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Crop Farmers' Knowledge Level of Climate Change in Ilorin East Local Government Area of Nigeria

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Abstract
This study was carried out to examine crop farmers' knowledge level of climate change in Ilorin East Local Government Area of Kwara State of Nigeria. Multistage sampling technique was used in the selection of 70 respondents for the study. Interview schedule was adopted in the collection of information from the sampled respondents. Data collected were presented with frequency distribution and percentages while the inferential statistics used was logit analysis. Age range of 74.2% of the respondents was between 41 years and 60 years and 87.1% of the farmers were married. Majority (55.7%) the respondents had no formal education while large percentage (97.1%) engaged in farming as their primary occupation. The farmers have diverse knowledge about effects of climate change therefore, farmers adopted different adaptation strategies like fertilizer application, cultivation of improved varieties and mulching to curb the various effects of climate on agricultural production. The knowledge level of 68.6% of the respondents was low while 31.4% of the farmers had high level of knowledge about climate change. Logit regression result showed a positive relationship between farmers knowledge level of climate change and their age (t= 1.792), marital status (t= 1.956) and farming as primary occupation of the respondents (t=1.908). Study concludes that the farmers have low knowledge of climate change. Recommendations were made that training be provided for the farmers and that governmental organization especially the Agricultural Development Programme (ADP) and non-governmental organization should actively be involved in sensitizing farmers about issues on climate change. Also farmers' organizations should help in providing first class information about climatic changes to farmers.
Key words: Knowledge, Farmers, Climate Change

1.0 Introduction

Agriculture is the main source of food and the main employer of labour in Nigeria, employing about 70-80% of the population and contributes about 40% to Nigeria's Gross Domestic Product (GDP) (Ozor, 2009). Cereals, groundnut and cowpea dominate crop production for the northern part of the country, while yam, cassava, maize and cocoa dominate crops in the southern part (Federal Ministry of Agriculture and Natural Resources (FMANR)(1997**).** It is a significant sector of the economy and also the source of a lot of raw materials used in the processing industries, as well as a source of foreign exchange earnings for the country (Rosenzwei et al, 1994). Therefore any change is bound to impact on the agricultural sector in particular and other socio-economic activities in general. Climate change could have both positive and negative impacts. The negative impact could be measured in terms of effects on crop growth, soil erosion incidents of pests and diseases and seas level rise. The positive impacts could be measured in terms of availability of soil water and soil fertility.

Many factors directly connect climate change and agricultural productivity. Such include factors include; Average temperature increase, change in rainfall amount and patterns rising atmospheric concentrations of CO2, pollution levels and change in climatic variability and extreme events Intergovernmental Panel on Climate Change (IPCC, 2007). Furthermore, IPCC (2007) stated that an an increase in average temperature can lengthen the growing season, adversely affect crops by increasing soil evaporation rates and increase the chances of severe droughts. Change in rainfall amount and patterns can affect soil erosion rates and soil moisture, both of which are important for crop yields. Also, changes in rainfall can affect soil erosion rates and soil moisture, both of which are important for crop yields. The IPCC predicts that precipitation will increase in high latitudes, and decrease in most subtropical land regions—some by as much as about 20 percent.

Nigeria has begun to feel the effects of climate change as the frequency and intensity of extreme events like droughts and floods have increased. Based on IPCC projections, the humid tropical zone of southern Nigeria, which is already too hot and too wet, is expected to be characterised by increase in both temperature and precipitation, especially at the peak of the rainy season Already, temperature increases of 0.2 degree to 0.3

degree per decade have been observed in the various ecological zones of the country, since 1960 (Ngeri, 2009). Furthermore, African agriculture is sensitive to climate change because it will result to losses in revenue as aresult of warming (Kurukulasuriya, and Mendelsohn, 2007)

A Nigerian study applied the EPIC crop model to give projections of crop yield in the 21st century. The study modeled worst case climate change scenarios for maize, sorghum, rice, millet and cassava (Adejuwon, 2006). The indications from the projections are that, in general, there will be increases in crop yield across all low land ecological zones as the climate changes during the early parts of the 21st century but, towards the end of the century, the rate of increase will tend to slow down. It was further explained that, this could result in lower yields in the last quarter than in the third quarter of the century. The decreases in yield could be explained in terms of the very high temperatures which lie beyond the range of tolerance for the current crop varieties and cultivars.

