years followed by 48-57 years.

However this disagrees with Gwary *et al.*, (2014) and Ali *et al.*, (2008) who reported that majority of the fishermen in Borno state is between 21 and 30 years. Nevertheless, Dambatta *et al.*, (2016) who reported that more middle aged people take part in fishing activities than old aged and younger ones in Kano state.

The analysis of results in Sokoto from Table 4.1 showed that there was a predominance of married respondents followed by single respondents, The high incidence of marriage shows a high level of responsibility among the respondents and implies that marriage remains an acceptable and valued culture in the area this is in line with Oladoja *et al.*, (2008) contended that marriage is an important factor in the livelihood of individuals in our society as it is perceived to confer responsibility on individuals; it could also be for the purpose of augmenting family labour. This result is in agreement with Shettima *et al.*, (2014) who reported a predominance of married people among fishermen in Lake Alau, Jere local government area in Borno state and Kainga and Adeyemo (2012) who reported that fish marketers were dominated by married people.

The results of the analysis from Table 4.1 showed that majority of the producers, marketers and processors had large households with mean household sizes of 8 persons for fishers and 10 persons for marketers and processors. This is in agreement with Tiri *et al.*, (2014) who reported that majority of fish marketers in Dutsin-Ma, Katsina state had household sizes of between 6-15 persons and Gwary *et. al.*, (2014) in an analysis of value chain of fish caught in Lake Alau in Borno state reported that fishers, processors and marketers had large household sizes with mean household sizes of 16, 12 and 11 respectively. However, it is not in line with the findings of Abah *et al.*, (2013) who reported that most fishermen had household sizes of less than 8 persons.

The analysis of the results from Table 4.1 indicates that the highest education for majority of the producers and marketers had tertiary education while majority of the processors had up to secondary school education. This shows that all the respondents had one form of education or the other, new innovations and techniques are easily adopted by educated persons this implies that new innovations and techniques will be adopted at varying degrees by most of the respondents in Sokoto state. This is in line with Ali *et al.*, (2008) and Dauda *et al.*, (2014) who reported that majority of the fish marketers had Qu'aranic education in Northeastern Nigeria and Katsina state respectively.

The analysis of the result in Table 4.1 shows that majority of the respondents had marketing experience of 10 years and below, According to Ali *et al.*, (2008), marketing experience is important in determining the level of profitability obtained by a marketer. The more years of

marketing experience the more knowledge and profits the marketers tends to get, as he/she will use his/her understanding of the marketing system, market condition, market trends and price etc this agrees with the findings of Abah *et. al.*, (2013) who reported that majority of the fishermen had marketing experience of between 5 and 10 years.

Majority of the producers, marketers and processors in Sokoto state belong to cooperative societies, this may be to pool resources together in order to help themselves achieve some certain goals. This agrees with This agrees with the findings of Omoare *et al.*, (2013) who reported that majority of the fish marketers in Niger state belonged to cooperative societies.

5.2 Socioeconomic characteristics of respondents in Katsina state

Table 4.2 shows that majority of the fish producers, marketers and processors are male in Katsina state are male, this is in line with Brummett *et al.*, (2010) who asserted that fisheries activities are usually dominated by men, however, it does not agree with the findings of Inoni and Oyaide (2007) and Kareem *et al.*, (2008) who asserted that processing and marketing are usually dominated by women.

Table 4.2 shows that the mean age of producers, marketers and processors were 45, 44 and 39, This implies that majority of fish marketers that is whether producers, marketers or processors are within the age range of 30-60 years; the analysis of results show that the mean age of majority of the producers, marketers and processors across the states are in their forties, that is they are middle aged, this implies that they are in their economic active age and therefore strong enough to carry out their production activities effectively and efficiently, this agrees with the findings of Tiri *et al.*, (2014) who reported that majority of fish marketers in Dutsin-ma Katsina State were within the ages of 35-54 years and Oladimeji *et al.*, (2013) who reported that majority of the fishermen in Asa and Patigi Local Government Area of Kwara state were within the age bracket of 38-47 years followed by 48-57 years.

The analysis of results in Table 4.2 shows that majority of the producers, marketers and processors in Katsina state are married, the high incidence of marriage shows a high level of responsibility among the respondents and implies that marriage remains an acceptable and

valued culture in the area this is in line with Oladoja *et al.* (2008) contended that marriage is an important factor in the livelihood of individuals in our society as it is perceived to confer responsibility on individuals; it could also be for the purpose of augmenting family labour.

The analysis of results on Table 4.2 showed that majority of the respondents had large household sizes, this could be as a result of marrying more than one wife which is prevalent and acceptable in the region due to the predominant religion, this agrees with Tiri *et al.*, (2014) who reported that majority of fish marketers in Dutsin-Ma, Katsina state had household sizes of between 6-15 persons and Gwary *et. al.*, (2014) in an analysis of value chain of fish caught in Lake Alau in Borno state reported that fishers, processors and marketers had large household sizes with mean household sizes of 16, 12 and 11 respectively. However, it disagrees with Adeleke (2013) who reported that artisanal fisher folks have household sizes of between 1 to 5 in Ondo state.

The analysis of the results in Table 4.2 shows that majority of the producers had Qu'aranic education while majority of the processors and marketers has up to secondary education, this agrees with the findings of Shettima *et al.*, (2014) who reported that majority of the fishermen in Alau Local Government Area of Borno State had Qu'aranic education.

The result of the analysis on Table 4.2 showed that majority of the producers had marketing experience of 10 years and below, while majority of the marketers and processors had marketing experience of between 11-20 years. This disagrees with the findings of Adewumi *et al.*, (2012) who reported that majority of the artisanal fishermen in Kwara state had marketing experience of 20 to 25 years.

Membership of cooperative societies is a factor which influences the adoption to improve fishing technologies and apparently alleviation (Olaoye *et al.*, 2012), majority of the producers, marketers and processors belonged to cooperative societies, and this disagrees with Olaoye *et al.*, (2012) who reported that majority of the fishermen in Ogun waterside did not belong to cooperative societies.

5.3 Socio economic Characteristics of respondents in Jigawa state

The result on Table 4.3 shows that capture producers are all male, while there are a few female culture producers, marketers and processors. Male marketers and processors are dominant. This implies is that both male and female are involved in fish production, marketing and processing this is in line with the findings of Gwary *et. al.*, (2014) who in an analysis of value chain of fish caught in Lake Alau in Borno state reported all producers and processors were male and a higher proportion of males than were involved in the marketing process.

The result from the analysis in Table 4.3 shows that majority of the producers, were within the age range of 51-60 years, while majority of the marketers and processors were within the age range of 41-50 years, this disagrees with Gwary *et al.*, (2014) who reported that majority of the fishers, processors and marketers in Alau Borno state were within the age range of 20-30 for fishers and processors and less than 20 for fish marketers. However, This implies that majority of fish marketers that is whether producers, marketers or processors are within the age range of 30-60 years; this agrees with the findings of Tiri *et al.*, (2014) who reported that majority of fish marketers in Dutsin-ma Katsina State were within the ages of 35-54 years and Oladimeji *et al.*, (2013) who reported that majority of the fishermen in Asa and Patigi Local Government Area of Kwara state were within the age bracket of 38-47 years followed by 48-57 years.

The result of the analysis on Table 4.3 indicates that majority of the respondents were married, this agrees with the findings of Abah *et. al.*, (2013), Oladimeji *et al.*,(2013), Bassey *et al.*, (2015) and Adeleke (2013). The high incidence of marriage shows a high level of responsibility among the respondents and implies that marriage remains an acceptable and valued culture in the area; it could also be for the purpose of augmenting family labour.

The results on Table 4.3 indicates that household sizes of the producers, marketers and processors have large household sizes This may be as a result of the high incidence of marriage of the respondents; early marriage of respondents; It could also be as a result of the major religion in the area (Islamic religion) which encourages marriage to more than one wife (polygamy). This is in agreement with Tiri *et al.*, (2014) who reported that majority of fish marketers in Dutsin-Ma, Katsina state had household sizes of between 6-15 persons and Gwary

et. al., (2014) in an analysis of value chain of fish caught in Lake Alau in Borno state reported that fishers, processors and marketers had large household sizes with mean household sizes of 16, 12 and 11 respectively.

The result of the analysis from Table 4.3 shows that the respondents had one form of education or another, Education influences the rate of adoption of new innovations and techniques; this implies that new innovations and techniques will be easy to introduce and adopted at varying degrees by most of the respondents in the study area. This result is in consonance with findings of Oparinde and Ojo (2014) who reported that majority of the fish farmers in Osun state had one form of education or another.. Culture producers had the highest percentage of tertiary education this is in agreement with Ele *et al.*, (2013) and Olasunkanmi (2012) who reported that majority of fish farmers have tertiary education in Cross river and Osun state respectively.

