

Farmers' Perception of Climate Change In Southern Guinea Savannah and Rainforest Agro-Ecological Zone of Southwest Nigeria

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Abstract

The study assessed the farmers' perception of climate change in the southern guinea savannah and rainforest agro-ecological zones (AEZ) of southwest Nigeria and corroborates their perception using secondary data. The study was conducted in Ekiti, Ondo and Oyo States in Southwest Nigeria. A multi-stage sampling was used for the study and 360 farmers were interviewed for the study. Descriptive statistics comprising 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. Relative humidity, rainfall and temperature trends from 1970 to 2014 were used to corroborate the farmers' perception of climate change in the southern guinea savannah and rainforest AEZs of the study area. The result revealed that 87.8% of the respondents were within the active productive age in southern guinea savannah, with a mean age of 49.2 years. In the rainforest, 66.1% of the farmers were within the active productive age with a mean age of 50.9 years. Farmers in the southern guinea savannah zone of the study area had more farming experience than their counterparts in the rainforest AEZ with 18.9 years and 16.6 years respectively. The results revealed that farmers in the southern guinea savannah had positive perception of high intensity of sun over time, high temperature over time, and high incident of drought. The study recommended that extension agents should be supported by both government and Non- Governmental Organisations (NGOs) to visit the farmers regularly and orientate them about climate change.

Keywords: Climate Change; Guinea Savannah; Rainforest; Farmers; Likert-Scale

Introduction

Climate is a dynamic phenomenon which changes continually, with long-term warming and cooling cycles. However, recent rapid and extensive changes are too extreme to be dismissed as 'normal' and have been shown to be closely correlated to changes in atmospheric carbon as a result of human activities (IPCC, 2015). It has been established that the links between agriculture and climate are quite pronounced and often complex (Molua and Lambi, 2013). Crops need nutrients, water and sunlight to drive the photosynthetic process and produce edible products. Clearly, water and sunlight are factors affected by climate but so are nutrients. Increased atmospheric carbon dioxide

concentrations can be beneficial to crop productivity but changes in temperature and precipitation can have mixed results (Molua and Lambi, 2013). This is compounded by the high sensitivity of crops to extreme events such as floods, wind storms and droughts and seasonal factors such as periods of frost, heat spells and rainfall patterns (Mani *et al.*, 2010).

Agriculture in the form of crop production, livestock breeding, fishery and forestry is the primary sector of the economy of Nigeria, accounting for employment for majority of the Nigerian population (Ayoade, 2012). About 80% of the country's poor people live in rural areas and work primarily in agriculture. About 25% of Nigeria's Gross Domestic Products

(GDP) comes from agriculture and related activities. Close to 70% of the national labour force is employed in agriculture, 10% in manufacturing and mining industries and 20% in services. So Nigeria's economy is predominantly agrarian as agriculture remains the driving force for the country's economic development (Olukoya, 2014).

Furthermore, scientists fear that lack of proper understanding of the concept of climate change among the farmers will have adverse effects on their farm yield, income and farming households' livelihood. This makes them vulnerable to the effects of climate change (Thompson and Amos, 2010). It is to a large extent perceived that the farming households in developing countries will be worst affected as they are heavily dependent on the agricultural sector that is highly sensitive to climate (Nanda, 2012). It is therefore necessary to find out farmers' perception of climate change as a matter of urgency. This is with the aim of providing meaningful orientation to them on what climate change is and how to mitigate its effects on their households. The study therefore assessed farmers' perception of climate change in the southern guinea savannah and rainforest AEZs of southwest Nigeria and corroborated their perception using secondary data.

