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Original Paper

Artisanal Inland Water Fishing and Challenges of Livelihood Sustainability in Ibi Local Government Area, Taraba State Nigeria

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Abstract

This study examined challenges of livelihood sustainability from artisanal inland water fishing activities in Ibi LGA, Taraba State, Nigeria. Descriptive survey design was adopted. Purposive sampling was used in selecting 406 respondents from 12 communities in 6 political wards of the LGA. Descriptive statistics was used to analyse 401 questionnaires retrieved. Findings of the study reveal decline in daily fish catch from three baskets 10 years ago to only one basket presently. Also, income from fishing has declined from ₦150,000 ($192) monthly 10 years ago to less than ₦50,000 ($64) presently. Factors responsible for decline in fish catch include rising water level, temperature increase, pollution, climate change, seasonality and unsustainable fishing practices. The unsustainable fishing practices include use of chemicals, small size nets and mosquito nets in fishing. The results reveal that fishermen engaged in non-fishing activities, fish farming and construction of fishing ponds along the floodplain as a way of achieving livelihood sustainability. Challenges of livelihood sustainability include seasonality of fishing activities, decline in fish stocks, use of traditional fishing methods and unsustainable fishing practices among others. The study recommend the need to enforce extant laws on fishery protection, enlightenment campaign, and government support to fishing cooperatives.

Keywords

artisanal fishing, fishfolk, inland water and livelihood sustainability

1. Introduction

The low economic diversity of the African continent with the attendant rise in unemployment makes artisanal fishing a big source of income for many riparian communities. More than 200 million people in Africa get their food from the small-scale sector (Stacey et al., 2021). Fishing is a large-scale, economically important industry that also has a big impact on the environment. This impact must be carefully managed to keep the environment from being destroyed in the long run.

In developing nations, especially Africa and Nigeria in particular, small-scale inland fisheries (SSIF) are an increasing source of income for people who live close to water bodies (Béné & Friend, 2009; Youn et al., 2014; FAO, 2016; Lammers et al., 2020). Fish is a major source of protein in many local communities in the poor countries and is essential for both human health and child development (Youn et al., 2014). Moreover, 20% of the population in sub-Saharan Africa relies on fish as their primary or exclusive source of protein (Sowman, 2020). It was estimated that 40% of the total supply was sold live, fresh, or chilled, 46% was turned into frozen, cured, or other types of fish that people can eat, and 14% was used in industry or for other non-food purposes (Andrews et al., 2021). Today, small-scale fisheries employ more than 85% of the world's capture fishers, giving local populations in developing countries access to secure sources of food and nutrition as well as a source of money (Welcomme et al., 2010, Funge-Smith, 2018). Fishing involves many activities and processes such as catching, processing, preservation, distribution and marketing of all landings (Hussaini et al., 2018) all of which provides different livelihood opportunities to the fishing communities.

The United Nations Food and Agriculture Organization (FAO) says that marine and inland fisheries and aquaculture gave the world about 148 million tons of fish worth $218 billion in 2010 (Andrews et al., 2021). In 2006, these industries had an economic impact of about US$660 billion, as measured by the average worldwide multiplier, which is the average economic effect of a dollar's worth of dock-sold fish. Recent studies have shown that Nigeria's current fish production stands at 1.2 million metric tons per annum, while the demand has risen to 3.6 million metric tons per annum (The Nation, 2022).

Bene (2020) and Allison and Ellis (2021) identify fishing as having a number of defining characteristics, including labor-intensive harvesting methods, small fishing vessels, short fishing trips, close proximity to land, a low relative catch per vessel, and a lack of capital investment. Therefore, small-scale fishing communities in developing countries are particularly at risk. It is crucial for small-scale fisheries to be able to adapt to the consequences of natural and human-caused pressures such as climate change, resource shortages, poor socioeconomic situations, and legislation (Smith, 2020). Ecosystems, biodiversity, and human systems are already feeling the effects of climate change consequences including increasing global average temperature and changes in precipitation patterns (Pauly, 2018). The fishing sector, defined as fisheries' capacity to provide food, income, and employment, is increasingly under pressure from climate change (Panayotou, 2020). Some of the short-term implications of climate change on fishing include loss of productivity and infrastructure due to the increasing frequency of severe weather events such floods, cyclones, and droughts, as stated by Garaway (2005).