According to Ali *et al.*, (2008), marketing experience is important in determining the level of profitability obtained by a marketer. The more years of marketing experience the more knowledge and profits the marketers tends to get, as he/she will use his/her understanding of the marketing system, market condition, market trends and price. Majority of the producers had marketing experience of between 11-20 years. while majority of the marketers and processors had marketing experience of 10 years and below , This result is in agreement with Ali *et al.*, (2008) and Bassey *et al.*, (2015) who reported that majority of fish marketers have marketing experience of 6-10 years in Borno state and Akwa Ibom state respectively.

Cooperative society involves a social participation that helps farmers to pool their resources together, to have access to fishing inputs and to have insight in their fishing issues. Membership of cooperative societies is therefore a factor which influences the adoption to improve fishing technologies and apparently alleviation (Olaoye 2012) Majority of the respondents belong to cooperative societies, this is not in line with Olaoye (2012) who reported that majority of the artisanal fishermen in Ogun State do not belong to cooperative societies.

5.4 Socioeconomic characteristics of respondents in Yobe state

The result in Table 4.4 shows that both male and female are involved in fish production, marketing and processing with males dominating. This is in line with the findings of Okwuokenye and Onemolease (2011) who found that males dominated the marketing of agricultural products with 78.8% compared to females of 21.2%. This is also in line with Gwary *et al.*, (2014) who in an analysis of value chain of fish caught in Lake Alau in Borno state reported all producers and processors were male and a higher proportion of males were involved in the marketing process. Velu *et al.*, (2009) reported that women were not major players in agricultural production in the northern part of Nigeria.

The high incidence of marriage shows a high level of responsibility among the respondents and implies that marriage remains an acceptable and valued culture in the area this is in line with Oladoja *et al.*, (2008) contended that marriage is an important factor in the livelihood of individuals in our society as it is perceived to confer responsibility on individuals; it could also be for the purpose of augmenting family labour. This result is in agreement with Shettima *et al.*, (2014) who reported a predominance of married people among fishermen in Lake Alau, Jere local government area in Borno state and Kainga and Adeyemo (2012) who reported that fish marketers were dominated by married people.

The result of the analysis in Table 4.5 shows that majority of the marketers have large household sizes, this is in agreement with Tiri *et al.*, (2014) who reported that majority of fish marketers in Dutsin-Ma, Katsina state had household sizes of between 6-15 persons and Gwary *et al.*, (2014) in an analysis of value chain of fish caught in Lake Alau in Borno state reported that fishers, processors and marketers had large household sizes with mean household sizes of 16, 12 and 11 respectively. However, it is not in line with the findings of Abah *et al.*, (2013) who reported that most fishermen had household sizes of less than 8 persons. The result of the analysis from Table 4.4 shows that the respondents had one form of education or another, Education influences the rate of adoption of new innovations and techniques; this implies that new innovations and techniques will be easy to introduce and adopted at varying degrees by most of the respondents in the study area. This implies that the producers, marketers and processors would have basic knowledge in the fishing operations and would be easier for them to adopt innovations from

extension agents and research institutes for efficient productivity This result is in consonance with findings of Oparinde and Ojo (2014) who reported that majority of the fish farmers in Osun state had one form of education or another.

Culture producers had the highest percentage of tertiary education this is in agreement with Ele *et al.*, (2013) and Olasunkanmi (2012) who reported that majority of fish farmers have tertiary education in Cross river and Osun state respectively. According to Ali *et al.*, (2008), marketing experience is important in determining the level of profitability obtained by a marketer. The more years of marketing experience the more knowledge and profits the marketers tends to get, as he/she will use his/her understanding of the marketing system, market condition, market trends and price. Majority of the marketers and processors had marketing experience of less than 10 years, this agrees with Madugu and Edward (2011) who reported that majority of fish marketers had marketing experience of less than 10 years in Adamawa state. Majority of the producers, marketers and processors belonged to cooperative societies.

5.5 Socioeconomic characteristics of respondents in Niger state

The result on Table 4.5 shows that fish production and marketing were dominated by males this implies that both male and females participate in fish production, marketing and processing. This is in line with Ali *et al.*, (2008), who reported a predominance of males involved in fish marketing in Borno state and this agrees with the findings of Gwary *et al.*, (2014) who in an analysis of value chain of fish caught in Lake Alau in Borno state reported all producers and processors were male and a higher proportion of males were involved in the marketing process. However, processing was dominated by women, this is in line with the findings of Odebiyi *et al.*, (2013) in an analysis of fish value chain actors in Ogun state reported that processors and marketers were female and a higher percentage of females were marketers, this agrees with the result of this study that shows a higher number of female processors than male processors in Niger state.

The analysis of the results on Table 4.5 indicates that the fish producers, marketers and processors are within the age of 31-60 years, this is in line with this agrees with the findings of Tiri *et al.*, (2014) who reported that majority of fish marketers in Dutsin-ma Katsina State were

within the ages of 35-54 years and Oladimeji *et al.*, (2013) who reported that majority of the fishermen in Asa and Patigi Local Government Area of Kwara state were within the age bracket of 38-47 years followed by 48-57 years.

The result on Table 4.5 shows that all the producers were married, while majority of the marketers and processors were married, the high incidence of marriage shows a high level of responsibility among the respondents and implies that marriage remains an acceptable and valued culture in the area; it could also be for the purpose of augmenting family labour. This result is in agreement with Shettima *et al.*, (2014) who reported a predominance of married people among fishermen in Lake Alau, Jere local government area in Borno state and Kainga and Adeyemo (2012) who reported that fish marketers were dominated by married people.

The result of the analysis from Table 4.5 shows that majority of the respondents have Qu'aranic education, this is in line with Shettima *et al.*, (2014) who reported that majority of the fishermen in Borno state had Qu'aranic education. The results on Table 4.5 shows that majority of marketers and processors have marketing experience of 10 years and below, this is in line with the findings of Madugu and Edward (2011) who reported that fish marketers in Adamawa state had marketing experience of less than 10 years. Cooperative society is a social participation that helps farmers to pool their resources in order to have access to fisheries inputs and to have insights in their fishing issues.

Membership of cooperatives is also a factor that influences the adoption of improved fisheries technologies and poverty alleviation. Majority of the producers, marketers and processors belong to cooperative societies, This agrees with the findings of Olaoye *et al.*, (2013) in who reported that most fish marketers in Niger state belong to cooperative societies, this is in line with Olaoye *et al.*, (2013) who reported that majority of the fish farmers in Oyo state belong to cooperative societies.

5.6 Socioeconomic Characteristics of respondents According to Geopolitical zones

The analysis of results indicates that males constitute the majority of fish marketers across the geopolitical zones. This is against the popular belief that women are more into processing and

marketing while the men are more into production. Perhaps the predominance of men in marketing may be due to the location, that is Northern Nigeria, whose culture does not permits the female folks engage in so much of economic activities. This finding contradicts the findings of Nwabunike (2015a) who reported that fish marketers in South east are mostly female with very few male that are engaged in marketing. This age of respondents across geopolitical zones is an indication that respondents are mature and in their energetic and productive age and this may have a positive impact in the marketing of fish, since fish marketing requires energy and is quite stressful. The implication of adults engaging in fish marketing is that it may increase the marketing efficiency of the enterprise.

This findings is in tandem with that of Ezihe *et al.*, (2014) who reported that most fish marketers in North central are adults who have business orientation and possibly engage in fish marketing because it is a profitable venture. The implication of the predominance of married respondents across the three geopolitical zones is that respondents will have sufficient supply of family labour and this may positively affect their marketing efficiency. This assertion is concomitant with that of Afolabi (2008) who observed that marketers with families have a positive effect on the availability of family labour and this will lead to the enhancement of fish marketing in the area.

Perhaps, the large household size may be due to their religion (Muslims) which permits polygamy. A large family size implies availability of family labour. This corroborates the findings of Ezihe *et al.*, (2014) who reported a large household size in the North central geopolitical zone. According to them this could be as a result of some level of sufficient family labour as more income from fish marketing will go into problem solving needs and welfare of the family. Large household also implies high dependency burden. With a lot of mouths to feed and lots of responsibilities to meet, the financial burden might be enormous and this may have a negative influence on the efficiency of fish marketing.

This result on educational qualification across the three geopolitical zones shows that the respondents had one form of education or the other. This means that to some extent, respondents are able to keep records and will be able to adopt innovations on fish marketing. This results is somewhat at variance with the findings of Ezihe *et al.*, (2014) who reported that most fish

marketers are illiterate who do not know how to read nor write and this will greatly affect the progress of their business.

