Research Article

Comparative analysis of socio-economic characteristics of aquaculture farmers in Borno state, Nigeria

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ABSTRACT

The study was undertaken with the main objective of comparative analysis of socioeconomic characteristics of aquaculture fish farmers with specific objective of determining the level of influence of socioeconomic variables on the status of aquaculture fish farmers for subsequent identification and formulation of policy framework that will suit the peculiar problem of the aquaculture fish farmers with the aim of embarking on sustainable large-scale aquaculture fish production in Borno State of Nigeria. Data for the study were obtained from both primary and secondary sources on socioeconomic characteristics of aquaculture fish farmers. Quantitative technique with descriptive statistics was employed in the comparative analysis and interpretation of the data on the socioeconomic characteristics of aquaculture fish farmers in the study area. Comparatively, the result shows Konduga local Government has more influence on the socioeconomic status of the aquaculture fish farmers at the high and lowest level categories of the comparative analysis than Jere local government at 80% and 20% level respectively in the study area. Recommendation were made for the transformation of the socioeconomic characteristics of the aquaculture fish farmers for the upliftment of the general well-being of the farmers by attainment of the economic, social and environmental requirement for truly sustainable large-scale aquaculture fish farming in the study area.

Keywords: Aquaculture in Nigeria, Livelihood, Socio-Economic analysis

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INTRODUCTION

As the world population is expected to be 9 billion by 2050 it is a major challenge to hundreds of millions of farmers, food processors, traders, researchers, technical experts and leaders in the world to feed the population with nutritious food. Aquatic food is very important in the provision of a nutritious, healthy and balanced diet complete with essentials micro-nutrients particularly to mothers and children. Thus, fish and other aquatic products plays an important role in meeting the dietary needs of the populace as well the food security of the poor. Therefore, in addition to the quest for an increase in production, the need for the enhancement in training and capacity building, diversification of production both at the regional and global market through the development of all the contributory means of the sector in the process of value addition. In other to maximize the contribution of aquaculture to employment, livelihood generation and poverty eradication, the elimination of hazardous work with supportive business opportunities are paramount important (Mathias, 2020). In Africa, Fisheries and Aquaculture contributes directly and indirectly complementing the diet of millions of households, fish serves as the main source of animal protein in some communities and contribute to food security through the sales of fish to generate revenue and create employment opportunities to get income that enables the acquisition of other items. Therefore, Fisheries and Aquaculture play an important role in food security for consumers, means of livelihood to producers, value chain actors and the wider community (Ana, 2020).

The country Nigeria was assessed as very suitable for aquaculture production as a result of it very good conditions for tropical fresh and marine fish culture as it owns significant coastline of 853 km and over 14 million hectares of inland waters with 75% being moderately suitable and about 112,085 km^2. Moreover, the country has quality surface and ground water sources with climatology suited for year – round production. Aquaculture thrives in most regions of Nigeria, but the most active regions are the Southwest, South, Southeast and the North Central (Adewumi, 2015). Borno State of Nigeria endowed with freshwater lakes, rivers, reservoirs, dams, free-flowing boreholes, and floodplains has the potentials for the development of the aquaculture sector in the country Nigeria, but the state aquaculture sub-sector has constraints as shown by the level of aquaculture fish production in the state. Notwithstanding, the State share of fish output from fish catch constitutes significant portion of the fish consumed in the country. Moreover, in the last decade 90^{th} 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. The adverse effects of the conflict in present Borno has further affected the fish industry consequently substantial loss of rural livelihoods. Fishing activities in the state were disrupted. Supply of fish gradually became irregular that at some point fish sellers rarely had fish to sell (Opeyemi, 2020).

PROBLEM SETTING AND OBJECTIVE

As a result of such factors as population increased without corresponding improvement in the standard of living of the people, stagnation of fish production because of pressure on capture fisheries accompanied with poorly developed aquaculture has made aquaculture