Methodology

The Study Area

The study was conducted in Ekiti, Ondo and Oyo States in Southwest Nigeria. The

three states are made up of 67 Local Government Areas (LGAs); Ekiti has 16 LGAs, Ondo 18 LGAs and Oyo 33 LGAs (Adejuwon and Odekunle, 2014). The study area is bounded in the East by Edo and Delta states and in the North by Kogi and Kwara states. The southern guinea savannah of southwest Nigeria covers an area that has an average annual temperature and rainfall of 27.3°C and 1051.7mm respectively. The false balsam Copaiba (*Daniellia oliveri*), used for carving mortars and pestles for pounding yam and *Vitex*, *Khaya senegalensis* (the poor mahogany) are the species found in the southern guinea savannah of southwest Nigeria. The rainforest zone of southwest Nigeria is characterised with a prolonged rainy season, resulting in average annual rainfall close to 1500mm thereby ensuring an adequate supply of water and promoting perennial tree growth. Economic cash crops such as oil palm, (*Elaeis guineensis*), cocoa (*Theobroma cacao*), banana/plantain (*Musa spp.*) and cola nut (*Cola nitida*) are found in the rainforest zone of the southwest Nigeria. (Oyenuga, 1967; Omotosho, 2012).

The states have a high density of human population of 8,971,752 (NPC, 2007) with agriculture as primary occupation of the people. The states are a major source of timber in the region. Also found are some principal staple food crops such as yam, cocoyams, maize, rice and cowpeas as well as a number of fruits. (Oyekale, 2009).

Table 1: Selected States, LGAs, Communities and Number of Respondents

STATE	AEZ	LGA	Communities	Number Of Respondents
Ekiti	Rainforest	Ekiti South-West	Ilawe	10
			Igbara-Odo	10
			Ogotun	10
		Ise-Orun	Afolu	10
			Ise	10
			Orun	10
	Southern Guinea Savannah	Moba	Otun	10
			Osun	10
			Igogo	10
		Ilejemeje	Iye	10
			Iludun	10
			Eda-Oniyo	10
Ondo	Rainforest	Idanre	Abababubu	10
			Fagbo	10
			Ayefemi	10
		Ifedore	Igbara-Oke	10
			Ijare	10
			Ipogun	10
	Southern Guinea Savannah	Akoko Southwest	Oka	10
			Akungba	10
			Oba	10
		Akoko Southeast	Isua	10
			Epinmi	10
			Iboropa	10
Oyo	Rainforest	Egbeda	Egbeda	10
			Erunmu	10
			Owo Baale	10
		Lagelu	Apatere	10
			Iyana Offa	10
			Lalupon	10
	Southern Guinea Savannah	Kajola	Idi-Ori	10
			Araromi	10
			Idi-Ayin	10
		Surulere	Iresa Adu	10
			Iresa Apa	10
			Iwofin	10
		12	36	360

Source: Field Survey, 2015.

Nature and Sources of Data

Data used in this study were collected from two main sources namely primary and secondary. Data were obtained through administering structured questionnaires on the farmers who were visited. The dataset collected from the farmers include trends of drought and flood in the study area in the

past two decades and their perceptions of climate change. AEZ data and information were collected from the State Ministries of Agriculture and Water Resources and Agricultural Development Programmes (ADP) in the three states. Other relevant data from 1970 to 2014 such as climate variable data (Temperature, Rainfall and

Humidity) were collected from the Nigerian Meteorological Agency (NIMET).

Data Analysis

Descriptive statistics comprising of frequency, means and percentages were 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 sunlight, degree of temperature, rainfall frequency, frequency of floods and droughts, using Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), and Strongly Disagree (SD).

The responses were scored as 5,4,3,2 and 1 for SA, A, U, D and SD, respectively. The means from each statement were obtained and used to classify the responses on each statement into SA (>4.50), A (3.50-4.49), U (2.50-3.49), D (1.50-2.49) and SD (<1.50). The grand means for all the statements were calculated and used 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 the study area. The relative humidity, rainfall and temperature trends from 1970 to 2014 were used to corroborate the farmers' perception of climate change in the southern guinea savannah and the rainforest AEZs of the study area.

Results and Discussion

The age distribution of farmers in both the southern guinea savannah and rainforest AEZs in the study area is presented in table 2. The Table revealed that 87.8% of the respondents were within the active

productive age (Between 18 years and 65 years) in the southern guinea savannah with a mean age of 49.2 years. In the rainforest, 66.1% of the farmers were within the active productive age with a mean age of 50.9 years. The result is in tandem with that of Olayemi (2004) who opined that for farmers to be productive in farm chores, they must be within the active productive age of 18 years and 65 years in order to contribute meaningful labour input into all the stages of production for efficient output realisation which in turn results in consumptive and income opportunities with proportional household welfare.

