

# Income inequality and producers share among fish farming households in Kaduna metropolis, Kaduna State, Nigeria

Balogun O. S.<sup>1\*</sup>, Usman M. B.<sup>1</sup>, Aasa O. S.<sup>2</sup>, Akure C. O.<sup>2</sup>, Afolabi, A. O.<sup>1</sup>,  
Nwahia, O. C.<sup>1</sup> and Agbomaka F. I.<sup>1</sup>

<sup>1</sup>Federal College of Forestry Mechanization, P.M.B 2273, Afaka, Mando, Kaduna state, Nigeria.

<sup>2</sup>Department of Agricultural Economics, Ahmadu Bello University Zaria, Kaduna State, Nigeria.

\*Corresponding author. Email: baaseg2006@yahoo.com

Copyright © 2021 Balogun et al. This article remains permanently open access under the terms of the [Creative Commons Attribution License 4.0](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Received 24th September, 2021; Accepted 29th October, 2021

**ABSTRACT:** The study examined inequality and farmers share among fish farmers in Kaduna metropolis. Multistage sampling procedure was employed to select fish producers and marketers. Primary data was collected with the use of questionnaire administered to eighty producers. Descriptive statistics, net farm income and measures of profitability such as return per capital invested, marketing margin, farmer's share and Gini index were used to analyze the data. The enterprise profit was estimated at ₦235,500.00 and a return per capital invested of 0.62. The index of income variability (Gini index) was 53 percent. Male headed households have slightly lower income inequality than their female counterparts. The challenges confronting the enterprise include poor access to credit, high cost of production and poor processing facilities. The study recommends provision of credit facilities, stable and affordable electricity to fish farmers to further enhance their business.

**Keywords:** Aquaculture, farmers share, welfare.

## INTRODUCTION

Fish plays a vital role in feeding the world's population and contribute significantly to the dietary protein intake of billions of the populace. On the global scale, almost 20% of total average intake of animal protein was attributable to fish in 2012 (FAO., 2014; Usman et al., 2020). In Nigeria, the fishery industry consists of major sub-sectors, which are artisanal, industrial and aquaculture. Aquaculture is the rearing of aquatic organism in enclosed water bodies such as ponds, pens, dams, cages, raceways, rice fields, tanks, reservoirs under control management. Specifically, fish farming is the culturing of fish in selected or controlled environments. Aquaculture was introduced to the country in the early 1950s and fish production through aquaculture has risen steadily from a few hundred kilograms to over 45,000 metric tons in 2004 (Oladimeji, 2017).

Nigeria is endowed with extensive mangrove ecosystem

which gives the country advantage that positioned the nation as one of the countries in sub-Saharan Africa with great potential to attain sustainable fish production via aquaculture. Also, fish farming may have arisen as an intervention mechanism to enhance food production, employment or livelihood diversification since artisanal fishery that dominated the fish supply in the 1960s and 1970s is already overexploited with drastic reduction in fish catches. For instance, Oladimeji (2017) observed that records from Federal Department of Fisheries (FDF) and Food and Agriculture Organization (FAO) show that Nigeria's self-sufficiency ratio in fish production was as high as 98.8% in 1983 but dwindled between 40% and 19.2% in 2005 and 2014 with an annual average of about 49% and standard deviation of 19.1.

The awareness of aquaculture potential contribution to

domestic fish production has continued to increase in the country because of the need to meet the much needed fish for domestic fish production export and consumption (Oladimeji et al., 2019). Awoyemi and Ajinoye (2011) noted that aqua-culture sub sector contributed between 0.5 percent and 1 percent to domestic fish production. Given its implication for individual and national health, fish contains Omega III fatty acids that are known to reduce cardiovascular diseases, hypertension and arteriosclerosis, thus becoming a preferred source of animal protein for those about 50 years of age and above. Omega III fatty acids are also known to enhance good brain cell development in developing fetus, thus a vital diet for pregnant women and Intelligent Quotient (IQ) in developing children, hence, the continuous craving for fish in Nigeria (Huffman et al., 2011; Oladimeji et al., 2019).

A major challenge facing rural and urban fish farmers over the years in Nigeria is poverty. Ehinmowo and Akinlade (2017) noted that inequality is a strong cause of poverty therefore; prevalence of high inequality is a good breeding platform for poverty. It is a manifestation resulting from poor income distribution for instance, as blessed as Nigeria is, the country is said to record a high level of poverty, with 63 percent, (112.47million) of its population living below US \$1 daily which invariably indicates high income inequality since poverty and income inequality are closely related (NBS, 2011; Ehinmowo and Akinlade (2017).

