Effects of Climate Change on Food Security among Farmers in Some Selected Communities in Edu Local Government Area, Kwara State, Nigeria

Ayinla Lateefah Olajumoke*, Henry Olawale Sawyerr, Shegun Victor Oluwatuyi
Department of Environmental Health Science, Kwara State University, Malete, Ilorin, Nigeria
**Corresponding Author*

Abstract:-

Introduction: Food security is an essential element of overall wellbeing and sustainability of the wealth a nation. Several publications has discussed climate change and its general impact on local or rural farmers and their food security, global warming, health, etc. but relatively fewer studies has been done focusing on the better adaptation techniques and technology for rural farmers in developing nations like Nigeria.

Aim & Objectives:This study aim to assess the effects of climate change on food security with its objectives as; assess the knowledge of the farmers on the climate change issues; determine the impacts of climate change on food security and identify adaptations options that can enhance farmers and community resistance to climate change effects with reference to food security.

Methodology: Quantitative questionnaires were administered to Hundred and Sixty-Seven (167) respondent farmers across randomly selected community from a total of one hundred. The data were organized, sorted, edited, coded and analyzed with Statistical Package for Social Sciences (SPSS) version 22.0 with Microsoft Excel 2010.

Result: The farmers according to the result above are inaccessible to rain forecast information for the past 5 years for any rainy season, since the p-value (0.108) is more than $\alpha = 0.05$. The findings in this study revealed that most of the farmer adopted expansion of cultivated land as measure adopted to reduce exposure to the risk of climate change

Conclusion: It was concludes that climate change has impact on food security in the study area. It was therefore recommended that Predictions should be in place to help develop appropriate interventions

Keywords: **Climate Change, Food, Food Security, Farmers, Global Warming, Health**

I. INTRODUCTION

Food security is an essential element of overall wellbeing and sustainability of the wealth a nation (Zewdie, 2014). Increasingly, in the last decade, attention has been focused on means of eliminating food insecurity and hunger worldwide. According to World Food Summit of 1996, Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 1996). Agriculture is the main source of food, industrial raw materials in Nigeria. It is predominantly a rain fed system and hence vulnerable to climate changes (Ibrahim *et al.,* 2010). Climate change is one of the environmental, topical and tropical life threatening issues facing the economic development and sustainability of man-kind worldwide (Zewdie, 2014).

Climate change refers to any variation in climate over time, weather due to natural variability or as a result of human activities (Bello *et al*., 2012). This is because it keeps occurring and reoccurring as days go by due to a lot of pressure in our environment making it an inter-twined process with agriculture (Zoellick and Robert, 2009). Natural climate cycle and human processes contributed to an increase in the temperature (global warming) (UNFCCC, 2007). Warming of the ecological system causes unpredictable and extreme weather events impact and increasingly affect crop growth, availability of soil water, forest fires, soil erosion, droughts, floods, rising sea level with prevalent infection of diseases and pest infestations consequently leads to increased rainfall and increased rainfall would lead to frequent flood and drought resulting in variability in crop yields in different ecological systems (Nwajiuba and Onyeneke 2010; Odjugo, 2010; Nwaiwu*et al*., 2014).

Climate change in the form of higher temperatures, reduced rainfall and increased rainfall variability, reduces crop yields, reduces net farm revenues and threatens food security in low income based economies including African countries (Adejuwon, 2004; Zoellick and Robert 2009). These environmental problems result to low and unpredictable crop yields, which invariably make farmers more vulnerable, especially in Africa (Ziervogel*et al*., 2006; UNFCCC, 2007). Desertification, uncontrolled grazing, livestock migration, poaching/settlement within protected areas, bushfires and deforestation also posed threats to the environments (Beloo*et al*., 2012). All these adversely affected agriculture and food supply, fresh water resources, natural ecosystems, biodiversity and human health, threatening human development and their

social, political and economic survival (Zoellick and Robert 2009).

The growing problem of climatic change impacts is global and the developing countries, especially Nigeria will be mostly affected (Greg *et al*., 2011). This is because, Nigerian economy is predominantly agrarian rain-fed, fundamentally dependent on the vagaries of weather, due to inability to cope as a result of poverty and low technological development, hence low level of cropping capabilities by the farmers (Ziervogel*et al.,* 2006; Jagtap 2007; Onyenechere 2010). The Northern zone faces the threat of desert encroachment at a very fast rate per year occasioned by fast reduction in the amount of surface water, flora and fauna resources on land (Ahmed *et al*., 2014). This makes people to exploit more previously undisturbed lands leading to depletion of the forest cover and increase on sand deposits in the Northern axis of Nigeria (Odjugo, 2010). Available evidences showed that Kwara State, Nigeria is already being plagued with diverse ecological problems with a predicted fall by 10-20% by 2050 or even up to 50% due to on-going climate change (Adefolalu, 2007; Ikyase and Iloh, 2014).

