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## FARMERS' PERCEPTION OF CLIMATE CHANGE IN ONDO STATE, NIGERIA

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### Abstract

Climate change is a phenomenon that is seen generally as a threat to agriculture, rural economy and livelihood of the farmers. Therefore, the need to study the rural farmers' perception of climate changes and its effects led to this study. A multi-stage sampling procedure was used to select 60 farmers per each ecological zone in Ondo State making a total of One Hundred and Eighty Farmers. From the study, the result of the 5point-likert scale revealed that in the guinea savannah ecological zone, the farmers' perceptions of climate change were high intensity of sun (3.88), high degree of temperature (3.88) and unusual drought (4.18). In addition, in the rain forest ecological zone, the farmers' perception of climate change was frequent rainfall (3.50). However, in the mangrove forest ecological zone, the rural farmers' perceptions of climate change were incessant flood (4.80) and frequent rainfall (4.27). Also, the result of the F-ratio statistics revealed that there is no significant difference in the farmers' perception of climate change in the three distinct ecological zones of the state. In conclusion, it was clear that the farmers in the state did not have full understanding of the concept of climate change. It was recommended that government at all levels should sensitize the farmers on the concept of climate change in the State.

**Keywords:** Climate change, Perception, Ecological zones, Ondo State, Nigeria

### Introduction

Agriculture provides humanity with food and fibre. Hence, the importance of its interaction with the environment cannot be over emphasized. Also, climate is the primary determinant of agricultural productivity. In view of this, the potential effects of climate change on agricultural productivity have been of critical concern to both the State and Federal Government in Nigeria (Apata *et al*, 2009).

Climate change which is regarded as changes in climate over time, whether due to natural variability or as a result of human activity is fast becoming a major threat to livelihood especially in the Less Developed Countries (LDCs) of the world (IPCC, 2010). Furthermore, it has been established that climate change will have a strong impact in Nigeria, particularly in the areas of agriculture; land use, energy, biodiversity, health and water resources (source). Since Nigeria like all the countries of Sub-Saharan Africa, is highly vulnerable to the effects of Climate Change (Nigerian Environmental Study Team, 2004).

More so, researchers are of the consensus that climate change is happening and will continue well into the future regardless of the effectiveness of mitigation measures. This view

emphasized the need to understand how farmers in the rural areas who are the most vulnerable in Nigeria perceive climate variability and change (Christensen *et al*, 2007). This will guide the strategies for policy formulation to mitigate its effects by governments and all stakeholders. Also, farmers in the rural areas, whose livelihoods depend on the use of natural resources, are likely to bear the brunt of adverse effects of climate change (Omotosho, 2007). Again, Nigeria specifically ought to be concerned about climate change because of the country's high vulnerability due to its long coastline (800km) that is prone to sea-level rise which often lead to flooding (Apata, *et al*, 2009).

Again, recent study revealed that there is consistent increase in the temperature of the guinea savannah ecological zone of Ondo state. In the study conducted by Thompson (2016) in the state, the guinea savannah means inter-annual temperature of over thirty years increased by 3.1<sup>0</sup>C compare with the other ecological zones in the State. Again, according to Ondo State Ministry of Information OSMI (2014), rainfall is no longer predictable even in the rainforest and mangrove ecological zone of the state. Furthermore, Rabiun and Omotosho (2013) attested to increase in radiation in the state as a result of industrialization especially in the rainforest zone of the state and which results in decrease in relative humidity and rainfall eventually.

Therefore, the main objective of this study is to determine the farmers' perception of climate change in the three distinct ecological zones in Ondo State. This is with the aim of improving the knowledge of the farmers in the rural areas on the concept of climate change and guide the government at all levels to formulate policies that will assist the rural farmers to mitigate the effects of climate change on agricultural productivity in Nigeria.

In view of this, this study investigated the perception of farmers in the rural areas on climate change in the three distinct ecological zones of Ondo state, Nigeria. Also, the study tested the hypothesis that there is no significant difference in the farmers' perception of climate change in the three distinct ecological zones of the State.

## **Methodology**

### Study Area

The study was carried out in Ondo State, Nigeria. The State is one of the six States in south-west of Nigeria. Ondo State is bounded in the West by Osun and Ogun States and in the North by Ekiti and Kogi States. Ondo State also shares boundaries with Edo and Delta States in the East and in the South by the Atlantic Ocean (Faphounda, 2005). The State is made up of 18 Local Government Areas with a total population of about 3.4 million inhabitants (National Population Commission, 2007). Ondo State has three distinct ecological zones; the mangrove forest to the south, the rain forest in the middle and the guinea savannah to the north. The state is well suited for the production of both permanent and arable crops and fishery products from both artisanal and aquaculture sub-sectors (Mafimisebi and Thompson, 2012).