fish production remained static or decreased. Low income levels, inadequate storage and processing infrastructure and the lack of marketing and distribution channels necessary to commercialize fish products, market penetration, the density and quality of transportation and distribution infrastructure also contributes to low aquaculture fish production in the study area. The drastic and rapid diminishing of production from capture fisheries in the predominantly fishing communities and the insecurity situation has increasingly threatened livelihoods, food security and the culture of the fishing dependent communities as a result of rural – urban migration which has affected millions of people due to population density of the study area which has affected the economy of the state at large. With capture fisheries production stagnating, the need to look beyond capture fishing to embark in modern aquaculture fish production most importantly, finding ways to involve in large scale aquaculture fish production and to sustain fish production. To achieved this; the need for comparative analysis of socioeconomic characteristics of aquaculture fish farmers for the determination of the level of influence of the socioeconomic variables on the status of the aquaculture fish farmers for subsequent identification and formulation of policy framework that will suit the peculiar problems of the farmers with the aim of embarking on sustainable large scale aquaculture fish production in the study area. The research work outcome would enable the individual fish farmers to make investment in a large-scale production and provide a basis for an approach to individual fish farmers by government and other non-governmental organization to ensure optimal utilization of resource endowment of the state. The information acquired may serve as a source of data to individuals, groups, agencies, organizations both governmental and non-governmental for decision making in order to produce actions that may improve the living and working condition of fish farmers for overall development of fisheries sector of the economy. Data collection for the research work was carried out within the period of thirty-one (31) days from 14th March, to 13th April, 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 a high demand for fish as a result of religious events and other festivities.

METHODOLOGY

The study was carried out in Jere and Konduga Local Government Area of Borno State of Nigeria. Borno State 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 Lake 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 $11^{0}40^{1}$E and $12^{0}05$ N and longitudes $13^{0}50^{1}$and $12^{0}\ 20^{1}$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 (Tijjani et al., 2010). 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 58 ^{0}C to 106 ^{0}C and is rarely below 52 ^{0}C or above 110 ^{0}C. The hot season lasts for 2.4 months from March 14th to May 27th with an average daily high temperature above 102 ^{0}C. The hottest month of the year in Khaddamari is May, with an average high of 103 ^{0}C and low of 80 ^{0}C. The cool season lasts for 2.1 months, from July 20th to September 23rd with an average daily high temperature below 92 ^{0}C. The coldest month of the year in Khaddamari is January, with an average low of 59 ^{0}C and high of 92^{0}C. 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 (OCHA, 2018). 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: 11^0 39' 6'' N, 13^0 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 (Kawuwa et al., 2007). 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 58 ^{0}C to 106 ^{0}C and is rarely below 52 ^{0}C or above 110 ^{0}C. The hot season lasts for 2.4 months, from March 11th to May 24th, with an average daily high temperature above 102 ^{0}C. The hottest month of the year in Konduga is April, with an average high of 105 ^{0}C and low of 77 ^{0}C. The cool season lasts for 2.1 months, from July 20th to September 22nd with an average daily high temperature below 92 ^{0}C. The coldest month of the year in Konduga is January, with an average low of 59 ^{0}C and high of 92 ^{0}C. 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 (OCHA, 2018).

The study area has a 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, Nigeria respectively. Twenty (20) respondents, fish farmers were used from each of the two (2) local government areas, made a total number of forty (40) respondents for the study. Fish farmers that are engaged in concrete pond fish farming method were considered for the purpose of this study (Figure 1). Sources of data for the study were obtained from 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 questionnaires were administered on comparative analysis of the socioeconomic characteristics of aquaculture fish farmers in the study area. Secondary data was obtained from the farmer's 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 of Nigeria.