Objectives

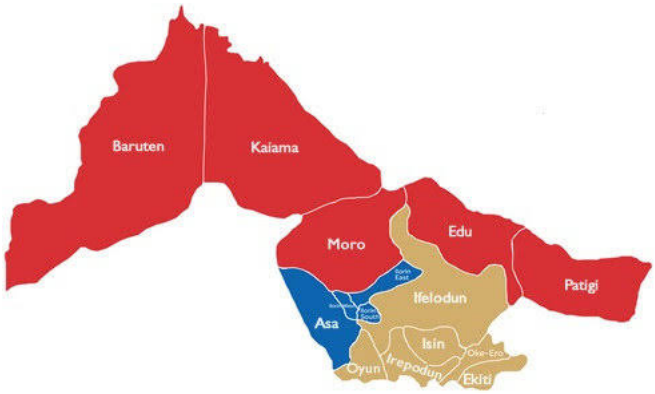
1. To assess the knowledge of the farmers on the climate change issues
2. To determine the impacts of climate change on food security.
3. To identify adaptations options that could enhance farmers and community resistance to climate change effects with reference to food security

Research Hypothesis

1. H_0: There is no significant relationship between climate change and food security in Edu Local Government Area of Kwara State.
2. H_1: There is significant relationship between climate change and food security in Edu Local Government Area of Kwara State.

II. METHODOLOGY

Study Area



This study was conducted in Kwara State, Nigeria. The State has sixteen Local Government Areas (LGAs) and each LGA is divided into districts which are made up of villages. It has a population of 1,566,469 and a total land size of 3,682,500 hectares and 247,975 farm families with majority living in rural areas, (NSG, 2006). It is located between latitudes 7^0 45'N and $9^0$30'N and longitude $2^0$30'E & 6^0 25'E. The topography is mainly plain lands to slight gentle rolling (KWADP CAYS, 1999). The annual rainfall ranges between 1,000mm and 1,500mm. The climate change is characterized by rainy and dry season. The rainy season begins from early April and ends in October and dry season begins at the end of November to March (NSG, 2006). Average temperature ranges between 30^0C and 35^0C.

Sampling Technique

Selection of the district was based on the past record of food insecurity incidence in some selected communities in Edu local government in Kwara North. Study was conducted in each representative village (shonga, zambufu and Tsaragi) within the local government for each ecological zone. Using stratified sampling technique each agro-ecological zone was regarded as strata. Selection of the villages was done by using a district map in collaboration with district authorities that are familiar with location of the villages in the district. The population number and list of farmer for each village was obtained from the village register and the households for interview. 167 questionnaires were distributed to the farmers for data collection. Sample size 167

Data Collection

The main source of data collection was questionnaire. Questionnaire was administered to the farmers in the communities to be sampled. The questionnaire administered was designed in order

1. To analyze the climatic variation (temperature and rainfall) using GIS techniques in the study area;
2. To assess the knowledge of the farmers on the climate change issues
3. To determine the impacts of climate change on food security.
4. To identify adaptations options that could enhance farmers and community resistance to climate change effects with reference to food security

Analysis

Quantitative data were organized, sorted, edited, coded and analyzed using a Statistical Package for Social Sciences (SPSS) version 22.0 computer software and Microsoft Excel 2010. Results are presented in frequency charts, figures and tables.

III. RESULTS

Table 1: Descriptive statistics of the characteristics of respondents

Variable	Levels	Number of Respondent (%)
Gender	Male	114(66.3)
	Female	57(33.7)
	Total	172(100)
Marital status	Single	53(30.8)
	Married	119(69.2)
	Total	172(100)
Age group	29-30	49(28.5)
	31-40	68(39.5)
	41-50	48(27.9)
	51 and above	7(4.1)
	Total	172(100)
Education status	Primary	12(7)
	Secondary	131(76.2)
	Tertiary	20(11.6)
	None	9(5.2)
	Total	172(100)
Location	Shonga	99(57.6)
	Tsaragi	44(25.6)
	Zambufu	29(16.9)
	Total	172(100)

The results from table1 above revealed that the percentage of male (66.3) that participated in the study is more than the female (33.7), also, the number of married participants is much more than the single respondents. Consequently, we also observed that the participants with age group 31-40, secondary education and the participant from Shonga are much involved in this study than any other level counterpart. Moreover, the figure 1 and 2 below also virtualized the various characteristics of the respondent demographic variables and the results can be interpreted in the same manner as in table 1 above.

