

The impact of climate change on food and human security in Nigeria

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Abstract

Purpose – The purpose of this study is to unravel the changing nature of climate change impact on the food and human security sector of the Nigerian State.

Design/methodology/approach – This study is an in-depth case study that involves the use of both quantitative and qualitative data. Statistical data on climate variability in Nigeria obtained from reliable databases were used in the making of analysis. Also, data derived from semi-structure interviews and special reports from International Non-governmental organizations on the subject matter were also used in the study. The findings of the study were based on an in-depth analysis of both primary and secondary sources of data. The secondary data were derived from existing published academic works. The primary data was developed using qualitative data that were collected from January to November, 2018 to 2019 in the different regions of Nigeria. For the South East, primary data was collected from Abakaliki, Ebonyi State. In the South-South, primary data was collected from Asaba, Delta State. In the South West, primary data was collected from Barutin, Kwara State. In the North East, primary data was collected from Maiduguri, while in North West, data was collected from Gusau, Zamfara State. In the North Central, data was collected from Markurdi, Benue State. During the data collection, 48 semi-structured Key Informant Interviews (KIIs) were carried out in the six selected research areas that represented their geo-political zones. Six Focus Group Discussions (FGDs) were carried out, one for each of these six selected cities. Each of the Focus Group Discussions comprised between five and seven respondents. The idea of KIIs and FGDs is to allow the respondents to freely express their ideas comprehensively. Again, in order to get varied forms of responses, the respondents are mainly farmers however, a number of NGOs, civil servants, fertilizer sellers, government officials, transporters and aged men and women/retirees. It should be noted that the respondents cut across male and female gender of all ages and ethnic configuration. The respondents were also randomly selected through social networking. To avoid having people of similar The KIIs were three academics; two community leaders; two small scale fish farmers; rice, cassava, fish, livestock and crop farmers. All KIIs and FGDs were transcribed and analysed using thematic content analysis.

Findings – The findings revealed that climate change has negatively affected food security in Nigeria. It has also led to continuous armed confrontations over natural resources thereby undermining human security in the country.

Originality/value – This study is 100% original and can be assessed through its contribution to evaluation.

Keywords Nigeria, Climate change, Food security, Global warming, Human security

Paper type Research paper



1. Introduction

The reality of climate change and frequency of its unpleasant consequences constitute significant threats to human lives across different regions of the world. The adverse outcome of climate change has necessitated global concerns and efforts at mitigating its effects as well as advocacy for measures that would restrict human actions that induce climate change. Climate change refers to changes in the mean variability properties of the climate, which persists over an extended period of time, typically within decades or longer. Climate refers to the atmospheric condition of a particular location over a longer period. The climatic condition is the long-term summation of the atmospheric elements such as solar radiation, temperature, relative humidity and precipitation and their variations over a long period. A persistent departure from the mean or/and variability properties of the climate is referred to as climate change. The main cause of the climate change experienced in the present time is the human expansion of greenhouse effect (IPCC, 2014). Human being progressively utter the concentration of greenhouse gases and aerosols, both of which influence the climate (Enete, 2000). The greenhouse gasses produce greenhouse effects and global warming that follows it.

Global warming which has been a persistent manifestation of climate change is caused by the trapping of heat radiated from earth towards the space by greenhouse gases such as nitrous oxide (N_2O), Carbon dioxide (CO_2), methane (CH_4) and chlorofluorocarbons (CFCs). These greenhouse gases in their natural occurrences serve to keep the earth's atmosphere warm enough for living organism including plants and animals. However, human industrial and agricultural activities have led to expanded emissions of these gases into the atmosphere thereby resulting to an expanded greenhouse effect which brings about increase in mean atmospheric temperature otherwise known as global warming. Human activities such as burning of fossil fuels, coal and oil have led to high concentration of carbon dioxide in the atmosphere. Also, clearing of land for agriculture and industrial processes have to a lesser extent contributed to greenhouse effect. The emissions of chlorofluorocarbons (CFCs), which are synthetic compounds that have industrial origin have contributed to the destruction of the ozone layer thereby contributing to global warming.

Similarly, the changes in the natural composition of the greenhouse gases expand the greenhouse effects thereby making the earth to become warmer. The warmer condition of the earth's atmosphere results in increases evaporation and precipitation that varies across the regions. The greenhouse effect also brings about the warming of the oceans resulting to partial melting of glaciers and ice sheets which results to rising sea level. Research has shown that high concentration of atmospheric carbon dioxide has positive and negative effects on crop yield. Some category of crops according to findings does well under this condition while others do not. Climatic conditions such as floods, droughts and extreme temperature are some of the consequences of climate change. These conditions have led to crop loses and has threatened the livelihood of farmers as well as poses food security challenges overtime, to some states, especially in developing countries. The threats posed by climate change on human security have generated global concerns leading to some global initiatives and measures aimed at regulating human activities that induce global warming. The Kyoto protocol for instance was aimed at regulating the emissions of greenhouse gases through industrial processes in the countries of the world.

Nigeria is not shielded from the rest of the world in terms of the effect of climate change. The outcomes of climate change have been felt across the vegetative regions of the Nigeria. Research has shown that climate change is increasingly becoming a major threat to agricultural productivity in Nigeria. Some previously well drained agricultural plains have become flooded in recent times, also the increasing aridity of the Sahel and Sudan savannah

belts have adverse effects on agricultural activities in the region (Ojo and Adebayo, 2012). Other outcomes of climate change such as heavy precipitation, abnormal onset and cessation of rainfall, rising temperature and alteration in relative humidity have negative consequences on agricultural activities and food systems in Nigeria. This alteration has led to disruption in the seasonal pattern of food production and distribution, thereby creating shortfall in supplies which bring rising food prices and limited access to food (Oyinloye *et al.*, 2018). This paper examines the impact of climate change on food security and human security in Nigeria.

