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EFFECT OF CLIMATE CHANGE ON HOUSEHOLD FOOD SECURITY IN IDEATO NORTH LOCAL GOVERNMENT AREA OF IMO STATE, NIGERIA

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ABSTRACT
Climate change has been implicated to have significant impacts on global and regional food production, particularly among the common staple food crops. This paper examined how the shift in climate in conjunction with other determinants affects the household food security in the study area. Data were collected through the use of structured questionnaire and subsequently, analyzed with simple descriptive statistics. Major findings of the study show that climate change affected food security of households in the study area in the following manner; reduction in production of crops and livestock 18.0%, changes in land suitable for production 18.3%, storage of planting crops and food item 8.9% and diseases infested of crops and livestock 15.6%. And they adapted the following strategies to mitigate the effect on their agricultural activities; changes in distribution of land under cultivation 8.9%, changes in land management 8.4%, increasing/decreasing planting materials 9.8%, fallowing 14%, mulching 15.4%, intercropping 16.3%, mix cropping 14.8% and indigenous agroforestry 4.9%. Based on the findings of this study, there is evidence that climate change affects agricultural production of the respondents which in turn will lead to a decline in output of their products. In all of these situations, the economic consequence is reduction in the availability of food.

Key Words: Climate Change, Rural Households and Food Security

INTRODUCTION
Climate refers to the characteristics conditions of the earth's lower surface atmosphere at a specific location; weather refers to the day to day fluctuation in this condition at the same location (IPEC, 2007). Mean global temperature have been increasing since about 1850 mainly owning green house gases in the atmosphere (FAO, 2008). The main causes are burning of fossil fuel (coal, oil and gas) to meet increasing energy demand and the spread of intensive agriculture to meet increasing food demand, which is often accompanied by deforestation. These changes will have serious impact on the four dimensions of food security: food availability, food accessibility, food utilization and food system stability (FAO, 2008). Effects are already being felt in the markets and are likely to be particularly significant in rural communities where crops fails and yields decline. For example, a cup of bread-fruit selling for ₦100.00 in 2012 was ₦40.00 between 2002 and 2004.

This will disrupt supply chain, market price increase, assets will be lost, purchasing power falls and these communities will be unable to cope. The possible impacts of climate change on food security have tended to be viewed with most concern because rain fed agriculture is still the primary source of food and income in most rural communities in Nigeria. FAO's view of a world without hunger is one in which most people are able, by themselves to obtain the food they need for an active and healthy life, and where social safety nets ensure that those who lack

resources still get enough to eat (FAO, 2004). Agriculture is important for food security in two ways: it produces the food people eat, and perhaps even more important, it provides the primary sources of livelihood for 75 percent of Nigerian total work force. In heavily populated countries of Asia and the pacific this share ranges from 40 to 50 percent, and in some sub-Saharan Africa, two third of the working population are still making their living from agriculture (ILO, 2007). There is no gainsaying that every threat to the environment affects human existence since there is a very close link between health and environment. Agriculture depends on, and affects the environment; availability of food depends on viable agricultural activities and health depends on good nutrition which is an outcome of bountiful food production through effective agricultural activity. Since national economic development is anchored on these (agriculture, environment, health and food nutrition) it calls for concerted efforts to ensure sustainable management (Food Security Magazine, 2012). If agricultural production in the low-income developing countries of Asia, Africa and Nigeria in particular is adversely affected by climate change, the larger number of the rural poor will be at risk and their vulnerability to food insecurity increased. This paper will therefore, identify the effect of climate change on households food security and strategies adopted by farmers to mitigate the effect, with the following specific objectives to:

1) identify the socio-economic characteristics of the respondents.
2) identify the effects of climate change on household food security in the study area.
3) ascertain the strategies adopted by respondents to mitigate the effect of climate change in the study area.

METHODOLOGY

This study was conducted in Imo State, Nigeria. The state has a total of 27 Local Government Areas (LGAs), with 3 agricultural zones, namely, Okigwe, Owerri and Orlu. It is located within latitude $4^0 45^1$N and $7^0 15^1$N and longitude $6^0 5^1$E and $7^0 25^1$E. Imo State has its total land area as 5,100sqkm and the population of the people is estimated to be 4.8 million (NPC, 2006). The major occupation of the people is agriculture and civil services. The people practices both crop farming and animal farming. The average annual rainfall of the area is between 1990 and 2200mm, and the annual temperature is between 20^0C and 27^0C with a relative humidity of 75% (Wikipedia).

A multi-stage random sampling technique was used in selecting the sample size. From the three agricultural zones, one agricultural zone (Orlu) was purposively selected. From these zone, one LGA – Ideato North was randomly selected from the 12 LGAs. They are Orsu, Orlu, Nwangele, Isu, Ideato South, Ideato North, Nkwere, Oru West, Oru West and Njaba. From this LGAs, a community (Urualla) was also randomly selected, and from this community – three villages, namely Eziokwu, Ukwualilu and Amanato with 50 respondents each were selected. Data were collected with the use of structured questionnaire and Focus Group Discussion and subsequently analyzed with the use of simple descriptive and like frequency distribution.

