Cost and Return Analysis of Fish Farming in Nigeria

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Abstract

The study was conducted in Jere and Konduga Local Government of Borno State, Nigeria. The study concerned with the analysis of cost and return of fish farming in the study area. Data collection for the research work was carried out within the period of thirty-one (31) days from 19th August, to 18th September 2023. Both primary and secondary sources of data were employed. The study revealed fish farming in the study area was favorable as all the fish farmers operates at gain although recommendation was made for the development of fish farming in the study area.

Keywords: Cost; Return Analysis; Fish Farming

Introduction

The expansion in aquaculture production, especially for species such as shrimps, salmon, bivalves, tilapia, carp and catfish (including pangasius spp.), has resulted in a steady increase in the rates of per capital consumption of these species groups in recent years. From 1990, at the start of the expansion in aquaculture production, average annual growth rates of per capital consumption up to 2017 were most significant for freshwater and diadromous fish (3.9 percent), crustaceans (2.9 percent) and molluses, excluding cephalopods (2.7 percent). Meanwhile, species categories comprised mainly of wild fish (cephalopods, pelagic fish, demersal fish and other marine fish) saw zero or negative growth in the same period, with the exception of cephalopods, for which per capital consumption increased slightly at an average annual growth rate of 0.1 percent in the period 1990-2017 [1].

The steady increase in developing countries share of international trade flows, with faster rates of growth compared with developed countries has been a defining feature of global fish market development. From 1976 to 2018, exports from developing countries increased by an average of 8.4 percent per year in value terms, compared with 6.8 percent for developed countries. In the period 1976-2018, the share of developing countries of trade in fish and fish products increased from 38 percent of global export value to 54 percent, and from 39 percent to 60 percent of total quantity (in live weight equivalent), supported by strong aquaculture production growth and heavy investment in export market development. China, the rest of developing East Asia, Southeast Asia and South America made the most substantial gains in this period. Both as a source of export revenue and as a provider of employment, trade in fish and fish products represents an important contributor to economic growth in developing countries [2].

Aquaculture reduce sea food trade deficit, especially, the seafood trade in America is mainly based on trade from Asia and Europe, with most of it being imported. The resultant balance places a trade deficit on the nation. Aquaculture

would provide a means for the reduction of this deficit at a lower opportunity cost as local production would mean that the seafood would be fresher. It would also be cheaper due to reduced transport costs. Aquaculture increases the number of possible jobs in the market. The increase in jobs is mostly realized in third world countries as aquaculture provides both a food source and an extra source of income to supplement those who live in these regions. Aquaculture also saves fishermen time as they do not spend days at sea fishing. It allows them free time to pursue other economic activities like engaging in alternative businesses. This boost entrepreneurship and provides more hiring possibilities and more jobs [3].

Nigeria has what it takes in term of resources to compete with World–leading aquaculture nations. Some of these potentials include more than 260 medium and large clamps. These dams have a combined storage capacity above 30 billion cubic meters of water. The dams can be used for cage and pen aquaculture. More than 850 km of coastline and maritime water of 210,900 km2 including the Exclusive Economic Zone; a narrow shelve extending for only about 15km in the western area and ranges from 60 to 80 km in the eastern tip. This condition limits the trawl-able grounds to 3200 mm2of the 1147 mm2 continental shelf area. The inshore waters (0.50m) are characterized by a variety of small fish species varying from 25 to 50 cm in total length [4].

The aquaculture industry in Nigeria have been very promising as a result of the natural resource endowment of water bodies and institutional commitment and high demand for fish among others. Despite some gains made by the countries and the huge potential of the aquaculture sector, it is however bedevilled with constraints such as inadequate infrastructure, inadequate supply of fish feed, irregular electricity supply, poor finance, irregular electricity supply, poor finance, high cost of feed, land acquisition, high price of input, disease and poaching, poor extension services, poor market/price and cannibalism [5,6].

In the last decade 90th the fish industry provided direct and indirect employment for residents in Borno state; fishers, fish processors, marketers, retailers, and many other actors earned their living from fish production and its value chains. Income from the industry contributed significantly to the market performance of other goods and services like food items, household needs, school fees etc [7].