1.1 Problem statement

Available evidences show that climate change has induced food crises in some parts of the world and also triggers security challenges in some environments due to resulting friction that arises from the struggle for control of limited agricultural resources. Nigeria is considered by some researchers as a place where the crisis complexes associated with climate change are playing out without any significant measures in place to mitigate the effects. The Food and Agricultural Organization (FAO) in its 2017, 2018 and 2019 reports titled “The State of Food Security and Nutrition in the World” indicated that the major causative factors of food insecurity in the world are climate change, national economy and conflict (FAO, IFAD, UNICEF, WFP and WHO, 2017, 2018, 2019). Nigeria has been identified as a country where the three drivers identified by the FOA play very significant part in the aggravating food security situation (Kralovec, 2020). Some other researchers such as George *et al.* (2020), Ogbo *et al.* (2013) and Ayinde *et al.* (2011) posited that climate change is the key driver of conflict in part of Nigeria which has worsened the food security situation in the country and has reinforced poverty in some communities. It is from this background that this study is designed to evaluate the extent to which climate change has affected food and human security in Nigeria.

1.2 Aim and objectives of the study

The aim of the study is to analyse the impact of climate change on food and human security in Nigeria. The specific objectives of the study are:

- to identify the food security situation in Nigeria;
- to identify the specific effects of climate change of food security in Nigeria; and
- to identify the effects of climate change of human security in Nigeria.

1.3 Literature review

This part of the study explores the findings previous scientific studies on the correlation between climate change and food and human security. Most of these empirical researches employed statistical approach and draws their conclusions through simulation models with a focus on the linkage between the varying climatic condition and food production performance. Also, literatures that focus on the relationship between climate variability and human security situation are equally explored.

2. Climate change and food security in Nigeria

Food security means access to basic nutritious food. Food security according to the United Nation’s Committee on World Food Security means that “all people at all times have physical, social and economic access to sufficient, safe and nutritious food that meets their food preferences and dietary needs for an active and healthy life.” Food security as defined

in the 1974 World Food Summit means the “availability at all times of adequate supplies of basic foods stuffs to sustain a steady expansion of food consumption and to offset fluctuation in production and prices.” Food insecurity according to FAO exists when “all people do not have adequate physical, social or economic access to food.”

Nigeria has been identified as one of the sub-Saharan African states that are vulnerable to changing climatic conditions (Ughaelu, 2017). Some researchers such as Ayinde *et al.* (2011), Ughaelu (2017) and Ikem (2018) have found noted that recurring environmental disasters in parts of Nigeria have worsened food productivity and human suffering in the past decade. In 2012, severe flooding that has not been recorded in the country in the past four decades occurred in many parts of Nigeria leading to heavy losses in human lives, crops and livestock as well as human displacement (Ogbuchi, 2020). The changes in environmental conditions brought about by climate change affect the six vegetative zones of Nigeria differently (Ughaelu, 2017). In the semi-arid Sudan and arid Sahel Savannah region, it brings about reduced rainfall, drought and increasing desertification, in the Northern and Southern Guinea savannah belt it brings about changes in rainfall pattern, often late arrival of rainfall and longer dry season, places along the shorelines experience severe flooding during the rainy season (Ikem, 2018). In the Rain Forest zone, it brings about delays in rainfall onset, prolonged dry season, heat waves and flooding along the coastal lines while in the Mangrove Swamp, it results in flooding of usually dry plains and persistent rise in sea level poses risk to farming activities, also increasing water temperature affects fishing negatively (Berhanu and Wolde, 2019).

Studies have shown that extreme climatic conditions that manifest as desertification, high rainfall and flooding have very adverse consequences for food production (Tirado *et al.*, 2010; Wossen *et al.*, 2018; Uwazie, 2020). The reason for food security and human security crises currently faced in Nigeria is not far-fetched; climate has identified by researchers as the subtle causative factor for these (Uwazie, 2020). Persist fall of rainfall gradient in parts of northern Nigeria have increasingly rendered the affected areas unfit for crop and animal production through the use of natural resources (Wossen *et al.*, 2018). Also, persistent flooding of coastlines and southernmost part of the Nigeria has led to crop damages, loss of soil fertility, soil toxicity and disruption of soil ecosystem (Wossen *et al.*, 2018). The World Bank and the Food and Agricultural organization has through their various publications warned that climate change will continue to pose serious danger to sustainable food production in Nigeria (World Bank, 2016; FAO, 2017).

Many research findings point to the fact that the climatic vagaries that are brought about by climate change have adverse effect on agricultural productivity in Nigeria leading to lowered productive outputs. This situation has led to short fall and disruptions in food and has brought about hiking food prices. The era of food insecurity is becoming intensified across Nigeria as a result of climatic factors which have limited agricultural productivity. Climate change induced alterations such as droughts, heavy precipitation, flooding of farmlands; rising temperature, increasing aridity and soil acidity, changes in relative humidity, increase evaporation, among others have adverse effect on agricultural productivity and food systems in Nigeria. Adishi and Oluka (2018) noted that climate change has become an everyday reality in Nigeria with growing intensity and resulting to frequency of environmental issues such as floods, droughts, rising temperature and extreme weather events which disrupt agricultural productive activities. Similarly, Onuoha and Ezirim (2010) stated that “the livelihood of some 15 million pastoralists in northern Nigeria are threatened by decreasing access to water and pasture shortages linked to climate change.” Ayo *et al.* (2014) in their study noted that climate change is gradually exacerbating food insecurity in Nigeria especially in areas currently vulnerable to hunger and under

nutrition. [Ayo et al. \(2014\)](#) also noted that climate variability and climate extremes are likely to pose greater challenge for food stability. They further stated that persistent food price rise experience in part of Nigeria would make basic food unaffordable to low-income earners. [Fasona and Omojola \(2005\)](#) in their study found that increasing aridity in the Sahel and Sudan savannah regions has renders large areas of land useless for agricultural productivity with a resultant food security crises in the affected areas which are densely populated. They further stated that the number of malnourished children in Nigeria is expected to be a steady rise as a result of threats posed by climate change. [Idumah et al. \(2016\)](#) examined the short-term and long-term relationship between some climatic variables such as rainfall, temperature and relative humidity and agricultural output in Nigeria using some time series data from 1975 to 2010. Their study found that climatic data are related to food production both in short and long run. Their findings corroborate with some others that have made similar investigation.