It is a common fact that every actor along the marketing chain attempts to maximize profit. Often times, the activities of players along the marketing channel leaves the producers (farmers) at a cross road in terms of share of profit share. Farmer's share is an important determinant of farm investment decision and a reflection of the transmission of price at the retail end of exchange transaction. An increase in farmers' share is taken as evidence that the farmers benefit from changes in agricultural product prices while a decrease is a clear proof that the middlemen are getting richer at the expense of the farmers. Many factors could be responsible for poor farmers share along the marketing chain. Aasa et al. (2020) pointed out that unstable market prices and poor market information's among other challenges often predispose the farmer to poor share of the profit along the marketing chain as middle men exploitations are a common phenomenon in agricultural produce marketing. Depending on the value added to the produce and the volume of turnover, a low farmer's share of any farm produce will obviously be a disincentive for producers to continue to invest.

The relationship between farmer share (FS) and marketing margin (MM) is similar to profit margin in that it shows the relationship between the amounts a company paid for a product and the amount its customer pays. It also refers to the differences in the price paid for a commodity at different stage of marketing system. Thus, farmer share refers to the proportion of the retail price that gets to the

producers (farmers). It is important therefore to note that that farmers' share is a component of MM analysis and the values vary with changes in MM values. However, MM analysis is a measure of profitability and efficiency.

This study is therefore poised to address the following research questions: is fish farming profitable in the study area? what is the farmers share along the marketing system? what is the inequality status of the farmers and are there constraints to aquaculture farming within the metropolis? Therefore, the objectives of the study are:

1. to examine the profitability of fish farming within Kaduna metropolis;
2. profile the inequality status among the fish farmers;
3. examine the farmers share of profit along the marketing chain and
4. to describe the constraints facing aquaculture production in Kaduna.

## MATERIALS AND METHODS

### Study area

Kaduna metropolis is located between latitudes 10°25'15"N and 10°36'08"N and longitudes 7°23'31"E and 7°29'33"E. The metropolis is the state capital. The metropolis comprises of Kaduna north, Kaduna south, parts of Chikun and Igabi L.G.A. Igabi and Chikun has a projected population of about 1,242,524 at a growth rate of 3% per annum as at 2020 (KDBS, 2018). It covers an area of about 118 km<sup>2</sup>, the distance between the Eastern and Western limits of the metropolis is approximately 13.7 km and between the North and South is approximately 20 km (Balogun et al., 2021) (Figure 1).

### Sampling techniques and data collection

Multistage sampling which involves a combination of purposive and random sampling techniques was used for the study. In the first stage, seven locations within the metropolis known for high concentration of fish farmers (producers) were purposively selected. The second stage involves the random selection of respondents from these points in proportion based on the number of farmers estimated to be in that vicinity as shown in Table 1. Primary data were collected with the use questionnaires administered to eighty (80) producer marketers for the study.

### Analytical technique

Analytical techniques employed include descriptive statistics such as mean, percentages. Other techniques used were the net farm income (NFI) and farmers share model. Income inequality was measured by using both the Lorenz curve and Gini coefficient.

