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Effects of Climate Variability on Fishing and Farming Activities in Yola North Local Government Area, Adamawa State, Nigeria

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Abstract: The study was conducted to determine the impact of climatic fluctuations on fishing and fish farming activities in Yola, Adamawa State. It assessed fish farmers' awareness of climate change, identified the fish species commonly found in Yola and its environs, examined the effects of climate change on fish farming, and evaluated the adaptive strategies employed by fish farmers in response to changing climatic conditions. Descriptive statistics were used to analyze the level of fish farmers' awareness of climate change and to identify the prevalent fish species in the study area, while the Pearson Product Moment Correlation was applied to determine the relationship between climate change and fish farming activities. The findings revealed that the majority of fish farmers are aware of recent climatic changes, although a few remain unaware. The study further showed that the major fish species caught in Lake Gerio and around Jimeta Bridge include Tilapia, Clarias, Mormyrus, and Lates niloticus, with Tilapia being the most frequently caught species. Additionally, the results indicated a positive relationship between rainfall variability and fish production, with an r-value of 0.145, suggesting that changes in climate conditions are likely to affect fish yield in the study area. Based on these findings, the study recommends urgent efforts to increase awareness and provide support to help fish farmers adapt effectively to the changing climate.

Keywords: Fish farming, Climate Change, Farmers Adaptation Strategies, Socio-economics status

INTRODUCTION

Climate change has become a global issue affecting varying degree of economic activities in different parts of the world. Its effects are being felt in different extent and nature by many countries, triggering change in economic response to the impacts (Ariko et al. 2024). Climate change is the complete variation or average state of the atmosphere over scales, ranging from decades to millions of years in a region or across the entire globe, and is caused by processes internal to the earth, external forces from space or human activities (Lemke, 2006). Climate change in the context of this study refers to the variation in the statistical distribution of average weather conditions over a prolonged period of time. Anthropological activities have influenced climate change causing increased effects on different sectors of agriculture and livelihoods in many communities of the world (Ariko et al. 2024). The major human activities attributed to have caused climate change is the increase of Greenhouse Gases (GHG) in the atmosphere resulting from gas flaring, fossil burning and deforestation arising from clearing of land for agricultural and industrial uses, in addition to other human activities that have led to increased concentrations of GHG especially carbon IV oxide (CO) (Intergovernmental Panel on Climate Change, [IPCC] 2007). The projected effects of climate change on agricultural production are numerous and varied. Fish is one of the most traded food commodities in Nigeria. Fish trade supports economic growth processes by providing an important source of cash revenue to service international debt, funding the operations of national governments, and importing food for domestic consumption, thus contributing to national food security and diversification of diets. However, the benefits gained from the sector are often ignored or understated in national economic planning. This is mainly because well over half of the fish produced in Nigerja are from small-scale artisanal fisheries which are often not accounted for in national statistics and thus their contribution to the economy and food security remains invisible (Mohammed & Uraguch, 2013). While the importance of fisheries is often understated, the implications of climate change for these sectors and for coastal and riparian communities in general are difficult to ignore Climate change poses significant threats to fisheries on top of many other concurrent pressures such as overfishing, habitat degradation, pollution, introduction of new species and so on (Brander, 2010). Globally, relative to the level that would support maximum sustainable yield, 20% of targeted fishery resources are moderately exploited, 52% are fully exploited with no further increases anticipated, 19% are overexploited, 8% are depleted and 1 per cent is recovering from previous depletion (Food and Agriculture Organisation [FAO], 2009). Changes in biophysical characteristics of the aquatic environment and frequent occurrence of extreme events will have significant effects on the ecosystems that support fish. This will affect food security in multiple ways. Firstly, extinction of some fish species means lower fish production for local consumption. Secondly, migration of many fish species to aquatic environments with optimal climatic condition will have a tremendous effect on fishers who follow fish due to political (borders) and economic reasons. Finally, since most of the fish harvested for export in many developing countries is supplied by small-scale fisheries this will lead to reduced fish production thus lower

earnings from fish export, and consequently reduced capacity to import food and exacerbation of national food insecurity. Since climate change affects a number of people globally especially as it relates to fisheries, studies on the nexus between climate change and fisheries are very important.