One of the major reasons why climate change has remained a global concern is the threat it poses to agricultural production. Empirical studies have revealed that higher and varying temperatures and rainfall patterns witnessed in Nigeria within the past decade is gradually shifting the usual agricultural production pattern in Nigeria ([Ikem, 2018](#); [Wossen et al., 2018](#)). Recurrence of extreme climatic events such as drought and flood have plunged the agricultural productive system into crises ([Ogbo et al., 2019](#)). Considering the place of food sufficiency in human survival, some researchers have focused on the relationship between climate change and food security. Most of these studies were carried out through direct observation, surveys and analysis of weather data ([Oyinloye et al., 2018](#); [Ayinde et al., 2020](#)). Modelling approach has also been used by some researchers to extrapolate on future climatic scenarios with a view to making valid suggestions to policy makers on ways to circumvent future consequences of climate change ([Zwedie, 2014](#); [Wossen et al., 2018](#)).

Some empirical studies have demonstrated that climatic variability affects agricultural productivity adversely ([Jung and Kunstman; Kralovec, 2020](#)). [Muringai et al. \(2020\)](#) studied the impact of declining water resources, higher temperature an increasing CO₂ emission on food production. Their findings like those of most other researchers established a significant link changing climatic condition and poor crop performance. Climate change as seen in most scientific literature affects the very first phase of food supply chain which is production. Hence, its effects inevitably affect every other element in a food supply chain. The supply chain of the fishery sector as noted by [Muringai et al. \(2020\)](#) is also affected by climate variability. According to [Muringai et al. \(2020\)](#), climate change-induced drought has negatively affected the fishery sector especially in environments where fishery is dependent on natural water resources. [Anyika \(2020\)](#) also, noted that shrinking water resources in the Lake Chad area of Nigeria brought about by climate change has drastically affected the hitherto flourishing and lucrative fishing activities in the area, thereby cutting the fish supply chain that originates from the zone and rendering many fishermen jobless. A related by [Oyinloye et al. \(2018\)](#) it was noted climate change has very dangerous consequences for aquatic life. According to the researchers, rising water temperature brought about by climate change results in low volume of oxygen in water which destabilizes the fish habitat and may cause death in fish, low productivity or contamination of fish with harmful bacteria. Researchers are generally of the view that increasing desertification leads to loss of water bodies and aquatic animals.

Another aspect of food production that is affected by climate change is food quality. Some empirical studies have revealed variability in climatic condition have serious consequences on nutritional composition of food crops. Hence, people may be exposed to consuming toxic food or may not be able to get the recommended quantity of daily calorie

intake due to decrease in crop quality. [Taub *et al.* \(2018\)](#) conducted a meta-analysis of different experiments on the effect of climate change on food production and found that the exposition of crops to high CO₂ concentration reduced the protein concentration in crops. Hence, as CO₂ concentration in the atmosphere continues to increase, the quality of food crops will gradually be decreasing. A similar study carried out by [Berhanu and Wolde \(2019\)](#) found that the composition of mineral elements in the soil are negatively affected by extreme weather events such as high rainfall, flooding and drought. According to the study, excessive rainfall can lead to loss of soil fertility from leaching and flooding can bring about increase in soil acidity. The study also linked drought to soil toxicity. All these conditions have adverse effects on food production. [Igwe \(2019\)](#) also found that persistent flooding can result to high solution of harmful element such as arsenic in the soil which if absorbed by crops can lead to heart failure when consumed by man in high quantity. Some other studies also correlate flooding and drought to food contamination ([Ughaelu, 2017](#); [Ikem, 2018](#)).

Apart from its effect on food production, variability in climatic condition also pose serious challenges to food storage. [Ikem \(2018\)](#) in his study found that changing climatic conditions which has often resulted in high temperatures and persistent heavy waves in sub-Saharan Africa has made some farmers and farm produce merchants to incur heavy losses as a result of spoilage of farm produce. He also noted that most of the affected farmers and merchants lack the capacity to put up storage facility that would assist in conditioning the storage environment to prevent spoilage. [Ufot \(2019\)](#) stated that changing climatic condition has some adverse effects of the storage of roots, tubers and vegetable crops. His finding correlates with that of [Ikem \(2018\)](#) as he also noted that increasing atmospheric temperature quickens decomposition process for crops such as yams, potatoes, tomatoes, onions, carrots, cabbage, pepper, pumpkins and other vegetables crops. He further stated that over 2000 tons of yams and 2500 tons of vegetable crops are lost annually as a result of decay in Nigeria. He also stated that it was the perceived damages associated with yam spoilage that made the Benue State government to construct a 200,000 tuber capacity yam storage facility in Zaki Biam, a town that is popular for yam production. [Ufot \(2019\)](#), however, consider the storage facility insufficient as Benue State account for about 70% of total yam production in Nigeria. [Ughaelu \(2017\)](#) stated that farmers in Nigeria will continue to grapple with the challenges associated with food storage until efforts are made to provide storage facilities that will cushion the effect of climate change.

Another impact of climate change on food security as noted by [Ogbuchi \(2020\)](#) is that it brings about changes in environmental condition which can force people to move out of their original habitation where they engage in food production and other economic activities, thus making them susceptible to food insecurity. The link between forced migration and food insecurity has been established in so many other studies such as [Ogbo *et al.* \(2019\)](#), [Oyinloye *et al.* \(2018\)](#) and [Ngo and Otekumrin *et al.* \(2019\)](#). From the findings of these studies, forced migration limits access to food thereby exposing the victims to under-nutrition.