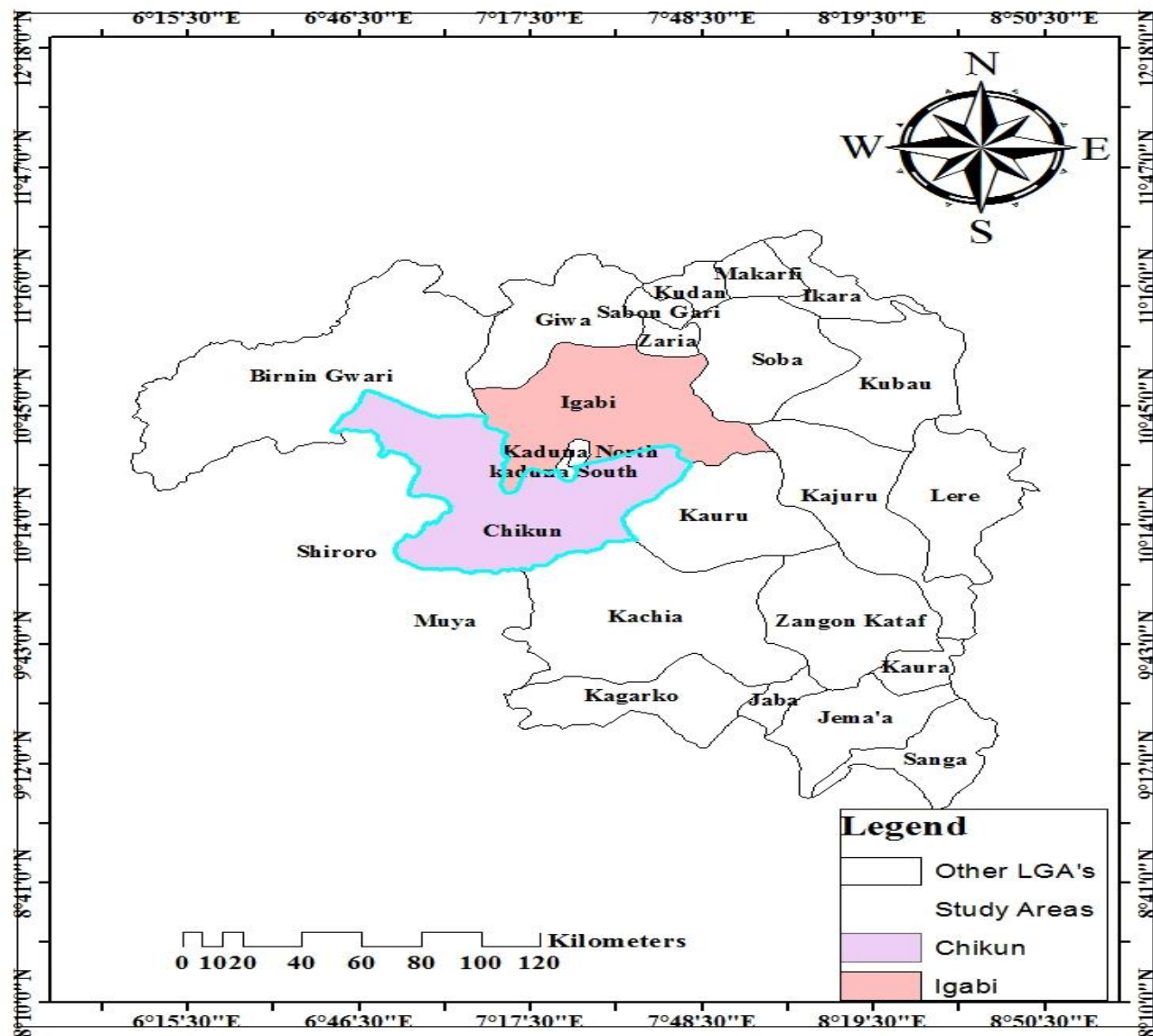


Figure 1. Map of Kaduna metropolis.

### Specification of model

$$NFI = TR - (TVC + TFC) \quad 1$$

$$NFI = TR - TC \quad 2$$

Where: *NFI* = Net farm income (₦), *TFC* = total fixed cost (₦), *TVC* = total variable cost (₦), *TC* = total cost (₦), *TR* = total revenue (₦).

### Measure of profitability and marketing margin analysis

The measure of profitability ratio that was used to determine the level of profit of the farmers is Return Per Capital Invested (RPCI).

$$RPCI = \frac{\text{Net income}}{\text{Total Revenue}} \quad 3$$

It indicates the amount of money return to the investor on every naira invested.

The market margin is expressed as follows;

$$MM = \frac{RP - FGP}{RP} \times 100 \quad 4$$

Farmer share was obtained as follows;

$$F.S = 100 - MM \quad 5$$

Where: *MM* = Marketing Margin, *RP* = Retail Price, *FGP* = Farm Gate Price and *FS* = Farmer Share.

## Inequality index

Inequality of farmers was achieved by using Gini Index. Following the approach of Oyekale et al. (2006) and Akinlade et al. (2015). Incomes are ordered such that  $Y_1 \leq Y_2 \leq Y_3, \dots \leq Y_4$ . The model considered expenditure such that  $X_1 \leq X_2 \leq X_3, \dots \leq X_4$ . The Gini coefficient is given by;

$$I_{Gini}(X_i) = \sum_i^n \alpha_i(Y)X_i \text{ and } a_i(X) = \frac{2}{n^2\mu} \left\{ i = \frac{n+1}{2} \right\} \quad 6$$

$$I_{Gini}(X_i) = \frac{2}{n^2\mu} \left\{ i = \frac{n+1}{2} \right\} \quad 7$$

Where:  $n$  = number of observations,  $\mu$  = the mean of the distribution,  $X_i$  = the expenditure of the  $i$ th household,  $\alpha_i(Y)_i$  = the weight,  $i$  = corresponding rank of the total expenditure.