Based on the fore going, farmers must have observed and learnt from the changes in climate as it concern crop production about the best techniques and adaptation options through three ways: (Maddison, 2006); (1) learning by doing, (2) learning by copying, and (3) learning from instruction. This paper examined the issue of climate change from the perspective of the farmer of which Gbetibouo (2009), describe as a bottom-up approach that requires farmers to first notice that the climate has changed, and then identify useful adaptations and implement them.

The scientific agreement that climate change is happening and will continue well into the future regardless of the effectiveness of mitigation measures (Christensen *et al*., 2007) shows that it is important to investigate what farmers know about climate change and management practice adopted by the to combat its effect on their crop production.

In lieu of these the research work was embarked upon to consider the following objectives:

1. examine the socio-economic characteristics of the farmers
2. assess the farmers' knowledge about the changes in climatic factors
3. ascertain the copping and adaptation strategies used by the respondents in the study area.

Hypothesis of the study

The study hypothesis is stated in the null form;

$H0_1$: There is no significant relationship between the farmers' knowledge level of climate change and their socio-economic characteristics.

2.0 Methodology

The study was carried out in Ilorin East Local Government Area of Kwara State. Ilorin is on latitude 8^0 30N and longitude 4^0 35D. Ilorin East Local Government Area was created in 1991 from with the headquarters at Oke – Oyi. The area has eleven wards. It has two main seasons dry and wet season with an intervening cold and dry harmmattan period usually experienced from December to January. It has a natural vegetation consisting of rain forest and wooded savannah. Ilorin East Local Government Areas has annual rainfall which ranges between 1,000 and 1,500mm while maximum average temperature range between 30^0C and 35^0C. The population of the study consists of crop farmers in Ilorin East Local Government Area of Kwara State.

Multistage sampling procedure was adopted for the study. In the first stage, 30% of the town was randomly selected and these towns include Apado, Oke – Oyi, Panada – Agbeyangi and Budo Are. Second, 25% of the population of crop farmers was considered from the lists of the farmers' association in each area. Therefore, 28 crop farmers were randomly selected from Apado, 10 crop farmers from Oke-Oyii, 19 crop farmers from Panada-Agbeyangi, and 13 crop farmers from Budo-Are respectively, summing up to a total of seventy (70) respondents that constituted the sample size of the study.

The data for this study were collected with the aid of an interview schedule. The schedule consists of both open and close ended questions for the effective collection of useful information from the respondents. The statistical analytical tools used for the study include descriptive (frequency distribution and percentage) and inferential tool (Logit regression).

3.0 Result and Discussions

3.1 Personal characteristics of the respondents

As shown on Table 1, 74.2% of the respondents were within the age range of 41-60 years while few (15.7%) were above 60 years. This implies that majority of sampled farmers were within active for economic activities and this is expected to influence their knowledge level about the climatic change in relation to their farming activities. The mean age of the respondents was 50.6years. This is similar to the finding of Ozor et al. (2010) that the mean age of farming household in Southern Nigeria is 49 years. Also, 87.1% of the respondents were

married, 10.0% were widowed and equal proportion of 1.4% were divorced and separated. This result indicates that large proportion of respondents was married.

Distribution of educational level of the farmers indicates that 55.7% of the farmers sampled had no formal education, 31.4% had primary education and 12.4% had secondary school leavers. This implies that majority (55.7%) of the farmers were illiterate, while minority percent were literate. This may have adverse effect on the use of information available to the respondents regarding climate change in the area. More than half (58.6%) of the respondents had family size of 8 persons, 25.7% had family size of 3-5person while 15.7% had family size of 7-10 persons. Their mean family size was 7person**.** It implies that all the farmers sampled had considerable family size and the reason for this size of family may be personal or alternative for labour need for agricultural activities in the area. All the people sampled have respective primary occupation. Very few (2.9%) engaged in civil service, while 97.1% were farmers; 87.1% of them do not have secondary occupation, 9.5% and 1.4% of them engages in trading and carpentry as their secondary occupation. This finding indicates that the majority of the respondents were farmers. The result also indicates that 91.4% of the respondents were Muslim, while 8.6% of them were Christian.