Borno state as one of the state that met environmental requirement for fish production in Nigeria but majority of the farmers engaged in small – scale artisanal mode of fish production regardless of the natural resources endowment

to compete with other leading fish farmers in the country as a result there exists wide gap between the production level and the fish demand in the state in spite the state rating among the largest fish producers in the country. This has immensely contributed to the underutilization of the fisheries resources. Many research works have been carried out on fish production and other fisheries related development studies in the study area among others includes; Opeyemi O, et al. [7], Zanna BG, et al. [8], Olarewaju AN, et al. [9], Raji A, et al. [10] and Obetta MC, et al. [11] but their studies centered on either economic profitability which was based on projection, progress, prospects and problems of fish farming. Research work that carry out economics of fish farming in the study area base on practical experiment is limited if any? in the study area. Hence the need to close the literature gap. To attained efficient and effective utilization of the fisheries resources of the state the need to engage in full swing fish farming in the state. Thus, it has become imperative to know the nature of costs and returns in fish farming to enable the determination of relative cost implication of each input resources in direct proportion to the aggregate returns derivable from the fish farm. This will enable us to determine the profitability of fish farming at various technical combinations of production resources possible at a efficient utilization of the production capacity of the farm and or inefficient at a underutilization of the production capacity of the farm and or impossible output at various technical combination of the production resources of the farm. Never the less, important questions were asked such as; are resources being optimally utilized at profitably sustainable level? If not, what are the necessary steps to be taken to ensure optimal utilization of resources at a profitably sustainable level?.

In view of the above, this research work was undertaken with the main objective to determine the production cost and return of fish farming in Nigeria. The specific objectives are to: -
- determine the production cost of farm in the study area;
- determine the output value of farm in the study area;
- Analyze the production cost and return of farm in the study area.

The outcome of this research work may provide basis for the ascertainment of the profitability of fish farming in the study area thus provides operational insight for prospective fish farmers as new beginners and aid the existing fish farmers with the level of operation in the subsequent production season. The outcome of this research work may aid the fish farmer in the apportionment of cost to various production inputs thus aids in the allocation of resources efficiently which may result to profitable venture and minimizes underutilization of resources or wastages may be avoided. The information obtained may be useful to the

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government, private sectors, researchers and students for decision making for developmental purposes and references. This may metamorphose to the advancement in the operational system of the fish farming from small-scale to large-scale production, from crude method to technological advance method and capital-intensive mode of production which may yield fortunes to the nation economy as well at the global level.

Data collection for the research work was carried out within the period of thirty one (31) days from 19th August, to 18th September, 2023 due to the fact that during that period majority of the fish farmers embarked on harvest as pre-planned for intensive marketing as there was high demand for fish as a result of religious events and other festivities as "Id el Maul" was held on the 27th of September 2023. On this day, holiday was observed celebrants attended special prayers and celebrated with family and friends accompanied with gifts in form of charity to the poor and needy.

Methodology and Data

The study was carried out in Jere and Konduga Local Government Area of Borno State, North eastern zone of Nigeria. Borno State which has an area of 61,43589 km is the largest state in the federation of the Federal Republic of Nigeria in terms of land mass. The state occupies the greatest part of the Chad Basin and shares borders with the Republic of Niger to the North, Chad to the North – East and Cameroon to the East. Jere Local Government Area of Borno State, Nigeria, has its headquarters in the town of Khaddamari. Jere is one of the twenty-seven local government areas of Borno State, carved out of Maiduguri Metropolitan Council (M.M.C.) in 1996. It lies within latitudes 110 401 E and 120 05 N and longitudes 130 501 and 120 201 E; it occupies a total landmass of 160 square kilometers. Within the state, it shares boundaries with Mafa Local Government Area to the east, Maiduguri Metropolitan Council to the north and Konduga Local Government Area to the South. Jere Local Government Area has a projected population of 211, 204 persons with annual growth rate of 2.8%. Majority of the inhabitants are farmers, traders, and civil servants. The major ethnic groups are Kanuri and Shuwa Arab. Others includes Hausa, Bura, and Fulani and many immigrant settlers from within and outside Nigeria [12]. In khaddamari, the wet season is hot, oppressive and mostly cloudy and the dry season is sweltering and partly cloudy. Over the course of the year, the temperature typically varies from 580 F to 1060 F and is rarely below 520 F or above 1100 F. The hot season lasts for 2.4 months from March 14th to May 27th with an average daily high temperature above 1020 F. The hottest month of the year in Khaddamari is May, with an average high of 1030 F and low of 800 F. The cool season lasts for 2.1