## RESULTS AND DISCUSSION

### Cost and return analysis

Results presented in Table 2 show the gross margin and the net farm income of producer. According to Aasa et al. (2020) the cost incurred in running the farm and the returns accrued from it shows whether the farm business is profitable or not. If the returns are higher than the cost, there is a surplus that could be put into further economic use. Table 2 shows the gross margin and the net farm income of the fish farmers. The total output from a standard fish pond in the study area was about 500 kg while the price per kg of catfish was on the average determined to be ₦750.00 thus giving a gross return of ₦375, 000.00 per cycle of about five months. This finding is similar to that of Benson (2017). On the other hand, the profit was found to be ₦231, 000.00. The average rate of return per capital invested was 0.62, this means that for every naira invested 62 kobo was gained by the producer.

### Marketing margin and farmer share

Farmer share (FS) refer to the proportion of the retail price that gets to the farmer and it is an important determinant of farm investment decision and a reflection of the transmission of price at the retail end of exchange transaction. The MM in this study was found to be 21.11 while the FS was calculated to be 78.90 percent. This means that about 21.11 kobo out of everyone naira (100.00kobo) goes to the middlemen. An increase in farmer share is taken as evidence that the farmer benefit from change in product price while a decrease is a clear proof that the middlemen are getting rich off the farmer (Mejeha et al., 2000; Aasa et al., 2020). Meanwhile, result from the study shows that the farmers have significant share from changes in retail price.

**Table 1.** Description of sampled producers and marketers according to location.

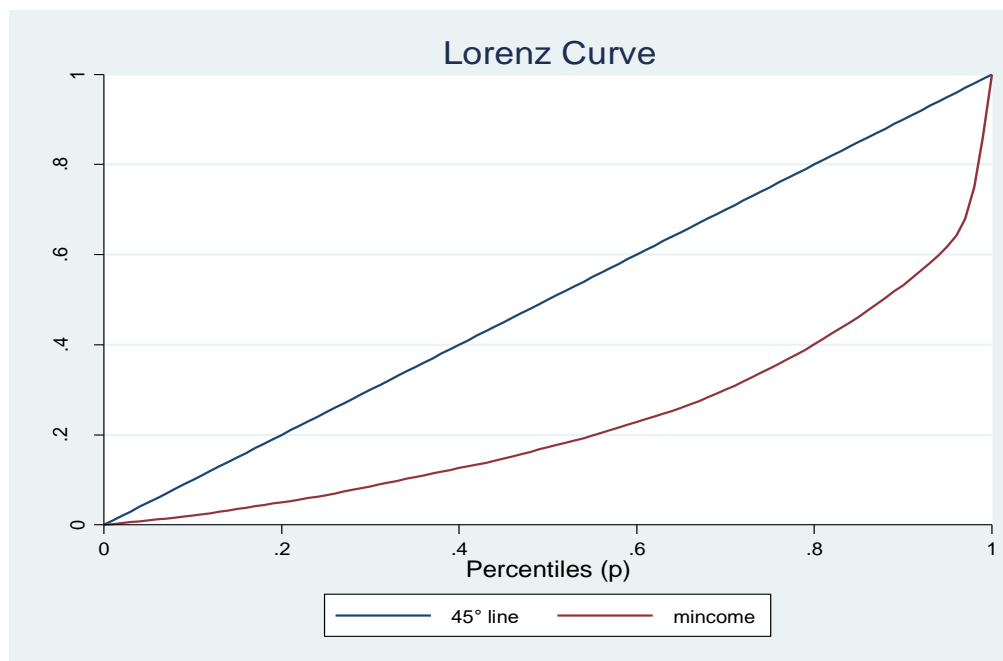
Location of farmers	No of producers
Mando	20
Goningora	15
Narayi	15
Nasarawa/Kakuri	10
Sabo	10
Airforce base	5
Romi	5
<b>Total</b>	<b>80</b>

