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## **Effect of Climate Change on Farmers Income Generating Activities in Kwara State, Nigeria**

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## **Abstract**

*The study examined the effect of climate change on income generating activities of farmers in Kwara State, Nigeria. Multi-stage sampling procedure was used to select 240 crop and livestock farmers for the study. The majority (52.4%) of the respondents were literate and had multiple income generating activities (83.7%). Crop farming, collection of forest products, poultry production and goat rearing were the most negatively affected income generating activities. Sex, educational level and household size had significantly positive relationship with farmer's involvement in income generating activities. A positive significant differences existed in farmers' income generating activities before and after climate change. Indigenous practices adopted in controlling the effect of climate change do not have significant relationship with farmers' involvement in income generating activities. Government, research institutes, extension officers, non-governmental organizations and community leaders should intensify efforts at educating farmers on the need for use of environmentally friendly farming systems in order to reduce the effect of climate change.*

**Keywords:** Climate change; farmers' income generating activities,

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## Introduction

Climate is an average atmospheric condition of a place for a long period of time usually 35 years and above (Intergovernmental Panel on Climate Change, 2017). Climate change refers to any change in climate over time whether due to natural variability or as a result of human activities (Global Carbon Project, 2015). This usage differs from that of the United Nations Framework Convention on Climate Change (UNFCCC, 2018) which defines climate change as change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural variability observed over a comparable time (Intergovernmental Panel on Climate Change, 2017). Climate change is defined as a thirty or more years of persistence pattern of revolving changes in weather characteristics, these are in relation to temperature, pressure, wind system and direction, humidity, cloud cover and precipitation (IPCC, 2017). In Nigeria just as in many developing countries in the sub-tropical region, the agricultural sector is more vulnerable to climate change, landless farmers, livestock keepers, people on poor health; those with low level of education are more exposed to risk of climate change (Barber, 2016). The climate change patterns play a fundamental role in shaping natural ecosystems and the human economies and cultures that depend on them. Because many systems are tied to climate, a change in climate can affect many related aspects of where and how people and animals live, such as food production, availability and use of water and health risks. Climate change is projected to increase threats to human health. One of the major aspects that has been significantly affected by climate change are the income generating activities of farmers.

In Nigeria, it has been found that most people engage in several income generating activities to 'make a living' with various combinations of farm and non-farm activities (Olawoye, 2015). The sustainability of many of these income generating activities is however often not assured under conditions of global warming-induced climate change leading to environmental degradation and economic instability (Olawoye, 2015). Presently in Kwara State, seasons that were predictable are no longer so. Season rains are erratic and droughts have become more frequent and severe even as many rivers are drying up over the years (Adefalu *et al.*, 2016). Overall, climate change has brought poverty to the people of the state. It is pertinent to note that trees in the forests have been reduced gradually without replacement, and this has affected the availability of various plants and animal species. Although there is an increase in demand for them, the substantial effect of deforestation on the soil makes it exposed, while vegetation cover becomes thinner, and affects the fertility of the soil (Shove, 2016). All these affects the income generating activities of farmers, forcing them to diversify to cultivation of other crops or even the adoption of different income generating activities. It is against this background that the study examined the changes in income generating activities of farmers, and determined the perceived effect of climate change among farmers in Kwara State, Nigeria.

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## Methodology

The study was conducted in Kwara State, Nigeria. The state which lies between latitudes 7° 45' N and 9° 30' N and longitudes 2° 30' E and 6° 25' E. Kwara state has sixteen (16) local government areas (LGAs). The state is classified into four (4) agricultural zones – A, B, C and D based on their agronomic uniqueness.

A multi-stage sampling procedure was employed in the selection of zones, blocks, cells and villages for the study. The first stage involves a random selection of Zone A and D of Kwara ADP administrative zone. Thereafter, a systematic random sampling of two (2) LGAs from the chosen ADP zones was implemented in the second stage. In the third stage, random selection of 2 villages from each of the 4 LGAs selected in the second stage was carried out. Hence, a total of 8 villages were sampled. The last stage involved the use of a systematic random sampling to select thirty smallholder farmers across the eight selected villages. Thus, a total of two hundred and forty (240) respondents were used for the study. However, only 214 respondents were used in the final analyses due to some incomplete responses. Primary data were used for this study and were collected through the use of structured questionnaire coupled with interview schedule.

Changes in income generating activities of farmers were assessed by asking respondents to tick from a list of 27 of both agricultural and non-agricultural income generating activities with a minimum score of 0 and maximum of 27 and asking respondents to respond to them using a 3point Likert scale of always, rarely and never with weighted values of 2, 1 and 0, respectively. The cumulated score obtained was then categorized as high and low.

## Results and Discussion

### Changes in Income Generating Activities

Table 1 reveals that the income generating activities with observable changes in which farmers were involved were selling of firewood (20.5%), hunting (17.1%), crop planting (16.4%), snail collection (15.2%), fishing (12.9%), and palm-oil processing (4.3%), while those in which more people are now involved were transportation (19.5%), petty trading (19.1%), hired labour (18.5%), tailoring (12.9%), and hired plating (11.2%).

The percentage change for selling of firewood (20.5%), and hunting (17.1%), may be a reflection of the availability of firewood for sale as a result of deforestation. Collection of snail had a percentage change of 15.2, which may be indication of reduced availability of game as a result of change in climate. Petty trading had a percentage increase of 19.1. This suggests that more people are drifting from farming and are now involved in trading activities. The result is a reflection of the fact that while climate change is negatively affecting cultivation of major crops, it is making farmers more involved in off-farm income generating activities. This implies that there is diversification in income generating activities of farmers to reduce risk due to climate change. This is in line with Alalade, Oladunni, Akinboye, Daudu, and Ogunrinde (2019) that non-farm activities help farmers in spreading production risk

through diversification in income generating activities. As a result of climate change, changes were seen in both agricultural and non-agricultural income generating activities of the respondents. The implication of this is that there would be decrease in food production in the area. This is in line with Adeyonu, Aremu, Ajeigbe, and Ayinle (2016) that climate change poses a threat to food security and sustainability of agricultural production. It is therefore imperative that extension activities be sensitive about these diversifications by concentrating more on activities in which more of the farmers are now involved, that is, those income generating activities with positive percentage changes (Shove, 2016).

