IMPACT OF CLIMATE CHANGE ON AGRICULTURE, FOOD SECURITY AND SUSTAINABILITY IN NIGERIA

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Abstract
Climate change has been a cause of great concern to the world. And there are many reasons to be concerned about the impact of climate change on agriculture and food security. These include deforestation, over-cultivation of grasslands, increased poverty, unplanned urbanization, loss of flora and so on. This paper argued that the scientific community should be involved in studying climate change and forecasting weather, and then transmitting this information to all sectors of Nigerian society, industry and economy so that these sectors can adapt and be ready to meet a very different future than the present. It also called on the Nigerian government to adopt strategies and policies that will encourage improved farming and agricultural methods, and that will encourage improved farming and agricultural methods, and that will protect our cherished forest and the bio-diversity of this great country.

Keywords: Climate Change, Food Security, Agriculture, Sustainability, Development

Introduction

From inception, climate change is already a challenge to the world at large and Nigeria in particular. It becomes imperative that Nigeria takes serious action in adapting and curbing the effects of climate change. There is need for Nigeria to use this opportunity of covering wide ground in developing among the people, a

sharp understanding of impacts of climate change, adaptation and mitigation of the effect on the environment. According to Nji, Chinyelugo and Robert (2018) opined that climate change could be seen as a long-term alteration or change in global weather patterns as a result of increased greenhouse effect, natural climate variability and anthropogenic and natural processes. Nasheed (2012) observed that climate change is an urgent and real threat that knows no border nor respects a nation's sovereignty and truly, a global issue. Climate change according to Uja (2008), is a process of making some lands unenviable and affecting water supplies threatening people's basic needs and triggering displacement in Nigeria. He went further to state that, Nigeria is experiencing increasing incidence of disease, declining agricultural productivity, increasing number of heat waves, unreliable or erratic weather patterns, flooding, declining rainfall in already desert prone areas in the north causing increasing desertification, decreasing food production and destruction of livelihoods by rising waters in coastal Areas where people depend on fishing and farming (p.6).

However, Offorma (2010) posit that climate change is seen as the average weather conditions of a place over a period of year; the prevailing set of conditions such as temperature and humidity and is influenced by its latitude, attitude, ice or snow cover, as well as nearby water bodies and their currents (p.19). Offorma buttressed that climate includes patterns of temperature, precipitation, humidity, wind and scasons. These climate patterns play fundamental role in shaping natural ecosystems, the human economies and cultures that depend on them. Hence, a change in climate can affect many related aspects of where and how people, plants and animals live such as food production, availability and sue of water, and health risks (Department of Ecology, State of Washington, (2012). Consequently, Department of Ecology, State of Washington (2012), referred climate change in the weather stating that some short-term climate variation is normal, but longer-term trends now indicate a changing climate. This shows that, it is not all changes in climate that become climate change rather the change must endure over a long period of years like over a decade.

Furthermore, N.W.S. (2007) stated that, the global climate is currently changing, noting that the last decade of the 20th century and the beginning of the 21st have been the warmest period in the entire instrumental temperature record, starting in the mid-19th century. Moreso, the federal ministry of environmental, special climate change unit (2011) observed that, Nigeria's climate is already changing and noted that, between 1941 and 2000, annual rainfall decreased by 2-8mm across most of the country and in the extreme northeast, extreme northwest and extreme southwest, average temperature rose by 1.4 – 1.9^{0}C.

Over the years, the economy of Nigeria has experienced issues of flooding, erosion, heat waves, drought, wind storm, unreliable or erratic weather patterns, rising sea level and so on all leading to exacerbation of poverty, breakdown of infrastructure, loss of environmental pattern, political, economic and social security; decreased in agricultural inputs and destruction of livelihoods among others. In view of this, Department of Ecology, State of Washington (2012) gave the following as indications of global climate change as noted by international panel on climate change (IPCC, 2007). Thus includes: retreating mountain glaciers on all continents, thinning ice caps in the Arctic and Antarctic, rising sea level – about 6 – 7 inches in the 20th century, more frequent heavy precipitation events (rainstorm, floods or snowstorms) in many areas; and more intense and longer droughts over wider areas, especially in the topics and sub-topics (p.3).

