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Farmers' Knowledge and Perception of Climate Change Impact on Crop Production in Akinyele Local Government Area of Oyo State, Nigeria

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Abstract:- Nigeria is plagued with diverse ecological problems that are directly linked to climate change. The vicissitudes of climatic conditions have been documented to negatively impact agricultural production. Sustainability of agricultural production however depends largely on farmers' action and their ability to make decisions given the level of knowledge and information available to them. This paper therefore reports farmers' knowledge and perception of climate change on crop production in Akinyele Local Government Area of Oyo State, Nigeria. Stratified random sampling method was employed for the study. Data obtained through oral interviews using structured questionnaire administered on the farmers were analyzed using descriptive and chi-square (χ^2) statistics at $\alpha_{0.05}$. Focus group discussions were also carried out in each of the sampled ward within the local government area to complement information from the farmers. Secondary data on some climatic variables and agricultural practices in the study area spanning ten years were also obtained to backstop primary information on the study. Modal age among the respondents' (31.1%) was between 50-60years, 78.9% were males and 95.6% were married. Although 83.3% of the farmers' perceived their level of knowledge on climate change as good, only 42.2% subscribed to reduced rainfall as their perceived impact of climate change. However, majority submitted the change in seasonal rainfall pattern as indicator of climate change (70.0%) and that humans are not responsible for the observed climate change in the study area (97.8%). Also, they identified deforestation (41.1%), bush burning (27.8%) and vehicular emissions' (11.1%) as agents of climate change. Further, only the farmers' age was found to impact their knowledge on climate change (χ^2 = 33.85; df = 18) and their perceptions of climate change (χ^2 = 27.77; df = 12) and its effect (χ^2 = 46.69; df = 24) in the study area. Information from secondary data indicated variability in climate variables and corroborated famers' perception of climate vagaries, most noticeably, the rainfall pattern in the study area. The study therefore identified with farmers' knowledge and perception of micro climate indices as important inputsin the formulation of sustainable environment and food production policy.

Keywords:- *Climate Change; Seasonal Rainfall Pattern; Perception; Knowledge; Crop Production.*

I. INTRODUCTION

Climate change is one of the most serious environmental threats facing mankind worldwide and by extension, Nigeria. As supported by MOEFRN(2003) and Folke, et al.(2005) climate change has become a global issue, manifesting in variations of different climate parameters including cloud cover, precipitation, temperature ranges, sea levels and vapour pressure. According to IPCC (2007), it can be directly or indirectly attributed to human activities, which alter the composition of the global atmosphere in addition to natural variability observed over comparable periods of time. Nyong(2005) also predicted the possibilities of climate changes effects accumulating until thresholds are crossed, which could cause the entire thresholds to collapse. This envisaged risk is greatest where much of the livelihoods and socio economic systems depend on natural resources, one of which is the forests. According to World Development Report(2010), the impacts of climate change aggravate desertification and erosion processes, result in reversible changes in ecosystems and biodiversity loss and finally, affect human life and activities. This was reposed by UNEP(2008) that clearing of forests for agricultural production replaces forests with arable crops thereby reducing the rate at which carbon(iv) oxide gas trapping and absorbing occurs.

As observed by Adefolalu (2007) and Ikhile (2007) Nigeria is already being plagued with diverse ecological problems, which have been directly linked to climate change. In Oyo State, environmental problems that are termed degradation collectively, such as erosion, flooding and drought have strong links with deforestation. In Akinyele Local Government Area of Oyo State, climate change is perceived as a potential threat to sustainable development. Incidence of climate change include changes in soil moisture, soil quality, crop resilience, timing of growing seasons, yield in crops and animal production, atmospheric temperatures, weed insurgence, flooding, unprecedented droughts, sea level increment, and many more (Spore, 2008; Nicholas and Nnaji, 2011). The southern ecological zone of Oyo State largely known for high rainfall is currently confronted by irregularity in the rainfall pattern, while Derived Savannah to the North is experiencing gradually increasing temperature (MOEFRN, 2004; Obioha, 2008).

As submitted by Cotching et al.(2009), the natural environment is changing as forests are been depleted when farmers clear bushes for farming; settlements, charcoal

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production and building materials without commensurate replacement. Increased intensity and frequency of drought and flooding, altered hydrological cycles as well as precipitation variance have implications for future food availability. Changes in the frequency and severity of droughts and floods pose challenges for farmers. These could make it more difficult to grow crops, in the same way and same places as they have done in the past. Climate change thus worsening the working conditions for farmers in several ways due to frequent crop failure, that farmers become more impoverished as frequent droughts also discourage farmers to invest more in farming (Kiteme, 2009).

West Africa was submitted by IPCC(2007) as one of the most vulnerable to the vagaries of the climate, based on the scope of the impacts of climate variability spanning three to four earlier decades. The recent food crises in Nigeria is a reminder of the continuing vulnerability of the region to the vicissitudes of climatic conditions. This was largely attributed to weak institutional capacity, limited engagement in environmental and adaptation issues, and a lack of standard and practical local knowledge validation method by Spore(2008),NEST(2008), Royal Society (2005) as well as Adams et al.(1995).

Accordingly, there is the need to gain as much information as possible, and learn the positions of rural farmers and their needs, about what they know on climate change, in order to offer adaptation practices that meet these needs. Consequently, this paper reports farmers' knowledge and perception of adaptation to changes and variation in climate change. This is important because sustainability of agricultural production depends largely on actions of farmers and their ability to make decisions given the level of knowledge and information available to them.