**Table 1: Changes in income generating activities**

<b>Activities</b>	<b>Before</b>	<b>Now</b>	<b>% change</b>
	<b>Percentage</b>	<b>Percentage</b>	
Goat/sheep rearing	48.1	53.3	5.2
Fishing	21.9	9.0	-12.9
Livestock production	37.1	28.6	-8.5
Hunting	27.6	10.5	-17.1
Piggery production	5.7	8.1	2.4
Palm oil processing	63.3	59.0	-4.3
Crop planting	84.0	67.6	-16.4
Selling of firewood	90.0	69.5	-20.5
Keeping of local fowls	71.0	91.0	20.0
Rabbit rearing	4.3	5.2	0.9
Snail collection	37.1	21.9	-15.2
Basket weaving	9.0	14.8	5.8
Food vending	5.2	11.0	5.8
Petty trading	23.3	42.4	19.1
Hair plating	7.6	19.5	11.9
Hired labour	18.6	37.1	18.5
Tailoring	3.3	16.2	12.9
Palm-tapping	5.2	8.6	3.4
Blacksmithing	3.8	3.8	0
Cloth weaving	11.4	19.5	8.1
Carpentry	2.4	7.6	5.2
Welding	0.9	3.3	2.4
Barbing	5.7	6.2	0.5
Transporter	14.8	34.3	19.5
Traditional medicine	1.4	1.4	0

**Source: Field Survey, 2020**

### **Perceived Effect of Climate Change**

Table 2 reveals that the majority perceived soil degradation/loss of fertility (64.8%), deforestation (58.1%), change in farming patterns (54.3%), reduced productivity (47.1%), and changes in rainfall patterns (45.6%) as the major negative effects of

climate change. The result shows that climate change has serious effect on farming. This could be responsible for respondents engaging more in off-farm income generating activities so as to enhance their livelihood. This is in line with the position of Alalade *et. al*, (2019) that climate change has undesirable effects on farming activities. It therefore becomes pertinent to examine the effects of climate change and to consider how these activities would be addressed in order to help sustain the farming profession. From table 2 also, soil degradation, a result of exposure of the soil to the vagaries of weather has serious effect on the income generating activities of respondents in the study area. In addition, deforestation is also a significant factor as it exposes the soil to climatic torture, thereby affecting the courses of crops, and thus the productivity attained by farmers.

**Table 2: Perceived effect of climate change**

Effect	Negative Effect		Positive Effect	
	%	Rank	%	Rank
Change in farming patterns	54.3	3 <sup>rd</sup>	-	-
Change in land tenure system	43.3	6 <sup>th</sup>	-	-
Bush fire	23.3	9 <sup>th</sup>	-	-
Soil degradation/loss of fertility	64.8	1 <sup>st</sup>	-	-
Deforestation	58.1	2 <sup>nd</sup>	-	-
Reduced productivity	47.1	4 <sup>th</sup>	-	-
Change in rainfall pattern	45.6	5 <sup>th</sup>	-	-
Reduced availability of forest products	38.5	7 <sup>th</sup>	-	-
Slight increase in water resources	37.6	8 <sup>th</sup>	47.1	2 <sup>nd</sup>
Easy drying of grains	-	-	55.2	1 <sup>st</sup>
*Multiple response	$\bar{x} = 49.6$		$\bar{x} = 42.1$	

**Source: Field Survey, 2020**

### **Relationships between Selected Characteristics of Respondents and Income Generating Activities**

Table 3 reveals that there is a significant relationship between selected personal characteristics of respondents such as sex ( $\chi^2 = 3.79$ ,  $p \leq 0.05$ ), educational level ( $\chi^2 = 12.65$ ,  $p < 0.01$ ) and income generating activities of farmers. Correlation analysis also revealed that age ( $r = 0.169$ ,  $p < 0.05$ ) and household size ( $r = - 0.159$ ,  $p < 0.05$ ) were significantly related to income generating activities. The result is in consonance with Uddin *et. al*. (2015) that significant relationship exists between selected personal characteristics and farmers' participation in own enterprises and non-farm

employment. However, household size is at variance with the finding of Oladeji (2016) that household size is positively associated with involvement in income generating activities. This may be due to the fact that in the long run, dependants generate income to support family subsistence.

**Table 3: Relationships between selected personal characteristics and income generating activities**

Variables	Chi-square value	r	Df
Sex	3.79*		1
Educational level	12.65*		4
Household Size		-0.159*	N = 210
Age		0.169*	N = 210

- **P≤0.05. Source: Field Survey, 2020**

### Conclusion and Recommendations

There was a significant change in the following activities; crop planting, snail collection, fishing, hunting, transportation, petty trading and hired labour as a result of a change in climate. There exists a significant relationship between selected personal characteristics of farmers and their income generating activities. Government, non-government agencies and community leaders should as a matter of urgency intensify efforts to educating farmers on the need for the use of environmentally friendly farming systems such as tree planting on crop land for soil protection so as to improve soil fertility. Furthermore, there is the need to mitigate the effects of climate change, while extension efforts should be concentrated on the delivery of information about income generating activities in which the respondents are now more involved in order to enhance their livelihood.

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