



# The Method of Land Acquisition and the Size of Pond for Aquaculture Fish Production in Nigeria

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## Research Article

Volume 7 Issue 4

Received Date: October 04, 2023

Published Date: October 27, 2023

DOI: [10.23880/ijoac-16000271](https://doi.org/10.23880/ijoac-16000271)

## Abstract

The study area of the research work was Jere and Konduga Local Government Area of Borno State, Nigeria. The study concerned with the method of land acquisition and the size of pond for aquaculture fish production. Data for the study was collected within the period of thirty-one (31) days from 14th March, to 14th April 2022. Both primary and secondary sources of data were employed. The result of the study translates majority of the aquaculture fish farmers lacked personal ownership of land for fish farming and practice small-scale mode of operation of aquaculture fish farming in the study area. Recommendations were made to create an avenue for the fish farmers in the study area to access adequate land for large-scale aquaculture fish production in the study area.

**Keywords:** Aquaculture; Fish Production; Method of Land Acquisition; Size of Pond

**Abbreviations:** IMTA: Integrated Multi Trophic Aquaculture; SDG: Sustainable Development Goal; MMC: Maiduguri Metropolitan Council; IDPS: Internally Displaced Persons.

## Introduction

World aquaculture production has progressively surpassed that of capture fisheries. The contribution of world aquaculture to world fish production has constantly increased, reaching 46.0 percent in 2016 – 2018, up from 25.7 percent in 2000. By excluding the largest producer, China, this share reached 29.7 percent in 2018 in the rest of the world, compared with 12.7 percent in 2000. At the regional level, aquaculture accounted for 16 – 18 percent of total fish production in Africa, the Americas and Europe, followed by 12.7 percent in Oceania. The share of aquaculture in Asian

fish production, China exclusive rose to 42 percent in 2018, up from 19.3 percent in 2000. World aquaculture output in 2018 was 114.5 million tons, including 82.1 million tons of aquatic algae and 26,000 tons of ornamental sea shells and pearls [1].

Since seventy percent of the world's surface is covered in water, humans have realized its importance as a resource. Aquaculture is the process of rearing, breeding and harvesting of aquatic species, both animals and plants in controlled aquatic environments like the oceans, lakes, rivers, ponds and streams. It serves different purposes, including food production, restoration of threatened and endangered species populations, wild stock population enhancement, the building of aquariums and fish cultures and habitat restoration [2].

Kongkeo reported that there are different types of aquaculture depending on Hydro biological features, the motive of farming and depending on the special operational techniques. The most common type of aquaculture is fish farming. It involves the selective breeding of fish either in freshwater or seawater with the purpose of producing a source of food for consumption. Fish farming is highly exploited as it allows to produce a cheap source of protein. Furthermore, fish farming is easier to do than other kind of farming as fish are not care-intensive but only requiring food and proper water conditions as well as temperature. The process of fish farming is also less land intensive as the size of ponds required to grow some fish species such as tilapia compared to the space required for cattle breeding with the same level of protein output. In addition to fish farming other types of aquaculture includes; Mari-culture, algae culture, integrated multi-trophic aquaculture (IMTA), inland pond culture, recirculating systems, open-net pen and cage systems, flow through or race way system [3].

Code of Conduct for Responsible Fisheries; with time the fallacy of infinite resources was replaced by the realization that fisheries resources, although renewable are not infinite. The Code promotes responsible fisheries and aquaculture, covering virtually all aspects of the sector, from responsible fishing and aquaculture practices to trade and marketing and it has guided government policies on all continents. It recognizes the nutritional, economic, social, environmental and cultural importance of fisheries and aquaculture, as well as interests of all those involved in the harvesting, farming, processing, trade and consumption of seafood [4].

Sustainability, Tenure, Access and User Rights; For natural resources such as land, water, forest, fisheries and other aquatic resources in lakes, rivers, and seas, the term “tenure” generally refers to the norms and rules about how people govern, access and use these resources. The term “user” means the person, group of people, or other entities who may be doing these actions. Thus, the topic of tenure and user rights is about who can use these resources, for how long and under what conditions. The governance of tenure and user rights describes whether and how people are able to clarify, acquire and protect rights to use and to manage these resources. Therefore, appropriate tenure systems, including clear access and user rights are fundamental elements of securing sustainable fisheries and their contribution to the Sustainable Development Goals (SDGs) [5].