However, the percentage of those in active age in the southern guinea savannah was more than that of the rainforest AEZ. This is likely going to be because most youths in the southern guinea savannah were involved in the cultivation of subsistence crops such as cocoyam, maize, rice and yam compared to their counterparts in the rainforest. Since the rainforest AEZ is mainly known for cash crops such as cocoa, there is a tendency for most young farmers in the AEZ to devote most of their time and energy to cash crop production (Burkard, 2013).

The sex variation of the respondents as observed on the field showed that 85% of the respondents in the southern guinea savannah were male while 66.8% were male in the rainforest AEZ. This can be attributed to the fact that men always have greater access to land as a productive resource than women. Since there is great disparity between female and male in the size of land holdings, the mode of women participation in farming in the two AEZs will definitely vary with the land-ownership status of households (Onuk *et al.*, 2010). The study revealed that more

women (33.2%) were involved in farming in the rainforest AEZ compared to 15.0% in the southern guinea savannah AEZ. This actually buttresses the fact that men in the rainforest AEZ will likely give more attention to cash crops such as cocoa and allow their women to be involved in staple food farming and processing. The men in the rainforest AEZ will definitely like to take advantage of the regular and steady rainfall to plant cash crops and other viable economic crops that actually require regular water such as plantain.

From the Table, 91.7% of the respondents in the southern guinea savannah were married and 83.3% of the respondents in the rainforest were equally married. This revealed that most of the farmers in both AEZs may likely rely on family labour to augment seemingly fizzled-out hired labour thereby reducing the cost of labour. This shows that marital status of farmers may have a lot of influence on the production performance of the farmers in the study area. This finding supports that of Ogunwande (2014) that marriage increased the number of households members; making more labour available for farming to boost farm activities. Furthermore, the spouses would likely assist in the processing and marketing of output. The children of such farmers could also assist in the production process thereby reducing labour wage and ultimately production cost.

From table 2, it was revealed that in the southern guinea savannah AEZ, 13.9% of

the respondents had no formal education, 3.3% had adult education, 16.1% had primary school education, 32.8% had secondary school education and 33.9% had tertiary education. In the rainforest AEZ, 17.2% had no formal education, 11.7% had adult education, 32.8% had primary education, 25.0% had secondary education and 13.3% had tertiary education. The Table revealed that in the rainforest AEZ, half of the respondents were illiterates, the percentage (50%) of those who had no formal education and primary school education is half and those who had adult education, secondary school and tertiary education were also 50%. Education is important for sound-decision making in all human endeavours and these results suggest that extension workers need to do more to sensitise farmers on the importance of formal education in the rainforest AEZ by encouraging them to attend adult education schools. From the Table, farmers in the southern guinea savannah AEZ appear to be more literate than their counterparts in the rainforest AEZ. This findings underscore the opinion of Olarinde and Kuponiyi (2013) that education is an important factor that determines the adoption of innovations. It provides reading ability, consciousness and awareness which enable good decisions to be made. Therefore, the higher the level of a farmer's education, the better his decision-making ability especially in the adoption of new technologies and other innovations.