### Data Collection

A multi-stage sampling procedure was used to select one hundred and eighty (180) respondents for the study. In the first stage, Ondo State was purposively selected because it is the only State in South-West zone of Nigeria with three distinct ecological zones. In the second stage, two Local Government Areas (LGAs) from each ecological zone were randomly selected. From the rainforest ecological zone, Akure North and Idanre LGAs were selected. Also, from the guinea savannah ecological zone, Akoko South West and Akoko

South East LGAs were selected. Finally, from the mangrove forest ecological zone, Ilaje and Ese-Odo LGAs were selected for the study. In the third stage, sixty (60) farmers were selected from each ecological zone to make a total of one hundred and eighty (180) farmers as sample for the study. Data were obtained from the farmers with the aid of structured questionnaire with the assistance of Agricultural Extension workers from Ondo State Ministry of Agriculture.

Data Analysis

Descriptive statistics comprising of frequency distribution, mean and percentage was used to describe the socio-economic characteristics of the farmers. A 5-point Likert-type scale was used to determine farmers’ perception of climate change. Farmers were asked to respond to statements relating to intensity of sun, degree of temperature, rainfall frequency, frequency of floods and droughts, using Strongly Agreed (SA), Agreed (A) Undecided (U), Disagreed (D), and Strongly Disagreed (SD).

The responses were scored as 5,4,3,2 and 1 for SA, A, U, D and SD, respectively. The mean from each statement was obtained and used to classify the responses on each statement into SA (>4.5), A (3.5-4.4), U (2.5-3.4), D (1.5-2.4) and SD (<1.5). The grand means for all the statements were calculated to be able to place all the responses on a continuum that enabled a conclusion to be drawn on the perception of the farmers on climate change in each ecological zone in Ondo state.

Also, Analysis of Variance (ANOVA) was used to test the hypothesis. The equation is stated thus;

$$MS \text{ between} = \frac{SS_{\text{Between}}}{(k - 1)} \text{----- (1)}$$

Where

- MS = Mean Square between Sample
- SS = Sum of Square for variance between sample
- K = Number of sample
- K-1 = degree of freedom

Again, mean square within sample was calculated thus:

$$MS \text{ within} = \frac{SS_{\text{Within}}}{(n - k)} \text{----- (2)}$$

Where,

- SS = Sum of Square for variance within sample
- K = Number of sample
- n = total number of items in all the samples
- (n-k) = degree of freedom within sample.

Finally, F-ratio was calculated thus:

$$F\text{-ratio} = \frac{MS_{\text{Between}}}{MS_{\text{Within}}} \text{----- (3)}$$

Note, the samples are the three ecological zones

F-ratio was used to determine whether there is significant difference in the farmers' perception of climate change in the three distinct ecological zones of the state.

## **Result and Discussion**

### Socio-economic Characteristics of the Respondents

The analysis of the socio-economic characteristics of the respondents was carried out on the basis of ecological zone. From Table 1, most of the farmers interviewed in the three ecological zones were male. In the guinea savannah, rain forest and mangrove forest ecological zone, the percentage of male farmers interviewed were 70 percent, 85 percent and 65 percent respectively. This revealed that most of the rural farming households in the study area were headed by male who were struggling to eke out a living for their family. This finding is in line with that of Tunde (2011), that rural farming households are mostly headed by male who depend on agriculture as a means of livelihood.

Furthermore, in all the ecological zones, above 80 percent of the farmers were in their active age, with their age ranging between 21 and 50 years. Therefore, most of the farmers in the three ecological zones are expected to be very productive. More so, the mean age of 46, 42 and 48 years in guinea savannah, rain forest and mangrove forest ecological zone respectively corroborate the fact that most of the farmers in the three ecological zones were in their active age. In addition, the mean farming experience of the three ecological zones is above 10 years. This validates the suitability of the assessment of the farmers' perception of what climate change is and its effects on agricultural activities. According to Karnaukhov (2001), climate change is often defined as a change in the state of the climate that are identifiable using statistical tests. This includes changes in the mean and/or the variability of its properties, which persists for an extended period, typically decades or longer.

Therefore, since the mean farming experience of the farmers in the three ecological zones are more than a decade, it is possible for them to compare the climate change variable over a period of time and make a reasonable judgment of what climate is in the last ten years and what it is now.

Furthermore, in the three ecological zones, more than 80 percent of the farmers interviewed were married, which indicates their probability of getting access to family labour for use on the farm. Also, in the three ecological zones, more than 75 percent of the farmers interviewed in the study area were literate. Most of them have secondary education. More so, perceptions are context and location specific due to heterogeneity in factors that influence them such as education (Progress *et al*, 2011). In view of the above, the farmers' perception of climate change will be positively influenced by their level of formal education.

