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THE INTERPLAY BETWEEN CLIMATE CHANGE AND FOOD SECURITY IN NIGERIA: CHALLENGES AND OPPORTUNITIES

IDREES Mahmud Gana
Department of Political Science, Edusoko University Bida, Niger State
Corresponding Authors E-Mail: mahmud.idrees@gmail.com
+2348064064787

KHADIJAT Sadiq
Department of Political Science, Bayero University Kano
khadijatsadiq056@gmail.com
08057539629

OGAJI Tijani Adamu
Department of Political Science, Federal University Dustin-Ma, Katsina
ogajitijaniadamu1@gmail.com
08088230100
&
MOHAMMED Aliyu
Department of Political Science, Federal University Dustin-Ma, Katsina
maliyu276@gmail.com
08036540393

Abstract
Climate change presents substantial problems for Nigeria's food security, affecting agricultural productivity, freshwater resources, energy security, and general economic stability. System theory was applied as the theoretical foundation of the study. This qualitative study looks at the complex link between climate change and food security in Nigeria, using current literature and data analysis. According to the findings, Nigeria is facing increasing temperatures, erratic rainfall patterns, droughts, floods, and desertification, which are resulting in lower agricultural yields, greater food insecurity, and increased vulnerability for millions of people who rely on agriculture. The agriculture industry, which employs a large proportion of the population, is especially vulnerable to these effects. Beyond agriculture, climate change has an impact on the energy, health, and security sectors, aggravating Nigeria's problems. To address these issues, recommendations include encouraging sustainable agriculture practices, improving climate resilience, investing in climate-resilient infrastructure, promoting climate-smart agricultural research and innovation, raising awareness, and working with regional and international partners. These activities seek to alleviate the consequences of climate change on food security while also promoting adaptation and resilience in Nigeria's agricultural sector.

Keywords: Climate change, Food security, Agriculture, Adaptation, Nigeria.

1.0 Introduction

In recent decades, the world has witnessed the profound effects of climate change, which have reverberated across continents and threatened the stability of ecosystems and human societies alike. Changes in the environment and climate in the twenty-first century are influencing people's ways of life all over the world. Man is proud of his capacity to conquer

time and space while also demystifying his environmental limitations via scientific invention, technological advancement, and the revolution in computers and the internet (Behnassi, 2019). However, these advancements have also contributed to the acceleration of climate change through increased carbon emissions and deforestation. As a result, it is crucial for individuals and governments to prioritize sustainable practices and policies to mitigate the impacts of climate change.

The unethical practices of humanity in terms of too many activities in industries, pollution, environmental hazards, the release of carbon emissions, destabilization of water, encroachment into forests, bushfires and bush burning, excessive rainfall and drought, desertification, and other ecological problems have all coalesced into issues that are affecting the ozone layer, stirring seas leading to flooding as a result of melting glaciers and ice, and other harmful practices (Lieberman & Gordon, 2018). These harmful practices have resulted in a significant impact on climate change, with rising global temperatures and extreme weather events becoming more frequent. Urgent action is needed to address these issues and mitigate their effects on the planet's ecosystems and inhabitants.

The fact of climate change, as well as the frequency of its negative repercussions, poses serious hazards to human existence in many parts of the world. The negative consequences of climate change have prompted global concern and efforts to mitigate its impacts, as well as lobbying for legislation that would limit human activities that cause climate change. Climate change refers to changes in the mean variability of the climate that last for decades or more. Climate refers to the atmospheric conditions in a certain area over time. The climatic state is the long-term total of atmospheric factors, including solar radiation, temperature, relative humidity, and precipitation, as well as their fluctuations throughout time. Climate change is defined as a long-term divergence from the climate's mean or fluctuation. The primary source of current climate change is human-caused greenhouse gas emissions (IPCC, 2014). These emissions trap heat in the Earth's atmosphere, leading to an increase in global temperatures and changes in weather patterns. The consequences of climate change include rising sea levels, more frequent extreme weather events, and threats to biodiversity.