Precipitation is one of the key determinants of food production output. The delayed onset and early cessation of rainfall witnessed in parts of Nigeria has resulted to changes in agricultural productive patterns in parts of Nigeria. Also, heavy flooding of farmlands experience in some parts of Nigeria has resulted to huge crop losses. The recurring frequency of these occurrences has grave consequences on food security in Nigeria. [Okoli and Ifeakor \(2014\)](#) stated that Nigeria is vulnerable to climate change. They further stated that climate change is impacting negatively on food security in Nigeria as a result of decreasing agricultural outputs. They also noted that a large number of Nigerians are malnourished, hungry, starving and poor stating that these conditions are being aggravated by climate

change. In a similar vein, [Ethan \(2015\)](#) noted that changes in the pattern of rainfall as experience is gradually altering the growing and harvesting season in Nigeria. Ethan further stated that alteration in evapotranspiration, photosynthesis and biomass occasioned by climate change negatively affect crop yield.

The Nigeria Meteorological Agency (NIMET) observed some changes in the climatic parameters such as rainfall, temperature and extreme weather events. These changes which have adverse effect on agricultural productive activities were recorded in various ecological zones in Nigeria (NIMET, 2005). Similarly, [Ethan \(2015\)](#) analysed Nigerian climatic data from 1914 to 1970; from 1971 to 2000 and from 2001 to 2011. His findings indicate that there were changes in onset and cessation of rainfall which has affects the Nigerian food system pattern.

The subtle nature of climate change conceals its devastative effects on human lives. Food insecurity is one of its major effects. It has obvious physiological effects on crops and livestock such as alteration of soil nutrients, shrinking of water resources, change in relative humidity, rising temperature and increased weed and pest. Climate change induces conditions such as desertification, erosion and ecological devastation thereby threatening human security in the affected regions. It also provokes droughts, floods and environmental extremes that limit agricultural production. Climate change has continued to be a threat to agricultural development in Nigeria, the loss of farmlands to flood and increasing aridity in Sahel and Sudan vegetative zones has grave consequences for agricultural productivity. Poor agricultural output that results from climate change constitute major food security crisis in Nigeria. The pattern of food production and distribution has continually been affected by climate change. The disruptions in the usual food production and distribution system have contributed to shortfall in the supply of food and have resulted in the steady rise in food prices.

The rapid population growth in Nigeria and unmatched agricultural productive output is a pointed to an aggravated food security crisis. This condition is attributed to the stresses that are connected with climate change. Climate change undermines the ability of developing countries to meet targeted agricultural output. The persistence of this shortfall indicates intense food security crisis. Climate change also affects aquatic ecosystem. Sea warming, changing in sea salinity and increasing sea acidity are some of the physical changes that climate change brings. Several incidents of mass aquatic deaths in the Niger Delta are indications of the horrendous consequences of climate change. Such loses threaten the livelihood of riverine communities that heavily dependent on food and trade.

Food insecurity is one of the major impacts of climate change. Changing climatic conditions has persistently affected agricultural productive activity in Nigeria adversely thereby making food production unstable and unsustainable. Some of the threats posed by climate change on food production in Nigeria include:

- Planting and harvesting season alterations: Climate change has gradually shifted the rainfall onset and cessation pattern in parts of Nigeria thereby altering the usual planting and harvesting seasons. The change has affected the food system and has made some basic food stuff unavailable or in short supply at certain periods in the year when such food should usually be surplus supply. Short supply of food stuffs contributes to steady rise in food prices, thus, making basic food inaccessible to low-income households and individuals.
- Reduced crop yield: Changes in environmental conditions such as increased precipitation, rising temperature, high evapotranspiration rate, drought, increased soil acidity and flood which are induced by climate change result to decrease in crop yield. Research finding have revealed that the increasing concentration of carbon

dioxide in the atmosphere has both adverse and positive effects of crop yields. Some plants do well under such condition while others do not. Increased CO₂ concentration according to research findings leads to low grain yield and this reduces the availability of grain for livestock and human consumption. On the other hand, high CO₂ concentration in the atmosphere increases the productivity of pastures, however; the quality of fodder and foliage from such pastures is decreased by the same effect thereby making them have low nutritional benefits for livestock. It is also speculated that when atmospheric temperature exceeds plants optimum temperature, their yields are likely to be adversely affected. Flood, drought and high temperature are extreme conditions that have continually reduced the quality and quantity of human food and grazing lands.

- Increased pests: Changes in atmospheric temperature and relative humidity has resulted to increased breeding of various plants and animal pests. More pests have continued to surface and attack plants and animals. The activities of some of these pests were hitherto insignificant but with current environmental changes their increased activities have given them some level of significance.
- Impact on livestock: Climate change also constitutes major threats to livestock. Global warming has resulted to persistent heat waves that have caused huge losses in livestock. Rising atmospheric mean temperature increases the vulnerability of animals to diseases, reduces fertility and milk production. Drought also poses serious threat to animal food supplies. Animals that are dependent on foliages often have to endure long period of food unavailability or under nutrition.
- Increased demand for irrigation: With the lowering level of rain fall and increasing aridity in the Sahel and Sudan savannah belts of Nigeria, the use of irrigation is gradually beginning to emerge as an alternative system of providing water to for farming. This practice would increase the cost of farming and invariably would result to increase in prices of food commodity. Also, many peasant farmers that have solely rely on natural sources of water for farming may not be able to remain in the farms as they cannot afford the cost of irrigating their farm and their withdrawal from agricultural productive activities would have adverse impact of food production.
- Flooding of farmlands: Increased rainfall and rising sea level have resulted to flooding in some parts of Nigeria. Flood disrupts agricultural activities and most cases results to destruction of crops. Several incidents of farmland submergence have been reported across Nigeria in recent time. Farmers have incurred huge loses severally as a result of flood. Incessant cases of flood have rendered some arable farmlands uncultivable thereby reducing agricultural output.
- Risk to fisheries: Changes in salinity, increasing acidity and rising sea temperature have adversely affected aquatic lives. In the Niger Delta, massive deaths of fish have been recorded in the past decade. Commercial fishing has adversely been affected by climate change. The reduced outcome from fishing activities poses significant threat to food security and livelihood of households that depend on marine resources.

