

CLIMATE CHANGE, ITS IMPLICATIONS FOR AGRICULTURE AND RURAL DEVELOPMENT IN NIGERIA

***EZEANO, C. I. AND **C.O. ALBERT**

***Department of Agricultural Economics and Extension, Nnamdi Azikiwe University, Awka – Nigeria**

Mobile phone: 08067503933; E-mail: chidykeeze@yahoo.com

****Department of Agricultural Economics and Extension, Rivers State University of Science and Technology, Port Harcourt**

Mobile phone: 07031616233; E-mail: carobinedo@yahoo.com

Corresponding Author: Dr. C.I. Ezeano

Email: chidykeeze@yahoo.com; Mobile phone: 08067503933;

ABSTRACT

This study identified the indicators of climate change both anthropogenic and natural variability which affect agriculture and rural development in Oji River Local Government Area of Enugu State, Nigeria. A structured interview schedule was used in sourcing information from sixty farmers. Data obtained were analysed using descriptive statistics. The following indicators of climate change affected agricultural and rural development; early on set of rainfall and early cessation, early on set of rainfall and late cessation, late on set of rainfall and late cessation, late on set of rainfall and early cessation, above normal rainfall, below normal rainfall, longer than normal rainfall, shorter than normal rainfall, high intensity rainfall, erratic/torrential rainfall, flash flooding, rainstorms, coastal flooding, gustiness, erosion/flooding, rivers and streams overflowing their banks, unusual patterns of precipitation, high sunshine intensity, early on set and early cessation of harmattan, late on set and early cessation of harmattan, erratic wind, high speed wind, frequency of clement weather, constant draught, rising temperature, high humidity, presence and incidence of unfamiliar pests and diseases.

Key words: climate change, agriculture and rural development

INTRODUCTION

Climate change, environmental degradation and exposure to natural disasters are at present among the greatest agricultural and rural development challenges facing Africa, Caribbean and Pacific (ACP) countries (Spore, 2008). Climate change is any variation in climate over a period of time as a result of anthropogenic activities or natural variability or both working synergically to constitute serious environmental threat to the earth planet. According to Intergovernmental Panel on Climate Change (IPCC) (2007), the changes in climate are attributed directly or indirectly to human activities and alter the composition of the global atmosphere over comparable time periods. These changes occur due to variations in different climate parameters such as cloud cover, precipitation, air temperature, air humidity, air pressure, wind speed, wind direction, sunshine duration, solar radiation, evaporation, soil and ground temperatures (Federal Ministry of Environment, 2003 and Ezeano, 2008). The anthropogenic activities and natural variability are responsible for the emission of about 30 greenhouse gases (GHGs) in the stratosphere which include carbon IV oxide (CO₂), methane (CH₄), Nitrogen IV Oxide (NO₂), chlorofluorocarbons (CFCs), benzene (C₆C₆), Nitrogen I oxide (N₂O), hydrofluorocarbons (HFCs), per fluorocarbons (PFCs), Sulphur Hexafluoride (Sf₆) etc. The main reason for global warming is the large increase of so-called greenhouse gases in the lower atmosphere of which CO₂ is the most abundant with a concentration of about 358 parts per million (ppm) in the atmosphere and

CFCs, the most harmful, which one molecule destroys the same amount of atmospheric ozone as 10,000 molecules of carbon iv oxide (CO₂) (Anne Marshall 1997).

Exposure to ultraviolet light as a result of ozone layer depletion by these GHGs damages crops, kills plankton and fish larvae, and causes sunburn in humans, which can cause skin cancers and cataracts in the long term has doubled in recent years (Anne Marshall, 1997). Agriculture contributes large amounts of methane gas. Rice (paddy) fields contribute 115 million tonnes of methane each year from decomposition of organic matter. Domesticated farm animals (mainly the world's 1.2 billion cattle) release 73 million tones from their digestic system. Tractor, industrial and commercial vehicles, are the greatest single source of NO₂ while Agro-industries and other industries are the main source of emission of CO₂. (Anne Marshall, 1997).