II. MATERIALS AND METHODS

A. The Study Area

The study was carried out in Akinyele Local Government Area (LGA) of Oyo state, Nigeria. The LGA (Figure 1) is very close to Ibadan, the capital of Oyo State, which is lies in the southwestern part of Nigeria; on longitude 3°54' of the Greenwich meridian and latitude 7°54' north of equator. Ibadan city is elevated at about 234 meters above the sea level and is situated on gently rolling hills running in a northwest or southeast direction. Akinyele LGA was established in 1976 with the administrative headquarters situated at Moniya. The major farming activity practiced in the area is crop faming with the main crops being cassava, maize, cocoyam, vegetables, rice, groundnut and beans while maize, cassava, and cocoyam are the most important food crop grown. This is because apart from sales these important crops are also consumed by the household. The sales or prices of agricultural produce in this area are based on the season, market and the location of the individual farm.

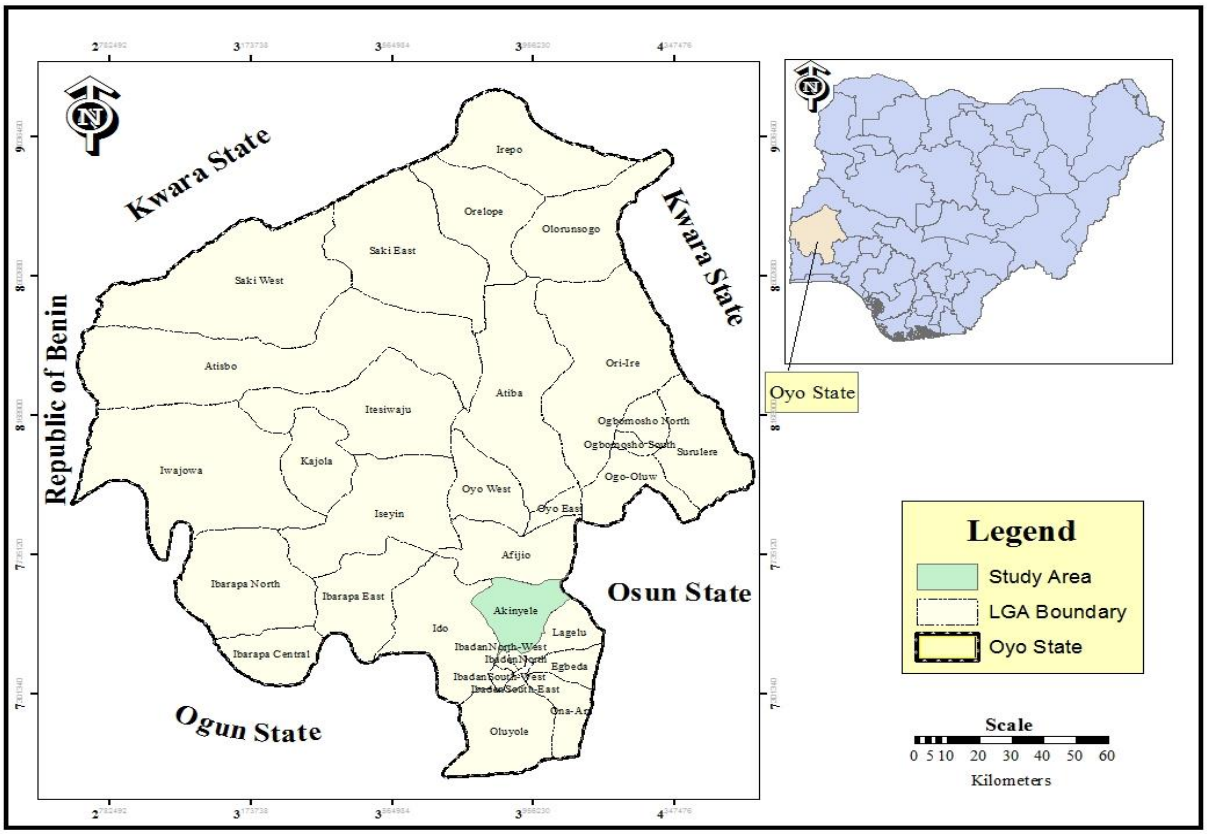

Fig. 1: Map of Oyo State indicating the study area.

B. Data Collection and Sampling Procedure

Akinyele LGA was stratified into wards. The Local Government Area consists of 12 wards. Six wards were randomly picked within the LGA. Fifteen respondents were randomly selected from each ward making a total of ninety respondents which constituted the sample size for the study. Primary data were obtained through oral interviews with the aid of structured questionnaire. The questionnaire sought for

farmer's perception of climate change effects, while the secondary data (Climatological and agricultural data for ten years) were also obtained. The climatological data included rainfall, temperature and relative humidity. Focus group discussion was also organized with the farmers in the local government area to assess their opinions about changes in some climatic variables.

C. Data Analysis

Data collected were subjected to descriptive (simple percentages; frequency counts, tables and line graph)and inferential (Cross-Tab and Chi-Square at $\alpha_{0.05}$)statistical analyses.

