

Impacts of Climate Change on Fish Production among Rural Fishing Households in Delta State, Nigeria

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ABSTRACT

The major aim of the study was to examine the climatic impacts on rural fishing households. Data were obtained with the aid of structured questionnaires and analysed using descriptive statistics and the chi-square analysis model. Multi-stage sampling techniques were adopted in the purposive selection of 45 rural fishing households. Most respondents were aged with large household size and male-headed households. Respondents were mostly married to a secondary school level of education. Respondents were dominated with low annual income indicating poverty which resulted from climatic effects. Flooding was severe that destroyed the rural fishing business resulting in critical climatic impacts. Short term relief measures should be given by the government and donor agencies to ease the agonies of rural fishing households.

Keywords: Climate change, fish, impacts, households production

INTRODUCTION

The word climate change refers to the changes in the climate of the earth globally within a period of 30 years ranging from 30 years to millions of years (Ikeme, 2001). The international panel of climate change postulated that climate change is caused by human activities accounted for about 90 – 95 percent.

Climate and environmental alterations had led to an alteration in the biophysical life aided system which includes vegetation, soil, atmosphere and

water resources that give life long-term earth sustainability (Emaziye, 2013). Climate change impacts on freshwater (H_2O) resources had a significant impact on water availability for agriculture and domestic (Emaziye, 2013). Climate change impacts change caused by human activities and natural climate cycles have negatively affected agricultural outputs in Africa (Ziervogel et al., 2006). Asia and Sub-Saharan Africa especially Nigeria with a high population that denied their living from Agriculture, and agricultural lands been flooded and degraded what will be their survival rate (Ilo, 2007).

This is a serious situation that needs an urgent answer and attention. FAO (2008) stated that if agricultural production in Asia and developing countries with low-income were seriously affected by climate change factors, resulting in rural poor household food insecurity.

Hoeppe and Curenko (2006) reported that floods, droughts and storms that are increasing were major causes of economic losses in the agricultural sector. IFAD (2010) also observed that if mitigation measures are not adopted crop outputs of Agriculture in Africa will be reduced by 50 percent.

Eurofish International Organization (2010) reported that climate change is having a serious impact on fish survivals in the ocean since there is the sea temperature in or ease, a melting of polar ice, acidifying of water bodies and reduction low-oxygen

content resulting to fish stock stress and immigration. The absorption of oxygen in warm water especially in the open sea is usually reduced as a result of climate change that causes sea-level rise. Acidification of the ocean and rising ocean temperature are seriously changing the marine aquatic ecosystem (Doney (2006), IPCC, 2007). Freshwater ecosystems are being affected by alterations in water flow, water temperature resulting to fish habitat loss fish distribution modification and productivity of freshwater species and marine (Cheung et al., 2009).

Climate change has led to the vulnerability of countries' fish producers and countries dependent on fish production (Allison et al., 2009). Fishing population variables such as stability, utilization, access and availability are been altered by climate change (Garcia (2010). Climate change had led to sea-level rise resulting in temperature increase and low-oxygen content in seawater which can lead to aquatic animals' extinction (Portner and Knust, 2007).

This situation is a serious concern to poorest counties nutrition as about three billion persons depend on the fish protein (World Fish Centre, 2008).

Does this research study tend to address the research gap of what are the levels of climatic impacts on fishing households? Also, other research questions are given below.

- i. What are the socio-economic characteristics of rural fishing households.
- ii. What are the annual income level of the respondents
- iii. What are the effects of climate change on rural fishing households.

Hypothesis

The following hypothesis was tested:
H₀: There was no statistically significant difference between the climatic impacts on the rural fishing household.

H₁: There was a statistically significant difference between the climatic impacts on rural fishing households.

The objective of the study

The objective of the study was to:

- i. examine the socio-economic characters of rural fishing households.
- ii. analyse the annual income level of rural fishing households.
- iii. Iii evaluates the effects of climate change on rural fishing households.
- iv. examine the climate and environmental factors that affect rural fishing households.
- v. determine the climate impacts level on rural fishing households.