3.2 Enterprise characteristics of the respondents

Mean farm size of the respondents was 3.23ha as majority (51.4%) had farm size of 3.0 to 4.9ha, 32.9% had farm size of 1.0 to 2.9ha and 15.7% had 5.0 to 6.9 ha. This implies most of the farmers were small scale farmers. Furthermore, table 2 shows the farming experience of the farmers was high because the respondents had mean farming experience of 34.99 years. The respondents engaged in diverse crop production. Majority (81.4%) and (97.1%) cultivate cassava and maize while 2.9%, 12.9%, 32.9%, 10.0% and 24.3% cultivate cowpea, sweet potato, rice, sugarcane and pepper respectively. Also, 10.0% cultivate okro, 37.1% cultivate guinea corn and cultivate 21.4% tomato. This result shows that most farmers grow cassava and maize in the area. The reason for this may be due to the fact that these two crops are the major staple food in Nigeria (Food and Agriculture Organization of the United Nations Statistics (FAOSTAT)). And the variation in the percentage of the other crops grown by the farmers may be due to the choice and interest of the individual farmers.

3.3 Knowledge about climatic effects on enterprises of the farmers

The respondents indicated their knowledge about various effects of climate change in their area as it appears to them and this is summarized on Table 3. As shown on the Table 3, all (100.0%) of the respondents sampled claimed that late rainfall usually have adverse effect on crops growth; disagreed that high increase in temperature would make plant to grow well and that increase in drought leads to increase in crop yield. All the respondents agreed that flooding usually have negative effect on crop production. Same proportion also agreed those practices that maintain soil moisture would make crop yield to increase. Majority of the respondents (82.9%) indicated that use of organic fertilizer assisted in conserving soil properties compared to inorganic fertilizer, while 17.1% of them disagreed. About 61.4% agreed that increase in rainfall rate has positive effect on crop growth, while 38.6% disagreed. Majority (90.0%) agreed that mulching is an effective way of reducing soil evaporation, while 10.0% of them disagreed. In addition, 75.7% of the farmers agreed that land portions have been less fertile for crop cultivation due to climatic factors, while 24.3% disagreed. Similar proportion of respondents that agreed that unpredictable weather changes favours disease prevalence , that agro-forestry helps in conservation of soil moisture, that drought results in frequent changes in the crop growing periods and that bush burning contributes to climatic changes were 98.6%, 74.3%,95.7% and 32.9% respectively.

This result implies that farmers sampled for the study has various degree of knowledge about specific climatic factors affecting crop production. The variation in their responses may be due to their knowledge level about climatic factors and changes in the climate. It also implies that most respondents know that adverse climatic factors usually lead to decrease in agricultural production. This is in line with the finding of Umoh and Eketekpe (2010) that effect of climate change on farming activities increase pest and disease infestation, flooding of farm land and crop loss. It is also in conformity with a study by Cumhur and Melcolm (2008), that some changes in soil moisture, increases in temperature and shifts in patterns of plant diseases and pests could lead to decreases in agriculture productivity.

The summary of the knowledge level of the respondents on climate change is as presented on Table 4. The result shows that majority (68.6%) of the respondents had low level of climate change while few (31.4%) of the respondents had high level of climate change. This implies that the farmers are not so knowledgeable about climate change. Based on this it could be inferred that despite the long years of farming experience of the farmers there is dire need for the farmers to be sensitized on issues about climate change especially as it regards farming.

