

A REVIEW OF THE EFFECTS OF CLIMATE CHANGE ON AGRICULTURAL PRODUCTION IN NIGERIA

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ABSTRACT

There is a strong relationship between climate and agricultural production. Understanding the climatic changes around us and how they affect agricultural productivity and livelihood will ensure food security. Climate change and global warming are the current global problems facing many countries, including Nigeria. Causes of climate change in Nigeria include emission of greenhouse gases from gas flaring, open burning, vehicle emissions, deforestation and use of solid fuel for cooking. Nigeria is still practicing rain fed agriculture which renders her vulnerable to the adverse effects of climate change. Severe climate events such as flooding, extreme heat and drought have led to soil degradation which results in low crop yields. Decline in agricultural productivity discourages farmers and may lead to change in livelihood, especially in rural settings. This can also lead to migration from rural to urban regions thereby affecting development of rural regions in the country. This paper discusses the causes, effects and mitigation of the effects of climate change in Nigeria.

Keywords: Climate Change, Food Security, Soil Degradation and Agricultural Production.

Introduction

In spite of the recent technological and scientific advances, weather and climate are still the most important variables in agricultural production in Nigeria. Thus the agricultural production in Nigeria is vulnerable to the adverse effect of climate change because her farmers still practice rain-fed agriculture. Ayoade (2011) observed that climatic factors affect agriculture and determine the adequacy of food supplies in two major ways. One is through climate change and its associated extreme weather conditions that affect crops, and the other is through the control exercised by climate on the type of agriculture that is feasible or viable in a given area. Thus, climatic parameters have an influence on all stages of the agricultural production chain, including land preparation, sowing, crop growth and management, harvesting, storage, transport and marketing. Therefore agriculture is the most important sector of the economy that is highly dependent on climate.

Climate change is perhaps the most serious environmental threat to fight against hunger, malnutrition, disease and poverty in Africa mainly through its impact on agricultural production FAO, (2001). Climate change and agriculture are therefore interrelated processes both of which take place on a global scale. Climate change affects agriculture in a number of ways, including change in average temperature, rainfall and climate extremes (e.g., heat waves) changes in pest and diseases, changes in atmospheric carbon dioxide and ground-level ozone concentrations, changes in nutritional quality of some foods and changes in sea-level. Specifically, it has been shown that the link between rainfall and animal numbers is approximately linear IPCC (2001) Drechsel et al. (2001) provided a glimpse into the problem of land deterioration related to agricultural practices and observed that farmers are more often not owners of the land they work on, the preservation of natural resources is generally

viewed as a secondary objective. In addition, pressures represented by increasing population and changing technology add to the problem of land deterioration related to agricultural practices.

Climate change is one of the most serious environment threats facing mankind worldwide. It affects agriculture in several ways, including its direct impact on food production. Climate change attributes to the natural climate cycle and human activities and adversely affects agricultural productivity in Africa (Ziervogel et al 2006). In Nigeria, agriculture is the main source of food and employer of labour, employing about 60-70percent of the population (Mayong et al. 2005). It is a source of raw materials used in processing industries as well as a source of foreign exchange earnings for the economy (Mohammed-Lawal and Atte 2006).

Climate change affects food and water resources that are critical for livelihood in Africa, where much of the population especially the poor, rely on local supply systems that are sensitive to climate variation. Disruptions of existing food and water systems will have devastating implication for development and livelihood. These are expected to add to the challenges climate change already poses for poverty eradication (De Wit and Stankiewicz 2006)

Rainfall is by far the most important element of climate change and water potential in the country (Adejumo 2004). The North-East region of Nigeria is increasingly becoming an arid environment at a very fast rate per year, occasioned by fast reduction in the amount of water, flora and fauna resources on land (Obioma 2008). Agriculture is a significant sector and the source of raw materials used in the processing industries as well as a source of foreign exchange earnings for the country (Mohammed-lawal and Atte 2006).

Overdick (1997) asserted that over the last 100years, human activities have significantly altered the earth atmosphere and increased the concentration of greenhouse gases which has led to warming the earth surfaces. This evidence thus suggested that by the last decade of the twentieth century, global warming has already made significant negative impact in a large number of regions. The menace of global climate change became a central issue of investigation in the 1990s and is on till date. This review therefore considered the effects of global warming on individual plants stands and entire units of agricultural product from regional to global scales.