There are enormous surface water resources, such as Rivers, streams, rivulet and ponds, in Taraba State. Rivers like the Benue, Taraba, and Donga, as well as their tributaries, fall within this category. About half a million acres of water and 140 ponds make up the state's total water area (TSEED, 2004). It has been estimated that the roughly over 390km of River Benue flows through the Local Government Areas of Ibi, Wukari, Gassol, Karim Lamido, Ardo Kola, and Lau in Taraba state of Nigeria (SEMA, 2012). The Taraba River flows through the local government areas of Gashaka, Bali, and Gassol before entering River Benue. On the other hand, the River Donga, a major tributary of River Benue flows from Sardauna LGA through Kurmi, Ussa, Donga, and Wukari LGAS before emptying into the Benue River. The Katsina Ala River flow through Kashimbila in Takum LGA. Fishing has therefore become an important human economic activity, after crop cultivation in the state. Some examples of these fish are the Tilapia (*Oreochromis niloticus*), Mudfish (*Clarias anguillaris*), silver side (Alestes macroleptilotus), silver catfish (Bagrus bayad), butter fish (Schilbemystus), tiger fish (Hydrocymus forscalii), nigra catfish (Synodontis nigrita), osteoglossus (Heterotis niloticus), sailfins (Polypterus senegulus), etc (Oruonye, 2014).

Annual fish output in the state averages 1,987 metric tons (TSEED, 2004). About 3000 kg of fish are caught daily in several LGAs including Ibi, Lau, and Donga. Over 30,000 households in the state make fishing their primary source of income (TSEED, 2004). More so, the state has ethnic groups who are predominantly known for artisanal inland water fishing activities that are not only restricted to Taraba State but beyond the shores of Nigeria. This ethnic group are the Jukun Wanu of Ibi LGA in Taraba State. Today many temporary migratory Jukun Wannu fishing camps are found doting the land scape all over the inland waters and the Lake Chad area and Cameroon and Niger Republic (Oruonye, 2014). Jukuns are the predominant tribes in Ibi local government area such as Jukun Dampar, Jukun Wapan, Jukun Wannu and Jukun Wurbo with several other minority tribes. These Jukun ethnic groups have a fishing festival called Nwonyo fishing festival held every year in Ibi Local Government Area (LGA) of Taraba State. In 2009's competition, a 230-kilogram fish was the heaviest one caught. Bantaji, Tella, Gindin Dorowa, Ibi, Donga, and Lau are some of the best-known fish market towns in the state. Traders from all over the region come to purchase fresh, dried, and smoked fish (Oruonye & Abbas, 2011).

Several studies have been carried out on fishing in Nigerian rivers and lakes including Imo River, Warri River, and Lake Enugu (Ogunremi et al., 2022) but not much has been done on rivers in Taraba State and Ibi waters in particular. This study examines artisanal inland water fishing and challenges of livelihood sustainability in Ibi local government area, Taraba State Nigeria.

1.2 Statement of the Research Problem

Fishing is a very important activity on inland waters in the study area. It gives the inhabitants protein, jobs, and money (Amos & Peter, 2018). Most people in Ibi local government area of Taraba State have relied on fishing for their income and livelihood for a long time and still do. However, the problems facing the fishing industry as a whole have been largely ignored. Each of these challenges are interconnected. Because of pollution, the quality of the water has depreciated, which has led to fewer

fish catch. Also, the catchment area has deteriorated, which has speed up erosion and sedimentation in and around the river (Aletor, 2021). But it is also common to overfish and use fishing methods that are not sustainable, like chemicals that hurt the environment in inland waters. Small-scale fishermen and other people who depend on the river's environment have been hit hard by the decline in fish capture (Amos & Peter, 2018).