Table 2: Socio-economic Characteristics of the Respondents

Socio-economic Characteristics	Southern Guinea Savannah Ecological Zone		Rain Forest Ecological Zone		Pooled	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Sex						
Male	153	85	120	66.8	273	75.8
Female	27	15	60		87	24.2
Total	180	100	180	100	360	100
Age in years						
= 20	4	2.2	7	3.9	11	3.1
21-30	20	11.2	10	5.6	30	8.3
31-40	17	9.4	11	6.1	28	7.8
41-50	53	29.4	62	34.4	115	31.9
51-60	68	37.8	60	33.3	128	35.6
= 61	18	10	30	16.7	48	13.3
Total	180	100	180	100	360	100
Farming Experience in years						
= 5	6	3.3	17	9.4	23	6.4
6 – 10 years	60	33.3	62	34.4	122	33.9
11 – 15 years	22	12.2	28	15.6	50	13.9
16 – 20 years	33	18.3	26	14.4	59	16.4
> 20 years	59	32.9	47	26.2	106	29.4
Total	180	100	180	100	360	100
Marital Status						
Single	3	1.7	10	5.6	13	3.6
Married	165	91.7	150	83.3	315	87.6
Divorced	4	2.2	3	1.7	7	1.9
Widowed	8	4.4	17	9.4	25	6.9
Total	180	100	180	100	360	100
Education Attained						
No formal Education	25	13.9	31	17.2	56	15.6
Adult Education	6	3.3	21	11.7	27	7.5
Primary School Education	29	16.1	59	32.8	88	24.4
Secondary School Education	59	32.8	45	25.0	104	28.9
Tertiary Education	61	33.9	24	13.3	85	23.6
Total	180	100	180	100	360	100
Mean Age	49.2		50.9		50.1	
Mean Farming Experience	18.9		16.6		17.8	

Source: Field Survey, (2015)

The number of years put into farming by the sampled farmers as shown in table 2 revealed that the mean farming experience of the respondents in the southern guinea savannah zone was 18.9 years with 6-10 years being the modal distribution. In the rainforest AEZ, the mean farming experience was 16.6 years with 6-10 years

being the modal distribution. These implies that farming is not a new enterprise in the two AEZs. Farming experience gained on farm first hand is better than theory read in schools or from seminars and workshops (FAO, 2013). In the two zones, an overwhelming majority (>90.0%) of the farmers have farming experience of not

less than six years. The overall average farming experience of over 17 years implies that most farmers in both AEZs have adequate farming experience therefore the respondents were not novices in farming activities.

In determining farmers' perception of climate change and corroborating the perception with climatic data recorded from 1970 to 2014 in the study area, the study revealed that the responses of the farmers in the southern guinea savannah AEZ to the perception statement of what they understood by climate change as presented in Table 3 shows that farmers had positive perception towards the first

(Increase in intensity of sunlight over time), second (Increase in degree of temperature over time), and the fifth (Unusual drought) statements with the grand mean values (\bar{X}) of 3.88, 3.81, and 4.18 respectively indicating 'Agree' to all the above statements. According to Oikeh *et al.* (2013), the zone is characterised by low rainfall and long dry periods compared to the rainforest ecological zone. This probably accounts for why the farmers in this zone perceived climate change as increase in intensity of sunlight over time, increase in degree of temperature over time and 'unusual drought'.

Table 3: Farmers' Perception of Climate Change in Southern Guinea Savannah AEZ

S/N	Perception Statements	Responses					Mean Score \bar{X}	Remark
		SA	A	U	D	SD		
1	Increase in intensity of sunlight over time	81 (45.0)	57 (31.7)	0 (0)	24 (13.3)	18 (10.0)	3.88	A
2	Increase in degree of temperature over time	66 (36.7)	51 (28.3)	42 (23.3)	18 (10.0)	3 (1.7)	3.81	A
3	Frequent rainfall (Unpredictable)	40 (33.3)	45 (25.0)	21 (11.7)	39 (21.7)	35 (8.3)	3.32	D
4	Incessant flood	3 (1.7)	9 (5)	45 (25)	75 (41.7)	48 (26.6)	2.13	D
5	Unusual drought	90 (50)	63 (35)	- -	24 (13.3)	3 (1.7)	4.18	A

Source: Computed from Field Survey, 2015

Figures in parenthesis are percentages

Note: Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), and Strongly Disagree (SD)

SA (>4.50), A (3.50-4.49), U (2.50-3.49), D (1.50-2.49), and SD (<1.50).

Table 4 revealed the responses of the farmers in the rainforest AEZ to the perception statements of what they perceived as climate change. The table showed that farmers had positive perception towards the third (Frequent rainfall (Unpredictable)) and fourth (Incessant flood) statements with the grand mean values (X) of 3.76 and 3.78 indicating 'Agree' to the above statements, 'Undecided' about the second (Increase in degree of temperature over time) statement and negative perception towards the first (Increase in intensity of sunlight over time) and fifth (Unusual drought) statement with the grand mean value (X) of 2.45 and 2.13 indicating 'Disagree' to the above statement. This zone is characterised with frequent rainfall and has an average annual rainfall and temperature of 1489mm and

26.5°C respectively (Omotosho, 2012). 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'.