METHODOLOGY

Study Area

Delta State is among the states that make up the Niger Delta Region, Nigeria. It has 25 Local Government Areas with diverse ethnic nationalities namely, Isokos, Urhobos, Itsekiris, Aniomas, Kwales and Ijaws. The area has a land area of 16,842 km² and a population of 4,112,445 persons (National Population Commission (2006). Delta State lies between latitude 5°00' and 6°45'E and longitude 5°00' and 6°30'N. Delta State has a plain topography with a wide coastal-belt. That inter-lace with streams and rivulets which constitute the River Niger. The main occupation of the area is agriculture.

Sampling

Multi-stage sampling procedures were used in the purposive collection of 45 rural fishing households utilized for the study. Firstly, five Local Government Areas were purposively selected due to constant adverse climatic factors such as flooding presence in the Local Government Areas. Secondly, three rural communities each were randomly selected to give a total of 15 communities and lastly was the purposive selection of three rural fishing households given a total of 45 rural fishing households.

Data collection and Analysis

Data were obtained with aid of structured questionnaires and analyzed using descriptive statistics such as mean,

mode, tables, frequencies and percentages. Also, the chi-square analysis model was used in the analyzing of climatic impacts on rural fishing households.

Specification of models

$$\bar{X} = \frac{\sum fx}{\sum f} \quad (i)$$

$$X_{ci}^2 = \frac{(f_{oci} - f_{eci})^2}{f_{eci}} \quad (ii)$$

$$V = K - 1 \quad (iii)$$

\bar{X} = mean

F = frequency

X = mean mark

Σ = summation sign

X_{ci}^2 = chi-square test on climatic impacts on rural fishing households

f_{oci} = observed frequency on the climatic impacts on rural fishing households

f_{eci} = expected frequency on the climatic impacts on rural fishing households

V = degree of freedom

K = categories of the climatic impacts

RESULTS AND DISCUSSION

Socio-economics characteristics of rural fishing households

The rural fishing households average age was 47 years with a household size of 11 persons indicating a large household size. Most rural fishing households were married (60.0%) and male gender household heads dominated the area of study. Most respondents had a secondary school level of education (42.2%) while no formal educational level (7.0%) and tertiary educational levels (04%) were least as shown in Table 1. These findings were similar to Emaziye (2020) who reported that most farming operations namely crops, livestock and fisheries production were left in the hand of aged persons with a low level of education and large household size in rural households in Delta State, Nigeria.

Table 1: Socio-economic characteristics of rural fishing households

Socio-economic characteristics	Frequency	Percentage (%)	Mean/mode
Age in years			
24-36	8	17.8	47 years
37-49	18	40.0	
50-62	16	35.5	
63-75	3	6.7	
Household Size (persons)			
4-6	2	4.4	11 persons
7-9	10	22.2	
10-12	16	35.6	
13-15	17	37.8	
Marital Status			
Married	27	60.0	Married
Single	0	00.0	
Widow	12	26.7	
Divorced	6	13.3	
Gender			
Male	32	71.1	Male
Female	13	28.9	
Education level			
No formal education	7	15.6	Secondary education
Primary education	15	33.3	
Secondary education	19	42.2	
Tertiary education	04	08.9	

Annual income level of rural fishing households

Table 2: Annual income level of rural fishing households

Income (₦)	Frequency	Percentage (%)	Mode
11,000-22,000	06	13.3	
23,000-34,000	12	26.7	
35,000-46,000	14	31.1	₦38,633.33
47,000-58,000	09	20.0	(\$80.5)
59,000-70,000	04	8.9	

Source: Field data

The respondents annual income level as shown in Table 2 revealed that ₦11,000 – ₦22,000 (13.3%), ₦23,000 – ₦34,000 (26.7%), ₦35,000-₦46,000 (31.1%), ₦47,000-₦58,000 (20.0%) and ₦59,000 – ₦70,000 with a mean annual income of ₦38,633.33 (\$80.5). This is ₦105.84 per day which is \$0.22 per day for less than the \$1 per day poverty line index. This clearly

shown that fish farming was greatly affected and rural fishing households remain poor. This collaborated with the work of Emaziye (2013) that rural households' annual income was ₦54,702 (\$353) indicating low annual income.