### Problem Settings and Objectives

In spite the potential of aquaculture in meeting the environmental requirement for aquaculture fish production in the study area majority of the farmers operates at a small-scale level of production as result of problem of land

acquisition and a poor site accompanied with inadequate supportive facilities necessary for farm operation as a result of lack of adequate capital to engage in full swing production and subsequent expansion. The aquaculture fish farmers in the study area have been marginalized compared to other productive sector of the economy as government has not prioritized its attention towards the sub-sector in policy formulation such as social, economic and political processes of development. Majority of the aquaculture fish farmers in the study area were in to fish farming as secondary form of occupation form another hinderance for involvement in large scale aquaculture fish farming. The lack of well-organized code of conduct for responsible aquaculture fish production practices especially with regards to farm land acquisition and subsequent expansion as a result of lack of well-established and improved legal and institutional frameworks for aquaculture governance to facilitates and promotes technical and financial cooperation for sustainable use of fisheries resources at a large-scale production that permit profitable venture has been another problem in the study area.

In view of the above, this research work was undertaken with the main objective to analyse the method of land acquisition and the size of pond for aquaculture fish production in Borno State of Nigeria. The specific objectives are to:

- Examine the method of land acquisition of aquaculture fish farmers in the study area.
- Assess the size of pond for aquaculture fish production in the study area.

The output of this research work would be useful in decision making processes concerning the development of the aquaculture fish production system in the study area such as the establishment of code of conduct for the promotion of general practices of aquaculture fish farming, establishment of guiding principles for aquaculture and related activities practices and for the conduct of aquaculture fish farmers and other parties related to aquaculture fish production either directly or indirectly. Enactment of broader aquaculture national policies for the development of the aquaculture fish farming through responsible management and development of aquaculture fish farming resources. The outcome of the research work may serve for references and other findings for researchers. Government and non-governmental organizations may use the outcome of the research work for formulation of legal and institutional policies for aquaculture governance in such a way that will quarrantee proper management and conservation of fisheries resources.

Data collection for the research work was carried out within the period of thirty-one (31) days from 14th March, to 14th April, 2022 during the period majority of the fish

farmers embarked on harvest as pre-planned for intensive marketing as there was a high demand for fish as a result of religious events and other festivities.

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. Over the course of the year, the temperature typically varies from 14.440 C to 41.110 C, with a minimum of 11.110 C and a maximum of 43.330 C in the Study Area [6].

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 kilometres. 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 [7]. 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 kilometres with a population of 375,000 [8].

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. Twenty (20) respondents, fish farmers were used from each of the two (2) local government, made a total sum of forty (40) respondents for the study area. 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 fixed capital asset-based capacity of

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.

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, Northeast, 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 has 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 (20) 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 (20) fish farmers from Jere Local Government Area and another ten (20) from Konduga Local Government Area made a sample size of twenty (40) respondents for the study.

Quantitative technique was employed in the analysis of the data. Descriptive statistics was used in the examination of the method of land acquisition of aquaculture fish farmers and assessment of the size of pond for aquaculture fish production in the study area.

## Results and Discussions

### Distribution of Aquaculture Fish Farmers According to the Method of Land Acquisition in Jere and Konduga Local Government Area of Borno State, Nigeria

Table 1 shows the result of method of land acquisition for aquaculture fish farmers; in Jere Local Government Area method of land acquisition from family source was recorded highest with frequency distribution score of 10 observation at a percentage rate of (50%), followed by method of land acquisition from the same source of family method of land acquisition with high frequency distribution score of 08 observation at a percentage rate of (40%) in Konduga Local Government Area of the study area. Another observation of the same frequency distribution score of 08 at a percentage rate of (40%) was also revealed in the same Konduga Local

Government Area of the study area. Followed by government method of land acquisition source recorded with frequency distribution score of 06 observation at a percentage rate of 30%. The least observations of the method of land acquisition for aquaculture fish farming in the study area were from the two local government areas in the same proportion under different classifications of bought method of land acquisition in Jere Local Government Area and rent method of land acquisition in Konduga Local Government Area of the study area with frequency distribution scores of 04 observations at

a percentage rate of 20% each respectively. Nevertheless, the result also shows Jere Local Government Area of the study area had zero frequency distribution score of observation accordingly with 0% percentage rate under rent classification method of land acquisition source as applied to Konduga Local Government Area with zero frequency distribution score as well at 0% percentage rate under government method of land acquisition source. No observation was recorded under other method of land acquisition source for both the two local government areas in the study area.