3. Climate change and human security in Nigeria

The subtle nature of climate change makes the phenomenon appear as if it is not a major human security threat. Evidences have shown that climate change has adversely affected

serene human existing in many parts of the world. Human security according to the United Nations “is a people-centred notion of security that seeks to integrate the various determinants of well-being such as economic, food, health, environment, personal, community and political security.” According to Human Security Network (1999) “building human security is essential for the establishment of a humane world where people can live in security and dignity, free from poverty, despair and fear of want.” The United Nations categorized human security in terms of acute risks from sudden disruptions such as natural disasters and chronic threats such as disease, hunger and conflict.

The conventional notion of national security and international security cannot be achieved without regards to human security. Human security is complementary to national security in the same way that national security complements international security. Hence, human security is rudimental to the notion of security both at national and international level as it offers more basic, detailed and comprehensive approach to security discourse. According to the United Nations’ General Assembly Resolution 66/290 “human security is an approach to assist member states in indentifying and addressing widespread and cross-cutting challenges to the survival, livelihood and dignity of their people.” This approach, according to the resolution calls “for people-centred, comprehensive, context-specific and prevention-oriented responses that strengthen the protection and empowerment of all people.” The effect of climate change on national and international security can better be appraises from a more comprehensive human security approach.

Climate change constitutes an emerging threat to human security in Nigeria. The phenomenon through its various manifestations has precipitated violent conflicts thereby disrupting public safety and stability. [Idumah *et al.* \(2016\)](#) noted that vagaries in climatic conditions occasioned by climate change has decreased agricultural productivity prospects and has resulted to increasing aridity of pasture areas in parts on northern Nigeria thereby forcing the pastoralists down south and pitching them against local farmers in the south as they compete for scarce resources. [Barnett and Adge \(2007\)](#) also noted that “climate change is undermining human security by reducing access to important natural resources and undermining the capacity of states to act in ways that could promote human security.” Flood, drought and desertification have led to population displacement and drop in agricultural output. This condition has been linked to violent conflicts and insurgency in parts of Nigeria. [Odo \(2012\)](#), [Folami \(2013\)](#), [Oladele \(2010\)](#) and [Adishi and Oluka \(2018\)](#) have established linkages between climate change and farmer-herder conflicts in parts of Nigeria.

Continued environment degradation of parts of Northern Nigeria which has resulted in the loss of grazing fields has induced a southward movement of pastoralists and the major consequences of this migration pattern is the incessant violent clashes farmer in the host communities and herders. The pattern of conflict has led to disruption of agricultural activities, huge losses in human lives and destruction farm settlements and communities. The pattern of conflict has increased armed trafficking across the countries. Some herders have resorted to using their acquired armed in perpetrating crimes such as kidnapping, armed robbery and rape, hence worsening the security situation in the country.

Rainfall controls agricultural activities in Nigeria. The Sahel and Sudan savannah belts represents an extensive grazing areas with cereals and vegetable cultivation more localized around the Fadamas ([Fasona and Omojola, 2005](#)). The Guinea savannah is the major food producing areas in Nigeria. It is in the region that root crops, tuber crops, cereals and vegetables are extensively. Crops such as yam, potatoes, cassava, guinea corn, zea maize and millet massively in the Guinea savannah and distributed to other parts of the country. The rain forest belt also serves as major area for root and tuber crops production but is an

exclusive region for cash crops such as oil palm, raffia palm, cocoa, rubber and cashew. These vegetative regions of Nigeria have been adversely affected in different ways by climate change. The persistent drought in the Sudan and Sahel savannah areas has forced many pastoralists out of the region towards the guinea savannah and rain forest areas. This has resulted to increased pressure on lands in these areas. Fallow grounds for crop cultivation have often been eaten up by cattle. The herders and their herds in their search for water and grazing field have often destroyed farmlands, thus bringing them in conflict with local farmers. Farmer herder conflicts have been a recurring incident in the middle belt region and parts of southern Nigeria. The studies of [Adishi and Oluka \(2018\)](#) indicate that land related violence account for about 31.1% of communal conflicts in Nigeria from 1991 to 2005. This finding is similar to that of many other studies.

3.1 Methodology

This study is an in-depth case study that involves the use of both quantitative and qualitative data. Statistical data on climate variability in Nigeria obtained from reliable databases were used in the making of analysis. Also data derived from semi-structure interviews and special reports from International non-governmental organizations on the subject matter were also used in the study. The findings of the study were based on an in-depth analysis of both primary and secondary sources of data. The secondary data were derived from existing published academic works.

The primary data was developed using qualitative data that were collected from January to November, 2018 to 2019 in the different regions of Nigeria. For the South East, primary data was collected from Abakaliki, Ebonyi State. In the South-South, primary data was collected from Asaba, Delta State. In the South West, primary data was collected from Barutin, Kwara State. In the North East, primary data was collected from Maiduguri, while in North West, data was collected from Gusau, Zamfara State. In the North Central, data was collected from Markurdi, Benue State. During the data collection, 48 semi-structured Key Informant Interviews (KIIs) were carried out in the six selected research areas that represented their geo-political zones. Six Focus Group Discussions (FGDs) were carried out, one for each of these six selected cities. Each of the FGDs comprised between five and seven respondents. The idea of KIIs and FGDs is to allow the respondents to freely express their ideas comprehensively. Again, in order to get varied forms of responses, the respondents are mainly farmers however, a number of NGOs, civil servants, fertilizer sellers, government officials, transporters and aged men and women/retirees.

It should be noted that the respondents cut across male and female gender of all ages and ethnic configuration. The respondents were also randomly selected through social networking. To avoid having people of similar The KIIs were three academics; two community leaders; two small scale fish farmers; rice, cassava, fish, livestock and crop farmers. All KIIs and FGDs were transcribed and analysed using thematic content analysis.

4. Results and analysis

4.1 Food security situation in Nigeria from 2006 to 2019

Data from the Nigerian General Household Survey, FOA database and structured interviews show that a significant population of Nigerians are currently facing the challenges of food insecurity ([Table 1](#)). The interviewees generally agree that food insecurity is affecting most households in many parts of Nigeria. The situation aggravated with the outbreak of COVID-19 pandemic. The situation did not get better after the relapsing of lock down measures that followed the COVID-19 outbreak. The prices of food items have continued to soar and the crisis of food insecurity has continued to deepen.