Similarly, the use of small nets to catch fingerlings affects the ecological balance of the river (Chilaka et al., 2013). This has had a big effect on how long people can make a living from fishing in the study area, which has led some people to turn to farming and other jobs (Nunoo et al., 2015). In the light of the above, this study examines the challenges of livelihood sustainability of artisanal inland water fishing in Ibi local government area.

1.3 Conceptual Clarification

1.3.1 Sustainable Fishing

Sustainable fishing arises from the need to protect the fishery resources and ensure that fish harvest is done at a sustainable rate, where the fish population does not decline over time because of fishing practices. The necessity to safeguard fishery resources gives rise to the concept of sustainable fishing, which ensures that fish are harvested at a rate that prevents the fish population from declining over time due to fishing techniques. Schijvenaars (2017) defines sustainable fishing as "The harvesting of fish stocks in a manner that maintains and enhances health and resilience of the marine ecosystem and the socio-economic welfare and viability of the present generations without compromising the ability of future generations to meet their own needs". Sustainable fishing entails preserving adequate fish in the ocean and rivers while also preserving threatened species' habitats. The preservation of rivers and oceans contributes to the preservation of the oceans and the people who depend on fishing for a living.

In the past, fisheries resources were believed to be infinite, but now have been revealed to be finite, which has led to a worldwide fisheries crisis (Pauly et al., 2002; Worm, 2016). The amount of fish that rivers and oceans can produce or support at our current pace of collection is limited because they have a limited capacity to develop new biomass across the periods on which we need it (Pauly & Christensen, 1995 cited in Kochalski, 2017). The total catch of fish is capped, but so are the total fish stocks. Modern fishing technique had improved to the point where overfishing and the depletion of fish resources had already become problems during the first half of the 20th century.

1.3.2 Sustainable Livelihood

Robert Chambers of the Institute of Development Studies (IDS) is largely credited with developing the idea of sustainable livelihood, which arose from rural development. According to Krantz (2001), a livelihood is an environment with resources that provide a means of subsistence and that offer sufficient amounts of money and food. Sustainable means long-term resource development that doesn't jeopardize the resources for future generations. A livelihood may become sustainable if one has access to land ownership, or livestock, or fishing, hunting or any source of stable employment that allows a stable source of income (Kadozo, 2009).

According to Carney (1998), a livelihood consists of the skills, possessions, and pursuits necessary to support oneself. A livelihood is sustainable if it can withstand stresses and shocks, recover from them, and retain or improve its capacities and resources both today and in the future without compromising the natural resource base. The sustainable livelihood approach, according to Lloyd-Jones (2002), strives to put individuals and the households in which they live at the center of the development process, starting with their strengths and assets rather than their problems. It suggests that meaningful labor should be available through sustainable livelihoods in order to meet the present and future social, economic, cultural, and spiritual requirements of every member of a society, whether they be people or non-people, and to protect both biological and cultural variety.

According to Moriarity (2002), this suggests that people should be able to earn enough money to cover necessities like food, clothing, and housing in order to live respectably. A definition of sustainable livelihoods, however, ought to go beyond the bare minimums of clothing, shelter, and food. The goal is to achieve a standard of living that is ingrained in the diverse local cultures of numerous places.