STUDY AREA

The study area is Yola North and its environs. Yola is located in Adamawa Central Senatorial Districts Adamawa State, Yola is located between latitude 9 00" and 9" 30" north of the equator and longitude 12° 00 and 12° 40 East of the Greenwich Meridian. Yola is however, bounded in the North by Girei Local Government Area (LGA), in the west by Demsa LGA, shares boundary with Mayo Belwa in the south west and shares boundary in the south and east with Fufore and Yola South LGA.

Figure 1: Adamawa State showing the study Area
Source: GIS LAB 2025

The climate of Yola North area exhibits typical tropical climate (Zemba, 2010). The study area has average sunshine hours of about 7-8 hours daily and the wind speed average of 76.1Km/hr. It has monthly mean sunshine hours of about 220 hours from January to April. This decreases to a mean value of 207 hours between May and September due to increases in cloud cover during the rainy season. The mean sunshine hours increase again to about 255 hours between October and December. The area is divided into two parts. The highland which constitutes the eastern and southern parts of the study area with sedimentary type of rocks (Bagale hills and Verre hills). The general elevation of the study area ranges from 700 to 1000feet. The low land consists mostly of sand and alluvium made up of the flood plains. Jimeta has both surface and ground water. The main surface water is the river Benue and its tributaries within the catchments which includes; river Chouchi and Njuwa Lalke which is the study area among others (Tukur & Adebayo, 1999).

Materials and Methods

Data collected for this study was obtained mainly from primary and secondary sources. The primary data was collected through the use of questionnaires and interview schedule. A total of 50 questionnaires were administered across the two fishing points; it was shared based on the population size of each fishing point. The secondary data was collected from journals, publications, seminar/workshop papers, texts and other relevant works. Maps were obtained from the ministry of land and survey. Climate data was obtained from Jimeta Yola. There were different fishing points along the bank of River Benue that flows within Jimeta, this study will use random sampling in administering questionnaires to fish farmers at those fishing points. The study employed the use of frequency distribution table and percentage was employed and this is due to the fact that percentage is one of the simplest statistical techniques often used in data presentation. Graphical presentation such as tables, charts, and histogram was used. Furthermore, correlation statistical analysis using SPSS statistical package was used to ascertain how climate specifically rainfall has affected number of fish harvested by each farmer.

Results and Discussions

Fishing Points distribution

Table 1 below shows the distribution of the Fishing point response of respondents that underwent the questioning process.

Table 1: Distribution of fishing points

Fishing	Number of respondents	Percentage
Lake Gerio	30	61.23
Jimeta	19	38.77
Total	**49**	**100**

Source: Field survey, 2025

It shows that 61.23%% of the total respondents fishing point was Lake Gerio which is the highest and the least were those whose fishing point were from Jimeta bridge with the value of 38.77%.

Gender distribution

Table 2 below shows the distribution of the respondent base on their gender.

Table 2: Gender Distribution of Respondents

Marital status	Number of respondents	Percentage
Male	42	82.71
Female	7	14.29
Total	**49**	**100**

Source: Field survey, 2025

It shows that 82.71% of the total respondents were male being the highest and the least were females with a value of 14.29% of the total number of respondents.

Educational Distribution of the respondents

Table 3 below shows the distribution of the respondent base on their Education background It shows that 57.14% of the total respondents respond were in favor of Secondary being the highest followed by Primary Education, Certificate/Diploma with a value 'of 26.53%, and 16.33% of the total number of respondents respectively and the least was the Bachelor's degree and Others responds with a value of 0% of the total respondents each.

Table 3: Educational Background of Respondents

Education	Number of Respondents	Percentage
Primary	13	26.53
Secondary	28	57.14
Certificate/Diploma	8	16.33
Bachelor's Degree	0	0
Others	0	0
Total	**49**	**100**

Source: Field survey, 2025

Family size

Table 4 below shows the distribution of the family size of the respondents that underwent the questioning process. It shows that 42.86% of the total respondents were of the family size range of 4 – 6 which is the highest, followed by the family size range of 1 -3 with a value of 38.78%, and the least were those of the family size range of 7 and above with the value of 18.37%.

Table 4: Family size representation of respondents

Family size	Number of respondents	Percentage
1-3	19	38.78
4-6	21	42.86
7 and above	9	18.37
Total	**49**	**100**

Source: Field survey, 2025

Years of Experiencing Fishing

Table 5 below shows the distribution of the How long have you been fishing here? responds of the respondents that underwent the questioning process. It shows that 51.58% of the total respondents responded with time range of 11 -15 years which is the highest, followed by the time range of 5 - 10 and 15 and above with a value of 33.63%, 28.57%, and the least were those of the time range of Less than 5 years with the value of 16.33%.