Table 1.
Stakeholders’
perceptions/reactions
to climate change
and food/human
security

Communities	% Response	Main nature of climate change	Government intervention	Individual response	Main NGOs response	Impact of climate change
Abakaliki	100% KIIs	Flood	Grants	Shifting cultivation	Building bridges	Crop damages
Asaba	100% KIIs	Flood	Building bridges	Shifting cultivation	Absence	hunger Relocation Flood Drowning Crop
Barutin	100% KIIs	Heat	Fertilizer supply	Shifting cultivation	Absence	Damages Crop
Gusau	100% KIIs	Heat desertification	Political communication securitization	Relocation	Absence	damages Deaths Relocation Armed conflict Securitization
Maiduguri	100% KIIs	Desertification Heat	Securitization	Relocation	Absence	Deaths, Relocation
Agatu	100% KIIs	Temperature Flood Herdsman attack	Securitization	Relocation	Absence	Securitization Hunger, poverty, International displacements Conflict herdsmen attacks

Source: Author’s fieldwork 2018-2019

Figure 1 and Figure 2 show the trend of food insecurity in Nigeria and shows that food many Nigerian households are food insecure. The figure shows that there is a persistent increase in the trend of undernourishment from 2008 up to 2018.

From the figures it is glaring that Nigeria is knee deep in food insecurity. Figure 2 shows a persistent upwards trend, indicating that undernourishment has come to a crisis point in

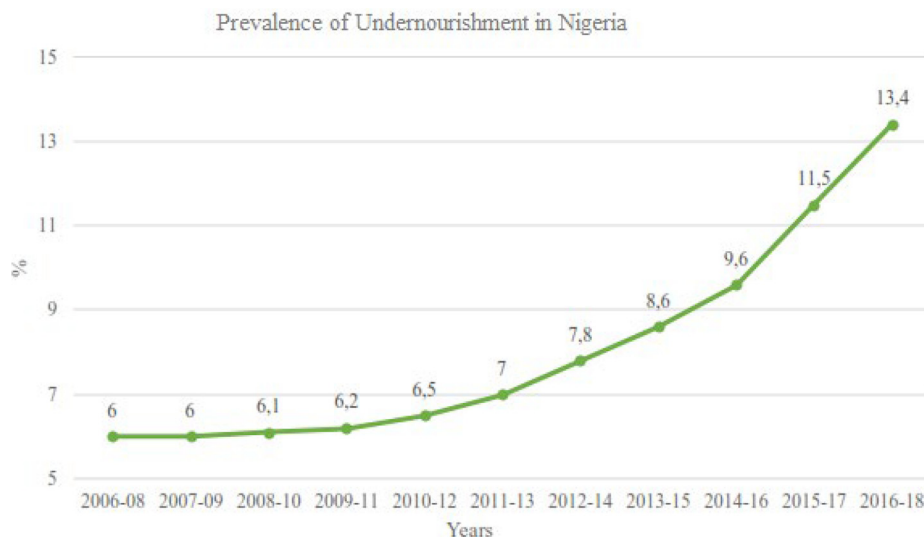


Figure 1.
Prevalence of
Undernourishment
showing three-year
average from 2006 to
2018

Source: FAO (2019)

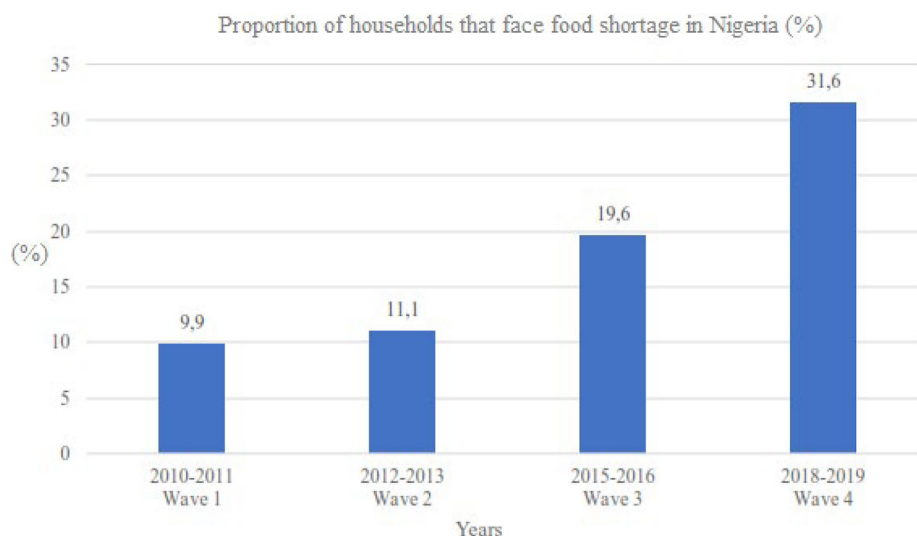


Figure 2.
Proportion of
households facing
food shortage in
Nigeria

Source: GHS Indicators (2010-2011; 2012-2013; 2015-2016; 2018-2019)

Nigeria. Similarly, [Figure 2](#) shows that more households are being exposed to food insecurity annually. In the first wave which span from 2010 to 2011 only about 10% of The Nigerian population were affected by food insecurity. In the second wave which span from 2012 to 2013, there was an insignificant increase in the number of persons affected in the first wave; however, from the third wave, there was a surge in the number of persons affected by food insecurity (19.6%) and by the fourth wave the number of persons affected had increased tremendously to the tune of 31.6%.

These indicators show that Nigeria is presently struggling with the problem of food insecurity as a very significant proportion of its citizens are undernourished.

4.2 The effect of climate change on food security in Nigeria

Findings from scientific literatures show that climate change is the key driver of food insecurity in Nigeria. Research findings also establish that climate change affects the first phase of food supply chain owing to the effect of climate change on crop production. It was also noted that climate change induces forced migration which leads to decrease in food access or undernourishment among the victims.