2. Methodology

2.1 Description of the Study Area

Ibi LGA is located between latitude 7°55'N to 8°43'N and longitude 9°30'E to 10°26'E. The town is located on the south bank of the Benue River, opposite the mouth of the Shemankar River. Ibi town is a river port in Taraba State located in east-central Nigeria. Ibi LGA with a landmass of 2,728km^2, has a population of 84,054 (45,350 male and 38,704 female) according to the 2006 national census and projected population of 130,055 inhabitants (Oruonye & Abbas, 2011). Ibi LGA has three large districts, namely; Ibi, Dampar and Sarkin Kudu. The major ethnic groups are the Jukun, Hausa-Fulani, Wurbo and Tivs. Other tribes such as Wurkum, Kakanda, Nupe, Jenjo and Angas are found in different parts of the Local Government Area. The major occupation of the people is farming and fishing. Ibi LGA is a lowland area with 2,073.47 km^2 plain and 655.40km^2 wetland (Oruonye & Abbas, 2011). The LGA is drained by river Benue and its tributaries such as the Shemankar river. Geological survey revealed that minerals such as Byrate are found in large quantity in the LGA.

Ibi LGA has a tropical wet and dry climate. The dry season lasts at least five months (from November to March), whereas the rainy season runs from April to October. The average annual precipitation in the study region is between 800 and 1200 mm. Average annual temperatures in the area are 30.4°C. The vegetation of Ibi LGA is Guinea Savannah made up of forests and tall grasses.

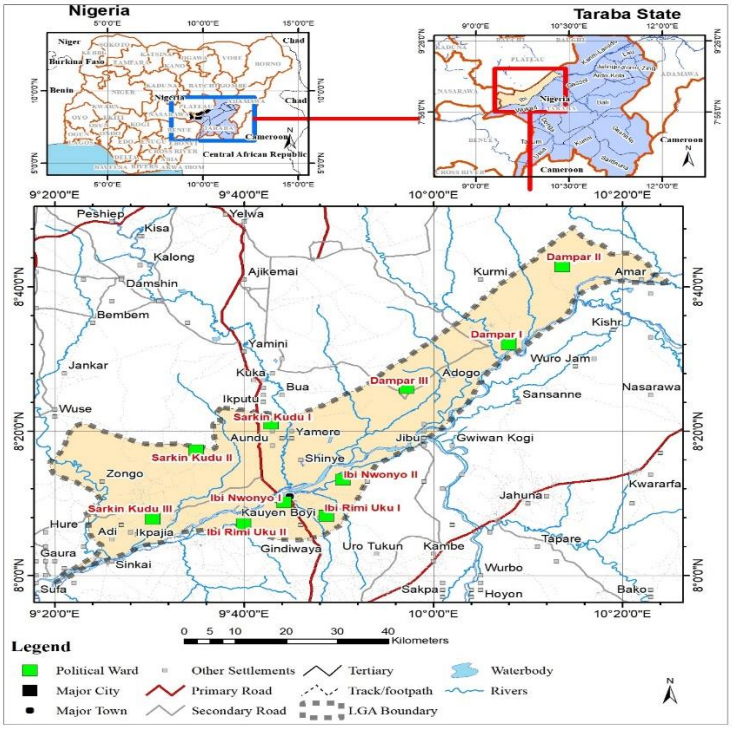

Figure 1. Map of Ibi LGA

2.2 Materials and Methods

The study adopted survey research design, which involves the use of a researcher-developed questionnaire and direct observation. Multistage sampling was employed in the study; purposive sampling was used in selecting 12 communities from 6 political wards out of the 10 political wards in the LGA. The 6 wards are Dampar I, Ibi Nwonyo I and Ibi Nwonyo II, Ibi Rimi Uku I and Ibi Rimi Uku II and Sarkin Kudu III. Simple random sampling was used to select the fishermen who were administered with questionnaire. Slovin's method of sample determination was used to determine the sample size as follows:

$$n = P\frac{N}{1+N\,(e)2}$$

N = Total Population 731

n = Sample

e = is the confidence level at 0.05

Substituting into the formula,

n=N/1+N (e) 2

$$n = \frac{731}{1 + 731\,(0.05)2}$$

$$n = \frac{731}{1.8}$$

$$n = 406.1$$

Therefore, n = 406 respondents.

Four hundred and six (406) fishermen were sampled out of the 750 total number of fishermen in the study area. The questionnaire was administered through an assistant engaged to interprete the questionnaire into local language in all the selected wards. The study was conducted between April and June, 2023. This is because it was the fishing season when most fishermen were in the river. The data was collated and analyzed using SPSS (version 25) and descriptive statistics.