RESULTS AND DISCUSSION

Table 1: Distribution of Respondents According to their Selected Socioeconomic Characteristics

Variables	Frequency	Percentage (%)
Sex		
Male	83	55.3
Female	67	44.7
Total	**150**	**100**
Marital Status		
Single	**50**	33.3
Married	**76**	50.7
Separated	**10**	6.7
Divorced	**14**	9.3
Total	**150**	**100**
Education		
No Formal Education	22	14.7
Primary	18	12
Secondary	63	42
Tertiary	47	31.3
Total	**150**	**100**
Household Size		
1 – 5	78	52
6 – 10	55	36.7
11 – 15	10	6.7
16 – 20	7	4.7
Total	**150**	**100**
Income 'N,000' Per Annum		
20 – 40	49	32.7
60 – 80	28	18.7
100 – 120	20	13.3
140 – 160		
Total	**150**	**100**
Age		
20 – 25	20	13.3
30 – 35	30	20.0
40 – 45	45	30.0
50 – 55	35	23.3
60 – 65	19	12.7
Total	**150**	**100**

Field Survey, 2011

Socio-economic characteristics of Respondents

This section contains the socio-economic characteristics of the respondents. The socio-economics characteristics selected are based on their relevance to agricultural production, climate change and food security. They are age, sex, marital status, educational level, farm size and income.

Table 1 shows the distribution of respondents according to sex. The table, shows that majority of the respondents were female 55.3% while 44.7% male. This is against most finings in most studies carried out in the south-eastern region of the country (Iheke, 2006 and Ogbe, 2009). This is because access to land for farming is mostly through inheritance which is partilinear in this part of the country. As a result of some socio-cultural factors that prevent women from having title to land, and with little tracts of lands for farming, there is need for proper information on climate change adaptation and mitigation in order to increase their agricultural output so as to boost their food security. Findings revealed the distribution of the respondents according to their marital status. The table, shows that majority of the respondents 77.7% were ever married while 33.3% were single. The implication is that there are more stable households which are better positioned to practice serious agriculture (Adaigbo *et al.,* 2009). Climate change have been implicated to have a significant impacts on global food production among the common stable food crop performance (Ayoade, 2003). There is need to identify ways of mitigating the effect of the climate change because lack of adequate food for the family will lead to food insecurity. The number of years spent in school by respondents is shown in table one also. About 31.3% of the respondents had no formal education while the rest had at least one form of education or another. The implication is that these respondents are better positioned to take advantage of new techniques and innovations that could mitigate climate change and boost food security. With large household size, farm labour is assured. But (Ayoade, 2003) cited two main factors that affect the availability of labour for the farm families, rural – urban migration and quality of household. With rural – urban migration able bodied young men of productive age migrate to urban centres in search of non farm employment, leaving the families with only the aging, possibly the very young children. The implication is that since they rely mostly on "household labour, absence of these people will cause scarcity of labour and inadequate food product. The high dependency ratio however, indicates the pressure placed on household resources and this according to Echebiri (2002) reduces both per capita income and savings that could be used to acquire more food for the family. Table 1 further revealed the income of the respondents. Out of the 150 respondents interviewed, 32.7% of the respondents had no income, about 18.7% earned between (N20 – 40,000) and 13.3% earned between (N60 – 80,000). The result indicated that the respondents are low income earners. The implication is that adoption of agricultural techniques that will help to cushion-off the effect of climate change, if it is cost effective will be very difficult to adopt, and (Cerda, 2009)cited that food insecurity.

Food insecurity, therefore is not just due to failure of agriculture to produce enough food as a result of weather condition but failure of households to procure and guarantee sufficient food for the family (Cerda, 2009). Table 1, further revealed the age of the farmers, from the result, majority of the respondents 30.0% were middle aged and therefore still energetic and innovative and will be able to face the challenges of the climate change. Okurut and Batezeka (2005) described this age as the 'working age' explaining that when the head of household is of this working age, there is the likelihood of his participating in different climate change reforms in order to break-even and the family food security will be highly assured.

Table 2: Distribution of Respondents on the Effects of Climate Change on Household Food Security

Variables***	Frequency	Percentage
Reduced production of food crops and livestock	137	18.03
Reduction in local supply	118	15.53
Storage of planting crops and food items	68	8.95
Change in demand for agricultural labour	71	9.34
Adoption of new cropping patterns	108	14.21
Trend changes in vectors and natural habitants of plants and animals disease.	119	15.66
Trend changes in suitability of land for crops and livestock production.	139	18.29

Source: Field Survey, 2011
***** Multiple Response**

Results on table 2, shows the distribution of respondents on the effects of climate change on household food security. From the result, 18.3% of the respondent stated that there is now a trend changes in suitability of land for crops and livestock production. According to the respondents, irregularity of weather conditions had affected forage availability and quality, and cassava crops planted last year had stated decaying before harvest as a result of flooding.