Statement of the Problem

In spite of the growing importance of oil, Nigeria's economy has remained an agrarian economy, with agriculture still accounting for a significant share in the Gross Domestic Product (GDP), total export and also providing employment to a majority of the county's population (Adejuwon 2005). About 70percent of the nation's population relies on agricultural production as a major trade and yields from agriculture accounted for 41percent of Nigeria GDP in 1999 (Farauta et al 2012) in the 1950s and 1960s, agriculture accounted for about 70percnet of Nigeria's GDP, (Ibrahim et al 2010) it however dropped to 40percent in the 1970s, with a steady decline to about 2percent in the 1990s and in 2020, the annual contribution of agriculture in nominal GDP was 24.45 percent (NBS, 2021). It is sad to note that even with the bulk of the country's population involved in agriculture, Nigeria is a net importer of food from countries around the world, especially Asia (Dimelu et al 2014). Though in the face of this scenario, agriculture is the main source of food for the nation's consumption which is predominantly dependent on annual rainfall, hence making agricultural production vulnerable to the impacts of climate change due to changes in weather patterns. It is important to note that about 90percent of the food produced in the country is from the rural areas, where the poverty level is severe.

Impact of Climate Change of Agricultural Production

Studies have shown that agricultural production can be affected by many climatic adversities such as drought, excessive rainfall and high temperature, as explained below:

Effect of Drought on Agricultural Production

Drought is a major climate change disaster that affects some parts of Nigeria. This has resulted in desert encroachment, which has led to severe drought and brought a quick depletion of resources such as surface water, flora and fauna in the region (Obioha, 2009). This condition puts further stress on the people in the affected region. Another negative effect is exploitation of already depleting resources by deforestation, which results in the formation of sand dunes/alien deposits in the northern and middle belt axis of Nigeria (Bello et al, 2012).

Livestock death and diseases: Livestock sales act as a buffer in times of hardship. Farmers disinvest in these assets to buy food. Therefore as the period of drought induced food deficit lengthens, farmers will have to start selling animals which constitute the basis of the household's wealth, for fear that if left, the animals might die.

Reduction of crop production: The most immediate consequence of drought is a fall in crop production, due to inadequate and poorly distributed rainfall. Farmers are confronted with poor harvests that are too small to both feed the families and meet their other obligations. Drought can cause entire crop failure or small crop output. Low crop production leads to losses in other industries that rely on agricultural products in order to stay in business; this can make prices of products such as feeds and grocery to escalate.

Reduction of feed quality and fodder shortage: When crops are badly affected by drought, pasture production is also likely to be reduced, though output from natural pasture tends to be less vulnerable to drought than crop production. Low rainfall causes poor pasture growth and may also lead to a decline in fodder around the village, leading to weight loss and increased death among stock, especially where immigrant herds put further pressure on limited local pastures. While the responses of most pastoral groups to fodder shortage are to move themselves and their herds elsewhere, this is not an option to be easily followed by livestock-owning farmers (Adams, 2019).

Death of aquatic organisms such as fishes: Inadequate rainfall in recent years has resulted in reduced fish production. Fishing is prohibited at certain locations on the river, when the water is low. This management allows water to settle down and encourages a deep area of the minor bed without being disturbed thus making their capture easier, once the fishing ban is lifted (Draget in Adams, 2019).

High rate of poverty and malnutrition among farmers: Changes in the distribution of wealth usually accompany drought. The farm household's ownership of assets, and their access to income from other sources will differ. The most vulnerable amongst those hit by drought will be those with few assets to sell, those who need to purchase grain due to an absence of their own household reserves and those who cannot get access to food through other means, such as borrowing, coercion or theft. The richest members of the community may be in a position to benefit during drought as they can acquire land and other assets at low prices, from distress sales by poorer neighbours (Senas in Adams 2019).