3. Result of the Findings

3.1 Demographic Characteristics of Respondents

The findings of the study on the demographic characteristics of respondents is presented in Table 1.

Table 1. Demographic Data of Respondents

Options		**Frequency**	**Percentage (%)**
Gender:	Male	349	87.0
	Female	52	13.0
	Total	**401**	**100%**
Age:	18 – 29	43	10.7
	30 – 41	87	21.7
	42 and above	271	67.6
	Total	**401**	**100%**
Level of Education:	Primary	63	15.7
	Secondary	18	4.5
	Tertiary	9	2.2
	No Formal Education	311	77.6
	Total	**401**	**100%**
Marital Status:	Single	92	22.9
	Married	297	74.1
	Divorced/Separated	5	1.2
	Widowed	7	1.7
	Total	**395**	**100%**
Ethnic Group:	Jukun Wanu	299	74.6
	Jukun Wapan	13	3.2
	Jukun Wurbo	63	15.7
	Hausa	26	6.5

	Others	0.0	0.0
	Total	**401**	**100%**
Household Size:	1 – 5	103	25.4
	6 – 10	251	62.8
	11 – 15	40	10.0
	16 and above	7	1.7
	Total	**401**	**100%**

Source: Field Survey 2023

The result in Table 1 reveals that male respondents in the study represent 87.0% while female respondents were 13.0%. The age bracket of the respondents shows that most of them are within the age bracket of 42 years and above (67.6%), followed by those in the age bracket of 30 – 41 years (21.7%), 18 – 29 years formed the lowest with 10.7%. Based on the level of education of the respondents, the result of the findings of the study reveal that majority of the respondents have no formal education (77.6%), followed by those with primary education (15.7%), secondary education (4.5%) and tertiary education (2.2%). The result shows married respondents as (74.1%), single respondents (22.9%), widowed/separated (1.2%) and widowed (1.7%). The result in Table 1 further reveal that 74.6% of the respondents are Jukun Wanu, 15.7% were Jukun Wurbo, 6.5% Hausa and 3.2% Jukun Wapan respectively. Table 1 reveal that the household size of the respondents ranges from 6 – 10 (62.8%), 1 – 5 (25.4%), 11 – 15 (10.0%), and the least being those having household size of 16 and above represented by 1.7%.

3.2 Fish Catch in the Study Area

The result of the findings on fish catch in the study area is presented in Table 2.

Table 2. Fish Catch in the Study Area

Daily fish catch presently	**Frequency**	**Percentage**
One basket	385	96.0
Two baskets	11	2.7
Three baskets	5	1.2
Total	**401**	**100.0**
Daily fish catch 5 years ago		
One basket	48	12.0
Two baskets	299	74.6
Three baskets	51	12.7
Four baskets and more	3	.7
Total	**401**	**100.0**
Daily fish catch 10 years ago		

One basket	22	5.5
Two baskets	101	25.1
Three baskets	200	49.9
Four baskets and more	78	19.5
Total	**401**	**100.0**

Source: Field Survey, 2023

Table 2 shows that 96.0% of the respondents claimed that they make daily fish catch of one basket presently, while 2.7% and 1.2% of the respondents claim they make daily fish catches of two baskets and three baskets respectively. The findings of the result on Table 2 indicates that 74.6% reported that their daily fish catches 5 years ago was two baskets, while 12.7% and 12.0% of the respondents claim they make daily fish catches of three baskets and one basket respectively. On the other hand, 0.7% of the respondents claim they make daily fish catches of four baskets and more five years ago.

The results in Table 2 also reveals the daily fish catches of artisanal fishermen in Ibi Local Government Area ten (10) years ago. Table 2 reveal that 49.9% of the respondents claim that they have daily fish catches of three baskets 10 years ago and 25.1% reported that their daily fish catch was two baskets and 19.5% reported their daily fish catch of four baskets and more 10 years ago. On the other, hand 5.5% reported that their daily fish catches ten years ago was one basket, that is to say, fisher men had more catches in the past than present.