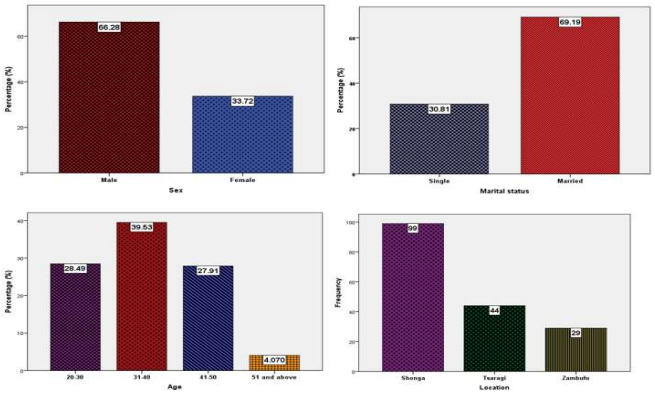


Figure 1: Virtual display of the respondent demographic variables

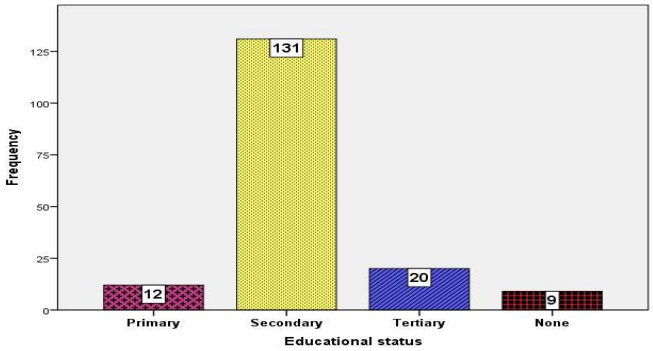


Figure 2: Virtual display of the respondent demographic variable (Educational status)

Objective 1: To assess the knowledge of farmers on climate change

Table 2: Assessment of knowledge of farmers on global weather pattern

Test statistic	Degree of freedom	P-value
Pearson Chi-Square	1	0.0001
Likelihood ratio test	1	0.003

The result above shows that farmers are knowledgeable on global weather pattern, since the p-value (0.0001) is less than $\alpha = 0.05$. Consequently, also observed that the knowledge assessment based on the global weather pattern is very important and necessary in this study.

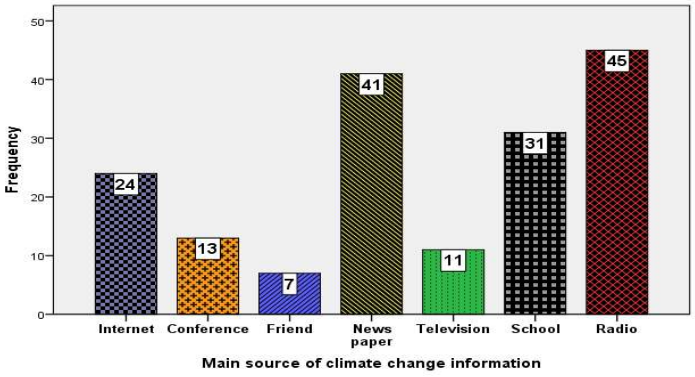


Figure 3: Virtual display on the sources of information regarding climate change

The plot above depicts that Radio is main source of information regarding climate change having up to 26 percent of the total population, with newspaper seconding with 24 percent of the population.

Table 3: Assessment of knowledge on climate issue

Test statistic	Degree of freedom	P-value
Pearson Chi-Square	2	0.0001
Likelihood ratio test	2	0.001

The result above shows that the farmers are accessible to knowledge possible on climate issue, since the p-value (0.0001) is less than $\alpha = 0.05$

Table 4: Farmers information on climate change as an environmental issue

Test statistic	Degree of freedom	P-value
Pearson Chi-Square	2	0.0001
Likelihood ratio test	2	0.001

The result above shows that the farmers are well informed on how important climate change is, as an environmental issue, since the p-value (0.0001) is less than $\alpha = 0.05$.