However, this finding is supported by that of Nwabunike (2015a) who reported that fish marketers in the South east had attempted secondary school level. The implication of being a member of a cooperative is that respondents will be have access to information and resources such as soft loans, inputs and implements. This in turn may increase the marketing efficiency of fish marketing in the geopolitical zones. This result is in line with the report of Ibitoye (2012) who observed that cooperative farmers had access to loan facilities which could be used to strengthen their productivities.

The result of the analysis on marketing experience across geopolitical zones shows that respondents in the study area had a high level of experience in fish marketing. The implication of this is that since their level of experience in fish marketing is high, it automates that they also have a high knowledge level about the business and this may help in improving the efficiency of fish marketing, This corroborates the findings of Umoinyang (2014) who stated that fish marketers in Akwa Ibom state had a high level of experience in fish marketing which implied that that the marketers had used a greater part of their active life in fish marketing.

5.7 Profitability and Efficiency indices based on form of fish marketed

The forms of fish marketed in the States in the Nigeria-Niger border and the Lake Kainji-inland fisheries were fresh fish, smoked fish, dried fish, frozen fish, fried fish and spiced fish. The results showed that the highest monthly revenue was gotten from smoked fish, this implies that smoked fish is more profitable this may be because smoked fish commands the highest selling price, it might also be due to value addition which translates to increase selling price and therefore increase in the revenue this is in consonance with the report of Dalhatu and Ala (2010) who reported a higher demand for smoked fish in Sokoto metropolis The gross margin per kg was highest for smoked fish, this may be because the total revenue gotten from smoked fish was high enough to cover the variable costs. The marketing efficiency of all the forms of fish were positive but the highest was for fresh fish, this may be because the variable cost accruing to fresh fish in relation to the revenue gotten from it is lower when compared to the other forms of fish

this is in line with the findings of Babalola *et al.*, (2015) who reported that fish marketing was efficient in Ogun State irrespective of the associated costs.

5.7.2 Profitability and Efficiency indices based on forms of fish marketed in the States along the Nigeria-Niger Border and Lake Kainji-inland fisheries

The results show that positive revenue, gross margin and net return values were recorded in all the states, this implies that fish marketing is profitable in all the States along the Nigeria-Niger border and Lake Kainji-inland fisheries, this is in line with the findings of Osarenren and Ojor (2014) who analysed fish marketing in Etsako Local Government area of Edo State. Niger state recorded the highest revenue for fresh fish while the least revenue was recorded in Sokoto State, this may be because the selling price of fresh fish was highest in Niger state and least in Sokoto State, another reason for lower revenue in Sokoto state may be that because of the high marketing cost and high operational cost recorded in the state. The highest gross margin was recorded in Niger State, this may be due to high revenue in relation to the variable cost incurred in Niger State, the least gross margin was recorded in Sokoto State this may be due to the high costs incurred in marketing fresh fish in Sokoto state. All the states had positive marketing efficiency for fresh fish but Niger state had the highest marketing efficiency while Sokoto state had the least this may be because the variable costs incurred in Niger State is lower in relation to their total revenue gotten from the marketing of fresh fish.

For smoked fish, the results show positive profitability indices across the States, this implies that fish marketing business is profitable, this is in consonance with the findings of Magawata *et al.*, (2014) who reported that fish processing in Argungun Local Government Area of Kebbi State is profitable. Niger State also recorded the highest selling price while Sokoto State also recorded the least selling price. The highest revenue for smoked fish was obtained in Niger State while the least was in Katsina State, the lower revenue can be due to the high variable costs and production costs incurred for smoked fish in Katsina State. A higher variable cost was generally recorded for smoked fish across the states than for fresh fish this might be because of the high cost of fuel for smoking the fish, the total revenue was also generally higher than that from fresh fish, this may be due to the higher selling price as a result of value addition, this is in line with the findings of Dalhatu and Ala (2010) who reported a higher demand for smoked fish in Sokoto metropolis.

The marketing efficiency for smoked fish in all the States were positive but Niger State had the highest marketing efficiency this implies that the revenue gotten from the sale of smoked fish in the State is able to cover the variable costs incurred on the marketing of smoked better than the other States while Yobe State had the lowest marketing efficiency this implies that the revenue gotten from the sale of smoked fish in Yobe State is least able to cover the variable costs incurred on the marketing of smoked fish.

The gross margin, net returns and marketing margin for dried fish were all positive across the States, this implies that the dried fish marketing in all the State is profitable. The highest total revenue for dried fish was obtained in Niger State though the highest variable cost and production was also obtained in Niger State, this implies that the total revenue obtained was high enough to cover the variable and production costs and still remain substantially higher than other States. The marketing efficiency for dried fish marketing across the State were positive, this contradicts the findings of Onyemauwa (2012) who reported that the marketing efficiency for fresh and dried fish markets in Southeast Nigeria were inefficient. The results of the ANOVA shows that there were no significant differences in the marketing efficiency of dried fish marketing across the States this implies that they are all able to cover the variable costs with the revenue obtained from the marketing of dried fish.

The gross margin, net returns and marketing margin for fried fish across the States indicates that fried fish marketing is profitable in the study area this is in line with the findings of Osarenren and Ojor (2014) who analysed smoked fish marketing in Etsako local government area of Edo State. The highest total revenue was recorded in Yobe State, this could be because fried fish marketing in Yobe State incurred the least total variable cost, Jigawa State had the least average revenue this could be because they had the least selling price.

5.7.3 Profitability indices based on level of operation in the States along the Nigeria-Niger border and Lake Kainji inland fisheries

The gross margin, net returns and marketing margin and revenue for fresh fish for producers, wholesalers and retailers in were all positive with wholesalers having the highest total revenue this corresponds with Bassey *et al.*, (2015) who reported positive profitability indices for fresh

fish marketers in Akwa Ibom State, this maybe because the high selling price this is in line with the findings of Odebiyi *et al.*, (2013) who reported that fish marketers incurred higher revenue than producers and processors. The marketing efficiencies for all levels of operation were positive with capture producers having the highest efficiency though they had the lowest monthly revenue, this implies that capture producers are able to perform their functions effectively at the least possible cost, this is in line with Dawang *et al.*, (2011) who assessed the efficiency of fishermen in natural Lakes in Plateau State, he reported that fishermen are relatively efficient in allocating their scarce resources however, Anene *et al.*, (2010) reported that the resources of artisanal fishermen in Imo State were inefficiently allocated and were utilised above their economic optimum levels

For smoked fish wholesalers had the highest average monthly revenue was highest for wholesalers, this may be because they had the highest selling price and also sold the highest quantity of smoked fish. All the actors recorded positive revenue, net returns and gross profit this implies that marketing of smoked fish is profitable to the actors, this is in line with Babalola *et al.*, (2015) who reported fish marketing was efficient in Ogun State irrespective of the associated costs. The highest marketing efficiency was recorded for processors this implies that they can perform their marketing functions at the least possible cost, this is in line with Tijani *et al.*, (2014) who reported efficient market for dried fish in Maiduguri, Borno State.

For dried fish the profitability indices indicated all positive values for all the actors, this is in line with the findings of Fadipe *et al.*, (2014) who analysed fish marketing in Kwara State. Wholesalers had the highest monthly revenue, this may be because they sold the largest quantity of fish this is line with Odebiyi *et al.*, (2013) who reported that fish marketers incurred higher revenue than producers and processors. The highest marketing efficiency was recorded for processors of dried fish though they recorded the least revenue, this implies that their revenue can cover all their variable costs efficiently.

The results of the profitability analysis of the marketers of fried fish were positive indicating that fried fish marketing is a profitable business this corresponds with the findings of Ike and Chuks-Okonta (2014) who reported fish farming enterprise to be a profitable enterprise from the positive mean gross margin and mean net incomes recorded. The processors had the highest

marketing efficiency implying that they are able to perform all their marketing functions at the least cost.

The results of the profitability analysis of marketers of spiced fish indicated that processors had the highest gross margin, marketing margin and marketing efficiency, these are indications of good marketing performance, the marketing efficiency of all the actors are positive indicating that fish marketing is efficient, this contradicts the findings of Onyemauwa (2012) who reported that fresh and dried fish marketing in the Southeast was inefficient.

The results of the profitability analysis of frozen fish shows that frozen fish business is a profitable business this is in line with the findings of Okeoghene (2013) who reported positive gross margin for frozen fish marketing in Edo State. The marketing efficiencies for all actors involved in the marketing of frozen fish had positive marketing efficiencies, this is in consonance with the findings of Esiobu and Onubuogu (2014) who reported that the frozen fish market in Owerri was efficient.