Agriculture contributes about 40% to Nigeria's Gross Domestic Product and production in most of the sectors is dependent on weather and climate (Ozor, 2009). The time of the on set and ceasation of rainfall, the amount and intensity of rainfall, the level and range of temperatures, the level and amount of humidity, the intensity and distribution of sunlight, the intensity of wind, biotic factors (Predators, parasites, soil microorganism, pests and diseases) including other anthropogenic, natural variability and edaptic factors heralds the farming season and also determine the agricultural productivity of a nation like Nigeria. Therefore, given that agriculture in Nigeria is largely non-mechanized, weather/climate determines the production processes of the farmers. Farmers on the other hand are led or misled by the vagaries of weather/climate. The problems then are to what extent have those anthropogenic and natural variability affected agricultural production and rural development and what are the implications for agricultural and rural development.

The study was designed to determine in details the changes in anthropogenic and natural variability that affect agricultural production and rural development in Oji River Local Government Area of Enugu State and its implications. Specifically, the study was designed to (1) identify the indicators of climate change (2) determine the effects of these indicators of climate change for agricultural and rural development and draw implication for climate change.

METHODOLOGY

The study area is Oji River Local Government Area of Enugu State, Nigeria, which is made up of four major towns- Achi, Inyi, Ugwuoba and Awlaw. Oji River Local Government Area is located between latitude 6°15¹N and longitude 7°20¹E (Microsoft Encarta, 2008). In each of the towns, fifteen (15) farmers were randomly selected and interviewed to give a total number of sixty (60) farmers. A structured interview schedule was developed and used in obtaining relevant information from the respondents. All the indicators of climate change under anthropogenic and natural variability were measured. A five point Likert type scale was developed and used to determine the extent to which the indicators of climate change affected agricultural production and rural development. The response option and values assigned were; very low effect (VLE) = 1 Low effect (LE) = 2; some effect (SE) = 3; great effect (GE) = 4, Very great effect (VGE) = 5. Decision rule: Any mean score ≥ 3.0 = Significant (High effect). Any mean score < 3.0 = Insignificant (low effect)

RESULT AND DISCUSSIONS

Extent of Effect of Indicators of Climate Change on Agricultural Production and Rural Development

Table 1 revealed that the following indicators of climate change affected agricultural production and rural development in Oji River Local Government Area of Enugu State Nigeria; early on set and early ceasation of rainfall (mean score =4.2; SD = 0.9); Early on set

and late ceasation of rainfall (mean score =3.7; SD = 1.3); late on set and early ceasation of rainfall (mean score =3.2; SD = 1.2); above normal rainfall (mean score =4.1; SD = 0.8); below normal rainfall (mean score =3.2; SD = 1.4); longer than normal rainfall (mean score =3.4; SD = 1.6); shorter than normal rainfall (mean score =3.2; SD = 1.7); high intensity rainfall (mean score =4.2; SD = 0.9); erratic/torrential rainfall (mean score =4.2; SD = 0.7); flash flooding (mean score =4.1; SD = 0.8); rainstorms (mean score =3.2; SD = 1.3); gustiness (mean score =4.1; SD = 0.8); erosion/flooding (mean score =3.1; SD = 1.3); Rivers and streams overflowing their banks (mean score =3.1; SD = 1.3); unusual patterns of precipitation (B=3.2; SD = 1.5); high sunshine intensity (mean score =3.1; SD = 1.3); early on set and early ceasation of harmattan (mean score =3.1; SD = 1.3); late on set and early ceasation of harmattan (mean score =3.0; SD = 1.6); high speed wind (mean score =3.1; SD = 1.6); erratic wind (mean score =3.2; SD = 1.5); frequency of clement weather (mean score =3.0; SD = 1.3); constant drought (mean score =4.0; SD = 0.6); high humidity (mean score =3.4; SD = 1.1); presence of unfamiliar diseases (mean score =3.6; SD = 1.3); presence of unfamiliar pests (mean score =3.2; SD = 1.2); high incidence of pests (mean score =4.2; SD = 0.7); high incidence of diseases (mean score =4.2; SD = 0.8).