**Table 2.** Cost and returns of fish enterprise producer (Farmers).

Items	Values
Output (₦750 per 500Kg)	375000
Variable inputs	
Cost of stocking	1500
Liming cost	4000
Feeding cost	97500
Fertilizer	5000
Total variable cost (TVC)	108000
Gross Margin (TR-TVC)	267500
Fixed inputs	
Pumping Machine(hired)	12000
Pond (rent)	20000
Total Fixed cost (TFC)	32000
NFI(GM-TFC)	235500
RPCI	0.628

### Inequality analysis

Table 3 reveals the inequality of the fish farmers in the study area. The link between income inequality and poverty has been a major issue among farming households. Figure 2 is a Lorenz curve income distribution of income among the fish producer marketers with a Gini coefficient of 0.5385 indicating that the level of income inequality among the farmers was 53 percent. This was higher than those obtained (35%) in a similar study in Oyo state by Awotide (2012). The implication of these findings is that a difference of 53 percent exists among the fish farmers earned income. A further disaggregation of the inequality based on some selected demographic characteristics shows that this variability (61%) was higher among farmers aged between 31 and 60 years than farmers  $\leq 30$  and those with ages  $\geq 60$  years. This trend is similar to those reported by in Oyo State where the highest inequality index was recorded for households whose ages falls between 40 to 60 years.



**Figure 2.** The Lorenz curve distribution of income.

**Table 3.** Inequality distribution based on demographic characteristics.

Socio-econ variable	Category	Income inequality
Age	≤ 30	0.3815
	31-60	0.6119
	≥ 61	0.2871
Household Size	1-5	0.6625
	6-10	0.4834
	≥ 10	0.3159
Gender	Male	0.5170
	Female	0.5636
Education	Primary	0.3009
	Secondary	0.3031
	Tertiary	0.6331
Marital status	Married	0.5997
	Not-married	0.3588
Average inequality		0.5384

Fish farmers older than 61 years of age had relatively low-income variability (28 percent) inequality difference consequently this category are not expected to be as poor as those with 61 percent variability. Different reasons could be adduced to this distribution. Since inequality is

highly correlated with poverty, family responsibilities tend to be higher for those in the age group (30-60 years) for instance, often times the dependency ratios of this age group are higher than those other two categories. Also, the lower inequalities recorded by the aged farmers is reflection of possible lower difference in income earned by these age group for reasons such as lower agility and versatility, etc. On household size, a decreasing trend in inequality with increasing household size among the farmers was observed. Households with 1 to 5 members had an inequality (Gini-coefficient) of about 66 percent. This is quite high compared to a value of about 31% recorded by households with members greater than 10 members. The analysis revealed further that the male headed households had a slightly lower inequality coefficient (51%) compared with their female (56%) counterparts in. This finding is contrary to those obtained by Awotide (2012) where she obtained 36 and 16% for male and female, respectively. The means that males exhibit slightly lower income variability compared to their female counterparts. Farmers with tertiary education recorded a higher variability in income with an index of 0.63; this is more than double those obtained among farmers with primary and secondary education..

### Constraints to catfish production and marketing in the study area

The following perceived constraints were observed for the catfish marketers; poor access to credit, low profit, poor marketing information, poor storage facilities, high cost of

**Table 4.** Constraints facing fish farming enterprise.

Problem	Frequency	Percentage	Ranking
Lack of credit	75	93.75	1 <sup>st</sup>
High cost of production	56	70.00	2 <sup>rd</sup>
High electricity bills	52	52.5	3 <sup>th</sup>
Lack of processing facilities	36	45.00	4 <sup>th</sup>
High cost of transportation	25	31.25	5 <sup>th</sup>
Non-uniform measures	13	16.25	6 <sup>th</sup>
Lack of market information	10	12.50	7 <sup>th</sup>
High marketing charges	5	6.25	8 <sup>th</sup>

transportation, etc. to be ranked as first, second, third and so on depending on the magnitude of the effect of each on their business. As presented in Table 4, the result reveals that 80.77 percent of the actors (producers and marketers) ranked poor access to credit as first implying that poor access to credit is the most serious problem confronting the sector. However, this might have been responsible for majority of the respondent reliance on personal savings (Table 4). It is important to note that profitability in fish farming is a function of the level of efficiency in management of available resources, most of the actors with low profile in production and marketing management are liable to operate at marginal profit and those farms which are successful are generally those farms with reduced cost of production due to rigorous standards of husbandry and management, and good market development. The results also suggested that quite a good number (86%) operate at high production cost, it is natural to expect marginal profits. Also, lack of uniform measures, poor marketing information and high marketing charges were ranked seventh, eighth and ninth, respectively. These findings are similar to those obtained by Aasa et al. (2020).