Available statistical data show Nigeria is significantly affected by the variability in climatic condition, and this has consequences for food production, storage and distribution. [Figure 3](#) shows the yearly mean temperature in Nigeria from 2000 to 2016, while [Figure 4](#) shows the yearly mean rainfall in Nigeria from 2000–2016. [Figure 5](#) shows the number of Nigerians displaced as a result of natural disasters associated with climate change from 2009 to 2018.

From [Figure 3](#), it could be seen that for the years under review, the coldest was the year 2000. Nigeria has intermittently experienced warm years, with the years 2005, 2009, 2010, 2014 and 2016 being the record warm years. In total the mean temperature trend has been on a steady rise up to half a degree. This demonstrates that Nigeria is experiencing temperature rise.

[Figure 4](#) shows that the Nigerian climate is varying increasingly in terms of rainfall. The years 2003, 2008, 2010, 2012 and 2016 witnesses spikes in rainfall. The impact of these rising temperature patterns is felt across the vegetative zone of Nigeria. The Mangrove Swamp and the Rain Forest zones witnessed intense flooding, which resulted to loss of crops and

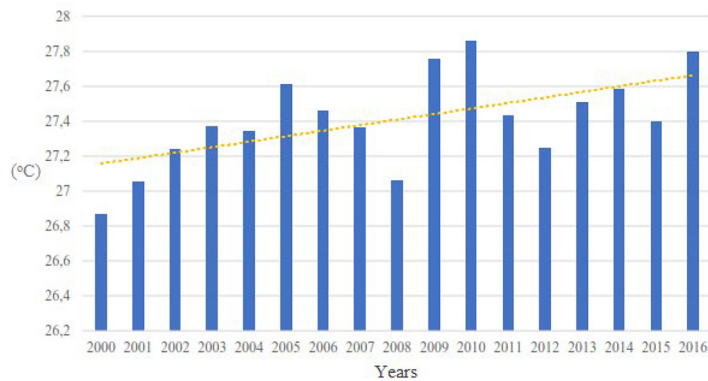


Figure 3.
Yearly mean
temperature in
Nigeria, 2000–2016

Source: World Bank Climate knowledge portal
(climateknowledgeportal.worldbank.org)



Source: World Bank Climate knowledge portal
(climateknowledgeportal.worldbank.org)

Figure 4.
Yearly mean rainfall
in Nigeria

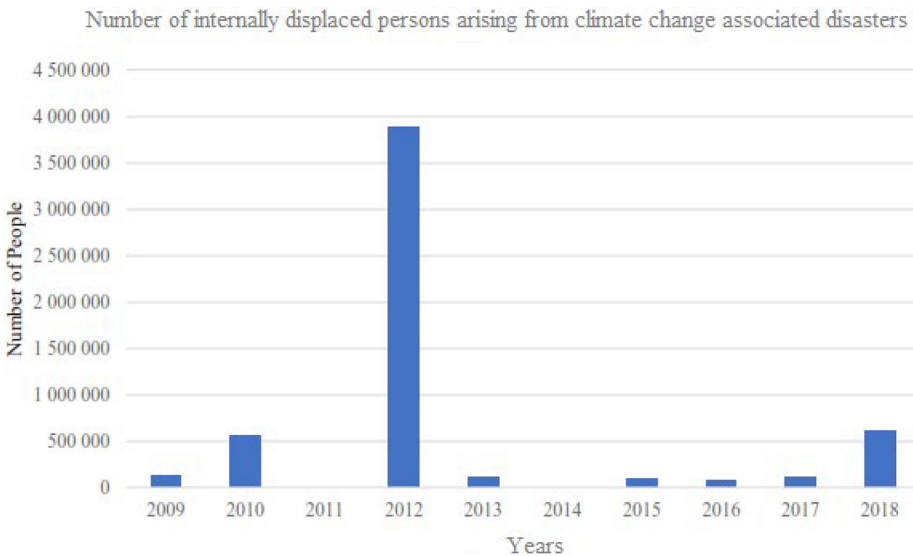


Figure 5.
Number of internally
displaced person
(IDPS) arising from
disasters

internal displacement. In the Southern and Northern Guinea zones flooding were also recorded in the coastal plain, while Sudan and Sahel reduced rainfall has continued to be witnessed and the resultant desertification have forced most herders from these arid zones into the Northern and Southern Guinea belt.

The crisis of flooding in Nigeria in recent times affects farmers who use the wet plain along the Niger and Benue Rivers. Huge amount of food crops have often been submerged and damaged by flooding. This has affected the seasonal pattern on food availability. Often early arrival of some food commodities has been made impossible due to climate related events.

Figure 4 shows the numbers of person in Nigeria that were displaced from their original habitation as a result of climate change-induced flooding. The figure shows that in the year 2012, Nigeria experienced a crisis of internal displacement from natural disaster which had not been recorded in recent times. Also, significant numbers of internally displaced persons were also seen in the years 2010 and 2018.

4.3 The impact of climate change of human security

Available evidences show that climate change-related events such as flooding and drought have significant impact on human lives. In 2012 alone, about 363 human lives were lost to flooding while about 2.1 million persons were displaced (NEMA, 2012). Other sporadic incidents of flooding have also claimed lives in parts of Nigeria.

On the other hand, persistent droughts in parts of the Sudan and Sahel Savannah zones have forced herders from these areas into the Northern and Southern Guinea belts. As the herder move with their cattle in search of greener grazing field they often come in conflict with the local farmers. Incidents of farmer-herder conflicts have been on a steady rise in Nigeria and has cause heavy toll on human lives. Table 2 shows some desertification prone states in Nigeria.

Table 3 shows some incidents of farmer-herder conflict in Nigeria from 2009 to 2020.

Recurring incidents of violent clashes before farmers and herders was not known in Nigeria before the year 2000. For centuries in Nigeria, both the farmers and herders have co-existed with no group crossing each other path. The sudden change in status quo is a valid pointer that something has gone wrong in the system. Climate change is indeed, the change agent. It is the key driver of this conflict complex. Drought and desertification have led to huge migration of herder southwards and pitching them against the local farmers in the struggle for the use of limited land and water resource. The rise of insurgency in the North-eastern part of Nigeria is also connected with climate change with and its attendant drought and desertification.