In corroborating the farmers' perception of climate change in both the southern guinea savannah and rainforest, recorded climate data for over forty years (from 1970 to 2014) were analysed. According to Palmer (2014) climate change is a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. Therefore, anomalies in the mean inter-annual temperatures of the two AEZs were glaringly revealed using 1970 mean annual temperatures of 30.8°C in the southern guinea savannah and 21.8°C in the rainforest as baseline mean to compare

Table 4: Farmers' Perception of Climate Change in Rainforest AEZ

S/N	Perception Statements	Responses					Mean Score X	Remark
		SA	A	U	D	SD		
1	Increase in intensity of sun over time	9 (5)	21 (11.7)	38 (21.1)	52 (28.9)	60 (33.3)	2.45	D
2	Increase in degree of temperature over time	15 (8.3)	12 (6.7)	60 (33.3)	36 (20)	57 (31.7)	3.42	U
3	Frequent rainfall (Unpredictable)	54 (30)	63 (35)	6 (3.3)	33 (18.3)	24 (13.3)	3.76	A
4	Incessant flood	36 (20)	63 (35)	24 (13.3)	30 (16.7)	27 (15)	3.78	A
5	Unusual drought	6 (3.3)	21 (11.7)	36 (20)	87 (48.3)	30 (16.7)	2.13	D

Source: Computed from Field Survey, (2015)

Figures in parenthesis are percentages

Note: Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), and Strongly Disagree (SD)

SA (>4.5), A (3.5-4.4), U (2.5-3.4), D (1.5-2.4), and SD (<1.5).

from 1970 to 2014. 1970 mean annual temperature was used as baseline to revealed the trend of mean annual temperature for the period of over forty years. Figure 1 shows the mean inter-annual temperatures departure from baseline mean annual temperature. There was a consistent increase in the temperature of the two AEZs in the study area from 1971 to 2014. The mean inter-annual temperature of over forty years was more than the baseline mean annual temperature of 1970 (i.e. 30.8°C in the southern guinea savannah and 21.8°C in the rainforest). The mean annual temperature increased to 32.8 °C in 2014 compared to 30.8°C in 1970 in the southern guinea savannah and 24.6°C in 2014 compared to 21.8°C in 1970 in the rainforest. This revealed a +2.0 °C deviation from the baseline mean annual temperature in the southern guinea savannah and +2.8 °C in the rainforest . It was warmer than normal in the year 1980, 1990, 2010 and 2014 in both AEZs of the study area. So in the two AEZs, temperatures were on the increase for over forty years. These variations are wide enough to cause stress in crop plants in the AEZ probably leading to reduced output and yield.

Therefore, farmers' perception of high degree of temperature over time in the southern guinea savannah is probably correct since there was a consistent increase in the mean annual temperature overtime (over forty years). The temperature increase is quite noticeable and can impact on the way an average farmer will perceive weather at a particular period. It was not temporary since the increase in the mean annual temperature spanned over forty years. In the rainforest AEZ, the temperature trend during the forty years

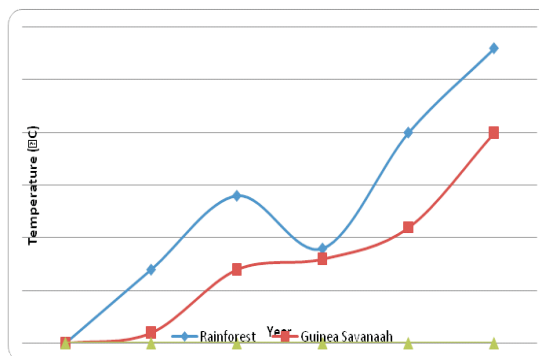


Figure 1: Mean Inter-annual Changes in Temperature of Southern Guinea Savannah and Rainforest AEZ in Southwest Nigeria between 1970 and 2014. Using 1970 as the base year.