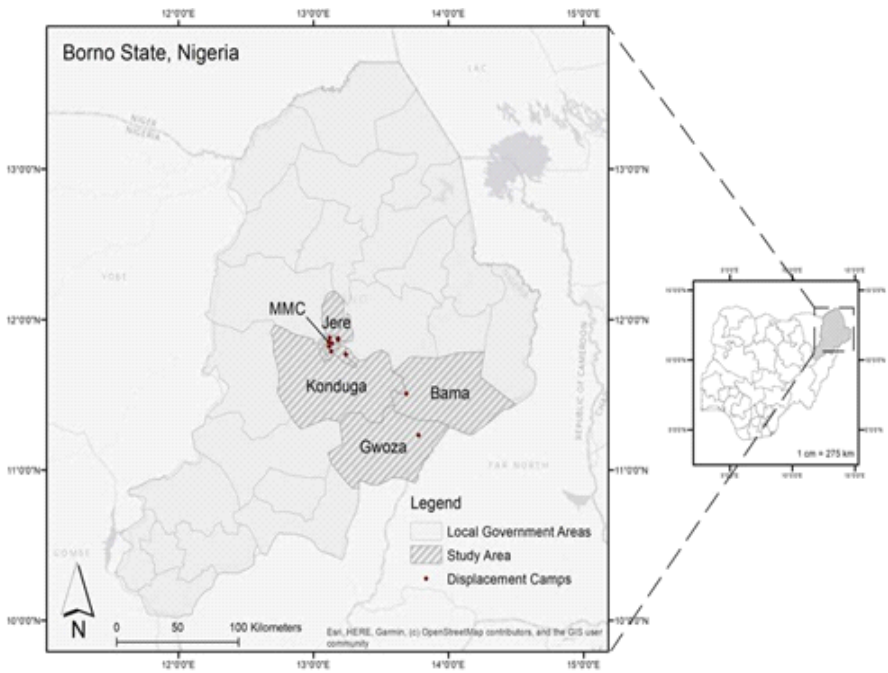

Fig 1: Study Area Map (Source: Field Survey, 2023)

Quantitative technique with descriptive statistics was employed in the comparative analysis and interpretation of the data on the socioeconomic characteristics of aquaculture fish farmers in the study area. Three comparative classification were made; high, low and lowest categories in both Jere and Konduga Local Government of the study area. Emphasis was given to two extremes observation in each of the local government "high, lowest and or low" classifications for easy analogical deduction, conclusion and subsequent possible experimentation as applicable. 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 central 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" (religious sect advocating a conservative interpretation of Islam often incorrectly translated as Western Education is forbidden: this group of people had almost affected all the rural fishing communities in the state). The insurgency had ravaged almost all the fishing communities in Borno State of Nigeria made the population of the study area increased due to inflows of internally displaced people (IDPS) in to Jere Local Government Area and part of Konduga Local Government Area. In the second stage twenty (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 twenty (20) fish farmers from Jere Local Government Area and another twenty (20) from Konduga Local Government Area made a sample size of forty (40) respondents for the study.

RESULTS AND DISCUSSIONS

Comparative Analysis of Socioeconomic Characteristics of Aquaculture Fish Farmers in Jere and Konduga Local Government of the Study Area

Table 1 & 2: shows the socioeconomic characteristics and comparative analysis of socioeconomic characteristics of aquaculture fish farmers in Jere and Konduga Local Government of the Study Area. The age distribution of the respondents shows most of the aquaculture fish farmers were within the productive age range of 48 years and above (60%) was recorded under this range as high percentage followed by 20% within the age range of 43 – 48 and 10% respondents were recorded within the age ranges of 26–30 and 31–36 respectively in Jere Local Government Area. While the age distribution of the respondents in Konduga Local Government Area of the study area shows (50%) high within the range of both 31–36 and 48 years and above and no other age groups recorded in Konduga Local Government Area of the Study Area. Cumulatively, Jere Local Government Area of the study area recorded highest within the productive age range of 48 and above with (60%) highest. As majority of the fish farmers were within productive age range in the study area it has positive influence on the level of production.

The comparative socioeconomic variable of age distribution of the fish farmers shows high percentage of 60% fish farmer fall within the age range of 48 years and above with lowest number of 10% fish farmers each under the age range of 24 to 30 and 31 to 36 years of age range distribution respectively in Jere Local Government Area considering the fact that zero observation was realized under lowest category in Konduga Local Government Area of the study area.

This result shows consistency with the findings of Ifeoma et al., (2019) identified, the low patronage of the sector by the vast majority of young people as a result of disincentive, poor access to formal credit facilities, difficulty in land acquisition, inadequate

water supply, poor source of fingerlings, extension services, poor road network and transportation, epileptic power supply, poor storage facilities, poor access to modern technologies, scarcity of fingerlings, unstable prices of fingerlings, inadequate information on management practices, limited knowledge on diseases, limited knowledge on health management in fish farming and the unavailability of high quality fish feed.