months, from July 20th to September 23rd with an average daily high temperature below 920 F. The coldest month of the year in Khaddamari is January, with an average low of 590 F and high of 920 F. The rainy period of the year last for 6.0 months, from April 23rd to October 21st, with a sliding 31-day rainfall of at least 0.5 inches. The month with the most rain in Khaddamari is August, with an average rainfall of 5.9 inches. The rainless period of the year lasts for 6.0 months, from October 21st to April 23. The month with least rain in Khaddamari is December, with an average rainfall of 0.0 inches [13]. Konduga is a community in Borno State, Nigeria and the Centre of a Local Government Area of the same name about 25km to the Southeast of Maiduguri situated on the North bank of Ngadda River. The local government area is shown within Nigeria coordinates: 110 39' 6'' N, 130 25' 10" E. Konduga Local Government Area have an area of about 6000 square kilometers with a population of 375,000. The ethnic groups in the local government are Kanuri, Shuwa Arab, Marghi, Mulgwai, Wula, Gamargu, Fulani and Hausa. The main occupation of the people is subsistence farming combined with livestock rearing, fishing and trading. The road network in the local government is over 300km mostly (over 90%) untarred bush roads and foot paths with substantial part of the villages living behind a river, which keeps them away from the local government headquarters. Those living behind the rivers use canoes to cross to the local government headquarters. The terrain becomes difficult during the rainy season [14]. In Konduga, the wet season is hot and mostly cloudy and dry season is sweltering and partly cloudy. Over the course of the year, the temperature typically varies from 580 F to 1060 F and is rarely below 520 F or above 1100 F. The hot season lasts for 2.4 months, from March 11th to May, 24th, with an average daily high temperature above 1020 F. The hottest month of the year in Konduga is April, with an average high of 1050 F and low of 770 F. The cool season lasts for 2.1 months, from July, 20th to September, 22nd with an average daily high temperature below 920 F. The coldest month of the year in Konduga is January, with an average low of 590 F and high of 920 F. The rainy period of the year last for 6.1 months, from April, 20th to October 22nd with a sliding 31- day rainfall of at least 0.5 inches. The month with the most rain in Konduga is August, with an average rainfall of 6.2 inches. The rainless period of the year lasts for 5.9 months, from October, 22nd to April 20th. The month with the least rain in Konduga is December, with an average rainfall of 0.0 inches [13].

The study area has population of 5,86,204 inhabitants. The targeted population for this study has 211,204 and 375,000 persons from Jere Local Government Area and Konduga Local Government Area of Borno State, Northeast, Nigeria respectively. Ten (10) respondents, fish farmers were used from each of the two (2) local government areas,

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made a total sum of twenty (20) respondents for the study. Fish farmers that are engaged in concrete pond fish farming method were considered for the purpose of this study.

Sources of data for the study were both primary and secondary sources. Primary data was collected from the farmers by the way of farm and market survey method with the used of questionnaires. The questionnaires were completed by interviewing the farmers which ensured that questionnaires were well attended with accurate and reliable information. The information obtained through the questionnaires were supplemented with information that was collected through informal discussed with the farmers. The information elicited from the respondents through the questionnaires were on both tangible and intangible material requirements for fish farming, production cost and the value of the output for cost and return analysis of the fish farm in the study area. Secondary data was obtained from the farmers books of account where available and through officially documented records and discussed with officials of Federal College of Freshwater Fisheries Technology, Baga, Maiduguri and State Ministry of Animal and Fisheries Development Maiduguri, Borno State, Nigeria.

Multistage sampling technique was employed for the selection of the respondents. In the first stage, two local government areas (Jere and Konduga Local Government Area) of Borno State, North-east, Nigeria were purposively selected, areas that met the environmental requirement for fish farming in terms of water, soil, and temperature. More so, fish farming in Jere and Konduga Local Government Areas have become dominant as a result of the "BOKO HARAM" insurgency that ravaged almost all the fishing communities in Borno State of Nigeria made the population of the study areas increased due to inflows of internally displaced persons (IDPS) in to Jere Local Government Area and part of Konduga Local Government Area. In the second stage ten (10) respondents were randomly selected in the study area from a list of registered fish farmers in each of the two local government areas of the state. The list of registered fish farmers group of the Borno State Ministry of Animal and Fisheries Resources Development formed the sampling frame. The randomly selected ten (10) fish farmers from Jere Local Government Area and another ten (10) from Konduga Local Government Area made a sample size of twenty (20) respondents for the study.