Again, in the three ecological zones, the farmers interviewed were mostly involved in planting yam, cassava, maize and cocoyam. The responses of the rural subsistence farmers in the guinea savannah ecological zone to the perception statement of what they understand by climate change were presented in Table 2. The table shows that farmers had positive perception towards the first, second and the fifth statements with the Grand mean values (X) of 3.88, 3.88 and 4.18 respectively indicating Agreed to all the above statement. According to Obioha (2009), the zone is characterized by low rainfall and long dry period compared to both rain forest and mangrove forest ecological zone. This probably accounts for the reason why the farmers in this zone perceived climate change as, high intensity of sun, high degree of temperature and unusual drought.

Also, Table 3 reveals the responses of the farmers in the rain forest ecological zone to the perception statements of what they perceived as climate change. The table shows that farmers had positive perception towards the third statements with the grand mean values (X) of 3.50 indicating Agreed to the above statement and negative perception towards the fifth statement with the grand mean value (X) of 2.13 indicating Disagreed to the above statement. This zone is characterized with frequent rainfall and has an average annual rainfall and temperature of 1489mm and 26.5°C respectively (Humphrey and Nkoli, 2011). Therefore, it is not surprising that farmers from this zone perceived climate change as frequent rainfall and have no basis to perceive it as unusual drought.

Table 4 shows the responses of the farmers in the mangrove forest ecological zone to the perception statement of what they understand climate change to be. The table shows that farmers had positive perception towards the third and fourth statements with the Grand mean values (X) of 4.27 and 4.80 respectively indicating Agreed to the former and Strongly Agreed to the latter.

This is the coastal zone of the state and is commonly regarded as the Niger Delta Area. This area and the people are victims of climate change and rising sea levels. Flood is a common occurrence in this area of the state making both crop and fish farming difficult (NEST, 2008). So it is not surprising that farmers from this zone perceived climate change as frequent rainfall and incessant flood.

Furthermore, in testing the hypothesis, the ANOVA table for the perception statement of the three ecological zones is set up as shown in table 5.

Table 6 shows that the calculated value of F is 0.38 which is less than the table value of 3.88 at 5% level hence this supports the hypothesis postulated that there is no significant difference in the farmers' perception of climate change in the three distinct ecological zones of the state. Since the three ecological zones are within the same tropical rainforest and they have bi-modal rainfall distribution according to Omotosho (2009), there is high tendency that the farmers' perception of climate change in the three zones will not be significantly different.

## **Conclusion and Recommendations**

It can be concluded that farmers in the rural areas of the state do not have full understanding of the concept of climate change as they had positive perception towards high intensity of sun, high degree of temperature as well as unusual drought by indicating "Agreed" to the stated perception statements in the Guinea Savannah Ecological Zone. In the Rain Forest Ecological Zone, rural farmers had positive perception towards frequent rainfall by indicating "Agreed" to the perception statement, while unusual drought was negatively perceived by indicating "Disagree". Also, frequent rainfall and incessant flood were positively perceived by indicating "Agreed" and "Strongly Agreed" to the two perception statements respectively in the Mangrove Forest Ecological Zone. From the above, it clearly shows that the farmers in the rural areas in each ecological zone perceived climate change based on their experiences in their area.

Again, the farmers in the rural areas in Ondo State as a whole did not have comprehensive knowledge of what climate change is all about. Therefore, it can be recommended that



Government, Non-governmental organisations and individuals should put in place programmes that can sensitise farmers in the rural areas on the concept of climate change. This would enable the farmers to have right perception about climate change, which would enable them to adopt adequate adaptive measures. Also, agricultural extension agents should intensify their efforts towards delivering timely and needed extension services to the farmers in the rural areas in order to improve their output levels and maximise their profit.

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**Table 1: Socio-economic characteristics of the respondents**