III. RESULTS

A. Respondents' Background

	Frequency	Percentages	Mode
Age (Years)			
10 -20	1	1.1	50 – 60 years
>20-30	1	1.1	
>30-40	1	1.1	
>40-50	22	24.4	
>50-60	28	31.1	
>60-70	21	23.3	
>70	16	17.8	
Sex			
Male	71	78.9	Male
Female	19	21.1	
Marital Status			
Married	86	95.6	Married
Single	2	2.2	
Divorced	2	2.2	
Religion			
Christian	34	37.8	Islam
Islam	52	57.8	
Traditional	4	4.4	
Duration Residence in the Study Area (Years)			
>0<5	2	2.2	>20
>5<10	3	3.3	
>10<15	20	22.2	
>15<20	17	18.9	
>20	48	53.3	

Table 1: Frequency Distributions of Respondents General Background

The study (Table 1) revealed that modal age (31.1%) among the respondents' was between 50-60years while those between ages 10 and 30 years were the least sampled. Also, the greater percentage of the respondents'(78.9%) was found (Table 1) to be male and 95.6% of the respondents were married. Similarly, the larger group (57.8%)of the respondents' were followers of the Islamic faith 53.3% of the respondents have been a resident in the study area for more than 20years, majorly since birth.

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	Frequency	Percentage	Mode
Primary Occupation			
Farming	65	72.2	Farming
Trading	21	23.3	
Civil servant	2	2.2	
Artisan	2	2.2	
Secondary Occupation			
Farming	37	41.1	Trading
Trading	40	44.4	
Civil servant	2	2.2	
Artisan	9	10.0	
Others	2	2.2	
Household Size (Person)			
1 – 4	5	5.5	9 - 10
5– 8	26	28.9	
9– 10	27	30.0	
11– 12	12	13.3	
13– 15	17	18.9	
>15	3	3.3	
Level of Education			
Primary Education	50	55.6	Primary Education
Secondary Education	19	21.1	
OND/NCE	7	7.8	
HND/First Degree	2	2.2	
Higher Degree	1	1.1	
No formal education	11	12.2	
Farm Size (Acre)			
1– 3	44	48.9	1 - 3
>3 – 5	23	25.5	
>5 – 8	15	16.6	
>8 –10	5	5.6	
>10 –15	1	1.1	
>15 –20	1	1.1	
>20	1	1.1	
Monthly Income (₦)			
<5000	4	4.4	>5000<10,000
>5000 - 10,000	28	31.1	
>10,000 - 20,000	19	21.1	
>20,000 - 30,000	15	16.7	
>30,000 - 40,000	13	14.4	
>40,000 - 50,000	4	4.4	
>50,000	7	7.8	

Table 2: Frequency Distribution of Respondents Other Background Information

Further, background information (Table 2) revealed the major occupation of 72.2% of the respondents to be farming, which is a secondary occupation to 41.1% of them and very next to trading (44.4%), the modal secondary occupation identified by the study. Also, the study (Table 2) found that the most subscribed (30.0%) household size was that holding between 9 – 10 people.

Also, educational status distribution in the study area (Table 2) revealed that 56.6% of the respondents' had only primary education (the most subscribed).On farm size, the study(Table 2) showed that the most popular size accessed by the respondents' was between 1 and 3 acres. Similarly on respondents' monthly income, the study (Table 2) found that most of the farmers (31.1%) earn between ₦5000- ₦10,000 as net income/month.

B. Farmers' Knowledge and Perception of Climate Change

	Frequency	Percentage	Mode
Knowledge Level			
Very good	3	3.3	Good
Good	75	83.3	
Don't know	6	6.7	
Poor	6	6.7	
Perceptionof Climate Change			
Change in seasonal rainfall pattern	63	70.0	Change in seasonal rainfall pattern
Change in temperature characteristics	22	24.4	
Frequent flooding	5	5.6	
Consent on Human as Agent of Climate Change			
Yes	2	2.2	No
No	88	97.8	
Perceived Human Actions Promoting Climate Change			
Emissions of vehicular fumes	10	11.1	Deforestation
Deforestation	37	41.1	
Bush burning	25	27.8	
God	18	20.0	
Perceived Effects			
Reduced rainfall	38	42.2	Reduced rainfall
Flooding	11	12.2	
Rising temperature	22	24.4	
Shifts in growing season	16	17.8	
Drought	3	3.3	
Perceived Impacts of Climate Change on Crop Production			
Loss of crops prematurely	25	27.8	Crop failure & low yield
Crop failure & low yield	65	72.2	
Perception of Rainfall Pattern			
Consistent & predictable	6	6.7	Inconsistent & not predictable
Inconsistent & not predictable	65	72.2	
Normal onset	19	21.1	
Perception ofRainfall Trend			
Delayed rainfall	52	57.8	Delayed rainfall
Irregular pattern	34	37.8	
Sometimes doesn't come at all	4	4.4	

Table 3: Frequency Distribution of Information on Farmers' Perception of Climate Change

Examining respondents' level of knowledge about climate change, the study (Table 3) found that 83.3% of them perceived their knowledge of the subject as good (the majority). On their view about climate change, 70.0% of them submitted change in seasonal rainfall pattern as indicator of climate change while 24.4% attributed it to change in temperature (Table 3).Responding to the causes of climatic variability (Table 3) 97.8% were of the opinion that humans are not responsible for the observed climate change in the study area. However, they were able to identify with deforestation (41.1%), bush burning (27.8%) and vehicular emissions'(11.1%) as agents of climate change (Table 3). Worthy of note also is that 20.0% attributed climate change as the work of God (Table 3).