Note:

(i). The values presented on the Y-axis are the differences between the mean annual temperatures of the years (1970-2014) under consideration and the base year (1970) mean annual temperature which was regarded as anomalies in this study and the X-axis are the years under consideration (1970-2014)

(ii). Mean inter-annual changes in temperature are the changes between the mean annual temperature of the years (1970-2014) under consideration and the mean annual temperature of the baseline year (1970)

was similar to the situation in the southern guinea savannah in the study area. Therefore, the undecided farmers' perception of high degree of temperature over time in the AEZ was likely their observation of deviation from the AEZ mean annual temperature of 21.8 °C as reported by (Labitzke, 2014). So the farmers' perception was not different from the recorded data, because the change in the mean inter-annual temperature was prolonged and very noticeable by the farmers in the rainforest AEZ. The farmers' perception of temperature in both zones is similar to that of farmers in other African countries as reported by Malone *et al.* (2013) and IFPRI (2014).

Figure 2 shows the rainfall anomalies for the various years with respect to 1970

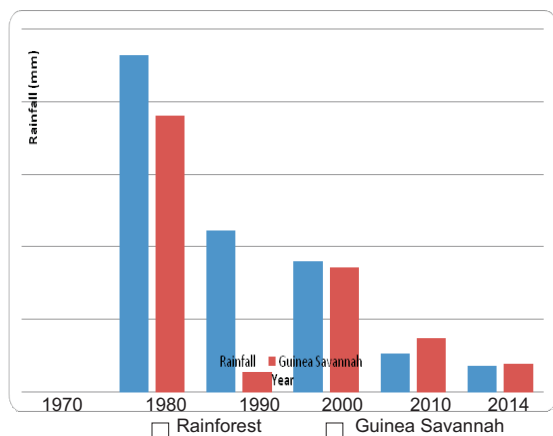


Figure 2: Mean Inter-annual Changes in Rainfall of Southern Guinea Savannah and Rainforest AEZ of Southwestern Nigeria between 1970 and 2014. Using 1970 as the base year.

Note:

(i). The values presented on the Y-axis are the differences in the mean annual rainfall of the years (1970-2014) under consideration and the base year (1970) mean annual rainfall which was regarded as anomalies in this study and the X-axis values are the years under consideration (1970-2014)

(ii). Mean inter-annual changes in rainfall are the changes between the mean annual rainfall of the years (1970-2014) under consideration and the mean annual rainfall of the baseline year (1970)

mean annual rainfall of 111.7mm in the southern guinea savannah and 111.9mm in the rainforest as the baseline. The figure shows that there was high mean inter-annual rainfall variability (vast variations in the amount of mean annual rainfall in the selected years (1970-2014) and the selected mean annual rainfall of the base year (1970)) with 1990 in the southern guinea savannah experiencing deviation of +1.4mm and the rainforest experiencing extreme increase as much as +23.2mm in 1980. The mean inter-annual rainfall variation in the two AEZs was noteworthy and this is likely to have a great effect on agricultural production since the amount and distribution of rainfall in a given year determines the success or failure of crop

production (Nelson *et al.*, 2014). Farmers are more likely to have greater yields if the rains fall at the right time and the right amount. Therefore, it is the amount of rain at any point that results in the soil reaching its field capacity which will result in availability of water for crops' optimum performance (Karfakis *et al.*, 2011).

With respect to the farmers' perception on frequency of rainfall in the rainforest AEZ, their perception is in line with the recorded data on rainfall in the AEZ as unpredictable. The farmers perception of rainfall as unpredictable (i.e. erratic) was corroborated by the recorded data. This is in line with studies in several other developing countries which indicates that most farmers have been perceiving rainfall to be unpredictable over the past decade or two (Luers *et al.*, 2010 and Deressa *et al.*, 2011). The observed mean inter-annual rainfall anomalies did not differ from the farmers' perception in the rainforest AEZ of southwest Nigeria that rainfall is unpredictable because of its wide variation. As shown in figure 2, there was an upward trend in the amount of rainfall over time in the rainforest zone compared to the southern guinea savannah. Such unpredictable increase in the rainfall over time in the rainforest AEZ would probably cause flooding in the AEZ. The recorded data revealed the unpredictability in the mean inter-annual rainfall of the rainforest AEZ which agrees with findings of Gbetibouo *et al.*, (2012) that rainfall is no longer predictable even in the rainforest zone. This causes farmers to be vulnerable to the climate variability and climate change especially those farmers who have limited access to the extension supports that will educate them on strategies to mitigate the effects of such flooding.