Global climate change has impacted agricultural activity in the majority of the world's countries, resulting in a severe decrease in productivity and an increase in food shortages. Over the previous two decades, 200 million people have been lifted out of hunger, and the frequency of chronic malnutrition in children has dropped from 40% to 26%. Despite this development, the World Bank reports that 702 million people remain in severe poverty, and 793 million are undernourished (Skullerud, 2018). These statistics highlight the ongoing challenges that global climate change poses to food security and poverty alleviation efforts.

Food is critical to development, and civilizations have been created on the basis of agricultural revolutions and the subsequent generation of food excess. Food security should be one of a government's top priorities. Food security meets people's nutritional requirements by assuring physical, social, and economic access to adequate, safe, and nutritious food. Nowadays, food security is critical since it not only alleviates hunger, poverty, and malnutrition, but it also affects national security and political and economic sovereignty of governments. The era of the oil boom in Nigeria marked the beginning of the agricultural sector's decline as a result of over-reliance on oil and general neglect of the non-oil sectors, with the country steadily shifting from producer to importer of agricultural products, with far-reaching consequences for food security. Nigeria is currently dealing with major difficulties with food security and the need to fulfill the demands of its fast rising population (Panshak, 2023). Climate change, which includes an increase in the concentration of atmospheric gases

such as carbon (IV) oxide and chlorofluorocarbon, among others, increases the frequency and intensity of some disasters such as droughts, floods, storms, pests, and disease, which have the potential to destroy crops, infrastructure, and livelihoods. Climatic fluctuation exacerbates pest and disease infection, thereby exposing Nigeria's agricultural system to serious stress, threats, and shortages. This can lead to food insecurity, loss of income for farmers, and ultimately impact the overall economy of the country.

Nigeria's agricultural potential is vast, and the country has a diverse range of ecosystems and agricultural practices that support a population heavily reliant on agriculture for sustenance and livelihoods. However, the intensifying impacts of climate change are increasingly undermining the country's agricultural productivity and exacerbating food insecurity. Erratic rainfall patterns, long-term droughts, rising temperatures, and extreme weather events are disrupting agriculture. It is against this that this study aims to investigate the complex relationship between climate change and food security in Nigeria, identifying problems, possibilities, and potential paths for long-term adaptation and resilience development.

2.0 Conceptual Clarifications

Climate Change

Over the past 100 years, the earth's average surface temperature has risen by 0.75 °C (Panshak, 2023). This steady rise has caused visible changes in the global weather pattern, affecting natural resources and the balance of nature, upsetting seasonal cycles, disrupting ecosystems and water supply, and causing sea levels to rise. The United States Global Climate Change Programme defines climate change as extreme weather reactions that have a negative impact on agricultural resources, water resources, human health, ozone layer depletion, vegetation, and soil, resulting in a doubling of carbon dioxide concentrations in the ecosystem (United States Global Climate Change Programme, 2013). Additionally, climate change is also linked to an increase in natural disasters such as hurricanes, droughts, and wildfires, which pose significant threats to human life and infrastructure. It is crucial for global efforts to mitigate climate change in order to protect the planet for future generations.

Climate change has various harmful consequences for humanity and the environment. Excessive drought and flooding are leading to food scarcity, insecurity, hunger, and famine (Parenti, 2018). Pollution poses a number of health risks, and the destruction of the ozone layer causes excessive burning, heat, and ice melting, culminating in increasing sea levels that endanger human habitation. Millions are driven into forced migration and relocation (Shrivastav, 2019). Additionally, the loss of biodiversity due to climate change threatens ecosystems and disrupts natural processes essential for human survival. Extreme weather events, such as hurricanes and wildfires, are becoming more frequent and intense, causing widespread devastation and loss of life (IPCC, 2021).

However, climate change is not left unchecked by humans. International key players such as the United Nations (UN), the World Bank, the European Union, the G-20, the African Union, and other economically powerful and industrial countries are pushing for negotiations, agreements, and other measures to regulate such harmful activities as the substitution of gas emissions and other pollution for renewable energy and other actions (The United Nations, 2019). Nonetheless, climate change continues to dominate deliberations at global meetings such as the United Nations and other institutions, and its consequences remain unabated.