S/NO.	Method of Land Acquisition	Jere Local Government Area (1A)		Konduga Local Government Area (1B)		Total (1C)	
		FRQ	PCT%	FRQ	PCT %	FRC	PCT%
1	Family	10	(50) *	8	(40) *	18	(45) *
2	Government	6	30	-	-	6	15
3	Bought	4	20	8	(40) *	12	30
4	Rent	-	-	4	20	4	10
5	Others	-	-	-	-	-	-
<b>Total</b>		<b>20</b>	<b>100</b>	<b>20</b>	<b>100</b>	<b>40</b>	<b>100</b>

Source: Field Survey (Data Analysis) 2022.

Note: the symbol () \* indicate highest percentage (%) recorded in each observation.

**Table 1:** Distribution of Aquaculture Fish Farmers According to the Method of Land Acquisition in Jere and Konduga Local Government Area of Borno State, Nigeria.

The cumulative results of the two local government areas in the study area reveals method of land acquisition from family source had the overall highest frequency distribution scores of 18 observation at a percentage rate of (45%) and the least frequency distribution was under the rent land acquisition method of land with frequency distribution score of 04 observation at a percentage rate of 10%. Finally, the result shows no observation was recorded under the classification of other method of land acquisition sources in the study area. Therefore, this result reveals majority of the aquaculture fish farmers acquired land for aquaculture fish farming through the family method of land acquisition in the study area. This result translates majority of the aquaculture fish farmers in the study area lacked personal ownership of land for fish farming.

This result confirmed to the finding of Poulomi B [9] aquaculture can be considered as an integral part of the natural environment and the interactions between aquaculture and the environment are inevitable. The major natural resources required for aquaculture are land, water and biological inputs such as seed and feed. In shrimp aquaculture also there is no exception and the impacts come from both the use of biological inputs and the land and water resource use. We can link the impacts using these natural resources with the issue of economic sustainability and the ecological

sustainability. Shows inconsistency with the findings of Ratnasingham S, et al. [10] the Code as a universally adopted and applicable policy instrument has been facilitator of change, catalysing cooperation at the local, regional, and global levels. Nowadays, the fisheries policies and legislation of most countries are compatible with the Code. The Code and its instruments have shaped fisheries policies, legal and management frameworks worldwide, instilling key principles of sustainable and responsible development of fisheries and aquaculture. The Code has also served as an important catalyst for incorporating conservation and environmental considerations in to fisheries and aquaculture management and inspired the development of the ecosystem approach to fisheries and aquaculture.

### Distribution of Aquaculture Fish Farmers According to the Size of Farm Fish Pond in Jere and Konduga Local Government Area of Borno State, Nigeria

Table 2 shows the result of fish pond size in square meters in Jere and Konduga Local Government Areas of the study area. The fish pond size of aquaculture fish farmers in Jere Local Government Area reveals; fish pond size of under 1.862 meters was the highest observation recorded

with frequency distribution score of 16 at a percentage rate of (80%) in the study area. Followed by the same fish pond size of under 1.862 meters was recorded with frequency distribution score of 10 observation at a percentage rate of (50%) as highest in Konduga Local Government Area of the study area. Another category of fish pond size within the range of 1.862–3.622 meters with frequency distribution score of 10 observation was at a percentage rate of (50%) also revealed in the same Konduga Local Government Area of the study area. Thereafter, followed by the fish pond size within the range of 1.862 – 3.622 meters with least frequency distribution score of 02 observation at a percentage rate of 10% in Jere Local Government Area of the study area. The

same least frequency distribution score of 02 observation at a percentage rate of 10% was revealed under the fish pond size category of 3.722 – 5.482 meters range in Jere Local Government Area of the study area. Whereas in the case of Konduga Local Government Area of the study area frequency distribution score of zero observation at a percentage rate of zero as well was recorded under this fish pond size category of 3.722 – 5.482 meters. Nevertheless, zeros frequency distribution scores of observations at zeros percentage rate were revealed as well in the categories of fish pond sizes within the ranges of 5.572 – 7.342 meters and 7.432 meters & above respectively in both the two local government areas in the study area.