5.8 Marketing channel

From the analysis of the marketing channel in figure 4.15, the order in which the goods flow from the producer to the final consumer is shown. The channel for distribution of fresh fish is both direct and indirect, direct marketing channel involves the sale of fish directly to the consumer from the producers while indirect distribution channels involves some intermediaries in the marketing process. Fresh fish was majorly distributed through the direct marketing channel in the States along the Nigeria-Niger border and Lake Kainji inland fisheries, however, more fish is sold through the indirect marketing channels than through the direct marketing channel. is an direct marketing.

Processed fish is marketed through both direct and indirect marketing channel with a greater percentage of the processed fish marketed through direct marketing channel, however more fish (quantity) is marketed through indirect marketing channels than through the direct marketing channels, this corresponds with the findings of Ismail *et al.*, (2014) who analyzed the marketing channel of dried fish in Borno state and reported the presence of many intermediaries in the

marketing process and Madugu and Edwards (2011) in Adamawa State who analyzed the distribution channel of processed fish in Adamawa state.

The marketing channel for culture fisheries both direct and indirect; this is because culture producers sell to marketers and processors as well as directly to consumers.

The results of the economic characteristics and marketing efficiency of the different marketing channels of the different forms of fish showed that for fresh fish the highest marketing efficiency and gross margin were observed in the direct distribution channel, this maybe because of the short length of the distribution channel, which results in low variable cost incurred by the producer and the producer sells to the consumer at reasonable prices without the exploitation of intermediaries, this is in line with the findings of Umoinyang (2014) who reported a higher marketing efficiency for direct marketing channel and inferred that the longer the chain of distribution, the higher the marketing costs and the lower the marketing efficiency.

For processed fish different trends were observed in their marketing efficiencies and economic characteristics. For smoked and fried fish the highest marketing efficiencies were observed through producers to wholesalers to consumers this maybe because the presence of intermediaries makes the distribution process more efficient, this is in line with the findings of Ezihe *et al.*, (2014) who reported that the presence of intermediaries makes the fish distribution process faster. For spiced and dried fish, the highest marketing efficiencies were observed through producers to processors to consumers, this maybe because of the short length of the distribution channel, it may also be as a result of low marketing and variable costs incurred in relation to the revenue gotten from the marketing of these forms of fish, this agrees with the inference of Umoinyang (2014) that the longer the chain of distribution, the higher the marketing costs and the lower the marketing efficiency.

5.9 Market Structure based on the forms of fish sold among the various actors

The value of the Gini coefficient computed for artisanal fish producers indicated a partial inequality in distribution of revenue among artisanal fishermen in the States along Nigeria-Niger border and Lake Kainji-Inland Fisheries this implies that although the fresh fish market is

concentrated just a few artisanal fishermen earn a larger part of the total revenue accruing to fresh fish, this also means that the market structure for capture fisheries is inefficient in the area. This is further buttressed by the Lorenz curve which does not fall only on the 45° line but there is a distance between the curve and the 45° line this corresponds with the findings of Adeleke and Afolabi (2012) who reported a Gini coefficient value of 0.5292 for fresh fish market in Ondo State Nigeria, which showed high level of concentration and consequently high inefficiency in the Ondo State fresh fish market structure this compliments the findings of Phiri *et al.*, (2013) who reported gini coefficient index for fishers' income to be 1.01 indicating that there was perfect inequality among fishers in income distribution.

The value of the Gini coefficient computed for culture producers indicated a partial equality in distribution of revenue among fish farmers in States along Nigeria-Niger border as a result of competition among the respondents this implies that the revenue of most of the culture producers in the States along Nigeria-Niger border and Lake Kainji-Inland Fisheries are within the same range, this indicates a high efficiency in the market structure and no culture producer dominates the market of cultured fish in the area this is further buttressed by the Lorenz curve which is close to the 45° line indicating partial equality this contradicts the findings of Adeleke and Afolabi (2012) who reported a Gini coefficient value of 0.5292 for fresh fish market in Ondo State Nigeria, which showed high level of concentration and consequently high inefficiency in the Ondo State fresh fish market structure, this therefore means that there is low level of concentration and efficiency of culture producer's market structure.

The value of the Gini coefficient computed for wholesalers of fresh fish indicates inequality in earnings with non-competitive behaviour, this implies that although the fresh fish market is concentrated, few wholesalers of fresh fish control the market, showing a tendency of monopolistic behaviour indicating that the market structure for fresh fish among wholesalers is inefficient. This is further buttressed by the Lorenz curve which is far from the 45° line indicating inequality in the market share. This corresponds with the findings of Oparinde and Ojo (2014) who reported a Gini coefficient of 0.64 which showed that there was inequality in the share of the market, it is also in line with the findings of Dia *et al.*, (2013) who analysed honey trade in Adamawa State reported that the sellers' concentration was medium in the market with

Gini coefficient of 0.62683. This implied that there was inequality in the concentration of sellers and sale revenue, and the honey market was imperfect.

The value of the Gini coefficient computed for retailers of fresh fish indicates that there is partial inequality in the market earnings of fresh fish retailers in the States along the Nigeria-Niger border and the Lake Kainji Inland fisheries, this implies that few retailers control the fresh fish market indicating that there is inefficiency in the market structure of fresh fish among retailers. This is further buttressed by the Lorenz curve which is far from the 45° line indicating inequality in the market share this corresponds with the findings of Oparinde and Ojo (2014) who reported a Gini coefficient of 0.64 which showed that there was inequality in the share of the artisanal fresh fish market.

The value of the Gini coefficient computed for smoked fish processors indicates that there is partial inequality in the market earnings of smoked fish processors this implies that the smoked fish market for processors is concentrated but few of them control the market share, this shows a monopolistic nature indicating inefficiency in the market structure of smoked fish among processors in the States along the Nigeria-Niger border and the Lake Kainji Inland fisheries this corresponds with the findings of Ismail *et al.*, (2014) who reported a Gini coefficient value of 0.5478 which indicated that the wholesaler of dried fish were concentrated indicating the possibility of existence of non-competitive behaviour with monopolistic nature.

The value of the Gini coefficient computed for wholesalers of smoked fish indicates that there is equality in the market share/earnings of wholesalers of smoked fish, this means that most of the wholesalers of smoked fish have revenue within the same range, this implies that there is high competition in the market and therefore the market structure is efficient. This is further buttressed by the Lorenz curve which is very close to the 45° line therefore indicating equality in market share. , this is in line with the findings of Ugwumba *et al.*, (2011) who analysed the market structure of fresh fish market in Anambra and reported Gini coefficient index of 0.19 for retailers reflected evidence of a perfectly competitive market.

The value of the Gini coefficient computed for retailers of smoked fish indicates that there is partial inequality in the market share of retailers of smoked fish in the States along the Nigeria-

Niger border and Lake Kainji inland fisheries, this implies that most of the retailers of smoked fish do not have revenue within the same range, that is that few retailers of smoked fish dominate the market indicating the possibility of non-competitive behaviour and monopolistic nature and therefore inefficiency in the market structure. The Lorenz curve is farther from the 45° line than that of wholesalers of smoked fish therefore indicating a level of inequality in the market share, this is in line with the findings of Ismail *et al.*, (2014) who reported a Gini coefficient of 0.5252 for retailers of dried fish in Maiduguri indicating high concentration and monopolistic behaviour.

The value of the Gini coefficient computed for processors of dried fish indicates there is partial inequality in the market earnings of dried fish processors in the States along the Nigeria-Niger border and the Lake Kainji Inland fisheries, this implies that most processors of dried fish do not have revenue within the same range, this implies a monopolistic nature in the market and hence an inefficient market structure of dried fish among processors this is in line with the findings of Afolabi (2008) who revealed a Gini coefficient of 0.5854 indicating a high level of concentration and hence high level of inefficiency in the market for smoked fish.

The value of the Gini coefficient computed for wholesalers indicates that there is partial equality in the market share/earnings of wholesalers of dried fish. This implies that there is low concentration of wholesalers and high competition amongst them. It means that no one firm dominates the market of dried fish amongst wholesalers hence high efficiency in the market structure. This is further buttressed by the area between the line of perfect equality and the Lorenz curve which is small, this is in line with the findings of Ugwumba *et al.*, (2011) who analysed the market structure of fresh fish market in Anambra and reported Gini coefficient indices of 0.26 for producers/suppliers, 0.34 for wholesalers and 0.19 for retailers reflected evidence of a perfectly competitive market.

The value of the Gini coefficient computed for retailers implies that there is inequality in the market share/earnings of retailers of dried fish marketed in the States along the Nigeria-Niger border and Lake Kainji inland fisheries, this means that there few retailers dominate the market of dried fish in the area. This implies an inefficient market structure for dried fish among retailers in the area. This is supported by the Lorenz curve which shows that the area between the perfect line of equality and the Lorenz curve is wide. This is in line with the findings of Oparinde

and Ojo (2014) who reported a Gini coefficient of 0.64 which showed that there was inequality in the share of the artisanal fresh fish market.