Food Security

Food security occurs when there is always enough food to feed the whole population. Crops and livestock should provide an individual's daily nutrient requirements. The idea of food security includes four primary components: availability, accessibility, use, and stability, which may all be examined at the national, family, and individual levels. At the national level, food security refers to the availability of food to fulfill domestic demand until reserves are replenished through harvests or imports. Individually, it implies that all members of society have access to the food they require, whether through their own production, markets, or the government (Ishaku, 2017). Food security is crucial for overall well-being and development, as it ensures that individuals have access to the necessary nutrients for a healthy life. Additionally, stability in food security is essential to preventing hunger and malnutrition in times of crisis or scarcity.

Food demand is rising as a result of many population and demographic changes, including population increases, changes in population structure, consumption growth, and urbanization. Meeting demand may be restrained by biological performance, climate change, and the local and global limitations that dictate the need for more sustainable agriculture. Simultaneously, current food production techniques are linked to enormous waste and a growing public health concern involving obesity, diabetes, and other non-communicable illnesses. Meeting the issues of food security requires more than just innovation to enhance yields; it also requires changes in agricultural systems that encourage sustainable and resilient food production to fulfill the nutritional needs of local and global populations (TG, 2017). These changes include promoting agro-ecological practices, supporting small-scale farmers, and improving access to markets for locally produced food. Additionally, addressing social inequalities and economic disparities is crucial to ensuring equitable access to nutritious food for all individuals.

3.0 Theoretical Framework

System theory was applied as theoretical framework of analysis to explain the interplay between climate change and food security in Nigeria. Ludwig von Bertalanffy developed systems theory in the 1940s, and it provides a comprehensive framework for understanding complex phenomena as interrelated and interdependent systems. Bertalanffy's core point is that comprehending a system requires knowing its linkages and interactions (Bertalanffy, 1968). Systems theory emphasizes the importance of viewing the whole system rather than just its individual parts. By considering how different components interact and influence each other, a more holistic understanding of complex systems can be achieved.

Applying this theory to the relationship between climate change and food security in Nigeria reveals a complex system in which environmental, economic, and social components interact dynamically. Climate change, typified by rising temperatures, irregular rainfall, and extreme weather events, has a direct influence on Nigeria's agricultural production, which is essential for food security. Climate change affects crop yields and livestock production, resulting in a reduced food supply. The agricultural system, impacted by soil health and water supplies, is not isolated; it is inextricably tied to Nigeria's economy, which is mostly based on agriculture. Reduced agricultural productivity owing to climatic variability can raise food costs and lower farmers' earnings, upsetting economic conditions and restricting access to food (IPCC, 2022). Climate change also poses a threat to the livelihoods of smallholder farmers in Nigeria, who rely heavily on agriculture for income and sustenance.

Systems theory places a premium on feedback loops, which may either stabilize or destabilize a system. In Nigeria, attempts to promote agricultural resilience through drought-resistant crops and improved irrigation create negative feedback loops that can help stabilize

food production. Conversely, actions such as deforestation for agricultural expansion produce positive feedback loops, intensifying climate change and further lowering agricultural production, hence jeopardizing food security. Understanding the feedback loops is critical for creating effective solutions.

3.1 Empirical Review

Research has indicated that increasing temperatures and variable rainfall patterns have a negative impact on agricultural output in Nigeria. According to Adejuwon (2004), temperature rises might affect agricultural yields such as maize, sorghum, and millet by 10–30% by 2050. Extreme weather events aggravate soil erosion and deterioration, putting agricultural output at risk. Nwafor (2007) stated that increasing rainfall intensity causes significant soil erosion, particularly in the southern districts, affecting agricultural productivity.

A loss in agricultural productivity frequently results in a reduction in food supply via both direct and indirect channels, such as lower crop and livestock output and disruption of food delivery networks (Akinboade et al., 2013). Furthermore, rising food costs make it harder for low-income people to purchase adequate food. Olagunju et al. (2015) discovered that climate-induced food price inflation disproportionately impacts rural families, resulting in increased food insecurity.