Table 1: Comparative Analysis of Percentage Distribution of Aquaculture Fish Farmers According to Socioeconomic Characteristics in Jere and Konduga Local Government Area, Borno State, Nigeria

Jere Local Government Area			Konduga Local Government Area		
Characteristics	**Frequency**	**Percentage**	**Characteristics**	**Frequency**	**Percentage**
Fmrs Age Range	**-**	**-**	**Fmr Age Range**	**-**	**-**
Less than 26	00	00	Less than 26	00	00
26 - 30	02	10	26 - 30	00	00
31 - 36	02	10	31 - 36	10	(50) *
37 - 42	00	00	37 - 42	00	00
43 - 48	04	20	43 - 48	00	00
48 and Above	12	(60) *	48 and Above	10	(50) *
Total	**20**	**100%**	**Total**	**20**	**100%**
Educ. Status	**-**	**-**	**Educ. Status**	**-**	**-**
Primary Educ.	00	00	Primary Educ.	00	00
Secondary Educ.	02	10	Secondary Educ.	00	00
Tertiary Educ.	16	(80) *	Tertiary Educ.	16	(80) *
No Education	02	10	No Education	04	20
Total	**20**	**100%**	**Total**	**20**	**100%**
Household Size	**-**	**-**	**Household Size**	**-**	**-**
1 - 4	04	20	1 - 4	00	00
5 - 8	12	(60) *	5 - 8	04	20
9 and Above	04	20	9 and Above	16	(80) *
Total	**20**	**100%**	**Total**	**20**	**100%**
Farming Expr.	**-**	**-**	**Farming Expr.**	**-**	**-**
0 - 4	04	20	0 - 4	00	00
5 - 9	10	(50) *	5 - 9	12	(60) *
10 - 14	06	30	10 - 14	04	20
15 - 19	00	00	15 - 19	02	10
20 - 24	00	00	20 - 24	00	00
25 and Above	00	00	25 and Above	02	10
Total	**20**	**100%**	**Total**	**20**	**100%**

Ext. Agt. Contact (Monthly)	**-**	**-**	**Ext.Agt.Contact (Monthly)**	**-**	**-**
None	16	(80) *	None	06	30
Once	04	20	Once	04	20
Twice	00	00	Twice	10	(50) *
Total	**20**	**100%**	**Total**	**20**	**100%**
E/Agent Source	**-**	**-**	**E/Agent Source**	**-**	**-**
Tertiary Inst.	04	20	Tertiary Inst.	08	(40) *
Govt. Ministries	00	00	Govt. Ministries	02	10
Private Sector	00	00	Private Sector	00	00
None	16	(80) *	None	06	30
Others	00	00	Others	04	20
Total	**20**	**100%**	**Total**	**20**	**100%**
Cooper. M/ship	**-**	**-**	**Cooper. M/ship**	**-**	**-**
Yes	00	00	Yes	04	20
No	20	(100) *	No	16	(80) *
Total	**20**	**100%**	**Total**	**20**	**100%**
Monthly Income	**-**	**-**	**MonthlyIncome**	**-**	**-**
Less than N28000	00	00	Less	02	10
N29000 - N39000	00	00	thanN28000	00	00
N40000 & Above	20	(100) *	N29000 -N39000	18	(90) *
			N40000& Above		
Total	**20**	**100%**	**Total**	**20**	**100%**
Marital Status	-	-	**Marital Status**	-	-
Single	06	30	Single	00	00
Married	14	(70) *	Married	18	(90) *
Widow	00	00	Widow	02	10
Divorce	00	00	Divorce	00	00
Total	**20**	**100%**	**Total**	**20**	**100%**
Other Occupatn	**-**	**-**	**Other Occupatn**	**-**	**-**
Business	02	10	Business	06	30
Civil Service	12	(60) *	Civil Service	04	20
Agricultural Prod.	06	30	Agricultural Prod	10	(50) *
Total	**20**	**100%**	**Total**	**20**	**100%**

Source: Field Survey, 2023, Multiple responses were recorded. Note: The Symbol (*) Indicates High Percentage (%) Recorded.

This result confirmed that of Amachree (2019) partly as 40% of the aquaculture fish farmers are within the age range of 31–40 years, while aquaculture fish farmers below the age range of 30 years was 14%. The least age group was recorded 16% range below the age of 26 years considered economically active, productive and signify better future for catfish production in the study area.

The educational status of the respondents in the study area indicates majority of the fish farmers have undergone tertiary education both in Jere and Konduga Local Government Area of the Study recorded high with (80%) in each of the two

Local Government Areas of the Study. Followed by no education with (20%) in Konduga Local Government area, no education with (10%) in Jere Local Government Area and secondary education with 10% also in Jere Local Government Area of the study respectively. Cumulative result indicates fish farmers in the study area have undergone tertiary education with (80%) recorded highest in both the Local Government Areas of the Study. The high literacy level of the fish farmers may contribute positively in exposing the fish farmers to advance method of fish farming in a facilitated manner in the study area.