The value of the Gini coefficient for fried fish processors indicates that there is partial inequality in the market earnings of fried fish processors in the States along the Nigeria-Niger border and the Lake Kainji Inland fisheries, this implies a monopolistic nature of the market, that means that although the market is highly concentrated only few fried fish processors control a large portion of the market share hence inefficiency of the market structure and is in line with the findings of Afolabi (2012) which indicate a high level of concentration and hence high level of inefficiency in the market of smoked fish.

The value of Gini coefficient for fried fish retailers indicated that there is equality in the market share/earnings of fried fish in the States along the Nigeria-Niger border and the Lake Kainji-inland fisheries. This implies that there is low concentration of fried fish retailers but high competition among them, it also means that no one retailer dominates the fried fish market resulting in efficiency of the market structure of fried fish among retailers. This is further supported by the Lorenz curve which shows that the area between line of perfect equality and the Lorenz curve is small, this is in line with the findings of Ugwumba *et al.*, (2011) who analysed the market structure of fresh fish market in Anambra and reported Gini coefficient index of 0.19 for retailers reflected evidence of a perfectly competitive market.

The value of the Gini coefficient for spiced fish processors indicates that there is partial equality in the market earnings of spiced fish processor in the States along the Nigeria-Niger border and the Lake Kainji Inland fisheries, this implies that there is low concentration of spiced fish processors but high competition among them, it also means that no one processor dominates the spiced fish market resulting in efficiency of the market structure of spiced fish among processors. This is supported by the Lorenz curve which shows that the area between the line of perfect equality and the Lorenz curve is small indicating equality in market earnings. This corresponds with the findings of Ugwumba *et al.*, (2011) who analysed the market structure of fresh fish market in Anambra and reported Gini coefficient index of 0.19 for retailers reflected evidence of a perfectly competitive market.

The value the Gini coefficient for retailers of spiced fish indicates that there is equality in the market earnings of spiced fish retailers in the States along the Nigeria-Niger border and the Lake Kainji Inland fisheries this implies that there is low concentration of spiced fish retailers but high competition among them, it also means that no one retailer dominates the spiced fish market resulting in efficiency of the market structure of spiced fish among retailers. This contradicts the findings Reuben and Mshelia (2011) in the structural analysis of Yam marketing in Taraba state who reported that Gini coefficient of 0.56 and 0.52 were obtained for wholesaling and retailing respectively. The sellers' concentration was high with high income inequality in yam wholesaling than retailing in the area. The markets, therefore, exhibit features of imperfect markets of monopolistic competition

The value of the Gini coefficient indicates that there is equality in the market earnings of wholesalers of frozen fish in the States along the Nigeria-Niger border and Lake Kainji inland fisheries, this implies that there is low concentration of frozen fish wholesalers but high competition among them, it also means that no one wholesaler dominates the frozen fish market resulting in efficiency of the market structure of frozen fish among wholesalers. This is in line with the findings of Garba *et al.*, (2015) who reported the Gini coefficients of 0.12 were obtained retailers and was found to be less than one. These value tend to indicate a high level of equality or a more equal distribution of Shea butter handled by the marketers.

The value of the Gini coefficient for retailers of frozen fish indicates that there is equality in the market earnings of frozen fish in the States along the Nigeria-Niger border and the Lake Kainji-inland fisheries this implies that there is low concentration of frozen fish wholesalers but high competition among them, it also means that no retailer dominates the spiced fish market resulting in efficiency of the market structure of frozen fish among retailers. This is in line with the findings of Garba *et al.*, (2015) who reported the Gini coefficients of 0.12 was obtained retailers and were found to be less than one, this value tend to indicate a high level of equality or a more equal distribution of Shea butter handled by the marketers

5.10 Barrier to Entry or Exit into/out of the market

The positive value of the regression coefficient implies that as the quantity of fresh fish sold increases, the total marketing cost increases, this implies that there is no scale of economies and therefore no barrier to entry into the fresh fish market this contradicts the findings of Ismail *et al.*, (2014) who reported a barrier to entry into the dried fish market in Borno State.

The positive value of the regression coefficient implies that as the quantity of smoked fish sold increases, the total marketing cost increases, this implies that there is no scale of economies and therefore no barrier to entry into the smoked fish market in the states along the Nigeria-Niger border and the Lake Kainji inland fisheries.

The regression coefficient value for dried fish is negative, this implies that as the quantity of dried fish sold increases, the total marketing cost decrease, this implies that there is scale of economies and therefore barrier to entry into the dried fish market in the states along the Nigeria-Niger border and the Lake Kainji inland fisheries this means that marketers will have to operate on a large scale in order to enjoy reduced marketing cost, this is in line with the findings of Ismail *et al.*, (2014) who reported a negative regression coefficient value and asserted that there was barrier to entry into the dried fish market in Maiduguri, Borno State.

The positive regression coefficient for frozen fish implies that as the quantity of dried fish sold increases, the total marketing cost increases, this implies that there is no scale of economies and therefore no barrier to entry into the dried fish market in the states along the Nigeria-Niger border and the Lake Kainji inland fisheries.

The positive regression coefficient for spiced fish implies that as the quantity of spiced fish sold increases, the total marketing cost increases, this implies that there is no scale of economies and therefore no barrier to entry into the spiced fish market in the states along the Nigeria-Niger border and the Lake Kainji inland fisheries.

The negative coefficient for fried fish implies that as the quantity of fried fish sold increases, the total marketing cost increases, this implies that there is scale of economies and therefore barrier

to entry into the fried fish market in the states along the Nigeria-Niger border and the Lake Kainji inland fisheries.

5.11 Pattern of Fish Trade

Fish trade in the study comprised of intra-State Trade, Inter-State Trade and Inter border/regional Trade. Dried fish from Sokoto State is traded to surrounding states like Kebbi State, and Zamfara State, this maybe because of the unique flavor and longer shelf life of dried fish. Inter-regional trade with Niger republic was not recorded in Sokoto State.

In Katsina State, inter-regional importation of fried fish from Niger republic and exportation of smoked and dried fish to Niger republic was recorded. There was also inter-State trade of smoked fish to Kaduna State and Abuja. Fingerlings are brought in from Kano, Ibadan and other States especially during the harmattan season which does not encourage fingerling production in the region during that period.

In Jigawa State, inter-regional importation of dried fish from Niger republic was recorded, but no inter-regional exportation from Jigawa State. Inter-State Trade in dried fish was also recorded, these fish were brought in from Niger State while fresh fish, smoked fish and dried fish are traded to other States of the country with high demand from Abuja, Kaduna and Kano States.

In Yobe State, inter-regional importation of fish was not recorded this may be due to the increasing ‘boko-haram’ insurgency in the area which has affected the importation of fish through Borno State from Cameroon and Chad, it could also be attributed to the desertification of Lake Chad. There is however a small percentage of fried fish traded across the border.

In Niger State, no inter-regional importation of fish was reported but there was inter-regional exportation of dried fish to Benin republic, this dried fish were mostly Cichlids, these have a unique flavor and are in high demand in the region.

5.12 TEST OF HYPOTHESES

5.12.1 Hypothesis 1: The socioeconomic characteristics of the respondents affect their profitability and efficiency

The result from Table 4.20 implies that as household size increases, the profitability and efficiency of capture producers decreases; this may be because there are more mouths to feed hence a high dependency ratio. The longer the marketing experience the less the profitability and efficiency, this may be due to reduction in vitality brought about as the fishermen grow older. On the other hand as age increases, the profitability and efficiency of the capture producers increase, this may be due to experience in marketing skills gained during years of marketing fish. Sex has a negative sign hence a positive relationship with profitability and efficiency meaning that gender affects the profitability and efficiency of capture producers.

The result from Table 4.21 implies that as household size increases, the profitability and efficiency of culture producers decreases; this may be because there are more mouths to feed due to a high dependency ratio. As the length of marketing increases the less the profitability and efficiency, this may be due to reduction in vitality brought about as the fish farmers grow older. The older the culture producer gets the lower the profitability and efficiency, this may be due to reduction in vitality brought about as one grows older age. However sex has a positive relationship with the profitability and efficiency of culture producers.

The result from Table 4.22 implies that as household size increases, the profitability and efficiency of marketers decreases; this may be because due to high dependency ratio as there are more mouths to feed. The longer the marketing experience the lower the profitability, this may be due to reduction in vitality brought about as one grows older age. On the other hand as age increases, the profitability and efficiency of the marketers increase, this may be due to experience gathered as the marketer gets older, the sex and marital status of a marketer affects the profitability and efficiency of the marketers.