Table 1: Effects of Indicators of Climate Change on Agricultural Production and Rural Development

	Climate change indicators	Mean	SD
1	Early on set of rain and early ceasation	4.2(.10)	0.9
2	Early on set and late seasation of rain	4.1(.11)	0.8
3	Late on set and late ceasation of rain	3.7(.18)	1.3
4	Late on set and early ceasation	3.2(.15)	1.2
5	Above normal rainfall	4.1(.11)	0.8
6	Below normal rainfall	3.2(.15)	1.4
7	Longer than normal rainfall	3.4(.14)	1.6
8	Shorter than normal rainfall	3.2(.15)	1.9
9	High intensity rainfall	4.2(.11)	0.9
10	Low intensity rainfall	2.8(.21)	1.9
11	Irratic/Torential rainfall	4.2(.11)	0.7
12	Flash flooding	4.1(.11)	0.8
13	Rainstorms	3.8(.16)	1.4
14	Coastal flooding	3.2(.15)	1.3
15	Gustiness	4.1(.11)	0.8
16	Erosion/flooding	3.1(.13)	1.3
17	Rivers and streams overflowing their banks	3.1(-13)	1.3
18	Constant waves	1.2(.23)	1.9
19	Unusual patterns of precipitation	3.2(.12)	1.5
20	Wet spells	1.1(.19)	2.0
21	Land slides	1.2(.20)	1.9
22	High sunshine intensity	3.1(.16)	1.3
23	Low sunshine intensity	2.8(.14)	1.4
24	Early on set and early ceasation of harmattan	3.1(.16)	1.3
25	Late on set and late ceasation of harmattan	2.2(.18)	1.3
26	Early on set and late ceasation of harmattan	2.1(.19)	1.3
27	Late on set and early ceasation of harmattan	3.0(.11)	1.6
28	Typhone wind	2.4(.18)	1.8
29	Erratic wind	3.2(.12)	1.5

30	High wind speed	3.1(.17)	1.6
31	Low wind speed	2.2(.17)	1.9
32	Frequency of cloudiness	2.3(.16)	1.8
33	Frequency of clement weather	3.0(.12)	1.3
34	Frequency of in clement weather	2.9(.14)	1.9
35	Constant fog	2.8(.18)	1.8
36	Constant drought	4.2(.01)	0.7
37	Rising temperature	4.0(.11)	0.6
38	Presence of frost	1.8(.19)	2.0
39	Presence of hailstones	2.1(.17)	1.6
40	Constant waves	2.8(.18)	1.8
41	High humidity	3.4(.12)	1.1
42	Low humidity	2.6(.13)	1.6
43	Presence of unfamiliar diseases	3.1(.19)	1.3
44	Presence of unfamiliar pests	3.2(.12)	1.2
45	High incidence of pests	4.2(.01)	0.7
46	High incidence of diseases	4.1(.11)	0.8

Values in parenthesis are standard errors

Decision rule: Any mean score ≥ 3.0 = significant (that is high effect); Any mean score < 3.0 = significant (that is low effect)

The low standard deviation (SD) indicates the closeness of the climate change indicators or observations to the respective mean. Some farmers were of the opinion that some of the climate change indicators have positive effect on agricultural production and rural development, while some farmers opined that the same climate change indicator has a negative effect on agricultural production and rural development. The intensity of the effect of each indicator and not the direction of the effect was considered in this research. The longer than normal rainy season experienced by farmers in 2011 farming season led to increased agricultural production resulting to food surplus and better standard of living of the rural clientele. The longer rainy season which lasted up to 29th December in various parts of southeastern states like Awka in Anambra State, Ezeagu, Ugwuoba and Inyi in Enugu State resulted to double or triple cropping of some crops like maize, local cowpea, groundnut, vegetable and relay intercropping of root/tuber and grain crops. As a result of above normal rainfall in some parts of the country, fresh maize, vegetables and green grasses were available for both human and animal consumption unlike previous years. Livestock production was positively impacted by the above normal rainfall which greatly helped to achieve enough pasture for good production of fodder against the dry season period thereby settling the usual conflict between farmers and cattle rearers in quest for fodder especially in Ugwuoba.