Table 5: Years of Fishing Experience

How long have you been fishing here?	Number of respondents	Percentage
Less than five years	8	16.33
5-10	14	28.57
11-15	17	34.69
15 and above	10	20.41
Total	**49**	**100**

Source: Field survey, 2025

Perception of climate change among Fish Farmers

This shows the perception of climate change among fish farmers information of the respondents which include; climate change, causes of climate change, and effect of climate change.

Species of fishes common to Yola North

This shows the species of fishes common to Yola North information of the respondents which include; specializing on harvesting on species of fish, Reason for specializing one on specie, species of fish harvested and species of fish harvested most.

Effects of Climate Change on Fish Farming
Relationship between Annual Rainfall and Annual of Fish

Table 6: below shows that the relationship between total annual rainfall and amount of fishing positive with r-value of 0.145. This means that with increase in rainfall there is increase the number of fish harvested by fish famers in the study area. It can be deduced from the study that rainfall has a positive effect on the number of fish harvested in the various fishing points of Yola and environs.

Table 6 Correlational Rclationship between Annual Rainfall and Annual of Fish

		Climate	Fish
CLIMATE	Pearson correlation	1	145
	Sig. (2-tailed)		436
	N	31	31
FISH	Pearson correlation	.145	1
	Sig. (2-tailed)	.436	
	N	31	31

Source: Author's Analysis 2025

Effects of Climate Occurrences on Fish Farming

Table 7: below shows that 77.56% of respondents have experienced high temperature that affected the number of fishes that the fishers harvested in the study area. Flooding was also experienced by 83.67% of the respondents in the study area.

Table 7: Effects of Climate Occurrences on Fish Farming

Occurrences of climate events	Hight Temperature		Flooding	
	Number of respondents	Frequency	Respondents	Frequency
YES	38	77.56	41	83.67
NO	11	22.44	8	16.33
Total	**49**	**100**	**49**	**100**

Source: Field Survey, 2025

Climate Change Adaptation Strategies

Table 8 below shows the adaptive strategies employed by fish farmers in the study area, 91.8% respondents listed providing alternative water supply, 63.2% listed flood control/provision of water outlet and $3,1% listed 53.1%. Most of combine different strategies in adaptíng climate change.

Table 8: Fish farmers' climate change adaptation strategies

Strategies	Respondents	Percentage
Stocking in favorable condition	26	53.1
Flood control/provision of water outlet	31	63.2
Providing alternative water supply	45	91.8

Source: Field Survey, 2023

CONCLUSION

The study concludes that climate change has significantly affected fishing activities in Yola, with serious implications for the livelihoods of fishers. The impact is evident in the reduced quantity of fish harvested in the study area. Flooding and high temperature events were identified as the major climatic factors adversely affecting fish farming. In addition, there is limited knowledge and application of diverse climate change adaptation strategies among fish farmers, resulting in increased vulnerability and losses. These losses negatively affect farmers' incomes and may contribute to rising poverty levels among fishing communities in Yola. There is therefore an urgent need to strengthen resilience through the adoption of sustainable mitigation and adaptation strategies. This conclusion aligns with the findings of the PCC (2010), which noted that climate change has led to a continuous decline in fish catch, thereby deepening poverty among small-scale fisherfolk and disrupting their well-being, including health, education, and social stability. The central challenge remains the development and implementation of practical, sustainable mitigation and adaptation measures to safeguard livelihoods and ensure long-term sustainability in the fisheries sector.

Recommendations

Based on the study's findings, several key recommendations are proposed.

First, awareness of climate adaptation strategies among fish farmers in the study area is low; therefore, urgent efforts are needed to educate and train farmers on effective adaptation measures.

Second, since climate change has a significant impact on fish farming, further research should be conducted to identify vulnerability hotspots and develop appropriate adaptation strategies, including financing options and risk-reduction mechanisms to support integrated national planning.

Third, to reduce the negative effects of climate change on fish farming and food security, increased and sustained investment is required in market development, sustainable artisanal fisheries, and market infrastructure to minimize post-harvest losses and income instability, alongside improved fisheries governance and economic incentive mechanisms.

Finally, both long-term strategies and short-term remedial programs should be implemented to address immediate challenges such as flooding and high temperatures while building long-term resilience in the sector.

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