The result from Table 4.23 implies that the older the processor gets the lower the profitability and efficiency, this may be due to reduction in vitality brought about as one grows older age. The sex of a processor affects the profitability and efficiency of the processor. As household size

increases, the profitability of processors decreases; this may be because due to high dependency ratio as there are more mouths to feed. The longer the marketing experience the lower the profitability, this may be due to reduction in vitality brought about as the processor grows older. The marital status of the processors affects the profitability and efficiency of the processor.

5.12.2 Hypothesis 2: There is no significant difference in the profitability of the marketing channels of the different forms of fish

Results of the Analysis of Variance of marketing channels of fresh fish showed that there was a significant difference ($p < 0.05$) between the average total monthly revenue in channel one and the three other channels (i.e channels two, three and four) therefore, the null hypothesis will be rejected and the alternative hypothesis rejected. There are no significant differences ($p < 0.05$) in the average monthly gross margin per kg, net return per kg, and marketing margin per kg between the channels, therefore, the null hypothesis is accepted and the alternative hypothesis rejected. There is a significant difference ($p < 0.05$) between the average monthly marketing efficiency of channel one and channels two, three and four for fresh fish, therefore the alternative hypothesis is accepted and the null hypothesis rejected.

Results of the Analysis of Variance of marketing channels of smoked fish showed that there is a significant difference ($p < 0.05$) between the average monthly revenue between channel four and the other channels therefore the alternative hypothesis is accepted and the null hypothesis rejected. There is a significant difference ($p < 0.05$) in the average monthly gross margin per kg, net return per kg, marketing margin and marketing efficiency per kg along the marketing channels therefore the null hypothesis which states that there is no significant difference ($p < 0.05$) in the profitability of the marketing channels is rejected and the alternative hypothesis is accepted.

Results of the Analysis of Variance of marketing channels of dried fish showed that there was no significant difference ($p < 0.05$) in the average monthly total revenue along the various channels, therefore, the null hypothesis which states that there is no significant difference in profitability among the marketing channels is rejected and the alternative hypothesis is accepted. There is no significant difference ($p < 0.05$) in the average monthly net return per kg, marketing margin per

kg, gross margin per kg and marketing efficiency per kg among the various marketing channels, therefore the null hypothesis which states that there is no difference in profitability among the marketing channels is rejected and the alternative hypothesis accepted.

Results of the Analysis of Variance of marketing channels of spiced fish showed that there was no significant difference ($p < 0.05$) in the average monthly total revenue, gross margin per kg, net return per kg, marketing margin per kg and marketing efficiency per kg among the channels for spiced fish, therefore, the null hypothesis which states that there is no difference in profitability among the marketing channels is rejected and the alternative hypothesis accepted and the alternative hypothesis rejected.

5.12.3 Hypothesis 3: There is no significant difference in the profitability and efficiency in marketing of different forms of fish in the Lake Kainji inland fisheries and along the States in the Nigeria-Niger border.

Results from Table 4.6 shows that there was significant difference ($p < 0.05$) in the average monthly revenue, gross margin per kg and net return per kg realized between smoked fish and fresh, dried, frozen, fried and spiced fish. There was also significant difference ($p < 0.05$) between the revenue of frozen and fresh and spiced fish, therefore, the null hypothesis is rejected. There was a significant difference ($p < 0.05$) in the monthly average marketing efficiency of fish products in the Lake Kainji inland fisheries and the States along the Nigeria-Niger border, therefore, the null hypothesis is rejected and the alternative hypothesis accepted.

Results from Table 4.7 shows that there was no significant difference ($p < 0.05$) in the average monthly revenue of fresh fish among the states along the Nigeria-Niger border therefore the null hypothesis is accepted and the alternative hypothesis rejected. However, there was a significant difference ($p < 0.05$) between the average monthly revenue of fresh fish of the Lake Kainji inland fisheries and the average monthly revenue of the states along the Nigeria-Niger border, therefore, the null hypothesis is rejected and the alternative hypothesis accepted. There were significant differences ($p < 0.05$) in the gross margin per kg of fresh fish between the Lake Kainji inland fisheries and the States along Nigeria-Niger border therefore, the null hypothesis is rejected and the alternative hypothesis accepted. There were significant differences ($p < 0.05$) in the average

marketing efficiencies of fresh fish between the Lake Kainji inland fisheries and the States along the Nigeria-Niger border, therefore the null hypothesis is rejected and the alternative hypothesis accepted.

Results from Table 4.8 shows that there were significant differences ($p < 0.05$) in the average monthly revenue of smoked fish among the States along the Nigeria-Niger border and the Lake Kainji inland fisheries. That is, Niger and Jigawa states were significantly different from the other states, therefore, the null hypothesis is rejected and the alternative hypothesis accepted. There was a significant difference ($p < 0.05$) in the gross margin per kg, net return per kg and the marketing efficiencies between the Lake Kainji inland fisheries and the States along the Nigeria-Niger border, that is Niger State was significantly different from all the other States. The null hypothesis is rejected and the alternative hypothesis accepted.

Results from Table 4.9 shows that there was a significant difference ($p < 0.05$) in the monthly average revenue, gross margin per kg and net returns per kg of dried fish between Lake Kainji inland fisheries and all other states along the Nigeria-Niger border therefore the null hypothesis is rejected and the alternative hypothesis accepted. However, there was no significant difference ($p < 0.05$) in the average monthly marketing efficiencies of dried fish among the States therefore, the null hypothesis is accepted and the alternative hypothesis rejected.

Results from Table 4.10 shows that there were no significant differences ($p < 0.05$) in the average monthly revenue, gross margin per kg, net return per kg and marketing efficiencies for frozen fish in the States along the Nigeria-Niger border, therefore, the null hypothesis is accepted and the alternative hypothesis rejected.

Results from Table 4.11 shows that there was no significant difference ($p < 0.05$) in the average monthly total revenue of fried fish along the States in the Nigeria-Niger border therefore, the null hypothesis is rejected and the alternative hypothesis accepted. However, there were significant differences ($p < 0.05$) in the average monthly gross margin per kg, net return per kg and marketing efficiency per kg between the States along the Nigeria- Niger border. Therefore, the alternative hypothesis is accepted and the null hypothesis rejected.

Results from Table 4.12 shows that there were no significant differences ($p < 0.05$) in the average monthly total revenue, gross margin per kg, net return per kg and marketing efficiencies of spiced fish between Jigawa and Yobe States.

5.12.4 Hypothesis 4: There is inequality in the distribution of income among the actors at the various levels of operation for the different forms of fish

Table 4.74 to 4.89 show results of the equality or otherwise in market share of actors at the various levels of operations dealing in different forms of fish. The results show that there was equality in market share for culture producers, wholesalers of smoked fish, wholesalers of dried fish, retailers of fried and spiced fish and wholesalers and retailers of frozen fish, therefore, the null hypothesis which states that there is inequality in the distribution of income among the actors at the various levels of operation will be rejected in these cases. However, the alternative hypothesis will be accepted for artisanal fishermen, wholesalers and retailers of fresh fish, processors and retailers of smoked fish, processors and retailers of dried fish and processors of fried fish because there was inequality in their income distribution.

CHAPTER SIX

6.0 SUMMARY AND CONCLUSION AND RECOMMENDATIONS

6.1 SUMMARY

Nigeria fish demand currently stands at 2.66 million tonnes, with a supply of 1.08 million tonnes in 2013, leaving a deficit of 1.58 million tonnes, there has been a significant increase in fish production, especially aquaculture supply over the years. Despite the growth of fish production, a large portion of the rural and urban population remain protein deficient due to the problems assailing the fish marketing system which results in an inefficient marketing system and in turn gives substantial cost to consumers. The problems mitigating against an efficient marketing system in Nigeria include: greater uncertainty in fish production, highly perishable nature of fish, high handling cost, too many species and as many demand pattern, fluctuations in prices, difficulties in adjusting supply to variations in demand, transportation of fish from areas of surplus to areas of deficit, providing different kinds of finished products to meet the diversified demands of final consumers, and inconsistent trade policies.

A multistage sampling procedure was used in the selection of respondents for this study. Random sampling was carried out in selecting four states Sokoto, Katsina, Jigawa and Yobe along the Nigeria-Niger border, Niger state was purposively selected based on its location in the Lake Kainji inland fisheries. Data was collected from 150 respondents in each of the states comprising of 50 producers, 50 processors and 50 marketers amounting to 750 with the use of a structured questionnaire. Data on socio-economic characteristics, marketing operations, marketing channel, market structure and profitability and Trade flow were obtained. Data were analysed using descriptive statistics, budgetary indices, and gini coefficient, linear regression, and ANOVA at $\alpha_{0.05}$.