Quantitative technique was employed in the analysis of the data. Descriptive statistics was used in the determination of the production cost, output value of the farm and in the analysis of cost and return of the farm to arrive at fish farm net return in the study area. Expressed as farm budget analysis; a written plan of resource allocation plus the anticipated

physical and financial outcomes of that plan [15]. Thus, farm budget was constructed by estimating the total input and the total output in physical term. Thereafter, total cost and total revenue was analyzed to arrive at net farm income expressed as:

$$NFI = TR - VC - FC$$

Where
NFI = Net Farm Income
TR = Total Revenue or Gross Returns
VC = Total Variable Cost
FC = Total Fixed Cost

Thus, a model budget was developed to show the Net Revenue or Net Farm Income derived from fish farming in each of the two areas studied.

The fixed capital asset consists of water pump, pelleting machine, grinding machine, vehicle, water quality instrument, water hose, weighting scale, vehicle, fishing net, fish pond, smoking kiln, basin/baskets. Bore hole (pump), hand globe, generator, hatching equipment and other farm tools, machineries and equipment as applicable. The farm fixed assets were depreciated at the rate of 2.5% per annum. The production period covered six consecutive months thus the rate of depreciation was applied at the rate of 1.25%. Material input used were mainly fingerlings, fish feed, chemical input and anti-biotic and labor cost includes hired and family labor. Running cost and other miscellaneous expenses were inculcated such as the expenses for fueling, minor repairs etc.

Results and Discussions

Identification of Farm Material Input, Distribution & Determination of Production Cost in the Study Area (Jere & Konduga Local Government Area of Borno State, Nigeria)

Table 1 shows the highest expenses incurred in Jere Local Government of the Study Area were incurred under the category of running cost and other miscellaneous expenses.

The amount expended under this category was to the total sum of two million seven hundred and three thousand naira (₦ 2,703,000) only. Followed by labor cost with two million six hundred and fifteen thousand naira (₦ 2,615,000) only. The lowest expenses expended were under rent and machine hire category with Ninety thousand naira (₦ 90,000), followed by the cost of chemical input amounted to the tune of one hundred and five thousand three hundred and fifty naira (₦ 105,350) only in Jere Local Government Area of the Study Area.

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S/No.	1	2	3	4	5	6	7	
Material Input	Fingerlings Cost ₦	Chemicals & Anti – Biotics Cost ₦	Labor Cost ₦	Deprecia – tions @ 2.5 % PA -1.25% ₦	Fish Feed COST ₦	Rent & Machi- ne Hire ₦	Running Cost & Other Miscellan -eous Exp ₦	Total ₦
Farm 01	60,000	9,650	1,25,000	6,424	7,31,600	30,000	1,86,000	11,48,674
Farm 02	1,50,000	3,000	1,92,000	4,807	8,85,000	60,000	2,40,000	15,34,807
Farm 03	1,12,500	17,950	1,23,000	6,283	6,37,200	-	2,10,000	11,06,933
Farm 04	2,40,000	36,500	1,20,000	10,423	12,74,400	-	2,43,000	19,24,323
Farm 05	87,500	19,800	1,30,000	15,431	5,42,800	-	2,40,000	10,35,531
Farm 06	2,80,000	3,750	1,35,000	12,683	12,98,000	-	1,98,000	19,27,433
Farm 07	80,000	1,800	65,000	10,768	5,31,000	-	2,46,000	9,34,568
Farm 08	1,32,000	9,000	12,30,000	42,607	25,48,800	-	3,30,000	4,292,407*
Farm 09	3,30,000	3,000	4,60,000	32,586	19,82,400	-	6,30,000	34,37,986
Farm 10	56,000	900	35,000	10,741	2,36,000	-	1,80,000	518,641*
Total	1, 528,000	1,05,350	26,15,000	1,52,753	1,06,67,200	90,000*	2,703,000*	1,78,61,303

SORCE: Field Survey Data Analysis, 2023

Note: The symbol * indicates highest and lowest observation recorded in each classification.

Table 1: Distribution of Fish Farm According To Cost of Production per Material Input in Jere Local Government of the Study Area.

Fish Farm 08 expended highest production cost to the tune of four million two hundred and ninety-two thousand four hundred and seven naira (₦ 4,292,407) followed by Farm 09 with three million four hundred and thirty-seven thousand nine hundred and eighty-six naira (₦ 3,437,986) only. The lowest cost of production was expended by Farm 10 with five hundred and eighteen thousand six hundred and forty-one naira (₦ 518,641) followed by Farm 07 with nine hundred and thirty-four thousand five hundred and sixty-eight naira (₦ 934,568) only in Jere Local Government of the Study Area.