Causes of Climate Change

According to Nji (2018) asserted that Greenhouse gases such as carbondioxide, fluorocarbons, sulphur hexafluoride and halocarbons are gases that trap the heat from the sun and warm the earth's surface to keep the earth's temperature at reasonable levels in order to support life. This process of heat trapping from the sun to keep the earth warm by the greenhouse gases is known as greenhouse effect. Yanda (2012); Department of Ecology, State of Washington, (2012) stated that other factors responsible for climate change may be grouped into natural factors and human activities/anthropogenic factors. They are explained below:

Natural factors: National Weather Service (2007), noted that climate change is a normal part of the earth's natural variability, which is related to interaction among the atmosphere, ocean and land as well as changing in the amount of solar radiation reaching the earth. These natural factors contributing to climate change include variations in solar radiation, variations in the earth's orbit, volcanism and ocean variations.

Anthropogenic forcing: According to Nyi (2018), as human population increased, the demand for land and fuel increases. Nji emphasis that trees and other plants absorb carbondioxide; when they are felled and forests encroached into, in a bid to meet human demands they no longer absorb carbondioxide. However, this increases the level of carbon emissions in the atmosphere. More carbondioxide and other greenhouse gases in the atmosphere increases in temperature levels. The level of greenhouse gages has risen as a result of man's activities. Nji (2018) cited state of Washington (2012) that one of the biggest ways people contribute to greenhouse gases is by burning fossil fuels. Fossil fuels

formed by long-dead-plants and animals are the single biggest source of humanity's greenhouse gas emissions. Nji (2018) cited Alero (2012); noted that, methane emitted by massive herds of livestock, rice farms, waste dumps, nitrous ride, hydrofluorocarbons, perfuorocarbons used in air conditioning and refrigeration all eventually
enter the atmosphere causing enhanced greenhouse effect.

Impact of Climate change on the Environment

Moreover, the current impacts of climate change may escalate in future leading to extreme poverty and low standard of living. Federal Ministry of Environment special climate change unit (2011) noted that, the impacts of climate change in Nigeria are expected to increase in the future affecting all sectors in the country (Education, agriculture, fresh water resources, coastal water resources, fishes, forests, biodiversity, health and sanitation, human settlements and housing energy, transportation and communications, industry and commerce, disaster, migration and security, Livelihoods and vulnerable groups). The ministry stated that, in the absence of adaptation climate change could result to a loss between 2% and 11% of Nigeria's GDP by 2020, rising to between 6% and 30% by the year 2050 which is equivalent to and ranges between N15 trillion (U.S$100 billion) and N69 trillion (US & 460 billion).

In view of this, the impact of climate cannot be neglected because of it rigorous cycle in nature. Climate change can affect all aspects of live and sector connected to it both directly and indirectly. Ibe (2012) noted that, the impacts of climate change affect every aspect of human endeavour. Department of environment and conservation, Government of Western Australia (2012) observed that even a very small rise in the earth's mean temperature will have quite dramatic negative impacts on the environment, which are predicated to include melting of polar ice caps, weather patterns, including prolonged droughts that will reduce agricultural productivity, recreational and tourism activities.

Sequel to this, it has been in the time past that Nigeria is highly vulnerable to the negative impacts of climate change. This vulnerability of climate change stems from the fact that, the country depends largely on land, natural resources and climate patterns for her survival coupled with the low lying nature of some coastal cities in the country and high population density among others. Nji (2008) cited the Federal Ministry of Environment (2010) noted that, due to climate change, the rapid southern expansion of the Sahara Desert had compounded access to water, increased incidences of drought, desertification and exacerbate the degradation of agricultural land with increased gully erosion in the South

East and coastal erosion in the southern region which is devastating the lives and livelihoods of over 50 million Nigerians living along the low laying coastal region and potentially posing threats to Nigeria's oil facilities located within these areas.

Problems and Consequences of Climate change on Agriculture and Security in Nigeria

According to Igwebuike, Odoh, Ezeugwu and Oparaku highlighted the major problems and consequences of climate change on agriculture and food security in Nigeria.

Climate change affects Agriculture in a number of ways

Extreme weather event such as thunderstorms, heavy winds and floods devastate farm lands and can lead to crop failure. Pests and crop diseases migrate in response to climate variation (e.g., the tsetse fly has extended its range northward) and will potentially pose a threat to livestock in the drier northern areas. Consequently, food security is vulnerable to extreme weather events such as drought and floods. When the Sahelian zone suffered drought in the 1970's and 1980's harvest failure was remarkable throughout the region. Close to one million livestock were lost, affecting meat and dairy supply throughout the country flood hazards in both the northlands south of the country consistently posed a danger to farmlands and hence, to food security. Food security is dependent on rainfall and rainfall amount, and is affected by the age – long ability of farmers to predict when to plant their crops. Unpredictable changes in the onset of rains in the last 20 to 30 years have led to situations where crops planted with the arrival of early rains to get smothered in the soil by an unexpected dry spell that can follow early planting.