There was a predominance of male producers, marketers and processors in Sokoto (100.0%, 98.0%, 80.0%), Katsina (100.0%, 98.0%, 98.0%), Jigawa (94.0%, 94.0%, 98.0%), and Yobe states (94.0%, 88.0% and 80.0%) while in Niger state, processors were dominated by women (54.0%). Majority of producers (36%), processors (40%) in Sokoto state, marketers (36%), processors(53%) in Katsina state, and processors (50%) in Niger were within the age of 31-40

years. Majority of producers (78%), marketers (38%) and processors (50%) in Sokoto state, marketers (52%), processors (38%) in Jigawa state, producers (48%), marketers (68%), processors (62%) in Yobe state, producers (44%), marketers (50%), and 72% of processors had marketing experience of 10 years and below. Majority of the producers (44%), marketers (54%), processors (54%) in Sokoto state, producers (46%), marketers (40%), processors (40%) in Katsina state, producers (64%), marketers (58%), and processors (74%) in Niger state had household size of between 6-10 persons.

Four marketing channels were identified for fresh fish: producers-wholesalers-retailers-consumers, producers-retailers-consumers, producer-wholesalers-consumers, producers-consumers and four for processed fish: producers-processors-consumers, producer-processor-wholesaler-consumer, producers-wholesaler-processor-consumers, producers-processors-retailers-consumers. Fresh fish were majorly (61.84%) marketed through the producer-consumer channel while processed fish were majorly marketed (56.32%) through the Producer-processor-consumer channel, these were also the most efficient channels for fresh and processed fish while producer-retailer-consumer was the least efficient for fresh fish.

The average volume of fish traded in Kg within the State were 1702.23 ± 978.32 , 1571.40 ± 530.36 , 1112.28 ± 262.00 , 882.25 ± 339.15 , 1378.41 ± 174.46 and 1266.69 ± 476.77 while the average volume traded across the States were 1673.20 ± 439.88 , 730.00 ± 226.27 , 730.72 ± 283.39 , 1487.42 ± 197.37 and 1426.74 ± 322.03 for fresh, smoked, frozen, fried, spiced and dried fish respectively. The volume traded across regional border was 1386.46 ± 760.57 for dried fish. Fish farmers had the highest average gross margin of $\text{₦}1,406,887.56 \pm 344,840.54$ while fishermen had the highest average gross margin per kg. The highest average marketing efficiency of 478.22 ± 292.01 and least efficiency of 91.04 ± 80.53 were recorded among artisanal fishermen and retailers respectively for fresh fish. Processors had the highest average gross margin and net return of $\text{₦}1,758,680.11 \pm 962,316.35$ while retailers had the least average gross margin of $\text{₦}613,228.67 \pm 360,239.90$. The highest average marketing efficiency of 161.55 ± 49.87 and least efficiency of 29.08 ± 35.30 were recorded among processors and wholesalers respectively for smoked fish. Processors had the highest average gross margin and net return per kg of $\text{₦}1,400,350.33 \pm 753,569.59$ while retailers had the least $\text{₦}481,849.57 \pm 384,599.26$, the highest average marketing efficiency of 182.48 ± 103.96 and least efficiency of 22.35 ± 12.69 were

recorded among processors and retailers respectively for dried fish. Wholesalers had the highest average marketing margin of ₦1,543,683.56±363,450.53 while retailers had the least average marketing margin per kg of ₦435.63±231.31, the highest average marketing efficiency of 104.26±84.90 and least efficiency of 41.3±28.79 were recorded among processors and retailers respectively. Processors had higher gross margin, and marketing efficiency of ₦947,197.28±378,543.37, ₦ and 95.04±32.48 respectively while retailers had the least ₦535185.00±176896.90 and 29.92±9.97 respectively. The Gini coefficient value of many of the actors showed partial inequality in the revenue distribution fresh, smoked, dried, fried, spiced and frozen fish, except for wholesalers of smoked fish, retailers of spiced fish and wholesalers and retailers of frozen fish whose Gini coefficient values were 0.34, 0.45, 0.41 and 0.43, respectively. The linear regression b values for all the forms of fish were positive except for dried fish and fried whose b values were -7.66 and -5.15 respectively. The major constraints faced by producers and processors in Sokoto state and producers and marketers in Yobe state was storage, for producers and processors in Katsina state and producers in Jigawa state it was access to credit, for marketers in Sokoto and Katsina states and processors in Jigawa and Yobe states it was transportation, In Niger state for producers and marketers it was lack of stall and for processors man-power.

6.2 CONCLUSION

The assessment of efficiency of fish marketing channels in the Lake Kainji inland fisheries and Nigeria- Niger border has provided information on the socio economic characteristics of actors in the fish marketing channel, it has identified the channels existing in the area through which the various forms of fish found in the markets are distributed, it has evaluated the profitability and efficiency of actors in the marketing channel and of the channels themselves and it has determined the structure of market that exists in the study area.

Based on the results of this study, it can be concluded that there are various fish products in the Lake Kainji-Inland Fisheries and Nigeria-Niger border. The high profitability values of the various actors (gross, market margin and net returns) of all the marketed fish products indicate that fish marketing is a profitable venture with high economic return for every capital invested irrespective of the product being marketed. There were also higher values and returns associated

with processed fish products compared to fresh fish, this implies that value addition improves the profitability of the actors along the marketing channels.

It was also observed that there is a decrease in the marketing efficiency of the actors (producers, processors, wholesalers and retailers) down the market channel. This indicates that activities of middlemen tend to reduce the marketing efficiency of the fish products before they reach the final consumer thereby causing hike in prices. The most efficient channel of marketing fresh fish is from the producers directly to the consumers while for processed fish is best channeled by it was from producers to the processors and finally to the consumers. Therefore it can be concluded that decentralized market is most effective for marketing fish products along Nigeria-Niger border and Lake Kainji-Inland Fisheries. There is presence of both intra-State and intra-regional trade in the study area but more fish is sourced from local intra-regional trade is still at infancy stage and has not yet been fully exploited.

The results of Gini coefficient indicate that the market structures for producers (capture), wholesalers and retailers of fresh fish as well as processors and retailers of smoked, dried and fried fish were concentrated without competition and monopolistic in nature.. Among producers (culture) of fresh fish and wholesalers of processed fish products, the market structure was competitive in nature. From the scale economies results, it can be concluded that there is no barrier of entry into fresh, smoked, frozen and spiced fish market while there is an existence of barrier into fried and dried fish market along Nigeria-Niger border and in Lake Kainji-Inland fisheries.

6.3 Recommendations

- i.** Government should encourage more females go into fish marketing by providing financial and other incentives;
- ii.** Government should establish more stalls and markets for fish sales in the study area ;
- iii.** Government should establish cold rooms in fish markets to reduce fish spoilage;
- iv.** The formation of better organized fish marketing cooperative societies through which some of their problems can be collectively solved and series of benefits can easily be accessed by the members so that they would not be totally dependent on the government;

- v.** There is need to organize training programmes for producers, processors and marketers on improve marketing strategies
- vi.** There is need to organize the fish market that permits free trade within the study area.
- vii.** Free international fish trade zones can be created across the border in order encourage international trade of fish products in order to ensure easy access to cheap and quality products by the consumers as well as high economic gain to the producers and other actors.

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Appendix I



Meeting with Stakeholders in Jigawa State

Appendix II



Monday Market in Niger State

Appendix III



Fish Processors at Katsina Fish Market

Appendix IV



Cold store shared by all fish marketers in Sokoto main market

Appendix V



Fish processing plant in Gashua Yobe state

APPENDIX VI



Fried Fish being sold by marketer in Dannako, Katsina State

APPENDIX VII



Smoked Fish being sold by retailer at Monday Market, New Bussa, Niger State.

APPENDIX VIII

FISH TRADE-AFRICAN CORRIDOR 3 RESEARCH QUESTIONNAIRE

Ref no:/.....

Name of Enumerator:

Date of interview:

Name of Community:

LGA:

State:

GPS readings: N^o E^o

Dear Correspondent,

I am a postgraduate student of the University of Ibadan, Nigeria. I am doing a survey on fish marketing channels under the fish trade program. The data I collect will only be used for research purposes and will help come up with policy recommendations to improve benefits from, fish trade in the country, region and Africa as a whole. I hope that you will be free to provide me with true and accurate data and information; your information will be treated with utmost confidentiality. Please feel free to ask any questions or raise any issues you might have. I hope that I can come back to give the results of these survey to your group, both for your information and further inputs. Thank you for your participation. Please tick the appropriate boxes.