3.3 Income from Artisanal Fishing in the Study Area

The Result of the Findings on the Income from Artisanal Fishing in the Study Area Is Presented in Table 3

Table 3. Income from Artisanal Fishing in the Study Area

Monthly Income	Frequency	Percentage (%)
Present		
50,000 - 100,000	323	80.6
101,000 - 150,000	67	16.7
151,000 and above	11	2.7
Total	**401**	**100.0**
5 years ago		
50,000 - 100,000	105	26.2
101,000 - 150,000	221	55.1
151,000 and above	75	18.7
Total	**401**	**100.0**
10 years ago		
50,000 - 100,000	50	12.5

101,000 - 150,000	209	52.1
151,000 and above	142	35.4
Total	**401**	**100.0**

Source: Field Survey 2023

Result of the findings in Table 3 reveal the income from artisanal fishing activities in Ibi local government area. The result reveals that 80.6% of the respondents claimed that they make ₦50,000 – ₦100,000 ($64 - $128 at exchange rate of ₦781/$1) as monthly income from fishing activities presently, 16.7% and 2.7% of the respondents claim they earn ₦101,000 – ₦150,000 ($128 - $192 at exchange rate of ₦781/$1) and ₦151,000 ($192) and above presently. The result on Table 3 indicates that 55.1% of the respondents claim to earn daily income of ₦101,000 – ₦150,000 five years ago from fishing activities, 26.2% and 18.7% earned ₦50,000 – ₦100,000 and ₦151,000 and above respectively from fishing activities 5 years ago.

The result of the findings in Table 3 reveals that 52.1% of the respondents claim that they make monthly income of ₦101,000 – ₦150,000 ten years ago, 35.4% of the respondents claim they earn ₦151,000 and above from fishing activities ten years ago, while only 12.5% of the respondents reported that they earn ₦50,000 – ₦100,000 ten years ago from artisanal inland water fishing activities in Ibi local government area of Taraba State. These also indicates greater fish capture in the past than present.

3.4 Factors Responsible for Decline in Fish Catch and income from Fishing Activities

The result of the findings of the study on factors responsible for decline in fish catch and income from fishing activities in the study area is presented in Table 4.

Table 4. Major Factors Responsible for Decline in Fish Catch and Income from Fishing Activities

Factor	Frequency	Percentage (%)
Rising water level	22	5.5
Temperature increase	5	1.2
Pollution	143	35.7
Seasonality	101	25.2
Climate change	130	32.4
Total	**401**	**100.0**

Source: Field Survey, 2023

The result in Table 4 indicates that, 35.7% of the respondents claim that pollution is the major factor responsible for decline in fish catch, 32.4% claim it was climate change, 25.2% claim it was seasonality, 5.5% rising water level and 1.2% temperature increase respectively. The pollution factor could be attributed to the dumping of plastic, polythene and other non-biodegradable and biodegradable wastes at

increasing rate along the river banks by passersby and by the fishermen themselves. Some of these pollutants are from flood and erosion runoffs during the wet seasons. The result of rising water level as claim by 5.5% of the respondents could be attributed to increased rainfall and opening of dam upstream of River Benue which results in flooding in the study area.

3.5 Challenges of Livelihood Sustainability Among Fishermen

The result of the findings on the challenges of livelihood sustainability among artisanal inland water fishermen is presented in Table 5.