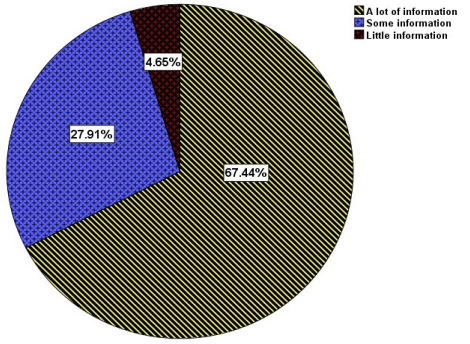


Figure 3: Virtual display of the respondent perspective on their information on climate change

The results in figure 3 shows that 67.44% of the respondent access to a lot of information on the climate change, 27.91% have some information and while only 4.65% have little information on the climate change and its effect on the agricultural products.

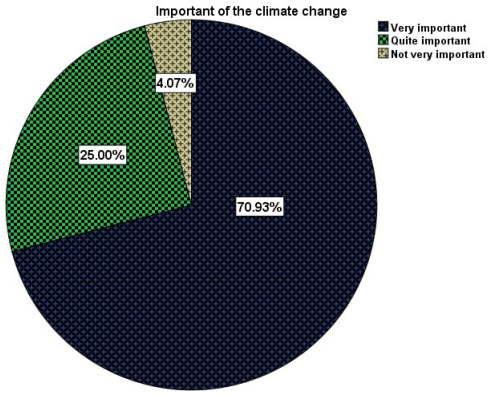


Figure 4: Virtual display of the respondent perspective on their information on climate change

In identifying the effect of climate change on the personal effect, we observed from figure 4 above that 70.93% of the respondent take the climate effect very important, 25.00% take the effect quite important, while 4.07% take the effect of the climate change not very influential as showcase in the figure above.

Objective 2: To determine the impacts of climate change on food productivity

Table 5: Impacts of climate change on food

Test statistic	Degree of freedom	P-value
Pearson Chi-Square	4	0.031
Likelihood ratio test	4	0.021

The results in Table5 above show that the climate change affect the rate of food production in households, since the p-value (0.031) is less than $\alpha = 0.05$. The result in figure 4 reviewed that 50.58% of the respondent agreed that climate change greatly affect the food production, 33.14% are of the opinion that the climate change affect the food production slightly and while only 16.28% are of the option that the climate change does not affect the food production respectively.

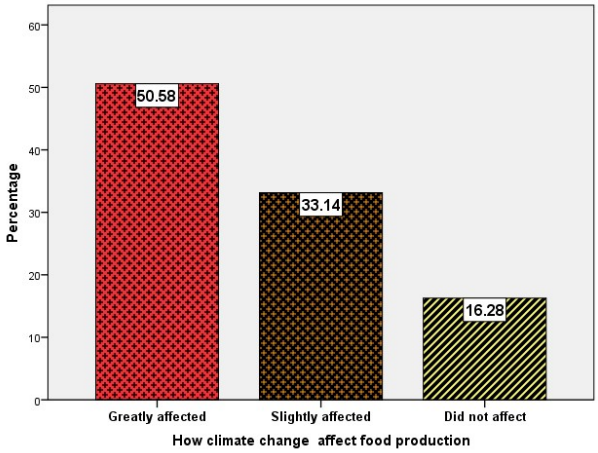


Figure 5: Virtual display of the respondent view on the effect food productivity

Objective 3: To identify adaptations options that could enhance farmers and community resistance to climate change effects with reference to food security

Table 7: Adaptation options that could improve food insecurity condition

Test statistic	Degree of freedom	P-value
Pearson Chi-Square	1	0.263
Likelihood ratio test	1	0.335

The results above show that no adaptation procedure was taken to enhance and improve food security condition in the farmers area, since the p-value (0.263) is more than $\alpha = 0.05$.

Table 8: Access of farmers to rain forecast information

Test statistic	Degree of freedom	P-value
Pearson Chi-Square	1	0.108
Likelihood ratio test	1	0.106

The farmers according to the result above are inaccessible to rain forecast information for the past 5 years for any rainy season, since the p-value (0.108) is more than $\alpha = 0.05$

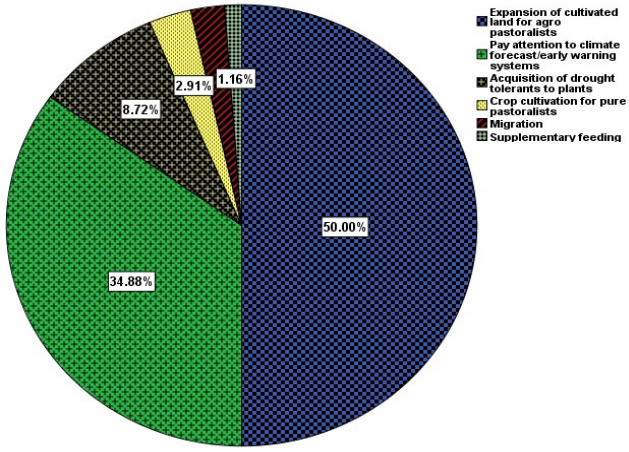


Figure 6: Virtual display of the respondent view on the type of measures used

The figure 6 above showcase the respondent opinion on the six different measure adopted to reduce exposure to the risk of climate change on the food security. Out of the six measures 50.0% of the farmer adopted expansion of cultivated land, followed by 34.88% of the respondent whose sees forecast, and early warning systems measures, and other measures are them follows subsequently.