Decline in agribusiness: Individual-farmers-induced distress sale of animals may be considered to be as much a loss as the animal's death. Since distress sales are associated with reduced prices offered, farmers also incur a substantial financial loss compared to sales under more normal circumstances. Other effects of drought on agriculture are inducing reduction in soil water balance, direct effect on the quality of fruits and vegetables etc.

Effects of Excessive Rainfall or High Moisture on Agricultural Production

Erosion and washing away of quality soil: Heavy flood damages infrastructure and crops and washes away top soil. Too much water can also leave the soil waterlogged, which may increase risk of compaction. In addition, oxygen in the soil becomes depleted, after a few days under water. Farmers need to watch out for water logging and oxygen depletion in the soil in high rainfall year.

Weed infestation on farm: Weed evolves rapidly to overcome control measures, aquatic weeds and those well adapted to flooded soils are major problems in lowland rice fields. The cultivation of lowland rice in rotation with upland crops and vegetation in the same fields has resulted in the selection of ecotypes of upland weeds.

Excessive moisture during harvesting: Challenges exist when harvesting due to excessive moisture on the farm. Farm output is affected, when crops that are ready to be harvested or about to ripe, get soaked in excessive rainfall.

Death and diseases of livestock, especially birds in poultry: Some livestock cannot withstand excessive cold, most especially poultry, and as a result of this, some die while some become infected by diseases.

Effect of High Temperature or Excessive Heat on Agricultural Production

Death and diseases of livestock: Pigs and poultry become uncomfortable whenever there is excessive heat. Heat stress is hard on livestock, especially in combination with high humidity. This, most times, leads to reduced semen quality, lower birth weights, excessive loss of water, lower mating effectiveness and intensity, lower hormone levels and fertility rates (Heath and Roach 1999). Other effects of high temperature on agriculture are reduction in the quality of vegetables, conducive environment for pathogens and vectors, reduction in the quality of food, and food shortage (Adams 2019).

Solutions to the Problems of Climate Change on Agricultural Production

Government efforts to deal with problems of climate change on agricultural production have not yielded much desired result. Therefore, in spite of several attempts by government to foster development in the agricultural sector through several programmes, the sector has continued to witness a steady and conspicuous decline. This paper has therefore outlined some solutions to the problems of agriculture, due to the effect of climate change as follows:

- Supply of clean and cool drinking water for livestock, during drought and excessive heat, through the construction of boreholes.
- Water management during drought is also necessary for some crops such as rice and vegetables to thrive well. Timely and accurate weather prediction can help farmers to plan better and get prepared for the next season.
- Suitable shelter or shade is required for livestock during high rainfall seasons.
- Research and technology development should be funded for agriculture.
- Trade liberalization and market development, funding, and infrastructure development should be consistent in government policy.
- Training of veterinary doctors.

Conclusions

Findings from this review indicate that climate change impacts negatively on agricultural production in Nigeria. This is due largely to the fact that all crops have their suitable climatic conditions and whenever these are exceeded or not enough, there is a negative effect on the crop and livestock, such as livestock's death and diseases – reduction of crop production, reduction of feed quality, soil water balance, death of aquatic organisms

such as fishes, and so on. Drought can be financially devastating for agricultural producers and have substantial adverse economic impacts on agribusiness.

Preparedness of farmers towards the next season, adequacy of and accuracy of weather forecast, availability of veterinary doctors, agricultural findings for research and technology development, trade liberalization and market development, funding and infrastructure development and consistency in government policy are veritable solutions to climate change impact on agricultural production.

The review has also shown that there is variability in Nigerian rainfall and temperature, which makes climate change to have significant effect on agricultural productivity. These papers also identify livestock farmers as the most vulnerable to climate, as all climate activities have a direct effect on livestock, especially poultry. This clearly reveals that rainfall is a more important variable of climate and a determinant of agricultural productivity in Nigeria than temperature.

Recommendation

In consideration of the issues raised, it is recommended that Nigerian government at Federal, State and Local Government levels should expedite action on giving agriculture a serious priority. The current climate change effect can be minimized, if there is a consistent effort geared towards mitigation. Agricultural productivity can be increased and sustained by developing agricultural technologies that are environmentally sensitive. Training of veterinary doctors and farmers on how to cope with climate change is also recommended.

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