Table 5. Challenges of Livelihood Sustainability among Fishermen

Factor	Frequency	Percentage (%)
Use of chemicals	143	35.7
Use of mosquito nets in fishing	101	25.2
Health challenges	83	20.7
Inadequate refrigerators	61	15.2
Inadequate modern fishing equipment	13	3.2
Total	**401**	**100.0**

Source: Field Survey, 2023

The result in Table 5 indicates that, 35.7% of the respondents claim that use of chemicals in fishing is one of the challenges of livelihood sustainability faced by artisanal inland water fishermen, use of mosquito nets in fishing 25.2%, health challenges 20.7%, inadequate refrigerators for short time preservation of fish catch 15.2% and inadequate modern fishing equipment 3.2% respectively. On the use of chemicals, the findings of the study reveal that the type of chemical used in fishing in the study area is the gamalin. This chemical is often used in killing fishes in order to make it easier for the fishermen to catch large quantity of fishes at a time. Although this action may yield immediate benefit to the fishermen, it kills both matured and juvenile fish stocks, which apparently distorts the ecological balance of the fish population in the waters. The use of small size nets in fishing could be attributed to lack of the necessary resources to purchase larger nets and other gears that will enable them to catch larger volumes of fishes. The study findings reveal that some fishermen used mosquito net in fishing. Some of the respondents claim that the use of mosquito nets in fishing was because of the decline in fish catch and the need to maximize their catch. The health challenges that most artisanal fishermen faced is malaria fever from mosquito bite. The swampy nature of the environment predisposes the people to incidence of malaria fever from mosquito bite.

3.6 Sustainable Livelihood Strategies Adapted by Fishermen in the Study Area

3.6.1 Engagement in Fish Farming

The declining stock of fish, fish catch and income from artisanal inland water fishing in the study area has forced many fishing households to undertake fish farming as strategies of enhancing their livelihood sustainability. The demand for fish is increasing daily as a result of increasing population while the fish supply is declining. Ogunremi et al (2022) reported drawing a sample of 600 fish farmers from the list of 740 fish farmers registered with the Department of Fisheries and Forestry of Ibi LGA, Taraba State. Notwithstanding the challenges associated with fish farming in the study area, the number of people joining the fish farming business is on the rise because of the enormous livelihood opportunities therein.

Plate 1. Fish Farming Reservoir

Plate 2. Artisanal Inland Water Fishing

3.6.2 Construction of Fishing Ponds along the Floodplain

The findings of the study reveals that the fishermen in the study area construct artificial ponds along the floodplain of River Benue which traps the annual flood in the area during peak of the rainy season. As the flood water recedes, substantial volume of water and fish are trapped in such pond. The individuals that owns the fishing ponds employ security to protect the ponds from intruders and makes decisions about the time and method of fish harvesting to be used in the pond. Oruonye (2014) reported that the owners of the fishing ponds usually rent them out to prospective fishermen who also rent it out to others or at least collect fees from smaller artisanal fishermen. This practice helps the fishermen enhance their livelihood sustainability from artisanal fishing in the study area.

Plate 3&4. Fishing Pond on the Floodplain of River Benue in Ibi LGA

3.6.3 Non-fishing Activities

The result of the findings of the study shows that the various non-fishing activities that artisanal fishermen are engaged include farming petty trading and commercial transport to support their livelihood. The engagement of fishermen in non-fishing activities is common in most fishing communities. The study shows that all the respondents contacted are engaged in non-fishing activities beside their artisanal fishing preoccupation. These activities are meant to support their livelihood because income from fishing alone is not sufficient to cater for their basic needs and household expenses.

3.7 Discussion of Findings

The findings of the study reveals that the fish catch and income from fishing has declined. The factors responsible for the decline in fish catch in the study area are rising water level, temperature increase, pollution, climate change and seasonality. This findings of the study reflect the views of Gebrekiros (2016) that increases in river water temperature stress aquatic organisms by reducing the dissolved oxygen concentration of the water and disrupting the timing of thermal signals that trigger development stages, or by causing direct mortality. These affects volume of fish catch as there will be limited number of fishes available during fishing seasons, because a disruption in the developmental stages of fish means there will be a halt in procreation and continuity. Similarly, the result of this study is in line with the assertion of Fatima *et al.* (2019) that the surface water (from 0 to 700 m deep) has warmed on average by 0.7°C per century on a global scale between 1900 and 2016, implying that significant changes in aquatic communities have been strongly associated with global warming.