Under the fish farmer's educational status comparative analysis 80% of the fish farmers reveals high with tertiary institution qualification in both Jere and Konduga Local Government Area of the study. Followed by 10% fish farmers with secondary school qualification and 10% fish farmers with no education under low classification in Jere Local Government Area of the study area as no entry for lowest observation was revealed under this classification in the study area.

This result shows consistency with the findings of Kumar et al., (2015) due to the fact that education is very important in every aspects of productivity by farmers, it was confirmed that majority of the fish farmers 92% involved in fish production possessed middle level education while 8% are illiterates. As a result, it was noted that the fish farmers are participating in government developmental schemes and program as a result of their educational level.

Table 2: Comparative Analysis of the Degree of Impact of Socioeconomic variables of Aquaculture Fish Farmers in Jere and Konduga Local Government Area of the Study Area

Variables	Jere Local Government Impact Level (Scores) %			Konduga Local Govt. Impact Level (Scores) %		
	High	Low	Lowest	High	Low	Lowest
Age Range	60	20	10 (2)	50 (2)	-	-
Educational Level	80	10 (2)	-	80	20	-
Household Size	60	20 (2)	-	80	20	-
FarmingExperience	50	30	20	60	20	10 (2)
Contact with Ext. Agent	-80	20	-	50	-30	20
Sources of Ext. Agent	-80	20	-	40	-30, 20	10
Cooperative Membershi	-100	-	-	-80	20	-
Monthly Income in Nair	100	-	-	90	10	-
Marital Status	70	30	-	90	10	-
Other Occupation	60	30	10	50	30	20

Source: Field Survey, 2023, Multiple responses were recorded. Note: The Symbol () Indicates Two Observation of the Value, (-) None/No.

The household size of the fish farmers in the study area shows (80%) high within the household size range of 9 and above members, followed by 20% within the household size range of 5 – 8 members in Konduga Local Government Area of the Study. While that of Jere Local Government was recorded high with (60%) within the household range of 5–8 household size followed by 20% under the household ranges of both 1–4 and 9 above in Jere Local Government Area of the Study Area. The study area result indicates highest percentage of (80%) was recorded within the household range of 9 and above household size under Konduga Local Government Area and followed by 60% within the household range of 5 – 8 household size in Jere Local Government Area of the State. Thus, most of the fish farmers have high proportion of family sizes therefore cost of labor in the production process would be less as the members of the family may supplement the labor required in the production process.

The comparative analysis of the distribution of household size in the study area reveals 80% high fish farmers within the range of 9 and above family size in Konduga Local Government Area followed by 20% fish farmers under low classification both within the range of 1 to 4 and 9 and above respectively under Jere Local Government area as no lowest entry was revealed under the household size distribution in both the two local government areas of the study area.

This result agreed with the findings of Omale et al., (2022) majority of the fish farmers are with a large household size from 5 persons and above. This implies availability of labor for production. Increases saving of cash which is making extra income earnings to cater for the family needs.

The result of the farmer's years of experience in the study area indicates most of the farmers have 5-9 years farming experience in the study area under which (60%) was recorded high, followed by 20% within the years of experience range of 10–14 years and 10% were recorded under the years of experience ranges of 15–19 and 25 and above years respectively in Konduga Local Government Area of the Study Area. Under Jere Local Government Area of the Study (50%) was recorded high within the years of experience range of 5–9 years, followed by 30% under the years of experience range of 10 – 14 years and 20% within the years of experience range of 0–4 years respectively. Most of the fish farmers have less than 9 years of experience as the highest percentage recorded with (60%) within the age range of 5 – 9 years of experience in the study area. The impact of the years of experience of the fish farmers on aquaculture fish production may be less in the study area compared to study areas where the farmers have more than 10 years of experience in the fish farming industry.

Under the comparative distribution of fishing experience of the fish farmers Konduga Local Government scores 60% high of fish farmers having 5 to 9 years fishing experience and lowest observations of 10% farmers within the years of experience range of 15 to 19 years and 25 years and above each was revealed respectively. The two extremes status were both realized under the same Konduga local government area of the study.