3.4 Management strategies adopted

Table 5 below, shows the different management system adopted by the farmers against the effect of climatic changes among the farmers in the study area. In the table below, it shows that 85.7% adopted cultivation of

improved varieties to a large extent. Very few, (7.1% and 5.7%) adopted mono-cropping to a larger extent and a lesser extent respectively, while 87.1% indicated not at all; equal proportion of 31.4% adopted mulching to a lager extent and a lesser extent; 95.7% adopted crop rotation to a larger extent. Also, 38.6% and 42.9% adopted agro-forestry to a larger extent and a lesser extent; 67.1% adopted irrigation to a larger extent; 67.1% adopted intercropping to a larger extent 35.7% and 32.9% adopted shifting cultivation to a larger extent and lesser extent; 38.6% and 27.1% adopted the cultivation of early/late maturing crops to a larger extent and lesser extent; 64.3% adopted adjusting of field operation to a larger extent. Majority (64.3%) adopted appropriate tillage method to a larger extent while 95.7% adopted fertilizer application to a larger extent. Majority (84.3%) adopted chemical/pesticide application to a larger extent. The result of ranking order of management strategies employed to curb the effect of climate change include; mulching, fertilizer application, irrigation, pesticide application, adjusting field operations and cultivation of improved varieties which supports Action aid (2006) that, changing rainfall patterns and higher temperatures have forced farmers to shorten the growing season and switch to more expensive hybrid crops.

This implies that all the respondents sampled adopted different management practices in order to cope with the effects of climatic changes in the area. This findings corroborate with a study by Parry *et al.* (2004), stated that two major adjustment to climate change include change in land use pattern and management practices. This is also in conformity with Kurukulasuriya *et al.* (2006), reported that common adaptation methods in agriculture include use of new crop varieties and livestock species that are better suited to drier condition, irrigation, portfolio diversification, adoption of mixed crop and livestock farming system and changing plating dates.

3.5 Test of hypothesis of the study

*T*here is no significant relationship between farmers' knowledge level and the socio-economic characteristics of the respondents. Logit regression was used to test for the significant relationship between the two variables i.e. farmers knowledge level and their socio-economic characteristics. The result indicates that some of the selected socio-economic variables were statistically significant at 10% level of significance.

There is positive significant relationship between farmers' knowledge level and the age (t= 1.792), marital status (t= 1.956) and primary occupation of the respondents (t=1.908). This implies that increase in the farmer's age would lead to an increase in the knowledge level of the farmers and again marital status is expected to influence the knowledge level of the farmers about climate change. This also implies that age of the farmer; marital status and primary occupation of the respondents have influence on the farmer's knowledge level about the climatic change in the study area.

4.0 Conclusion

It can be concluded that large proportion of the farmers are not educated and most of them are primarily farmers by occupation and they mostly practice Islamic religion. Majority respondents sampled had low level of knowledge about the effects of climatic change on their agricultural production. The farmers in the area also adopted different cropping strategies such as mulching, cultivation of improved varieties and fertilizer application. Significant relationship exists between the farmers' knowledge level and some selected socio-economic characteristics. There is therefore the need for the government to encourage and embark on re-orientation programme about the climatic changes and its effects on agricultural production for the farmers in order to encourage food production in the country.

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Table 1: Distribution of respondents according to their personal characteristics

Personal Characteristics	Frequency	Percentage	Mean
Age (years)			
31-40	7	10.0	
41-50	26	37.1	50.6years
51-60	26	37.1	
>60	11	15.7	
Marital status			
Married	61	87.0	
Widowed	7	10.0	
Divorced	1	1.4	
Separated	1	1.4	
Educational level			
No-formal education	39	55.7	
Primary education	22	31.4	
Secondary education	9	12.9	
Family Size			
3-5	18.0	25.7	
6-8	41.0	58.6	7 persons
7-10	11.0	15.7	
Primary occupation			
Civil servants	2	2.9	
Farming	68	97.1	
Secondary occupation			
Trading	8	11.5	
Carpentry	1	1.4	
Religion			
Islam	64	91.4	
Christianity	6	8.6	