The late arrival of rain due to climate variability, results in harvest failure in ecosystems that rely on rain-fed agriculture. The occurrences of extreme weather events usually causes irreparable damage of food crops and other livelihood material on which small Island populations depend. Extended droughts often causes damage to agricultural crops resulting in low exports and high imports, the latter usually resulting in a huge burden on foreign exchange earnings. The proliferation of pests and crop diseases can hinder storage when the need arises because of temperature increases. The pests in turn attack crops and animals. The current warming trend hinders livestock production. As well, livestock are usually subjected to long treks to find water and grass in the more southerly areas of the country during the dry seasons warming trends also affect

the growth of grain crop such as maize, guineacorn, millet and rice and makes storage of roots crops and vegetables difficult.

However, land degradation reduces the quality and productivity of land. Many factors contribute to it; and climate change can be one of the factors, result in water and wind erosion of land, drought and the creation of deserts, acid and salt accumulation; depletion of materials, and heavy – metal contamination. All forms of land degradation in Nigeria occur in different scales; but no part of the country is safe from it. The low – lying nature of Nigeria's 800km coastline makes it prone to coastal erosion and flooding, all of which are climate change – induced forms of land degradation. In the Sahelian zone of Nigeria's north, the most pronounced climate change related forms of land degradation are wind erosion and related sand dune formation, drought and desertification.

Moreso, changes in climate conditions can also modify tree growth and development, reducing the availability of non-timber forest products such as spicy vegetables and mushrooms. Climate change can increase inadent of pests and diseases that attack and de4cimate forest trees, it can lead to species extinction in the various ecozones of Nigeria for example, the iroko and oil bean in the south east; various mahogany in the northwest. Bio-diversity – a natural treasure can be disastrously affected by climate change. Many species of plants and animals are rapidly becoming extinct. The fruiting intensity of some trees is diminishing; aberrations in animal mating habits and changes in bird and animal migratory patterns are evident fish spawing patterns have changed; the rare and endangered species of plants and animals has increased.

Strategies to Reduce the Vulnerability of Climate Change in Agriculture and Food Security in Nigeria

In view of this, Igwebuike et al (2009) streamlined some of the possible solutions to the problems of climate change on agriculture and food security. They are:

Agricultural production could be increased by doubling the crop areas or by investing in agriculture management and technology. Producing more drought – resistant crops would help, as would better management of water resources, more efficient food storage systems, improved processing methods and better pest management of water resources, more efficient food storage systems, improved processing methods and better pest management. Government policies favourable to the agriculture "industry" could be instituted (for example, providing all season access and industry can alter its ways of doing things and adopt strategies to increase agricultural productivity in Nigeria.

Farmers can learn to exercise discretion in planting with the arrival of the earliest rains in the season. Water reservoirs can be created in dry areas such as the Sahel. Mixed farming practices can be introduced individuals and communities need to adopt behaviours or policies geared at restoring and conserving the environment. Increased self-reliance, avoiding unregulated forest exploitation, planting appropriate tree species, protecting water sheds, using agro-forestry and organic farming techniques and maintain adequate food supplies will lesson the vulnerability of the food supply sector, so too will maintaining water levels so that fish can spawn planting drought – resistant crops, draining wetlands for rice cultivation, and reforming land tenure and lad management policies. Government initiatives (such as greater support for research, improving transportation, offering subsidies and other productive trade regulations devices, making soil and water conservation a high priority) can help the adaptation process along. At a local level, erecting contour bunds around farm lands as a safeguard against soil erosion and flooding; using organic manure instead of the more preferred chemical fertilizers, establishing wood lots with fast – maturing plant species hat yield domestic fuel wood for community members; reducing bush burning; using disease – resistant, quick – maturing crop and plant species (cassava sticks, fruits and nuts); properly preserving seeds and plant seedlings to ensure healthy germination in the succeeding farming season; and disseminating research findings to farmers, would help mitigate the effects of climate change.

Furthermore, other adaptation measures could include: adopting new farming approaches using improved varieties; setting up gene banks; identifying and conserving threatened and endangered species of planting and animals in zoological gardens; and raising public awareness on the importance of bio-diversity.

Conclusion

There are many reasons to be concerned about the impact of climate change on agriculture and food security. These include deforestation, over-cultivation of grasslands, increased poverty, unplanned urbanization, loss of flora and so on. The scientific community must be involved in studying climate change and forecasting weather, and then transmitting this information to all sectors of Nigerian society, industry and economy so that these sectors can adapt and be ready to meet a very different future than the present. However, the Nigerian government must adopt strategies and policies that will encourage improved farming and agricultural methods, and that will encourage improved farming

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