Also 18.0% of the respondents stated that, they are now experiencing reduced production in food crops and livestock. Many crops have annual cycles and yields fluctuate with climate variability, particularly rainfall and temperature. So maintaining the continuity of food supply when production is seasonal is challenging. Therefore, in this community that depends on rain fed agriculture for an important part of their local supply, changes in the amount and timing of rainfall within the season and increase in weather variable are likely to aggravate the precariousness of local food system (Lal, 2004).

The table further reveals that 15.66% of the respondents complained about diseases and pest attack on their animals and crops reducing the quality and quantity of the products which later results to low harvest and food insecurity. Also, some of the respondents, 15.53 complained of reduction in local food supply from the neighboring villages. "If infrastructure is affected by climate through either heat stress on road or increases frequency of flood events, there are impacts on food distribution, influencing peoples access to markets to sell on purchase foods, (Abdulai and CroleRees, 2001) and Prebty *et al* (2005) supported this finding by stated that food often travels very long distance and this has implications for cost". Increasing fuel costs and bad roads resulting from flooding and landslide as a result of climate change is expected to have implications for food security.

From table 2, some respondents 14.21% complained about adoption of new cropping patterns (land management) which contributes to soil moisture retention, maintain appropriate amount of nutrients in the soil so as to strengthen resilience and enhance productivity, thereby diversifying our little income to purchase fertilizer instead of buying food for the family. Some of the respondents, 8.95% in the same table 2, complained about storage of planting crops and food items. According to (Maxwell and Slater, 2003) depending on the prevailing temperature regime, however a change in climate conditions through increased temperature on unstable moist weather conditions could result in grain being harvested with more than 12 to 14 percent

moisture required for stable storage. Therefore, because of general lack of drying facilities about from the normal sun-drying, the situation could create hazard for food safety or even cause complete crop losses resulting from contamination with microorganisms and their make solve activities. It could lead to a rise in food price which the average rural household cannot afford. An increase in prices has a real income effect, with low-income households often suffering most as they tend to devote larger shares of their income to food than higher income households (Thomson and Metz, 1998).

Finally, 9.34% of the respondents complained about change in demand for agricultural labour caused by changes in production practices in response to climate change. Most food is not produced by individual households but acquired through buying trading and borrowing (Du Toit and Ziervogel, 2004). So climate impacts on income generating opportunities can affect the ability to buy food.

Table 3: Distribution of Respondents according to Strategies Adapted for Mitigating the Effect of Climate Change

Variables	Frequency	Percentage
Changes in distribution of land under cultivation	82	8.9
Changes in land management	74	8.4
Increasing/decreasing density of planting population	90	9.8
Fallowing	134	14.6
Mulching	142	15.4
Intercropping	150	16.3
Mix cropping	136	14.8
Bush fallowing	67	7.3
Indigenous Agro-forestry	45	4.9

Multiple responses
Field Survey, 2011

Results on table 3, indicated strategies adapted by the respondents to mitigate the effect of climate change on their crops. About 8.9% of the respondents stated that they made some changes in distribution of land under cultivation. There has been a shift now towards the cultivation of crops with higher thermal requirement as a result of global warming. Also, according to one of the respondents, there is now a shift towards cultivation of more drought tolerant crops or crops with lower moisture requirement for changes in land management 8.4%, they practice irrigation when the rainfall is irregular and integrated pest management to reduce insect infestation. According to (Strange & Scott, 2005), diseases are responsible for losses of at least 10% of global food production, representing a threat to food security. The close relationship between the environment and diseases suggests that climate change will cause modifications in the current photosanitary scenario. Some of the respondents about 9.8% had decided to increased/reduce the density of planting materials while 14.6% practice fallowing method to reduce wearing away of the top soil, increase the soil fertility. The table 3, further revealed that about 18.4% of the respondents practices mulching to reduce the rate of evaporation of the water from the soil due to global warming.

Also, about 16.3%, of the respondents practices intercropping among others in order to minimize the adverse effects and to exploit to the optimum, the beneficial effects of new climate

regimes. This practices is linked to soil regeneration based on the regrowth of deep-noted trees and shrubs that recycle plant nutrient. About 14.8% also practices mix cropping. According to them, they see their choice and practice as a better hedge against crop failure resulting from climate change effect and also that the practice yield a larger returns per unit of farm space. Some of the respondents 7.3% practices bush fallowing retention while about 5% of the practices indigenous agroforestry. This is a low input soil management practiced by the farmers to replenished nutrient, inhibit weed growth and increase moisture retention.

CONCLUSION AND RECOMMENDATION

From the results of this study, there were evidence of climate change effects on the food security of the households in the study area. The households food security were affected in the following manner, reduction in production of food crops and livestock 18.3%, reduction in local food supply resulting from bad road network 15.3%, poor storage facilities for planting crops and food items 8.9%, change in agricultural labour demand 9.3%, adoption of new cropping patterns 14%, increase in pesticide diseases intensive 15.7% and changes in land suitable for cultivation 18.3%. it is recommended that if farming activities is no longer feasible owning to low or uncertain rainfall and increasing temperature or if agricultural opportunities are declining, the most suitable adaptation might be to develop off farm sources of income as a secondary occupation, even though people will shift from producing to purchasing food most of the time.

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