On the impact of climate change, 42.2% of the respondents subscribed to reduced rainfall, 24.4%, rising temperature while 17.8% fingered the shift in growing seasonas an effect of climate change. The study (Table 3) also identified crop failure and low yield as perceived major effects (72.2%) of climate change. Further, the rainfall pattern was viewed as inconsistent and unpredictable in the last decade by 72.2% of the respondents' while rainfall trend within the same timeframe was perceived as delayed and irregular by 57.8% and 37.8% of them, respectively (Table 3).

D. Impact of Farmers' Background on their Knowledge and Perception

This was examined using chi-square statistics to test the dependence of farmers' background on their Knowledge and perception of climate change using two null hypotheses viz:

H_{o1} Farmers' socio-economic background has no impact on their Knowledge of Climate change in Akinyele LGA of Oyo. State

H_{o2} Farmers' socio-economic background has no impact on their perception of climate change.

Further, where chi-square tests showed significant relationship, the cross-tab analyses were further used to explain the dependency.

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Age (Years)	Level of Knowledge about Climate Change				Total	Chi-Square Statistics
	Very good	Good	Don't know	Poor		
10 – 20	1	0	0	0	1	Pearson's χ^2 = 33.853; Asymp. Sig. = 0.013; df = 18.
>20 – 30	0	1	0	0	1	
>30 – 40	0	1	0	0	1	
>40 – 50	1	17	2	2	22	
>50 – 60	1	24	2	1	28	
>60 – 70	0	18	2	1	21	
>70	0	14	0	2	16	
Total	3	75	6	6	90	

Table 4: Cross-Tab Analyses and Chi-Square Statistics of Impact of Farmers' Age on their Knowledge about Climate Change

Chi-square test of the dependence of knowledge on farmers' age (Table 4) was significant (Asymp. Sig. = 0.013), hence the null hypothesis was rejected. Thus, there was a significant dependence of knowledge about climate change on age of farmers in the study area. Implicitly, farmers' age impacted their knowledge on climate change in the study area. Further, even though respondents age is from 10 to >70 years, most respondents' perceived their knowledge of climate change as good and this perception cuts across all age groups except those between 10 and 20 years of age.

Age (Years)	Perception of climate change			Total	Chi-Square Statistics
	Change in Rainfall	Change in Temperature	Frequent Flooding		
10 – 20	0	0	1	1	Pearson's χ^2 = 27.771; Asymp. Sig. = 0.006; df = 12.
>20 – 30	0	1	0	1	
>30 – 40	1	0	0	1	
>40 – 50	13	6	3	22	
>50 – 60	19	8	1	28	
>60 – 70	16	5	0	21	
>70	14	2	0	16	
Total	63	22	5	90	

Table 5: Cross-Tab Analyses and Chi-Square Statistics of Impact of Farmers' Age on their Perception of Climate Change

Investigating the impact of farmers' age on their perception of climate change, the study (Table 5) revealed a significant dependence (Asymp. Sig. = 0.006) of perception on age with Pearson's chi-square (χ^2) value of 27.771 at a degree of freedom of 12. Here, change in rainfall was the most favored climate change index among respondents and this was supported by those in age groups of>30 to >70 years with the modal subscription being from the >50 – 60 years group.

Age (Years)	Perceived Effects of Climate Change					Total	Chi-Square Statistics
	Reduced rainfall	Flooding	Rising temperature	Shift in growing season	Drought		
10 – 20	0	0	0	0	1	1	Pearson's χ^2 = 46.694; Asymp. Sig. = 0.004; df = 24.
>20 – 30	1	0	0	0	0	1	
>30 – 40	1	0	0	0	0	1	
>40 – 50	8	6	5	3	0	22	
>50 – 60	11	2	6	8	1	28	
>60 – 70	8	1	9	3	0	21	
>70	9	2	2	2	1	16	
Total	38	11	22	16	3	90	

Table 6: Cross-Tab Analyses and Chi-Square Statistics of Impact of Farmers' Age on their Perception about Identified Effects of Climate Change

Age was also found to impact farmers' perception of the effect of climate change (Table 6). A chi-square value of 46.694 at a degree of freedom of 24 was gotten. The Asymptotic Significance value of 0.004 for the test revealed a highly significant dependence of farmers' perception of the effect of climate change in the study area on age. All identified effects of climate change were subscribed to, but reduced rainfall was highest and this was most subscribed to by respondents' in ages >50 – 60 years, the modal age group in the study.