This result was inconsistent with the findings of Cai and Zhou (2019) aquaculture is a millennia-old activity that has evolved slowly, often by building on traditional knowledge, advances gained through farmer curiosity, needs, positive experience and

errors or cooperation. As a result, it has expanded for centuries, integrated with its natural, social, economic and cultural environments. Major developments in aquaculture have benefited from scientific progress in the twentieth and twenty first-first centuries. The result in terms of growth has been unprecedented, and aquaculture now supplies more than half of the world's fish for human consumption.

Majority of the fish farmers lacks contact with extension agents in the study area as (80%) of the farmers recorded high with no monthly contact with extension agents followed by 20% with once monthly contact with extension agents in the study area of Jere Local Government Area of the study. The monthly contact of farmers with extension agents was recorded (50%) high with twice monthly contacts in Konduga Local Government Area of the study area, 20% once monthly contact with extension agents and 30% none monthly contact with extension agents respectively. This result shows majority of the fish farmers lacks contact with extension agents in the study area as indicated by (80%) highest observation recorded under none contact with extension agents in Jere Local Government Area of the study. Thus, there would possible repercussion of deterrence of aquaculture fish farming from rapid transformation to technological advance mode of aquaculture system of operation. Consequently, large scale aquaculture fish production may be difficult in short-term period as a result of the continual operation at a small-scale level which might have been facilitated with the intervention of the extension services inadequate in the study area.

The comparative analysis of the monthly contact with extension agents indicates high score of 80% farmers with none contact with extension agent and lowest observation of nil farmers with twice contact with extension agent in the same Jere local government of the study area as none of the two extremes percentage values for analysis was realized in Konduga Local Government of the study.

This result confirmed that of Obwanga et al., (2018) there exist weaknesses of aquaculture sector in the aspect of extension services in Egypt, Ghana, and Nigeria as a result of low funding for extension services, inadequate human resources to support extension services in a wider geographical area, Governmental departments are underfunded and understaffed, inadequate number of extension workers to cover the wider geographical areas.

Under the sources of contact with extension agents (80%) was recorded high with no sources of extension agents, followed by 20% with source of extension agent from tertiary institution in Jere Local Government Area of the study. Whereas in Konduga Local Government Area of the study (40%) of sources of extension agent from tertiary institution was recorded high, followed by 30% no contact with extension agents, 20% with contacts with extension agents from other sources and 10% with contacts with extension agents from government ministries respectively were recorded. Overly, (80%) was the high observation recorded as a result of the none sources of contact with extension agents under Jere Local Government Area of the study. This result qualified the findings of the none contacts with extension agents due to inadequacy of the sources of contact with extension agents as it may also result in the same repercussion as specified under the contact with extension agent category which reveals low level of productivity due to continual operation at small scale level considering the limited possibilities for expansion.

While distribution of the comparative analysis of the sources of contact with extension agent shows high observation of 80% fish farmers with no sources of contact with extension agents and nil observation of contact with extension agent from other sources was revealed as lowest category in the same Jere Local Government Area of the study (Table 3). Although 10% fish farmers were revealed in Konduga Local Government of the study with source of extension agent from government ministries which was not considered either of the two extremes observation in the study.

Table 3: Summary of the Degree of Impact of Socioeconomic variables on the Status of Aquaculture Fish Farmers in Jere and Konduga Local Government Areas of the Study Area

Level of Impact	Jere Local Government	Konduga Local Government
High Level	480 and -260, Total: 740%	640 and -80, Total: (720%) *
Low Level	210%	150 and -60, Total: 210%
Lowest Level	050%	(070%) *

Source: Field Survey, 2023, Multiple responses were recorded. Note: The Symbol (*) Indicates High observation recorded, (-) Indicates None/No Observation.

This result confirmed that of Obwanga et al., (2018) aquaculture extension is understaffed; fish markets handled mostly by unskilled persons mostly from poor background.

Under the Membership of a Cooperative Society (100%) was recorded high with none membership of farmers in cooperative society from Jere Local Government Area of the study. The Membership of Cooperative Society was recorded high with (80%) none membership and 20% membership in Konduga Local Government Area of the study. Cumulatively, this result shows highest percentage of (100%) non-membership was recorded in Jere Local Government Area of the study. Membership of cooperative society bring about rapid development to the sector as it results to awareness creation among members and other associated productive groups as members jointly agitate for problem solving matters relating to the sector thereby remedying all the obstacles of development, consequently, rapid development to the sub-sector. Finally, the findings of this category of membership of cooperative society with highest observation of (100%) non-membership indicates drawback to the sector in the study area.