S/No.	1	2	3	4	5	6	7	
Material Input	Fingerlings Cost ₦	Chemicals & Anti – Biotics Cost ₦	Labor Cost ₦	Deprecia – tions @ 2.5 % PA -1.25% ₦	Fish Feed COST ₦	Rent & Machi- ne Hire ₦	Running Cost & Other Miscellan -eous Exp ₦	Total ₦
Farm 01	40,000	1,680	1,20,000	15,455	6,13,600	-	1,80,000	9,70,735
Farm 02	50,000	1,650	30,000	5,534	9,44,000	50,000	1,50,000	12,31,184
Farm 03	22,500	3,300	30,000	14,214	4,13,000	-	50,000	5,33,014
Farm 04	2,31,000	1,950	80,000	13,689	8,02,500	-	2,70,000	13,99,139
Farm 05	15,750	1,050	80,000	11,301	3,18,600	-	30,000	456,701*
Farm 06	1,05,000	5,100	2,20,000	20,218	4,72,000	1,25,000	1,65,000	11,12,318
Farm 07	1,40,000	8,000	1,30,000	58,041	19,47,000	-	2,10,000	2,493,041*
Farm 08	1,75,000	4,950	1,40,000	7,134	11,80,000	-	1,80,000	16,87,084
Farm 09	1,30,000	7,400	1,00,000	9,535	10,62,000	-	1,50,000	14,58,935
Farm 10	4,20,000	4800	1,40,000	17,342	16,52,000	-	1,80,000	24,14,142
Total	13,29,250	39,880*	10,70,000	1,72,463	9,404,700*	1,75,000	15,65,000	1,37,56,293

SOURCE: Field Survey Data Analysis, 2023

Note: The symbol * indicates highest and lowest observation recorded in each classification.

Table 2: Distribution of Fish Farm According to Cost of Production per Material Input in Konduga Local Government of the Study Area.

Table 2 shows in Konduga Local Government of the Study Area the highest category of production cost incurred was under fish feed category of material input to the tune of nine million four hundred and four thousand seven hundred naira (₦ 9,404,700), followed by running expenses and other miscellaneous cost category with one million five hundred and sixty five thousand naira (₦ 1,565,000) only. The lowest cost of production was expended under chemical input and other antibiotic category of material input at thirty-nine thousand eight hundred and eighty-naira (₦ 39,880), followed by rent and machine hire category of expenditure amounted to the tune of one hundred and seventy-five thousand-naira (₦ 175,000) naira only.

Farm 07 incurred the highest cost of production to the tune of two million four hundred and ninety-three thousand and forty-one naira (₦ 2,493,041) followed by farm 10 with two million four hundred and fourteen thousand one hundred and forty-two naira (₦ 2,414,142) only. The lowest cost of production was expended in Farm 05 with four hundred and fifty-six thousand seven hundred and one naira (₦ 456,701).

Followed by Farm 03 with incurred cost of production to the sum of five hundred and thirty-three thousand fourteen naira (₦ 533,014) only under Konduga Local Government of the Study Area.

Production Cost Summary of the Study Area

Table 3 Shows that total production cost of all the farms in Jere Local Government of the Study Area stood at seventeen million eight hundred and sixty one thousand three hundred and three naira (₦ 17,861,303) and that of Konduga Local Government of the Study Area amounted to the sum of thirteen million seven hundred and fifty-six thousand two hundred and ninety-three naira (₦ 13,756,293) only.

S/No	Cost Specification	Costs	
		Jere	**Konduga**
		Jere Local Government ₦	**Konduga Local Government ₦**
1	Fingerlings Cost	15,28,000	13,29,250
2	Chemical and Antibiotic Cost	1,05,350	39,880*
3	Labor Cost	26,15,000	10,70,000
4	Fish Feed Cost	10,667,200*	9,404,700*
5	Rent and Machine	90,000*	1,75,000
6	Running Cost & Other Miscellaneous	27,03,000	15,65,000
Production Cost		1,77,08,550	1,35,83,830
Add Depreciation (Depreciation 2,5% Per Annum)		152,753 (1.25%)	172,463 (1.25%)
Total Cost of Production		1,78,61,303	1,37,56,293

SOURCE: Field Survey Data Analysis, 2023
Note: The symbol * indicates highest and lowest observation recorded in each classification.
Table 3: Production Cost Summary of the Study Area (Jere and Konduga Local Government)
Thus, the total production cost of farm in the Study Area involved the total cost of thirty-one million six hundred and seventeen thousand five hundred and ninety- six naira (₦ 31,617,596*) only.