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Respondents' Perception of..	Background	χ^2 Value	Df.	Asymp. Sig	Decisions
Climate change	Age	6.668	6	0.353	NS
Climate change	Sex	0.047	2	0.977	NS
	Marital status	1.628	4	0.804	NS
	Education	6.826	10	0.742	NS
	Farm size	21.465	22	0.492	NS
	Income/month	9.519	12	0.658	NS
Level of knowledge of climate change	Sex	7.459	3	0.059	NS
	Marital status	12.419	6	0.053	NS
	Education	7.252	15	0.950	NS
	Farm size	30.864	33	0.574	NS
	Income/month	34.305	18	0.012	**S**
Effects of climate change	Sex	9.090	4	0.059	NS
	Marital status	8.005	8	0.757	NS
	Education	21.306	20	0.379	NS
	Farm size	88.091	44	0.000	**HS**
	Income/month	19.402	24	0.730	NS
Impact of climate change on Crop Production	Sex	2.464	1	0.116	NS
	Marital status	1.030	2	0.597	NS
	Education	2.875	5	0.719	NS
	Farm size	8.947	11	0.627	NS
	Income/month	11.961	6	0.063	NS

Table 7: Chi-Square Statistics of Impact of Farmers' Background on their Perception

NB* NS = Not Significant; S = Significant; HS = Highly Significant (All tests are at $\alpha_{0.05}$)

Table 7 shows the summary of the chi-square statistics of the impacts of some respondents' background information apart from age, which has significant impact on most tested perception variables apart from "Effects of climate change". The study (Table 7) found that apart from income of farmers', which impacted the level of knowledge of farmers about climate change (Pearson's χ^2 = 34.31; Asymp. Sig. = 0.01; df = 18; see Table 8 for the crosstab analysis) as well as farm size that impacted farmers' perception of the effects of climate change (Pearson's χ^2 = 88.09; Asymp. Sig. = 0.000; df = 44; See Table 9 for the crosstab analysis), farmers' socio economic background was found not have significant impact on farmers' knowledge and perception of climate change in the study area.

Income/Month (₦)	Perception of Knowledge of climate change				Total
	Very good	Good	Don't know	Poor	
<5000	1	2	1	0	4
>5000 - 10,000	0	26	2	0	28
>10,000 - 20,000	0	15	1	3	19
>20,000 - 30,000	0	14	0	1	15
>30,000 - 40,000	0	11	1	1	13
>40,000 - 50,000	0	3	1	0	4
>50,000	2	4	0	1	7
Total	3	75	6	6	90

Table 8: Cross-Tab Analyses on the Dependence of Farmers' Income/Month on their Perception of their Knowledge of Climate Change

A cross-tab analyses of the dependence of farmers' income on their perception of climate change knowledge (Table 8) although most of the respondents' were of the opinion that their knowledge of climate change was good in the study area, the bulk (26) fall under those earning between >₦5000 and ₦10,000/Month followed by those earning between >₦10,000 and ₦20,000/Month (15) and very closely (14) by those earning between >₦20,000 and ₦30,000/Month. From the table, it can be concluded that reactions on perception about climate change knowledge was highest from farmers' earning the modal income on the income distribution table from the study.

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Farm Size (Ha)	Perceived Effects of climate change					Total
	Reduced rainfall	Flooding	Rising temperature	Shift in growing season	Drought	
1	3	1	9	2	0	15
2	8	3	2	5	0	18
3	7	2	1	1	0	11
4	5	0	5	1	0	11
5	4	2	3	3	0	12
6	4	2	0	2	1	9
7	2	0	0	2	0	4
8	1	0	0	0	1	2
10	4	0	1	0	0	5
15	0	1	0	0	0	1
20	0	0	0	0	1	1
30	0	0	1	0	0	1
Total	38	11	22	16	3	90

Table 9: Cross-Tab Analyses of the Dependence of Farmers' Farm Size on their Perceived Effects of Climate Change

Examining how respondents' farm size impacted their perception of the effect of climate change, the study (Table 9) revealed that though about five effects were identified with twelve different farm sizes in the study area, reduction in rainfall and increase in temperature were the most popular identified effects. Also while 38 respondents favoured reduction in the amount of rainfall, 18 of them own between 1 and 3 hectares of farmland, which is the modal farm size on the farm size distribution platform.

Year	Rainfall (mm)	Temperature (º C)	Relative Humidity (%)
2003	1236.60	27.40	82.00
2004	1869.40	26.20	81.00
2005	1436.10	26.50	83.00
2006	1770.10	26.28	80.80
2007	1855.30	26.40	77.50
2008	1303.50	26.55	76.20
2009	958.70	26.73	82.00
2010	1504.30	27.06	80.00
2011	1222.60	26.59	80.00
2012	1176.40	26.39	79.00
2013	874.90	26.81	82.00

Table 10 : Annual Rainfall, Temperature and Relative Humidity Distribution in the Study Area

Source: Oyo State Agricultural Development Programme (OSADEP), 2015.

Analyses of the trend in some climate variables in the study area (Table 10) revealed inconsistencies in the distribution of rainfall, temperature and relative humidity from 2003 and 2013. For example, although annual rainfall increase sharply in 2004, it nose-dived in 2005 and sharply picked up again in 2006. This inconsistency was observed throughout the period under review for rainfall, temperature and relative humidity distribution in the study area.