Many Nigerian households rely on agriculture for their livelihood. According to Edeh and Gyimah-Brempong (2015), climate change has a negative influence not just on food production but also on agricultural employment, forcing more people into poverty. Climate change exacerbates hunger and health difficulties by limiting food availability and diversity. Olabisi et al. (2017) examined the relationship between climate change, food shortages, and the increased incidence of malnutrition and other health issues in vulnerable groups.

While some studies have looked at regional disparities, more in-depth, localized study is needed to understand how climate change affects food security differently in Nigeria's many ecological zones. As a result, the purpose of this study is to look at the relationship between climate change and food security in Nigeria: challenges and opportunities.

4.0 Methodology

The study adopts a qualitative approach, drawing on recorded materials such as books, journal articles, reports, online resources, and data from institutions and organizations. This approach was chosen because of the topic's wide scope, which makes it difficult to address thoroughly using methods such as interviews and questionnaires. The obtained data was thematically analyzed, which involved identifying significant themes and analyzing pertinent concerns within them.

5.0 Perspectives on Climate Change and Food Security: Nigeria Experience

Nigeria, like other states, is not immune to the crippling consequences of climate change, notably in terms of food security concerns. Evidence of climate change impacts on Nigeria includes higher temperatures, seasonal rainfall fluctuations, rising sea levels and floods, drought, desertification, land degradation, and biodiversity loss, all of which result in reduced farming productivity (Haider, 2019). These changes have led to decreased crop yields, increased food insecurity, and heightened vulnerability for millions of Nigerians who rely on agriculture for their livelihoods. Without effective adaptation strategies and sustainable practices, the situation is likely to worsen in the coming years, posing a significant threat to the country's overall development and stability.

Climate change is being noticed in Nigeria, with increased rainfall, rising sea levels, and floods in the south and drought and rising temperatures in the north. This is caused by the drying of Lake Chad, which is presently on the verge of extinction (Haider, 2019). According to Madu (2016), the North is more vulnerable to climate change than the South. The Northeast and Northwest are more vulnerable to climate change consequences than other areas of the country (Abdulkadir et al., 2017). Additionally, deforestation and desertification in the North exacerbate the effects of climate change in these regions.

From 1960 to 2006, temperatures in Nigeria increased by 0.8°C, affecting the north more than the south, while precipitation decreased by 3.5 mm per month in each decade (World Bank Group, 2021). These changes have had significant impacts on agriculture, water availability, and overall livelihoods in the region. The trend of increasing temperatures and decreasing precipitation is expected to continue in the coming years, exacerbating existing challenges related to climate change.

Nigeria has no consistent climate conditions or projections, especially between the tropical rainforest south and the Savanna north. Nigeria has nine distinct ecological zones, including dry zones, lowlands, plateaus, the tropical south, and intermediate central Nigerian climates. Average temperatures in southern Nigeria vary from 17 to 37°C, whereas those in the north range from 12°C to 45°C. The annual average rainfall in the South is 3,000 mm, but it is 500 mm in the North. The rainy season typically lasts from February to November in the South and from April to October in the North (United States Agency for International Development, 2019). Nigeria, with a population of 214, has 2.72% GHG emissions and 7.20% wooded area (USAID, 2022). Nigeria's diverse climate and geography contribute to its rich biodiversity and agricultural productivity. The country's population growth and economic development pose challenges for sustainable land use and natural resource management.

Climate change has a sectoral influence on Nigeria. In agriculture, 70% of the country's population is made up of subsistence farmers who rely primarily on farming for survival. Rain provides the primary source of sustenance for agricultural output in Nigeria. Unpredictable rainfall patterns have an impact on farm produce and agricultural outputs throughout the country (Onwutuebe, 2019). High temperatures, little rainfall, drought, flooding, desertification, increasing sea levels, and erosion all destroy cropland and impair agricultural output (Fasona et al., 2020). Additionally, climate change can lead to food insecurity and economic instability in Nigeria, as the agricultural sector plays a significant role in the country's economy. It is crucial for the government and stakeholders to implement sustainable practices and adaptation strategies to mitigate the impacts of climate change on agriculture.