The findings of this study shows that the income of artisanal fishermen in the study area has decreased over the years from an average of ₦150,000 and above ten years ago to an average of ₦100,000 5 year ago to ₦50,000 or less presently. This findings of the study corroborate the findings of Paul *et al.* (2020) that long-term decrease in income from artisanal fishing is a worrisome development for rural communities that depends much on income from fisheries. The result of this study is also corroborated by the findings of Bailey and Jentoft (2020) which revealed that overfishing is a major issue in the fisheries industry, negatively affecting fisher families' ability to make a living via decreased revenue and profits, heightened rivalry for fishing areas, and even armed conflict. Furthermore, the result of this study

is in tandem with the views of Stark (2021) that damage to fisheries may occur either immediately, as a consequence of pollutant toxicity, or later, as a result of ecological shifts. Due to the organic nature of pollution, enrichment pollutants predominate, leading to eutrophication (the enrichment of bodies of fresh water by inorganic plant nutrients) and the subsequent deoxygenation (the removal of molecular oxygen from a solvent), as these nutrients are no longer present at their natural levels for primary producers. Particularly in inland areas, these circumstances may cause fish deaths, altering species diversity in ways that favor coarse fish. When fish stocks are depleted, fewer fish are caught per unit of effort (CPUE), reducing fishermen's revenue. This therefore implies that with decreasing volume of fish catch, which is associated with the income from fishing, the economic livelihood of the fishermen would be affected both in the short and long run.

The findings of the study reveal the existence of unsustainable fishing practices such as use of chemicals, small size fishing nets and mosquito nets. These has contributed greatly to decline in fish and other aquatic organisms in the river which translate into decline in fish catch and income from fishing in the study area. More worrisome is the health effect of using chemicals in fishing. Paul *et al* (2020) observed that fishermen are not necessarily the poorest of the poor, but they may be among the most vulnerable socioeconomic groups in societies due to their heightened vulnerability to natural, health-related, or economic shocks and disasters associated with their environment.

The current economic realities and changing climatic dynamics causes fluctuations in fish catch and income from fishing activities. The result reveal that, 97.8% reported that income from artisanal inland water fishing is not enough to cater for their needs and domestic expenses. On the other hand, only 2.2% reported that the income from fishing activities is enough to cater for their needs and domestic expenses. This implies that generally, income from fishing activities alone does not meet the needs of the fishermen and their domestic expenses.

4. Conclusion

This study has examined artisanal inland water fishing and challenges of livelihood sustainability in Ibi Local Government Area, Taraba State Nigeria. The study adopted the survey research design method. The findings of the study reveal that fish catch has reduced over the years from an average of 3 basket full daily 10 years ago to an average of 1 basket full daily at the moment. The income from artisanal fishing in the study area has also declined from an average of ₦150,000 and above ten years ago to an average of ₦100,000 five (5) years ago to ₦50,000 or less presently. The findings of the study reveal that the factors responsible for the decline are rising water level, pollution, climate change, seasonality and temperature increase respectively. As the artisanal fishing livelihood diminishes, they fishermen devised alternative strategies to enhance their livelihood sustainability such as the construction of fishing ponds along the floodplain of the river, engaging in fish farming and undertaking non-fishing activities such as crop farming and trading.

5. Recommendations

Based on the findings of the study, the following recommendations are made:

i. There is need for the government to enforce extant laws aimed at protecting the inland waters and the riparian ecosystem (especially those banning the use of chemicals, mosquito nets and small nets in fishing) through both the federal inland water authority and the LGA department of agriculture.

ii. There also need for sensitization and enlightenment campaign of the fishing communities by both the state government ministries of agriculture and health and the local government council on the dangers of using chemicals in fishing

iii. The state government need to support fishing cooperatives with modern fishing and fish processing equipment.

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