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Crops	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Cassava	1325.76	1555.31	2380.67	1139.38	1488.82	1496.94	1511.91	1520.17	9263.8	2528.4	2496.17
Yam	959.94	808.65	1033.46	387.54	692.85	695.47	782.4	779.92	779.58	2020	2041.96
Maize	277.4	294.13	304.14	177.66	234.56	240.79	226.08	224.85	1847.45	912.96	277.11
Sorghum	51.64	51.7	60.58	19.31	25.78	26.02	26.32	26.75	56.85	58.62	29.31
G.Nut	25.4	22.45	27.54	4.26	13.14	7.42	10.77	10.66	14.37	25.03	27.25
Cowpea	9.82	10.47	12.52	5.1	6.9	6.92	6.95	6.93	49	22.87	6.39
Cocoyam	20.77	18.29	26.33	11.48	17.05	17.17	47.64	47.54	50.15	31.14	0
Rice	0	0	0	0	0	0	0	0	0	0	41.37
Melon	11.65	8.39	10.62	1.34	2.09	2.11	0	0	3.33	42.24	0
Okro	31.79	23.69	29.03	15.15	21.39	34.99	35.38	35.45	24.62	46.43	0
Soyabean	5.66	0.81	4.8	0.12	0.27	0.27	0.28	0.29	12.84	10.61	5.42
Pepper	33.94	31.46	36.9	15.26	21.33	21.6	41.65	39.3	74.14	55.97	0
S.Potato	46.97	48.13	54.36	1.1	24.58	25.12	35.82	36.06	16.08	74.13	0
Millet	0.04	0.1	0	0.99	1.31	1.33	1.11	1.11	0	0.1	0
Tomato	36.46	31.86	46.61	13.91	20.93	27.73	28.2	28.29	63.14	69.03	112.76
Vegetable	1.76	0.2	2.45	0	4.48	24.54	0	0	1.12	11.1	0
Pigeon pe	0.77	0.44	0.46	0	0.1	0.1	0	0	0	0	0
Onion	0	0	0	0	0	0	0	0	1.77	3.03	0
Ewedu	0	0	0	0	0	0	0	0	4.58	1.31	0
Cotton	0	0	0	0	0	0	0	0	0	3.66	1.65
Total	**2839.77**	**2906.08**	**4030.47**	**1792.60**	**2575.58**	**2628.52**	**2754.51**	**2757.32**	**12262.82**	**5916.63**	**5039.39**

Table 11: Annual Crop Production ('000 MT) – 2003 to 2013 in Akinyele Local Government Area, Oyo State, Nigeria

Source: Oyo State Agricultural Development Programme (OYSADEP), 2015.

Analyses of annual crop production in the study area (Table 11)also reveals variations in the yield of all identified crops. The variation was much demonstrated in Figure 3, which shows the trend in the yield of major crops in the study area. The production of Cassava, the leading crop in tonnage/year, was observed to increase up till 2005 before sharply dropping in 2006 and picking up again gradually up till 2010 before dropping sharply again in 2011. This inconsistency, which were more pictorially obvious in Figure 3, was observed in the annual production of all the crops produced in the study area just and it commensurate the inconsistencies observed in the climate variables in Table 10.

IV. DISCUSSION

A. Respondents' Background

Findings on respondents' age in this study is similar to that of Sangotegbe *et al*; (2012) who reported majority of farmers' in their study to be within the age range of 41 and 60years of age. Ratsimbazafy *et al.* (2012) also reported 67.0% of the respondents from the Makira Forest Project in Madagascar were between 30 and 55 years of age, which they expressed as the most productive age group. Tesfaye (2017) also reposed that people within this age bracket germane to decision making on sustainable rural land use. Also, majority of the respondents' are male, which is characteristic of most agrarian communities owing to the general perception of agriculture as energy driven and masculine in nature. Hoppock(1976) argued that women choose to do works that are perceived as more person oriented, affectionate and compassionate involving interaction with people unlike males that prefer the image of being forceful, analytic, ambitious, individualistic and competitive. Tesfaye (2017) also reported more male than female in a similar survey. This did not imply the presence of more male than female in the study area, but it is characteristic of rural survey where men are generally more favored on opinion polling than their female counterpart.

Similarly, the observed high household size in the study area (5 – 15 individual/household) may be adduced to the respondents' approach to meeting the labour requirement of their farming activities, especially through legal marriages and child procurement. This can be inferred from the fact that in the study area, majority of the farmers have more than one wife and the extended family system is practiced in the area whereby parents, children and other relatives live together as household. The submission of Ekwe *et al.* (2009) reposed this assertion. Engagement of family members in farm activities by household heads may also reduce the cost of hired labor. This was supported by Ekong (2003) who perceived marriage as an essential factor in the facilitation of household farming. Apart from the economic benefit of marriage, joining the marriage institution also confer a social responsibility on the actors involved in the study area. This was reposed by Olujide (1999) who observed that by customs and traditions, married persons are more highly respected and considered responsible in area where they live.

The study found out that there is low level of education among farmers' in the study area. As submitted by Ekwe *et al.* (2009), balanced assessment of disseminated information by farmers depends on their level education. Thus education status may impact farmers' knowledge base and by extension their perception of issues. More than 70.0% of the farmers in the study area have between 1 and 5 hectares of

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land. In fact, almost half, cultivate between 1 and 3 hectares of land. This has implication for the utilization of improved farm practices targeted at combating the effect of climate change. This was the submission from the studies by Erskine*et al.*(1984), Voh (1982) and Basu (1969), who all reported large farm size in terms of hectare and labour as significantly related to farmers' utilization of improved farm practices (such as the adaptation strategies) applicable to their farm enterprises.

The farmers' income otherwise termed as farm output is the physical measures that show all the efforts, energies and combination of inputs used on a specific land area. Higher output signifies correct combination of all the inputs utilized. In the study area, the most popular monthly income was between >₦5000:00 and <₦10,000:00. Judging from the World Bank standard, an income of this nature can barely maintain one person, not to talk of the large family size associated with the study area. Invariably, the standard of living in the study area is below World Bank standard.