Effects of climate change on rural fishing households

Table 3: Effects of climate change on rural fishing households

Effects	Frequency	Percentage (%)	Mode
Lost of fishes	41	14.4	
Lost of homes	33	11.6	
Lost of properties	40	14.0	
Lost of accessible roads	38	13.3	
Lost of processing and storage facilities	21	7.4	
Lost of investments	37	13.0	
Lost of farmsteads	31	10.9	
Loss of income	43	15.1	Loss of income
Lost of lives	1	0.3	

Source: Field data
Multiple responses observed

The study parameters of the effects of climate change on rural fishing households as shown in Table 3 were diversified as rural fishing households experienced the loss of fishes (14.4%), loss of homes (11.6%), loss of properties (14.0%), lost of the access road (13.3%), lost of investments (13.0%), lost of farmsteads (10.9%), lost of income (15.1%) and lost of live (0.3%). Most respondents their incomes were invested in the fishing business. This collaborated with the findings of Han-Otto and Myron (2010) that fish farmers were seriously affected negatively which led to income losses and the collapse of fisheries business.

Climatic and environmental factors affecting rural fishing households

Table 4: Climatic and environmental factors affecting rural fishing households

Factors	Frequency	Percentage (%)	Mode
Flooding	39	32.5	Flooding
Erosion	28	23.3	
Pollution	30	25.0	
Drought	0	00.0	
Thunderstorms	23	19.2	

Source: Field data, Multiple Responses observed

The parameters in Table 4 revealed that flooding (32.5%), erosion (23.3%), pollution (25.0%) and thunderstorms (19.2%) were the climatic and environmental factors that affected the rural fishing households while drought was not a factor recorded in the study area. The most critical factor was flooding that overflowed fish ponds resulting in a loss of investment and income. Another major issue was environmental pollution that led to fish poison and death. These reports collaborated with the findings of Emaziye (2015) that agricultural production was inhibited by flooding that destroyed farm produce in the Bayelsa State of Nigeria.

Climatic impacts on rural fishing households

The impacts were classified into three main categories namely less critical, critical and highly critical. For most rural fishing households climatic impacts were critical (44.4%). This was a serious concern to the growing population that needs protein for body maintenance as a result of flooding that destroyed the fishing business rendering fish farmers homeless and poor. This is in agreement with Emaziye (2013) that rural farming households experienced moderately food insecure as a result of flooding.

Table 5: Climatic impacts on rural fishing households

Impacts	Frequency	Percentage (%)	Mode
Less critical	9	20.0	
Critical	20	44.4	Critical
Highly critical	16	35.6	

Source: Field data

Table 5: Climatic impacts on rural fishing households

Impacts	F _{o_i}	F _{e_i}	F _{o_i} -F _{e_i}	(F _{o_i} -F _{e_i}) ²	(F _{o_i} -F _{e_i}) ² /F _{e_i} =X ² _i
Less critical	9	15	-6	36	2.4
Critical	20	15	5	25	1.7
Highly critical	16	15	1	1	0.07
Total	45	45	0	62	4.17

Significance at 0.05 2 degree of freedom
Chi-square tabulated = 10.6

Hypothesis test

H_{o_i} = There were no statistically significant differences between climatic impacts on rural fishing households

H_{a_i} = There were statistically significant differences between climatic impacts on rural fishing households.

Decision Rule

Reject if chi-square calculated > chi-square tabulated

Accept if chi-square calculated < chi-square tabulated

The chi-square calculated in table 6 shown that the less critical calculated chi-square was 2.4, critical was 1.7 and highly critical was 0.07 while the summation calculated chi-square was 4.17. All the calculated chi-square was less than the tabulated chi-square (10.6) at a 0.005 level of significance and 2 degrees of freedom. The results obtained clearly indicate that the alternate hypothesis can be accepted since the chi-square calculated (4.17) is less than the chi-square tabulated (10.6). So there were statistically significant differences between climatic impacts on rural fishing households in Delta State, Nigeria.

CONCLUSION AND RECOMMENDATION

Most respondents were aged with large household size and male-headed households. Married rural households and a secondary level of education dominated the study area. There was low annual income indicating poverty. There were various forms of climatic effects on rural fishing households but a loss of income was most critical. The climatic and environmental impacts most severe was flooding that destroyed the fishing business resulting in critical climatic impacts on respondents. Short term relief measures should be given by the government and donor agencies to ease the agonies of rural fishing households.

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