The variable membership of fisheries cooperative society of the fish farmers comparatively reveals 100% high non membership of the fish farmers with 0% observation recorded under the lowest category in the study area drawn from Jere Local Government area although 20% fish farmers were observed in the low category as fish farmers with membership of fisheries cooperative society in Konduga Local Government

of the study area which was not considered as either of the two extremes observations.

This result shows inconsistency with the finding of Agbogah (2018) successful cases demonstrate social protection schemes as integral elements of the sector development strategy- linking formalization, fishing licensing and access to market. The review also suggests that fisher's organizations are key actors for strengthening and complementing state provision of social security.

The monthly income of the farmers indicates the farmers earn more than (US $25.28) only per month recorded at (100%) level high in Jere Local Government Area of the study. While (90%) was recorded high with farmer's monthly earnings above ($25.28) only, followed by farmer's monthly earnings of less than $17.43 only rated at 10% level in Konduga Local Government Area of the study. In totality Jere Local Government Area recorded the highest percentage level of monthly income of more than forty thousand naira than Konduga Local Government Area of the study with only (10%) difference. This indicates aquaculture fish farming is favorable in the study area as it enables most of the farmers in the study area earned ($25.28) and above monthly in the study area. Thus, aquaculture fish farming is profitable in the study area (Figure 2).

Fig 2: Monday Fish Market in the Study Area (Source: Field Survey, 2023)

The comparative analysis of monthly income of fish farmers in the study area reveals 100% high number of fish farmers in Jere Local Government of the study area earns more than fifty-dollar (US $25.28) monthly income with nil observations under the lowest category in the study area. Although 10% fish farmers earn monthly income of less than US $25.28 in Konduga Local Government of the study area which was not categorized as either of the two extremes observations.

This result shows consistency with findings of Nandi et al.,(2014) as a result of increase in income earned from fish farming there has been improvement in the socioeconomic wellbeing of the fish farmers. High level of dividend has been recorded from fishing activities as fish farmer's standard of living has improved as evident by better food, improved housing condition, clothing, education among others. The fish farmers have experienced increased in purchasing power as a result of the worthiness of fish farming.

Under marital status classification majority of the fish farmers are married recorded high with (70%), followed by 30% single in Jere Local Government Area of the study. While in Konduga Local Government Area of the study (90%) was recorded high under married category and (10%) are widow in the study area. Cumulatively, most of the fish farmers in the study area are married with high observation recorded (90%) under Konduga Local Government Area of the study. This qualifies the findings of the category of age distribution as majority of the fish farmers are above the age of 26years in the study area. The need for the involvement of more youths for active participation in fish farming as the majority falls under productive age group consequently will have positive effect on employment generation, youth empowerment, poverty alleviation and food security.

The comparative analysis of the marital status of fish farmers in Jere and Konduga Local Government of the study shows 90% high of the fish farmers are married while nil entry of marital status was realized under lowest category of comparative observation in both Jere and Konduga Local Government of the study area. Although 10% windows were revealed under low category of the classification in Konduga Local Government of the study area as no observation was recorded under lowest category in the study area.

This result confirmed that of Ayeloja et al, (2021) majority of the fish farmers are married rated at 77.5%, 20% are single and 2.5 are divorce and single.

Under the classification of other occupation of the fish farmers in the study area in addition to the aquaculture fish farming majority of the farmers in Jere Local Government Area of the study are civil servant as recorded (60%) high, followed by 30% of the farmers engage in other agricultural production and 10% in other form business activities such as tailoring, transport, mechanical and electrical repairs business, carpentry etc. In Konduga Local Government Area of the study the fish farmer's engagement in other agricultural production activities was recorded at (50%) high followed by business activities rated at 30% and the aquaculture farmers that are civil servant was recorded 20%. Overall, 60% was recorded high under the civil service sub-category of other occupation in the study area under Jere Local Government Area of the study. This result indicates majority of the aquaculture fish farmers practice fish farming as secondary occupation in addition to civil service as their primary occupation. This ensures labor efficiency and diversification of the economy resulting to optimal utilization of the state resource endowment.

The other occupation classification of the fish farmers in the study area shows 60% high number of fish farmers are civil servant and 10% of the fish farmers involves in business activities are categorized under lowest category of observation in Jere Local Government Area of the study as none of the observation in Konduga Local Government has fallen in either of the two extremes observations.