The result 3.1A – 3.1C confirmed that of Pollock KH, et al. [16] the accurate definition of items of interest, reference points, and units is important in all aspects of statistics-based monitoring; that they are particularly nuanced in socio-economic studies. We consider issues related to defining the units of analysis, spatial sizes of communities and fishing trips that arise in socio-economic studies of fisheries.

Determination of Total Output Value of Farm in the Study Area

Table 4 indicates under the distribution of farm according to the farm output revealed that Farm 08 in Jere Local Government of the Study Area produced the highest value of output of 4200 kilograms sold at the rate of one thousand three hundred naira (₦ 1300) per kilogram thus Farm 08 recorded the highest sales to the tune of five million four hundred and sixty thousand naira (₦ 5,460,000), followed by Farm 09 with 3600 kilograms sold at one thousand two hundred naira (₦1200) per kilogram recorded four million three hundred and twenty thousand naira (₦4,320,000) only. Farm 10 produced the lowest number of 480 kilograms each was sold at the rate of One thousand five hundred-naira (₦ 1500) per kilogram amounted to the total sold value of seven hundred and twenty thousand-naira (₦ 720,000) only. Followed by farm 07 under which seven hundred (700)

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kilograms produced was sold at one thousand seven hundred naira (₦ 1700) per kilogram amounted to the total value of one thousand one hundred and ninety thousand naira (₦ 1190,000) only.

In Konduga Local Government of the study area Farm 10 produced the highest output value of three thousand-kilogram (3000) kilograms sold at the value of three million six hundred thousand naira (₦ 3,600,000) at the one thousand two hundred naira (₦ 1200) per kilogram. Followed by farmer 07 with total output of one thousand six hundred (1600) kilogram amounted to the value of

two million eight hundred and eighty thousand naira (₦ 2,880,000) only sold at the price rate of one thousand eight hundred naira (₦ 1800) per kilogram. The lowest value of the output produced was six hundred seventy-five thousand (₦ 675,000) naira only, the price sold was one thousand eight hundred naira per kilogram (₦ 1800) per kilogram of the three hundred and seventy-five (375) kilograms produced by farmer 03. Followed Farmer 05 that produced four hundred and fifty (450) kilograms sold at the value of eight hundred and ten thousand naira (₦ 810,000) at the price of one thousand eight hundred naira per kilogram (₦ 1800).

Jere Local Government of the Study Area					Konduga Local Government of the Study Area				
Farm S/No.	No of Ponds	No of Kilogram	Price Per Kilogram ₦	Total Sales Per Farm ₦	Farm S/No.	No of Ponds	No of Kilogram	Price Per Kilogram ₦	Total Sales Per Farm ₦
1	2	755	1700	12,83,500	1	4	640	1800	11,52,000
2	3	2000	1200	24,00,000	2	1	750	1800	13,50,000
3	1	1000	1300	13,00,000	3	3	375	1800	6,75,000*
4	2	1400	1600	22,40,000	4	3	1650	1250	20,62,500
5	5	1120	1650	18,48,000	5	3	450	1800	8,10,000
6	5	2170	1300	28,21,000	6	4	1400	1400	19,60,000
7	2	700	1700	11,90,000	7	4	1600	1800	28,80,000
8	6	4200	1300	5,460,000*	8	1	1534	1300	19,94,300
9	4	3600	1200	43,20,000	9	2	1500	1300	19,50,000
10	4	480	1500	720,000*	10	4	3000	1200	3,600,000*
Total	34	17,425	-	2,35,82,500	Total	29	12,899	-	84,33,800

SOURCE: Field Survey Data Analysis, 2023
Note: The symbol * indicates highest and lowest observation recorded in each classification.
Table 4: Distribution of Farm According To the Total Value of Output in Jere and Konduga Local Government of the Study Area.

The total value of output of all the farms in Jere Local Government of the Study Area stood at twenty three million five hundred and eighty two thousand five hundred naira (₦ 23,582,500) only and that of Konduga Local Government of the Study Area amounted to the total value of output to the sum of eight million four hundred and thirty three thousand eight hundred naira (₦ 8,433,800) only. Thus, the total value of output of farm in the Study Area involved thirty-two million sixteen thousand and three hundred naira (₦ 32,016,300) only.

This result shows consistency with the findings of Himes-Cornell A, et al. [17] in community level analysis, the definition of the area occupied by a fishing community is not always straight forward and has been a frequent topic of

research. One of the reasons for the difficulty is that fishing often affects an area larger than the immediate surroundings of the fishing site. Shopping in a location between a residential area and a fishing site illustrates the potential regional-level economic effects of fishing.