B. Respondents' Knowledge and Perception of Climate Change

Examining respondents' perception of climate change impact on crop production, the study (Table 3) doted on crop failure and low yield as most subscribed impact. Low yield was attributed to increase in annual temperature by 84.4% of the food crop farmres' in Oke Ogun area, Oyo State, Nigeria (Sangotegbe *et al*., 2012). The other identified impact, which is 'loss of crop prematurely' is just another semantics of crop failure and a precursor to low yield (another identified impact). This goes a long way to uphold majority of the respondents' perception of their knowledge of climate change as 'good'. Azeez and Adeniyi (2016) also observed reduction in agricultural production as a major impact of climate change on rural livelihoods in Ondo state, Nigeria. The respondents' also submitted during focus group discussions that there were delay in onset of the first rainy season than usual, which is also consistent with their perception of shorter rainy season as one of the effect of climate change in the study area. Sangotegbe *et al*; (2012) also reported 79.4% of food crops farmers as having similar feeling in Oke Ogun area of Oyo State. Respondents' perceptions of seasonal rainfall pattern and temperature as indicator of climate change also agree with available climatology data (Table 10). That is, there seems to be an agreement of inferences when respondents' opinion on rainfall trend and patterns (Table 3) are compared with secondary climatology information (Figure 2).

On this same note, majority of the respondents' were of the opinion that there is delayed rainfall with observed irregularities in the pattern (Table 3), which is consistent with pattern of the line graph of rainfall distribution in the study area (Figure 2) based on data from Table 10. Molua (2008) had reported the performance of agricultural sector to largely depend on the return of good rains as well as timely and adequate provision of agricultural input. The productivity of crops in sufficient quantity was equally observed by Ngigi (2009) to depend mainly on the availability of rainfall or irrigation technologies. Thus, irregular rain pattern may explain the observed irregularity in the production of major food crops in the study area (Figure 3). Further, Nicholas and Nnaji (2011) observed the significant impact of farmers' experience about climate change on agricultural production. Thus, the perception of respondents on climate change in the study area must be taken into consideration in policy formulation on crop production. This is more so when Ayoade (2004) also reported rainfall (the behavior of which was vividly captured by the respondents') as the most important climatic variable in agricultural production.

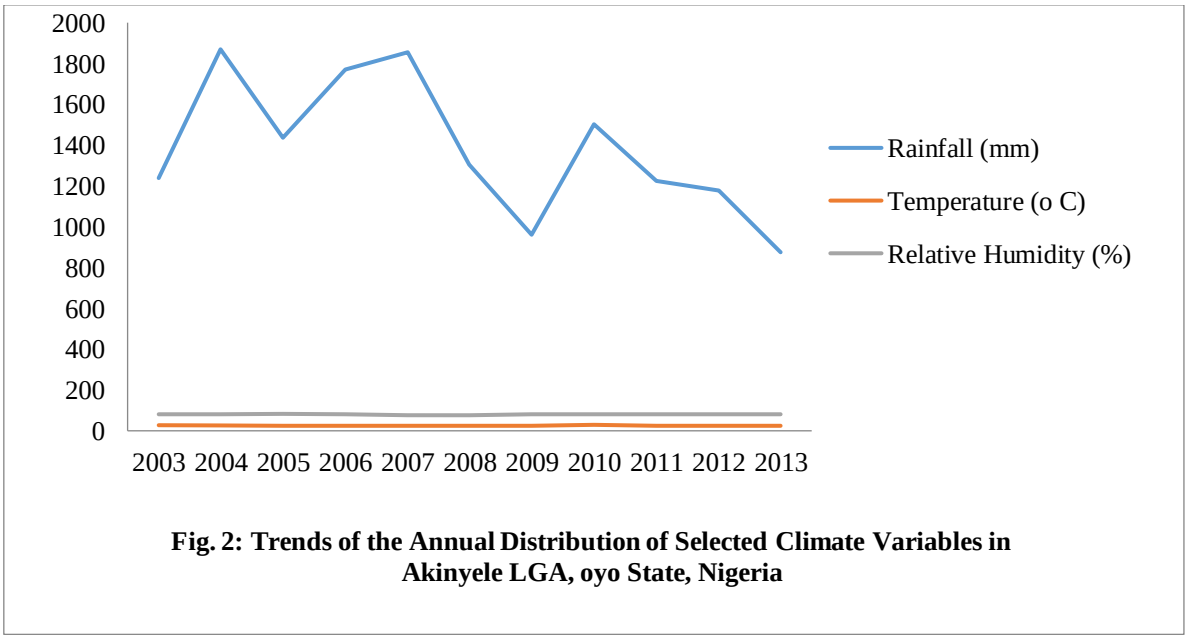

Fig. 2: Trends of the Annual Distribution of Selected Climate Variables in Akinyele LGA, oyo State, Nigeria