The longer length of rainy season in 2011 resulted to poor storage of grains like maize. Diseases and pests that are usually associated with excess rainfall such as Chronic Respiratory Diseases (CRD), coccidiosis, tse-tse fly, grasshopper (desert locust), stem borers, flower-feeding insects, millet head miner and grain-eating birds (quela birds) and environmental related diseases on crops and livestock were high. This resulted to huge expenses on feeds, vaccines and agrochemicals. The above normal rainfall resulted in high fish production in the area. High intensity rainfall, irratic/torrential rainfall, flash flooding, rainstorms and gustiness exacerbated flooding and erosion in the area which resulted in landslides and loss of lives and properties especially among people living close to Oji River and Mmam rivers. Also this situation resulted to physical damages to crops, agricultural equipment, structures, roads, telecommunication networks, power holding company

installations and houses. According to Nigerian Meteorological Agency (NIMET 2011), severe rainstorms resulted to poor visibility and slippery roads, the lower than normal temperature during the dry season made the environment less susceptible to fire outbreak, reduces heat stress and limits the incidences of meningitis and may make malaria parasite more active. The harmattan dust haze increased the possibility of air-borne disease. Also the above normal rainfall impacted positively on hydrology and water resources of various hydrological areas in Nigeria and its water related socio-economic activities.

CONCLUSION

This study examined the climate change and its implications for agricultural and rural development in Nigeria. It observed that the following indicate of climate change affected agricultural production and rural development in the study area namely: early on set of rainfall and early ceasation of rainfall, early on set of rainfall and late ceasation, late on set of rainfall and late ceasation, late on set of rainfall and early ceasation, above normal rainfall, below normal rainfall, longer than normal rainfall, shorter than normal rainfall, high intensity rainfall, irratic/torrential rainfall, flash flooding, rainstorms, coastal flooding, gustiness, erosion/flooding, rivers and streams overflowing their banks, unusual patterns of precipitations, high sunshine intensity, early on set and early ceasation of harmattan, late on set and early ceasation of harmattan, frequency of clement weather, constant drought, rising temperature, high humidity, presence and incidence of unfamiliar pests and diseases. These factors have both positive and negative effects on agricultural production and rural development in the study area.

There is no gainsaying the fact that climate change has impacted both positively and negatively on agricultural production and rural development in the study area and Nigeria in general.

RECOMMENDATIONS

In the light of the major findings of this study, the following recommendations were made. The Nigeria Meteorological Agency (NIMET) should provide information on those weather and climatic elements which affect agricultural production, processing and storage to farmers on daily basis. Farmers should be made to understand through the extension agencies the effect of these vagaries of weather on their production potentials.

REFERENCES

- Anne Marshall (1997). Guinness Book of Knowledge. USA Guinness Publishing Ltd.
- Ezeano, C.I. (2008). Agroclimatology. *Departmental Monograph Agricultural Engineering*. Institute of Management and Technology, Enugu.
- Federal Ministry of Environment (FME) of the Federal Republic of Nigeria, (2003). Nigeria's First National Communication under the United Nations Framework Convention on Climate Change.
- Intergovernmental Panel on Climate Change (IPCC) (2007). *Impact, Adaptation and Vulnerability Contribution of Working Group I of the Intergovernmental Panel on Climate Change to the Third Assessment Report of IPCC*. London: Cambridge University Press.
- Nigerian Meteorological Agency (NMET) (2011). Seasonal Rainfall Predication and Socio-Economic implications for Nigeria.
- Ozor, N. (2009), "Understanding Climate Change: Implications for Nigerian Agriculture, Policy and Extension". Paper presented at the National Conference on "Climate Change and the Nigerian Environmental", organized by the Department of Geography, University of Nigeria, Nsukka, 29 June – 2 July.
- Spore, (2008). Climate Change. *A Bi-monthly Magazine of the Technical Centre for Agricultural and Rural Corporation (CTA)*, Wageningen.