Interviewee details (you do not have to give me/us your name if you wish to remain anonymous)

A. Demographics

Age

1. Sex (M/F)

2. Marital status : a. Single () b. Married () c. Divorced () d. Widowed ()

3. Household head: a. Yes () b. No ()

4. Household size: _____

5. Number of males and females within the household: a. Male b. Female

6. Highest Education Attained: a. Primary () b. Secondary () c. Tertiary d. Qu'ranic School d. Others (specify) _____

7. Which of the following is your occupation:

a. Producer () b. Marketer () c. input supplier () d. Processor ()

b. If you are a producer, which do you operate? :

a. Capture () b. Culture () c. Both ()

8. Other source(s) of income (list in order of priority):

- a. _____
b. _____
c. _____
d. _____

B. Location

9. Country

10. Geopolitical

zone: _____

11. Agriculture Extension Project Zone(if applicable) _____

12. Group head (if applicable): _____ Phone
no.: _____

13. Hierarchy of Leadership (if applicable)

14. Village (if applicable)

C. Fishermen/ Fish Farmer operation

15. Water body: a) Freshwater () b) Brackish water () c) Marine ()

16. What is the name of the water body you operate in?

17. Season/ Months of the year you fish:

18. Landing site:

19. Type(s) fishing gear and crafts used/ Production facilities e.g concrete tanks, earthen ponds:

- a. _____
b. _____
c. _____
d. _____
e. _____

20. List your source(s) of fund (Government loans from commercial banks, microfinance banks, community banks, cooperatives, personal savings, inheritance, gifts, money lender e.t.c) Please rank in order of accessibility.

21. Species, quantity and seasonality of fish catch/ cultured fish:

S/N	Scientific and local name of fish species	Weight/Quantity	Season/Month of catch

D. Market Channel

22. Name of market(s) you buy your fish -

23. Name of market(s) you sell your fish -

24. Location of Market(s) you buy your fish

25. Location of Market(s) you sell your fish

26. At what level of the market do you operate a. Producer () b. wholesaler ()
Retailer () d. Others () (specify) _____

27. How long have you been marketing fish? _____ years

28. Who do you sell your fish to? a. Processors () b. Wholesalers () c. Retailer () d.
Consumers () e. Others () if others, please specify.....

29. In what form do you sell your fish (Tick more than one option if applicable)

Forms of purchase	Quantity sold per week				Price (₦: K)			
	Kg	Bag	Basket	Cartons	Per Kg	Per Bag	Basket	Cartons
Fresh/Life								
Smoked								
Dried								
Frozen								
Spiced								
Others (Specify)								

30. Where do you buy your fish from? a. Fish farm () b. Landing sites () c. cold
rooms () d. Processing plants () e. other markets ()

31. Who do you buy your fish from? A. Fishermen () b. Fish farmers () c. Fish Processors () d. Wholesalers () d. Retailers () e. Others (Specify).....

32. In what form do you buy your fish?

Forms of purchase			Quantity (week [], month [])		Price (₦)			
	Kg	Bag	Basket	Carton	Kg	Bag	Basket	Carton
Fresh/Life								
Smoked								
Dried								
Frozen								
Spiced								
Others (Specify)1 :								
2:								

33. How is fish price determined in the marketing channel? a. Fixed () b. Negotiated () c. Controlled by some Value Chain actors () d. Others (specify)_____

34. What are the factors that determine fish price in this market? _____

35. If controlled by some Value Chain actors, who are these and how do they do this? _____

36. Which of these modules do you use to sell your fish a. Basket () b. Bags() c. Pieces d. Cartons () e. Kilogram () f. Others (specify) ()

37. Do you store your products? a)Yes () b) No ()

38. If yes please fill in the following table accordingly

Means of Storage	Quantity / volume / month				Period of storage (days/ months/ years)	Cost (₦: K)			
	Kg	Carton	Bag	Basket		Kg	Carton	Bag	Basket

39. Do you preserve your stored product? a) Yes () b) No ()

40. If yes to the above question, fill in the following table accordingly

Chemical	Quantity / volume / month	Period of storage	Cost (₦: K)
----------	---------------------------	-------------------	--------------

	Kg	Liter	Other measures	(days/ months/ years)	Kg	Liter	Other measure
Fungicides							
Pesticides							
Insecticide							
Smoking/Drying							
Cooling							
Specify others i ii							

41. What months do you operate? (Please tick on the months of operation)

Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec

Please indicate * for low operation

** for medium/average operation

*** for High operation

42. Is the price of fish determined by the time of the year? a. Yes () b. No ()

43. In which months of the year is fish more expensive? _____

44. In which months of the year do you buy more fish? _____

45. In which months of the year do you sell more fish? _____

46. In which of the markets do you sell more and make more gain?-

_____. Give reasons for your

answer _____

47. How do you transport your fish? a. Foot () b. Animal () c. Bicycle () d.

Motorcycle () e. Van () f. Lorry () g. Others (specify) _____

48. Please fill in the following table accordingly

Forms	Number	Year of acquisition	Cost of acquisition (₦)	Expected life span (years)	Maintenance cost per (₦)		
					Repairs/ month	Fuelling/week	Other cost
Animal							
Pick-up Van							
Lorry							
Motor-bike							
Bicycle							

49. Indicate the source and what you use including the cost of getting your products to those destinations

Source	Distance (km or Mile)	Method and cost of transportation of stock per day.					
		By head (₦)	Bicycle (₦)	Motor bike (₦)	Pick-up (₦)	Lorry (₦)	Animal (₦)

From farm to store/market							
From landing site to market/store							
From wholesaler to retailer							
From processor to store							
Others specify							

50. Who determines the price of capital inputs? a. Fixed by government () b. Free market () c. Others (Specify).....



* **Banks** could be commercial banks, community banks, micro-finance banks

52. Operational costs²

Item	Source	Cost for current transaction (business cycle)		Cost for last transaction (business cycle)		Cost per month		Length of time
		Local currency	US \$ equivalent	Local currency	US \$ equivalent	Local currency	US \$ equivalent	
Total								

²**Operational costs** are the day-to-day expenses required to run a business. E.g fingerlings, juveniles, labour, fuel, maintenance of equipments, etc.

Notes

For the column on length of time, for fishers length of time could mean current/ last fishing trip/ cycle;

For fish farmers, time for current/ last production cycle;

For traders/ processors, time to gather enough fish to take to the market/ transportation of consignment and time to sell consignment for current/ last transaction/ cycle;

For retailers, time it took to sell current/ last consignment

53. Revenue³ (for all chain actors at different nodes)

Revenue (Fish type)	Source	Destination of fish (Buyer)	Price/kg	Volume (kg)	Revenue from current transaction (business cycle)		Revenue from last transaction (business cycle)		Total revenue for month	

³ **Revenue** is the total amount of money a business receives from conducting business. Revenue is the ‘gross income’ from which costs (operational and Capital equipment depreciation) are subtracted to determine net income (profit).

54. Who determines the price of operational inputs? a. fixed by government () b. free market () c. others specify _____

55. What percentage of interest is paid on the loan acquired? (if applicable)

56. What is the duration of the loan? _____

57. Is there a collateral on the loan? a. Yes () b. No ()

58. What is the collateral on the loan secured?

59. What other criteria is used for obtaining the loan?

60. What are the major challenges affecting the growth of your business? Please tick and then rank with 1 being the most severe

Constraints	Tick	Rank in order of severity
Water availability/supply		
Electric supply		
Transport/Road condition		
Corruption/pilfering		
Storage		
Land accessibility		
Credit accessibility		
Man-power		
Training		
Others (specify) 1:		
2:		

With 1st being the most severe and 2nd being the next.

Section E: Informal Cross Border Trade (ICBT)

61. Do you send fish for sale outside the country? a. Yes () b. No ()

62. If yes how do you do this?

63. Do you send fish to your friends/relatives outside the country? a) Yes () b) No ()

N _____

74. If yes, indicate the form and fill the table as appropriate;

Forms	Number	Year of acquisition	Cost of Acquisition (N)	Expected life span (years)	Maintenance cost (N)		
					Repairs/ month	Fuelling/ week	Other costs
Animal							
Bicycle							
Motor bike							
Pick-up van							
Lorry							
Bus							

[illegible]

store									
From landing site to market/ store									
From coldroom to market									
From processor to store									

76. Are there any standards in place for exported products?: a. Yes () b. No ()

77. If yes, what type of standards are in place? _____

78. Are there any barriers to the exportation of your fish? a. Yes () b. No ()

79. What type of barriers are in place? _____

80. How do you tackle the barriers to trade? _____

81. What are the marketing activities you carry out and the costs?

Marketing activity

Costs (₦)

.....

.....

.....

.....

.....

.....

Enumerator's number: _____

Duration of answering the questionnaire: Time Started _____ Time Ended _____ Signat

ure _____ Date _____

This is the end of the questionnaire. Thank you for your time and wish you a very nice day.

THANK YOU FOR YOUR TIME