## Conclusion

The study revealed that fish production is a profitable venture with profitability index of about 0.62. Moreover, a marketing margin of 21.11 and farmers share of about 78% was recorded meaning that producers had a fair share of the total accrued profit along the marketing channel. Income inequality was relatively high across board for the fish farmers with an index of 53 percent. Further disaggregation shows that the most active working class (30-60), highly educated farmers and female headed households had a very high-income inequality of 61, 63 and 56%, respectively. The farmers were faced with poor access to credit, poor/unstable electricity supply and inadequate storage facilities. It was recommended that stake holders in sustainable agriculture assist in provision of credit facilities and enact laws that further improves on fish farming such as strict regulation of FOREX to discourage indiscriminate importation of fresh fish into the

country. Improved infrastructure especially electricity should be put in place by the government to reduce cost of production and facilitate storage marketing. Farmers are also encouraged to form cooperative groups to improve their access to credit facilities.

## CONFLICT OF INTEREST

The authors declare that they have no conflict of interests.

## REFERENCES

- Aasa, O. S., Usman, M. B., Balogun, O. S., & Yahaya, U. F. (2020). Economic analysis of catfish production and marketing in Kaduna metropolis, Kaduna State, Nigeria. *Journal of Agricultural Economics, Environment and Social Sciences*, 6(1), 199-209.
- Akinlade, R. J., Adeyolu, A. G., & Carim-Sanni, A. (2015). Income inequality and poverty among farming households in Southwest, Nigeria *International Journal of Agricultural Economics and Rural Development*, 7(1) 59-67.
- Awotide, B. A. (2012). Poverty and income inequality among fish farming households in Oyo State, Nigeria. *Agricultural Journal*, 7(2), 111-121
- Awoyemi, T. T., & Ajinoye, A. J. (2011). Analysis of profitability of fish farming among women in Ogun State Nigeria. *Journal of Economics and Sustainable Development*, 4(2), 1-8.
- Balogun, O. S., Balogun, O. L., Olorukooba, M. M., Emeghara, U. U., Abayomi, E. Z., Alabi, O. F., & Tor, L. G. (2021). Poverty and welfare status of urban farming households in Kaduna metropolis Kaduna State, Nigeria. *Ethiopian Journal of Environmental Studies & Management*, 14(3), 306-318.
- Ehinmowo, O. O., & Akinlade, R. J. (2017). Assessment of income inequality among rural women entrepreneurs in South-Western, Nigeria. *International Journal of Management Studies business and Entrepreneurship Research*, 4(4), 212-223.
- Food and Agricultural Organization (FAO) (2014). The state of world fisheries and aquaculture: Opportunities and challenges. Rome, Italy.
- Huffman, S. L., Harika, R. K., Eilander, A. & Osendarp, S. J. (2011). Essential fats: How do they affect growth and development of infants and young children in developing countries? A literature reviews. *Maternal and Child Nutrition*, 7(Suppl 3), 44-65.

- Kaduna State Bureau of Statistics (KDBS) (2018). Kaduna State statistical year book.
- National Bureau of Statistics (NBS) (2011). Provisional total 2011 census figures by Local Government Areas. Retrieved from <http://www.nigeriastat.gov.ng/nbsapps>.
- Oladimeji, Y. U. (2017). Trend in fish production parameters in Nigeria and its total estimated demand: Empirical evidence from fish production. *Journals of Animal Production Resources*, 29(1), 410-418.
- Oladimeji, Y. U., Galadima, S. A., Hassan, A. A., Sanni, A. A., Abdulrahman, S., Egwuma, H., Ojeleye, A. O., & Yakubu, A. (2019). Risk Analysis in Fish Farming Systems in Oyo and Kwara States, Nigeria: A Prospect towards Improving Fish Production. *Animal Research International*, 16(1), 3226-3237.
- Oyekale A., Adeoti A. I., & Oyekale, T. O. (2006). Measurement and sources of income inequality among rural and urban households in Nigeria University of Ibadan. *PMMA Working Paper No. 2006-20*. Retrieved February 2021 from <http://papers.ssrn.com>.
- Usman, M. B., Aasa, O. S., Balogun, O. S., & Yahaya, U. F. (2020). Profitability analysis of marketing of frozen fish in Kaduna metropolis, Kaduna State, Nigeria. *FUDMA Journal of Sciences*, 4(2), 577-583.