Hypothesis

Group	N	Mean	Std. Error	Std. Deviation	Df	T-value	p-value	Remark
Experimental	20	44.0	1.1120	8.2210	39	0.672	0.331	Rejected
Control	20	42.0	1.0624	7.1022				

Hypothesis Testing for Relationship between climate change and food security

H_0: There is no significant relationship between climate change and food security in Edu Local Government Area of Kwara State.

H_1: There is significant relationship between climate change and food security in Edu Local Government Area of Kwara State.

Decision rule: Reject Ho if p≤0.05, since P-value (0.015) is less than 0.05 alpha level of significance, Ho is therefore rejected and concluded that the average concentration of $PM_{2.5}$ across the motor parks is not the same.

IV. DISCUSSION

Based on result analyzed above it was discovered that farmers are knowledgeable on global weather pattern, since the p-value (0.0001) is less than $\alpha = 0.05$. Consequently, also observed that the knowledge assessment based on the global weather pattern is very important and necessary in this study this is in agreement with the result of Evelyne Binyaya 2010 who in her studies revealed that farmers in Kenya has knowledge on global weather pattern and disagrees with the result of Alfred et al 2014 who in his study revealed that farmers have no knowledge global weather pattern, a result which he attributed to poor communication and awareness program. It was also discovered that the farmers are accessible to knowledge possible on climate issue which is in agreement with the result of (Anyadike 2003; Hess *et al.,* 2005) who claimed that farmer has exclusive access to knowledge on climate change due to Government prioritizing climate issue in Tanzania. The result shows that the farmers are well informed on how important climate change is, as an environmental issue which is different from the result of (Adams, 2006; Dabi and Anderson, 2008) who revealed in their studies that farmers are not well informed on climate change. Anderson 2008 further stressed that the lack of awareness is due to illiteracy level among practicing farmers in the study area. It was also discovered that farmers have access to a lot of information on the climate change and its effect on the agricultural products. It was revealed in this study that most of the respondents take the climate effect very important which is similar with the result computed by Aggarwal (2009), who claimed that most of the respondents in India takes climate change very important even though they had no idea how it could be controlled. This study revealed that climate change significantly affects the rate of food production in households, this is further established by the result of NicollasTrilla (2013) who stressed that food production in the community and households reduces drastically due to climate change hence, food security is threatened. The results above showed that no adaptation procedure was taken to enhance and improve food security condition in the farmer's area, this is in agreement with the result of Omondi*et al.,* 2013 who said in his study that farmers in South Africa has to rely on other methods to improve productivity and enhance food safety and security. Gregory (2005) also had a similar result claiming that most farmers in Hungary resort to alternate adaptation procedure to ensure food security due to climate change. It was also revealed in this study that the farmers are inaccessible to rain forecast information for the past 5 years for any rainy season, this is different from the result of Hollander 2005 who claimed that farmers in Austria are well equipped with information to rain forecast for the past 10 years as these assist farmers to have a good cultivation pattern. Appiah (2008) had a similar result in her study wherein she revealed that farmers has no access to rain forecast information since 1998 in Ghana and that's over a decade. The findings in this study revealed that most of the farmer adopted expansion of cultivated land as measure adopted to reduce exposure to the risk of climate change on the food security indicating 50% while 34.88% of the respondent said forecast, and early warning systems measures will reduce exposure to the risk of climate change on the food security. This result is in

agreement with the Article review by Herrero *et al.,(*2010) who stressed that the most effective way to ensure food security is to establish an early warning system which will assist the farmers to understand and plan for cultivation as appropriate by expanding cultivation land at the right time and season. Adeleke et al 2006 had a different opinion revealed by respondents in their study; it was revealed that improving methods and tools such as installation of rainfall and temperature measuring instruments for assessing extreme weather events as this will guide adaptations and facilitate to carryout mitigation to increase awareness of climate change drivers that brought such change/variations. Predictions should be in place to help develop appropriate interventions.

CONFLICT OF INTEREST

The Authors have no conflict of interest to declare

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