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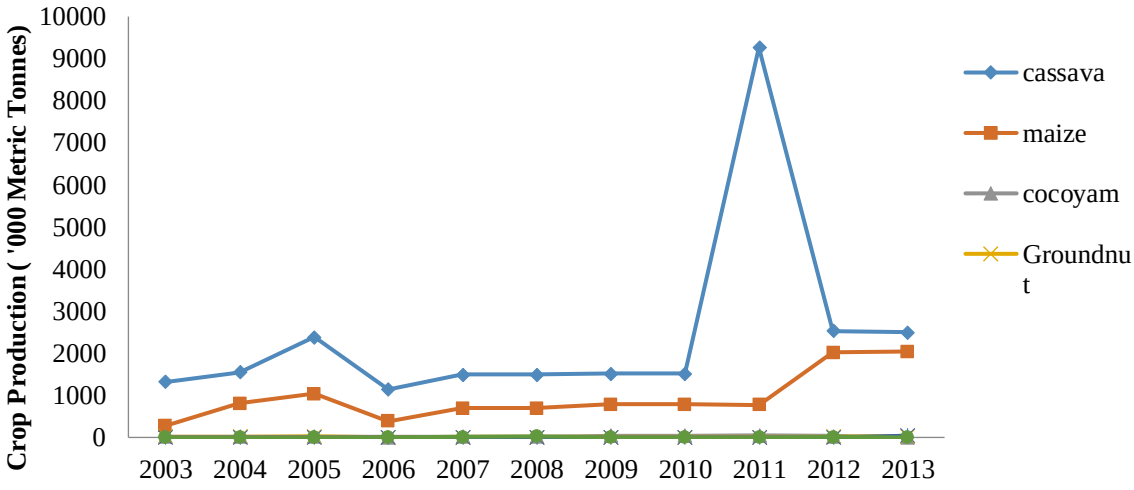

Fig. 3: Production Trends of the Most Important Food Crops in Akinyele LGA, Oyo State, Nigeria (2003 - 2013)

Also, it must be noted that respondents' did not agree with humans being responsible for the observed effects of climate change in the study area, but as the handiwork of God. This deviates from the submission of Okali (2008), which identified human activities such as increase in consumption of earth's resources, changes in technology and economic advances as one of the drivers of climate change. However, respondents identified with deforestation, bush burning and vehicular emissions' as agents of climate change (Table 3). Again, identifying with deforestation, bush burning and vehicular emission already agreed with Okali (2008) submission of human as drivers of climate change. This is because all the activities perceived by the respondents' as leading to climate change in this study are all human driven.

C. Impact of Respondents Background on their Perception and Knowledge of Climate Change

From this study, it can be observed that more than 80.0% of the respondents' rate their knowledge of climate change as good, which may mean that most of them are aware of climate change since awareness is an offshoot of knowledge. But also worthy of note is that apart from farmers age, other socio-economic defines of the farmers have no significant impact on their knowledge and perception of climate change. It could therefore be concluded that perception and knowledge about climate change is the same, general and popular among the respondents irrespective of their socio-economic status although age and by extension experience may impact perception. This is in agreement with the finding of Zalkuwi(2013) that perceived older farmers perception and response to risk management more prompt compared to younger ones.

However, the study slightly differs from the submission of Bzugu (1988) and Akinyemi (2004)who established a link between farmers' knowledge and their socio-economic status unless commensurate relationship can be establish between age and socio-economic status. The studies of Gillingham and Lee (1999), Mehta and Heinen (2001) and that of Vodouhê *et al.* (2009) also reported perceptions in local communities as a function of residents' sex, occupation and educational status. However, Inanç (2017) reported that gender, age and family size of residents' surrounding Karagöl Sahara National Park, Turkey had less influence on their perception of forest conservation. This study did not completely support nor refute the influence of local residents' background on their perception. This is because apart from age, farmers' income/month was found to significantly impact their knowledge of climate change while their farm sizes were observed to have highly significant impact on their perception of the effects of climate change. Ani *et al.*, (2013) also reported an increase in farm size coupled with ecological flexibility as guarantee for groundnut farming productivity.

It is equally imperative to note that 66 (76.0%) of the 75 respondents' who perceived their knowledge of climate change as good earn <₦30,000:00/month and that the modal group in the income/month distribution (those earning between>₦5000:00 and₦10,000/month) made-up 42.4% of the group (66) while the remaining 2(7.14%) of the 28 in the modal income/month group could not make up their mind on how they perceived their knowledge on climate change. also, on perception of climate change effects, 27 (71.1%) of the 38, 20 of the 22 (90.9) and 12 (75.0%) of the 16 respondents that subscribed to reduced rainfall, rising temperature and shift in growing season, respectively as effects of climate change in the study area had between 1 and 5 hectares of land. These identified significant effects of climate change among majority and significant land holders in the study area conforms with the findings of Lobell (2008) and Apata *et al.*(2009) that higher temperature and delayed rainfall are the determinants of climate change.

V. CONCLUSION AND RECOMMENDATIONS

The study established a sound understanding of climate change and its attendant effects on food crop production in

the study area. It could also be concluded that such knowledge and perception of climate change and attendant effects is a function of respondents' age. It further observed that food crop farmers in Akinyele Local Government Area of Oyo State are experiencing various effects of climate change on food crop production, directly and indirectly. This is indicated by their unfavorably perception of the effects of climate change on their productivity. The study also established a commensuration between perceptions of residents and evidence from scientific data on the impact of climate change on food crop production in Akinyele Local Government Area in Oyo State, Nigeria. It is therefore recommended that efforts be put in place to include residents of rural communities in formulating policies relating to impact of climate change on food crop production. Efforts should also be put in place to improve their awareness and understanding of climate change within the frame of variable surrounding them. This is expected to assist researchers in data collection within rural environment without much ado.

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