Again, humidity is simply the amount of water vapour in the air that is needed to form rain. Relative humidity (RH) is a measure of the amount of moisture in the air relative to the total amount of moisture the air can hold. Without humidity, there would be no clouds, no precipitation and no fog (Palmer, 2014). RH has an inverse relationship with solar radiation which is mainly responsible for the intensity of the sun and temperature. Therefore the perception of the farmers in the rainforest about drought, high intensity of the sun over time, high temperature over time, flood and drought are correct based on the recorded data. Figure 3 shows the mean inter-annual changes in the RH of the southern guinea savannah and rainforest. Using 1970 RH (62.1% in the southern guinea savannah and 70.0% in the rainforest) as the baseline year, the figure

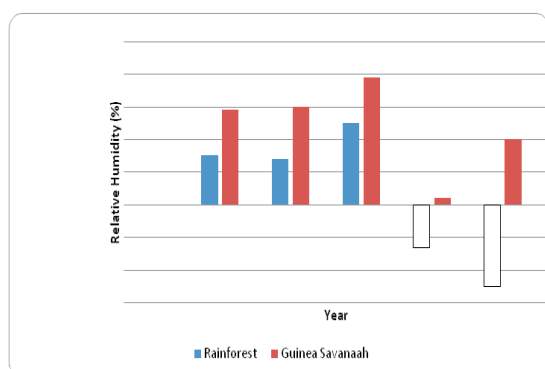


Figure 3: Mean Inter-annual Changes in Relative Humidity of Guinea Savannah and Rainforest AEZ in Southwestern Nigeria between 1970 and 2014. Using 1970 as the base year.

Note:

- (i). The values presented on the Y-axis are the differences between the mean annual RH of the years (1970-2014) under consideration and the base year (1970) mean annual RH, which was regarded as anomalies in this study and the X-axis are the years under consideration (1970-2014).
- (ii). Mean inter-annual changes in RH are the changes between the mean annual RH of the years (1970-2014) under consideration and the mean annual RH of the baseline year (1970)

shows that there was positive change in the RH in 1970 to 2014 in the southern guinea savannah and in the rainforest AEZ except in 2010 and 2014. In 2010, the RH reduced by 1.3% in the rainforest AEZ and in 2014 it reduced by 2.5%. According to Rabiou and Omotosho (2013), increase in radiation results in decrease in relative humidity and vice versa. Significant correlation exists between the solar radiation and relative humidity at seasonal and annual levels. There is a tendency for the southern guinea savannah to experience drought in the period in which there is a drop in the RH because of an increase in the solar radiation which increases the intensity of sunlight and temperature (Labitzke, 2014).

The increase in the intensity of sunlight and temperature in the southern guinea savannah will eventually lead to drought in the AEZ. This corroborates the perception of the farmers in the AEZ about high intensity of sun over time, high temperature over time and unusual drought. This supports the findings of Oikeh *et al.*, (2013) that one of the major differences between the rainforest and the guinea savannah AEZ is the high RH in the rainforest compared to the southern guinea savannah.

Conclusion and Recommendations

The study shows that majority of the farmers in the two AEZs were male, educated and in their active age (working age bracket of 18 years and 65 years). Farmers in the rainforest perceive climate change as frequent unpredictable rainfall and incessant flooding. Furthermore, results revealed that farmers in the southern guinea savannah had positive perception of high intensity of sunlight over time, high temperature over time and high incidence of drought. The anomalies in the mean inter-

annual temperature, rainfall and relative humidity recorded between the Year 1970 and 2014 corroborated the farmers' perception of climate change. Therefore the study recommended that extension agents should be supported by both government and NGOs to visit the farmers regularly and orientate farmers about climate change and how to mitigate its effects on farm yield, income and farming households.

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