This result shows consistency with the findings of Pinello, Gee and Dimech (2017) although it was not stated here that there exists civil servant category but it has been clearly stated that 47% of small-scale fish farmers engage in crop production as main economic

activity more than the other group of fish farmers. Others involved 23% of the fish farmer's household engage in business activities such trading and or shop owning as their prime economic activity. Whereas 17% of the fish farmer's household consider aquaculture fish farming as their prime economic activity. Other group of 25% small scale fish farmers engage in cultural fishing activities as their as prime economic activity. This result confirmed to the findings of Sumanaa et al., (2023) majority of the aquaculture fish farmers 82.5% responded that they have not receive any funding outside the occupational source of income such as the crop production, business activities, aquaculture and cultural fishing activities which provided the respondents with income (100%).

Table 3 shows the summary of cumulative percentage impact of comparative analysis in the study area; Jere Local Government of the study area made high-level impact in the influence of the socioeconomic status of aquaculture fish farmers at total percentage value of 740% (740% - 260%) = 480% positive impact in the study area. Whereas Konduga Local Government Area of the study area made high level impact in the influence of the socioeconomic status of aquaculture fish farmers at total percentage value of 720% (640% - 80%) = 560% positive impact in the study area. Thus, cumulatively Konduga Local Government has more influence on the socioeconomic status of aquaculture fish farmers in the study area compared to Jere Local Government Area at 560% - 480% = 80% level. On the other extreme observation Jere Local Government of the study area made lowest-level impact in influencing the socioeconomic status of aquaculture fish farmers at total percentage value of 50% in the study area. Whereas Konduga Local Government Area of the study area made lowest level impact in influencing the socioeconomic status of aquaculture fish farmers at total percentage value of 70% in the study area. Therefore, cumulatively Konduga Local Government has more influence on the socioeconomic status of aquaculture fish farmers at the lowest level category compared to Jere Local Government Area in the study area at 70% - 50% = 20%.

This result is in line with the findings of Umesh et al, (2010) community-based aquaculture is an essentials tool that enable farmers accessing credits, technologies and markets; understand one another and exchange views concerning critical aspects such as experience, vital information and risk on the other hand; enforce mode of conduct; promote good management practices; increase bargaining power; and enhance community cohesion among others thus community-based management or cluster-based aquaculture serves as an effective way to empower disadvantageous stakeholders. The results of the study also confirmed the findings of Radheyshyam (2001), De and Saha, (2005) the accomplishment of such institutional framework requires a cooperation amongst the aquaculture fish farmers, organizational strength and tools and means of coordination that some community farmers may rarely possessed.

CONCLUSION

The study concerned with comparative analysis of socio-economic characteristics of aquaculture fish farmers of Jere and Konduga Local Government Area of Borno State, Nigeria. The findings of the socio-economic characteristics revealed the aquaculture fish

farmers engages in part-time fish farming and full-time in either of the other activities such as other agricultural production activities, business activities and or government service in the study area. Eighty percent (80%) majority aquaculture fish farmers are married with seventy percent (70%) majority 5-8, 9 and above household size members with low level years of aquaculture fish farming experience inconsiderate of their age range and having monogamous family with majority fifty-five percent (55%) no contact with extension agent. Majority aquaculture fish farmers fell within the age range of 37 to 42 and 48 above at ninety percent (90%) age range level. Eighty-five percent (85%) majority aquaculture fish farmers of the community have undergone tertiary formal system of education with infrastructural support and other social services but lacking in adequate supply of modern desired aquaculture fish production facilities and other services. Majority ninety-five (95%) aquaculture fish farmers earned $17.43 and above as income on monthly basis. Majority ninety percent aquaculture fish farmers in the study area were not registered members of any fish farming cooperative society in the study area. Comparatively, the result shows that Konduga local government has more influence on the socioeconomic status of aquaculture fish farmers at the high and the lowest level categories than Jere local government of the study area. Given the analysis presented and taking in to account the socio-economic characteristics of the aquaculture fish farmers; the study recommends that the government and non-governmental agencies with community level participation should jointly formulate a robust policy framework for the transformation of the socio-economic characteristics of the aquaculture fish farmers for the upliftment of the socio-economic wellbeing of the aquaculture fish farmers in the study area to meet the economic, social and environmental requirement for the attainment of truly sustainable aquaculture fish farming community.

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