Socio-economic Characteristics	Guinea Savannah Ecological Zone		Rain Forest Ecological Zone		Mangrove Forest Ecological Zone	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
<b>Sex</b>						
Male	42	70	51	85	39	65
Female	18	30	9	15	21	35
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>
<b>Age in years</b>						
21-30	9	15	5	8.33	3	5
31-40	17	28.33	21	35	7	11.67
41-50	23	38.33	18	30	28	46.67
51-60	7	11.67	9	15	20	33.33
Above 61	4	6.67	7	11.67	2	3.33
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>
<b>Farming Experience in years</b>						
1-10	19	31.67	16	26.67	23	38.33
11-20	21	35	18	30	27	45
21-30	15	25	24	40	10	16.67
Above 30	5	8.33	2	3.33	0	
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>
<b>Marital Status</b>						
Single	6	10	4	6.67	5	8.33
Married	49	81.67	56	93.33	53	88.34
Divorced	Nil	0	Nil	0	2	3.33
Widowed	5	8.33	Nil	0	Nil	0
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>
<b>Education Attained</b>						
Some primary School	Nil	Nil	2	3.33	8	13.33
Completed Primary School	12	20	8	13.33	6	10
Some Secondary School	4	6.67	10	16.67	9	15
Completed Secondary School	38	63.33	29	48.34	34	56.67
Tertiary	6	10	11	18.33	3	5
<b>Total</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>	<b>60</b>	<b>100</b>
<b>Mean Age</b>	<b>46.34</b>		<b>42.51</b>		<b>48.73.11</b>	
<b>Mean Farming Experience</b>	<b>11.45</b>		<b>12.78</b>		<b>18.12</b>	

**Table 2: Rural farmers' perception of climate change in Guinea Savannah ecological zone**

S/N	Perception Statements	Responses						Mean Score X	Remark
		SA f/(%)	A f/(%)	U f/(%)	D f/(%)	SD f/(%)			
1	High intensity of sun	27 (45.0)	19 (31.7)	0 (0)	8 (13.3)	6 (10.0)	3.88	A	
2	High degree of temperature	22 (36.7)	17 (28.3)	14 (23.3)	6 (10.0)	1 (1.7)	3.88	A	
3	Frequent rainfall (Unpredictable)	10 (16.7)	15 (25.0)	7 (11.7)	23 (38.3)	5 (8.3)	3.03	U	
4	Incessant flood	1 (1.7)	3 (5)	15 (25)	25 (41.7)	16 (26.6)	2.13	D	
5	Unusual drought	30 (50)	21 (35)	- (-)	8 (13.3)	1 (1.7)	4.18	A	

Figures in parenthesis are percentages

**Table 3: Rural farmers' perception of climate change in Rain Forest ecological zone**

S/N	Perception Statements	Responses					Mean Score X	Remark
		SA f/(%)	A f/(%)	U f/(%)	D f/(%)	SD f/(%)		
1	High intensity of sun	3 (5)	7 (11.7)	26 (43.3)	14 (23.3)	10 (16.7)	2.65	U
2	High degree of temperature	5 (8.3)	13 (21.7)	24 (40)	8 (13.3)	10 (16.7)	2.92	U
3	Frequent rainfall (Unpredictable)	18 (30)	21 (35)	2 (3.3)	11 (18.3)	8 (13.3)	3.50	A
4	Incessant flood	12 (20)	21 (35)	8 (13.3)	10 (16.7)	9 (15)	3.28	U
5	Unusual drought	2 (3.3)	7 (11.7)	12 (20)	29 (48.3)	10 (16.7)	2.13	D

Figures in parenthesis are percentages

**Table 4: Rural farmers' perception of climate change in Mangrove Forest ecological zone**

S/N	Perception Statements	Responses					Mean Score X	Remark
		SA f/(%)	A f/(%)	U f/(%)	D f/(%)	SD f/(%)		
1	High intensity of sun	4 (6.7)	6 (10)	3 (5)	24 (40)	13 (21.7)	1.90	D
2	High degree of temperature	2 (3.3)	5 (8.3)	1 (1.7)	34 (56.7)	18 (30)	1.98	D
3	Frequent rainfall (Unpredictable)	31 (51.7)	22 (36.6)	-	6 (10)	1 (1.7)	4.27	A
4	Incessant flood	48 (80)	12 (20)	-	-	-	4.80	SA
5	Unusual drought	2 (3.3)	3 (5)	-	26 (43.3)	29 (48.4)	1.72	D

Source: Field Survey, 2013

Figures in parenthesis are percentages

**Table 5: ANOVA table for the perception statement of the three ecological zones**

Perception Statements	Ecological Zones		
	Guinea Savannah	Rainforest	Mangrove Forest
High intensity of sun	3.88	2.65	1.90
High degree of temperature	3.88	2.92	1.98
Frequent rainfall (Unpredictable)	3.03	3.50	4.27
Incessant flood	2.13	3.28	4.80
Unusual drought	4.18	2.13	1.72

**Table 6: Computed ANOVA results**

Source of Variation	SS	df	MS	F-ratio	5% F-Limit (from the F-table)
Between Sample	0.853	(3-1) = 2	0.853/2 = 0.4265	0.4265/1.1243 = 0.38	F (2,12) = 3.88
Within Sample	13.492	(15-3) = 12	13.492/12 = 1.1243		
<b>Total</b>	<b>14.345</b>	<b>(15-1) = 14</b>			