State	Geographical region	Land area		Population (2006)		Rate of desertification
		(km ²)	% of Nigeria	Number	Density (/km ²)	
Sokoto	North West	27,825	3.06	3,702,676	133	Severe
Zamfara	North West	37,931	4.17	3,278,873	86	Severe
Katsina	North West	23,561	2.59	5,801,584	246	Severe
Jigawa	North West	23,287	2.56	4,361,002	187	Severe
Kano	North West	20,280	2.23	9,401,286	464	Moderate
Kebbi	North West	36,985	4.06	3,256,541	88	Severe
Kaduna	North West	42,481	4.67	6,113,503	144	Moderate
Borno	North East	72,609	7.98	4,171,104	57	Severe
Yobe	North East	46,609	5.12	2,321,339	50	Severe
Bauchi	North East	41,119	4.52	4,653,066	113	Moderate
Gombe	North East	17,100	1.88	2,365,040	138	Moderate
Adamawa	North East	38,700	4.25	3,178,950	82	Moderate
Taraba	North East	56,282	6.19	2,294,800	41	Moderate
Niger	North Central	68,925	7.58	3,954,772	57	Moderate
Plateau	North Central	27,147	2.98	3,206,531	118	Moderate
Total		580,841	63.83	62,061,067	107	

Table 2. Desertification-prone frontline states

Sources: National Bureau of Statistics, 2010b; National Population Commission, 2006, Olagunju (2015)

Table 3.
Incident of farmer-
herder conflict in
Nigeria from 2009 to
2020

Year	No. of death	No. injured	No. displaced	States of incidents
2019 - 2020	1900	Several (Not specified)	Several (Not specified)	Anambra, Benue, Enugu, Ebonyi, Benue, Plateau
2017- 2018	1500	Several (Not specified)	300, 000	Adamawa, Benue, Nasarawa, Plateau, Taraba
2015- 2016	695	Several (Not specified)	7000	Benue, Enugu, Kogi
2013- 2014	398	Several (Not specified)	Several (Not specified)	Benue, Kaduna, Nasarawa, Zamfara
2011- 2012	113	Several (Not specified)	6500	Adamawa, Benue, Borno, FCT, Nasarawa, Sokoto
2009- 2010	Several (Not specified)	Several (Not specified)	Several (Not specified)	Plateau, Nasarawa

Sources: International Crisis Group, 2017; Relief web (reliefweb.int), Amnesty International, 2019, Okoye, 2016

5. Conclusion

Climate change no doubt presents an emerging threat to food and human security in Nigeria. The phenomenon causes complex forms of human security crises, which have resulted to destruction of human lives, loss of public peace and stability, destruction of communities, hunger, malnutrition, poverty and unemployment.

The growing number of Nigerian that are malnourished, starving and poor are pointers to the fact that food and human security in Nigeria are in a very low ebb and if not addressed would continue to stimulates social instability and conflicts. Climate change constitutes a growing risk to food security in Nigeria. Variability of climatic elements in recent times has gradually and increasingly altered the food production system in Nigeria. Shortfall in food supply linked to climate change results to rising food prices in the country thereby worsening food security situation. The persistence of drought in parts of northern Nigeria has adversely affected agricultural productive activities in the area. Also, the gradual disappearance of pasture in the areas has forced most herders out of the region towards the middle belt and southern parts of Nigeria. These herders are often involved in violent clashes with local farmers. Such frictions have aggravated human security situation in Nigeria.

The place of poor governance in worsening the challenge of climate change cannot be over-looked. Politics should necessarily ensure that the necessary requirement for nation building that would mitigate the negative effects of climate change are put in place but the reality in Nigeria, is that the political elite are largely self-centred and corrupt. They think more self and interest of their clique.

The place of inadequate education in the dynamics of food and human security as well as climate change problems has continued to remain a national problem in a society where many are graduates but are not interested in agriculture education and extension services. There is a very high disconnect between the theoretical learning in secondary and tertiary institutions and the need for technical science education that is largely needed to transform the nature of agricultural development and climate change management.

Nigeria needs to adopt and implement some adaptive strategies that would enable her cope with the challenges of climate change to ensure food availability through sustainable agricultural system. Such measures will also address some challenges that lead to farmer herder crises in parts of the country that have worsened human security situation.

5.1 Recommendations

To address the challenges posed by climate change on food and human security more robust and comprehensive strategies that would address the root causes of vulnerabilities and emerging risks. to be addressed. Approaches to climate change vulnerabilities must seek to deploy new approaches to agricultural practices, adaptability of agricultural practices to changing environment and regulation of anthropogenic factors that trigger climate change. To address the emerging risks poses by climate change on food and human security this study recommends the following measures and strategies.

- Appropriate legislative measures and policies should be put in place to ensure environmental-friendly practices. Practices such as gas flaring, deforestation, illegal construction of waterways and illegal diversion of natural waterways should be prohibited. This measure will help in redeeming the environment from further degradation. Effective legislation would also ensure that conservative practices are sustained and that anthropogenic factors that contribute to climate change are minimized.
- More research in natural and climatological sciences should be carried account to advance a more robust and beneficial alternative to natural agricultural production pattern to ensure food sufficiency and sustainability. Research should be geared towards the development of crop and animal varieties that with short maturity period to ensure that cases of reduced rainfall will have minimum effect of crops.
- Smart food system or agricultural methods that are resistant to climate change should be adopted to ensure sustainable food security in Nigeria.
- Drought resistant grasses should be introduced and widely propagated in areas affected by drought. This would reduce the tide of pastoral north-south migration pattern that have induced frictions and clashes between herdsmen and local farmers. This measure will also ensure sustainability of peace and human security across Nigeria.
- Alternative practices such as the use of irrigation and recharging of shrinking water bodies in the Sudan and Sahel savannah regions should be carried by government and other stakeholder to ensure that farmers are streamed back into productive activities.

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