Cost and Return Analysis of Fish Farm of the Study Area

Table 5 indicates the cost and return analysis under Jere Local Government of the Study Area Farm 08 recorded the highest return of one million one hundred and sixty-seven thousand five hundred and ninety-three naira (₦ 1,167,593) only.

Jere Local Government of the Study Area				Konduga Local Government of the Study Area			
Farm S/No.	Total Sales ₦	Total Cost ₦	Net Return ₦	Farm S/No.	Total Sales ₦	Total Cost ₦	Net Return ₦
1	12,83,500	11,48,674	134,826*	1	11,52,000	9,70,735	1,81,265
2	24,00,000	15,34,807	8,65,193	2	13,50,000	12,31,184	118,816*
3	13,00,000	11,06,933	1,93,067	3	6,75,000	5,33,014	1,41,986
4	22,40,000	19,24,323	3,15,677	4	20,62,500	13,99,139	6,63,361
5	18,48,000	10,35,531	8,12,469	5	8,10,000	4,56,701	3,53,299
6	28,21,000	19,27,433	8,93,567	6	19,60,000	11,12,318	8,47,682
7	11,90,000	9,34,568	2,55,432	7	28,80,000	24,93,041	3,86,959
8	54,60,000	42,92,407	1,167,593*	8	19,94,300	16,87,084	3,07,216
9	43,20,000	34,37,986	8,82,014	9	19,50,000	14,58,935	4,91,065
10	7,20,000	5,18,641	2,01,359	10	36,00,000	24,14,142	1,185,859*
Total	2,35,82,500	1,78,61,303	57,21,197	Total	1,84,33,800	1,37,56,293	46,77,507

SOURCE: Field Survey Data Analysis, 2023.
Note: The symbol * indicates highest and lowest observation recorded in each classification.
Table 5: Distribution of Farm According To Cost and Return in Jere and Konduga Local Government of the Study Area.

Followed by Farm 06 with eight hundred and ninety-three thousand five hundred and sixty-seven naira (₦ 893,567) only. The lowest return was recorded by Farmer 01 with one hundred and thirty-four thousand eight hundred and twenty-six naira (₦ 134,826), followed by farm 3 with one hundred and ninety-three thousand and sixty-seven naira (₦ 193,067) only.

Under Konduga Local Government of the Study Area the highest production return was recorded in farm 10 with production return of one million one hundred and eighty-five thousand eight hundred and fifty-nine naira (₦ 1,185,859) followed by Farm 06 with production return of eight hundred and forty- seven thousand six hundred and eighty-two naira

(₦ 847,682) only. The lowest return was recorded in Farm 02 at one hundred and eighteen thousand eight hundred and sixteen naira (₦ 118,816), followed by one hundred and forty-one thousand nine hundred and eighty-six naira (₦ 141,986) only in farm 03 of the area.

Farm Production Net Return of the Study Area (Jere and Konduga Local Government)

Table 6 shows the production cost and return analysis of fish farm in the study area revealed that Jere Local Government of the study area derived highest net return of five million seven hundred and twenty-one thousand one hundred and ninety-seven naira (₦ 5,721,197) only.

Specification	Jere Local Government Area ₦	Konduga Local Government Area ₦
Total Output Value	2,35,82,500	1,84,33,800
Less Total Cost of Production	1,78,61,303	1,37,56,293
Net Return	5,721,197*	46,77,507

SOURCE: Field Survey Data Analysis, 2023
Note: The symbol * indicates highest and lowest observation recorded in each classification.
Table 6: Farm Production Net Return of the Study Area (Jere and Konduga Local Government).

While compared to Konduga Local Government of the Study area with four million six hundred and seventy-seven thousand five hundred and seven (₦ 4,677,507) naira only. Thus, fish farming in the study area is favorable with overall total return of Ten Million Three Hundred and Ninety-Eight Thousand Seven Hundred and Four Naira (₦ 10,398,704*) only although, Jere Local Government Area of the Study Area earned the highest return.

Highest and Lowest Value of Observation on the Basis of Cost Specification

Table 7 shows the summary of highest and lowest value of observation based on cost specification per local government area and individual farm in the study area. The highest cost of material input incurred in the study area was

nine million four hundred and four thousand seven hundred naira (₦ 9,404,700) only under Fish Feed category of cost specification. While the lowest cost of material incurred was cost of chemical and antibiotic category amounted to the sum of thirty-nine thousand eight hundred and eighty naira (₦ 39,880) only. Both were under Konduga Local Government of the Study Area.