Table 2: Distribution of respondents by enterprise characteristics

Enterprise characteristics	Frequency	Percentage
Farm size (ha)		
1.0 – 2.9	23	32.9
3.0 – 4.9	36	51.4
5.0 – 6.9	11	15.7
Farming experience (years)		
≤ 15	3	4.3
16 – 20	7	10.0
21 – 30	16	22.9
31 – 40	26	26.1
41 & above	18	25.7
Crops cultivated		
Cassava	57	81.4
Maize	68	97.1
Cowpea	2	2.7
Sweet potato	9	12.9
Rice	23	32.9
Sugarcane	7	10.0
Pepper	17	24.3
Okro	7	10.0
Guinea corn	26	37.1
Tomato	15	21.4

Table 3: Distribution of respondents by knowledge about climate effects on enterprises

Effects of climate change as perceived by the respondents	True	False
Late rainfall has adverse effect on crops growth	70(100.0)	0 (0.0)
High increase in temperature will make plant to grow well	0(0.0)	70 (100.0)
Increase in drought leads to increase in crop yield	0(0.0)	70(100.0)
Flooding usually has negative effect on crop production	70 (100.0)	0 (0.0)
Practice that maintain soil moisture would make crop yield to increase	70 (100.0)	0. (0.0)
Use of organic fertilizer as soil in conserving soil properties compared to inorganic fertilizer	58 (82.9)	12 (17.1)
Increase in rainfall rate has positive on crop growth	43 (61.4)	27 (38.6)
Mulching is an effective way of reducing soil evaporation	63 (90.0)	7(10.0)
Land portions have been less fertile for crop cultivation due to climatic factors	53(75.7)	7(24.3)
Unpredictable weather changes favour diseases prevalence	69 (98.6)	1(1.4)
Agro-forestry helps in conservation of soil moisture	52 (74.3)	18 (25.7)
Change in drought, has made frequent changes in the crop growing	67 (95.7)	3 (4.3)
Bush burning contributes to climatic changes	23 (32.9)	47 (67.1)

Source: Field Survey, 2010. % in parentheses

Table 4: Distribution of respondents' knowledge about climate change

Knowledge Level	Frequency	Percentage
Low	48	68.6
High	22	31.4

Table 5: Distribution of respondents by management strategies adopted

Management strategies	To a large extent	To a lesser extent	Not at all	Mean	Rank
Cultivation of improved varieties	60(85.7)	9(12.9)	1(1.4)	1.8*	3
Mono-cropping	5(7.1)	4(5.7)	61(87.1)	0.2	15
Mixed farming	22(31.4)	22(31.4)	26(37.1)	0.9	14
Mulching	67(95.7)	3(4.3)	0(0.0)	1.9*	1
Crop rotation	33(47.1)	27(38.6)	10(14.3)	1.3*	7
Agro-forestry	27(38.6)	18(25.7)	25(35.7)	1.0	11
Planting of cover crops	27(38.6)	30(42.9)	13(18.6)	1.2	10
Irrigation	64(91.4)	3(4.3)	3(4.3)	1.8*	3
Intercropping	47(67.1)	3(4.3)	3(4.3)	1.3	7
Shifting cultivation	25(35.7)	23(32.9)	22(31.4)	1.0	11
Early maturing crops	27(38.6)	19(27.1)	24(34.3)	1.0	11
Adjusting field operations	45(64.3)	19(27.1)	24(34.3)	1.5*	6
Appropriate tillage method	45(64.3)	7(27.1)	18(25.7)	1.3	7
Fertilizer application	67(95.7)	1(1.4)	2(2.9)	1.9*	1
Pesticide application	59(54.3)	8(11.4)	3(4.3)	1.8*	3

Grand mean=1.33 * –most important strategy adopted
Figures in parentheses are percentages

Table 6: Test of significant relationship between farmers' knowledge level and socio-economic characteristics respondents

Socio-economic characteristics	**Coefficients**	**Standard error**	**t- value**
Constant	3.3080	3.4749	0.952
Age	0.2494	0.1393	1.792*
Marital status	1.0794	0.5519	1.956*
Educational level	0.7562	0.8466	0.893
Family size	0.3785	0.2610	0.145
Primary occupation	0.4232	0.2218	1.908*
Religion	- 1.6431	1.3983	- 1.175

Source: Field Survey, 2010.