S/NO.	Fish Pond Size (Square Meters)	Jere Local Government Area (1A)		Konduga Local Government Area (1B)		Total (1C)	
		FRQ	PCT%	FRQ	PCT%	FRQ	PCT%
1	Under 1.86 <sup>2</sup> meters	16	(80) *	10	(50) *	26	(65) *
2	1.86 <sup>2</sup> – 3.62 <sup>2</sup> Meters	2	10	10	(50) *	12	30
3	3.72 <sup>2</sup> – 5.48 <sup>2</sup> Meters	2	10	-	-	2	5
4	5.57 <sup>2</sup> – 7.34 <sup>2</sup> Meters	-	-	-	-	-	-
5	7.43 <sup>2</sup> Meters & Above	-	-	-	-	-	-
<b>Total</b>		<b>20</b>	<b>100</b>	<b>20</b>	<b>100</b>	<b>40</b>	<b>100</b>

Source: Field Survey (Data Analysis) 2022.

Note: the symbol ( ) \* indicate highest percentage (%) recorded in each observation.

**Table 2:** Distribution of Aquaculture Fish Farmers According to the Size of Farm Fish Pond in Jere and Konduga Local Government Area of Borno State, Nigeria.

Finally, the overall result of the study area indicates 26 as the highest frequency distribution score of observation at a percentage rate of (65%), followed by 12 frequency distribution score at a percentage rate of 30% and 02 frequency distribution score of observation at a percentage rate of 05% under fish pond size categories of under 1.862 meters, 1.862 – 3.622 meters and 3.722 – 5.482 meters respectively in the study area. Therefore, the outcome of the research work revealed majority of the aquaculture fish farmers operates with the least fish pond size category of under 1.862 meters in the study area. This result shows the farmers practice small-scale mode of operation of the aquaculture fish farming in the study area.

This result agreed with the findings of Watkiss P, et al. [11] the fisheries sector requires access to financial services such as savings, credit and insurance and investments to support the transition to more sustainable and responsible fishing as well as to address climate change adaptation and mitigation. Investment programs recognize that small-scale fisheries often operate within overfished coastal areas, with open-access regimes. Associations to build capacity among rural finance institutions on doing business with

the fisheries sector and to increase access by small-scale fishers to microfinance, credit and insurance services. Shows inconsistency with the findings of Davies TK, et al. [12] social sustainability in fisheries and aquaculture value chains has become a major focus of the international community and key stakeholders of the fisheries and aquaculture sector. Effort to build consensus around international guidance and provide technical assistance to developing countries, especially the least developed ones, so that they can meet modern requirements and their sustainable development goal (SDG) commitments for social sustainability in fisheries and aquaculture.

## Summary and Conclusion

The study focused on the analysis of the method of land acquisition and the size of pond for aquaculture fish production in Borno State of Nigeria. The cumulative results of the two local government areas with respect to the method of land acquisition in the study area reveals method of land acquisition from family source had the overall highest frequency distribution score of 18 observation at a percentage rate of (45%) and the least frequency distribution was under



the rent land acquisition method with frequency distribution score of 04 observation at 10% percentage rate. The overall result of the study area with respect to the size of fish pond for aquaculture fish production indicates 26 as the highest frequency distribution score of observation at a percentage rate of (65%), followed by 12 frequency distribution score at a percentage rate of 30% and 02 frequency distribution score of observation at a percentage rate of 05% under fish pond size categories of under 1.862 meters, 1.862 – 3.622 meters and 3.722 – 5.482 meters range respectively in the study area. This result translates majority of the aquaculture fish farmers in the study area lacked personal ownership of land for fish farming and this translates small-scale mode of operation of the aquaculture fish farming in the study area as revealed majority of the aquaculture fish farmers operates with fish pond size under 1.862 meters. Thus, the study recommends the followings:

- Create an avenue for the fish farmers in the study area to access capital adequately with the intervention of government and non-governmental organizations to acquire land for aquaculture fish farming that will enable the operations of large and numerous numbers of fish ponds.
- The provision of aquaculture fish farming facilities and other required input should made readily available for the support of the expanded land for aquaculture fish farming in large-scale operation.

### Acknowledgement and Conflict of Interest

Contributions; Conceptualization: Babagana Zanna, writing original draft preparation: Babagana Zanna, Writing – review and editing; Mohammed Musa and Babagana Zanna, Supervision: Mohammed Musa. The authors have read the manuscript and agreed for onward vetting, corrections, guidance for further consideration and approval and subsequent publishing of the final version of the manuscript accordingly. The research work was carried out by Babagana Zanna without any financial support from any agency or individual and finally the research work has no any conflict of interest.

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