The highest cost of input per farm was expended under Farm 08 of Jere Local Government of the Study Area to the tune of four million two hundred and ninety-two thousand four hundred and seven naira (₦ 4,292,407) only. The lowest was under Farm 05 of Konduga Local Government of the Study Area amounted to the tune of four hundred and fifty-six thousand seven hundred and one naira (₦ 456,701) only.

The highest value of sales was recorded under Farm 08 of Jere Local Government of the Study Area amounted to the sum of five million four hundred and sixty thousand naira (₦ 5,460,000) only, whereas the lowest was under Konduga Local Government of the Study Area amounted to the tune of six hundred and seventy five thousand naira (₦ 6,75,000) only under Farm 03.

The highest value of return from production was earned under Farm 10 amounted to the sum of one million one hundred eighty-five thousand eight hundred and fifty-nine naira (₦ 1,185,859) only in Konduga Local Government of the Study Area. The lowest return from production was one hundred and eighteen thousand eight hundred and sixteen naira (₦118,816) only in the same Konduga Local Government of the Study Area.

S/NO.	Cost Specification	Highest Value ₦	Lowest Value ₦
1	**Cost of Material Input in Jere Local Government Area:**		
	Running Cost & Miscellaneous Expenses	27,03,000	-
	Rent & Machine Hire	-	90
2	**Cost of Material Input in Konduga Local Government Area:**		
	Fish Feed	9,404,700*	-
	Chemical & Other Anti-biotic	-	39,880*
3	**Cost of Farm Input in Jere Local Government Area:**		
	Farm 08	4,292,407*	-
	Farm 10	-	5,18,641
4	**Cost of Farm Input in Konduga Local Government Area:**		
	Farm 07	24,93,041	-
	Farm 05	-	456,701*
5	**Value of Output (Sales) in Jere Local Government Area:**		
	Farm 08	5,460,000*	-
	Farm 10	-	7,20,000
6	**Value of Output (Sales) in Konduga Local Government Area:**		
	Farm 10	36,00,000	-
	Farm 03	-	675,000*
7	**Value of Production Return in Jere Local Government Area:**		
	Farm 08	11,67,593	-
	Farm 01	-	1,34,826
8	**Value of Production Return in Konduga Local Government Area:**		
	Farm 10	1,185,859*	-
	Farm 02	-	118,816*

SOURCE: Field Survey Data Analysis, 2023
Note: The symbol * indicates highest and lowest observation recorded in each classification.
Table 7: Distribution Summary of Highest and Lowest Value of Observation on the Basis of Cost Specification per Local Government Area and Individual Farm in the Study Area.

Thus, the study shows that at individual Farm Level; Farm 10 in Konduga Local Government of the Study Area earned the highest Production returned but Jere Local Government of the Study Area earned the highest return of the Study Area.

This result confirmed that of Pollnac RBS, et al. [18], Himes-Cornel A, et al. [19] and Jepson M, et al. [20] quantitative studies of the socio-economic characteristics of a fishery can involve the development of quantitative indicators to measure conceptual attributes such as well-being, vulnerability, and resilience. Method such as factor analysis, and principal component analysis are used to identify group of specific variables that contribute to quantitative indexes measuring these concepts.

Summary and Conclusion

The research work covered the analysis of cost and return of fish farming in Nigeria. The study revealed the highest cost of production was incurred under running cost and other miscellaneous expenses to the tune of two million seven hundred and three thousand naira (₦ 2,703,000) only in one segment of the study area and on fish feed in the other segment of the study area amounted to the sum of nine million four hundred and four thousand seven hundred naira (₦ 4,292,407) only in Jere and Konduga Local Government of the Study Area respectively. The total cost of production for the study area was thirty-one million six hundred and seventeen thousand five hundred and ninety-six naira (₦ 31,617,596) while the total value of the output was twenty-three million five hundred and eighty-two thousand five hundred naira (₦ 42,016,300) only. This result indicates the return from fish farming in the study area amounted to the total sum of ten million three hundred and ninety-eight thousand seven hundred and four naira (₦ 10,398704) only. Therefore, fish farming in the study area is favorable. The following recommendations were made:

- Effort should be made by the government, non-governmental organization and members of the community to engage capital intensive mode of production.
- The farmers should be financially and technically supported to shift from small-scale method of fish farming to modern technologically advance mode of production.
- Avenues for the creation of fish farmers association should intensified for the formation of strong farmers association for onward awareness creation on all matters relating to the development of fish farming in the study area.

Acknowledgement and Conflict of Interest

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