In the aquatic industry, climate change is influencing freshwater resources. Rising sea levels and increasing salinity are impacting fishing in Nigeria (Ebele & Emodi, 2016). Food production is hampered by erratic rainfall and drought, posing food security issues (Haider, 2019). Erosion threatens to wipe away a large area of forest, while severe weather, such as heat waves, poses health hazards to Nigerians (Abdulkadir et al., 2017). Climate change has a detrimental impact on the Nigerian economy since agriculture contributes significantly to GDP, and diminishing productivity means lower revenue and economic activity (Haider, 2019). Also, the changing climate patterns are leading to the spread of diseases such as malaria and cholera, further straining the healthcare system in Nigeria. Furthermore, the displacement of communities due to extreme weather events like floods and storms is exacerbating social issues and creating internal conflicts within the country.

Climate change is also expected to have an impact on Nigeria's energy security and supply. High temperatures can disrupt the limited power supply, while the usage of firewood causes fast encroachment into Nigerian woods, leading to desertification (Ebele & Emodi, 2016). For example, the national grid collapsed more than twice between January and April of 2024. Climate change has influenced security threats because the changing climate is producing resource conflict, such as farmer-herder disputes and ethno-religious crises, in an attempt to compete for finite resources (Sule et al., 2022). These conflicts have the potential to escalate into violence and further destabilize the region, posing challenges to national security and social cohesion. It is crucial for Nigeria to address these issues through sustainable energy practices and resource management to mitigate the impacts of climate change on security.

5.1 Challenges of Climate Change on Food Security

Climate change has resulted in protracted global warming, precipitation and drought, water scarcity in many areas due to lake and sea depletion, extreme storms and tsunamis, and security concerns for humanity. Climate change is generating a massive gap in the global food supply (Sarkar et al., 2019). It is becoming increasingly challenging to feed the world's current population of roughly 8 billion. Meeting food security is already a significant concern worldwide due to the consequences of climate change. While the environment pressures for improved agricultural output, a loss has been seen as a result of global warming activities. The Food and Agriculture Organization (FAO) predicted that in order to fulfill global food demand in 2050, yearly crop and livestock output would need to increase by 60% over 2006. In developing nations, notably in Africa, around 80% of the above-mentioned improvement should come from increasing yield, which is now exceedingly tough and appears impossible to overcome (Oliveira et al., 2019). This challenge is further exacerbated by the impacts of climate change, such as extreme weather events and shifting growing seasons, which can significantly affect agricultural productivity.

Because the area also faces other human security risks, poorer nations will bear the brunt of the consequences of climate change. Climate change may soon be linked directly to security concerns and conflicts in the global south (Morano, 2018). Climate change will have an impact on future food production. According to FAO (Oliveira et al., 2019), cereal output will decrease by 2.2% by 2080. Climate change poses a severe danger to agriculture worldwide, and the impact is most visible in developing nations such as Sub-Saharan Africa, where approximately 70% of the population relies on peasant farming (Anyorigya, 2022). This will not only lead to food insecurity but also exacerbate poverty and inequality in these regions. It is crucial for global leaders to take immediate action to mitigate the effects of climate change on agriculture and ensure food security for vulnerable populations.

Temperature, rainfall, drought, and flood patterns are reducing agricultural output in nations such as Nigeria, posing food security concerns. Climate change is exacerbating the already terrible climatic conditions in Africa's arid and semi-arid regions, resulting in drought, starvation, economic hardship, mass migration, war, and death (De Blasi, 2019). These impacts are not only affecting the livelihoods of farmers but also leading to increased food prices and potential conflicts over scarce resources. Urgent action is needed to address the root causes of climate change and support vulnerable communities in adapting to these challenges.

5.2 Opportunities of Climate Change on Food Security

Climate change poses both difficulties and possibilities for food security in Nigeria, a country primarily reliant on agriculture. One noteworthy opportunity is the potential for greater agricultural production as the growing season lengthens in some locations. Higher

temperatures and changing precipitation patterns, for example, might lengthen the agricultural calendar, allowing for several cropping cycles per year in some locations and thus increasing overall food output (Adejuwon, 2004). However, the difficulties lie in the increased frequency of extreme weather events such as droughts and floods, which can devastate crops and reduce yields.

Furthermore, introducing climate-resilient crops and new agricultural methods, such as drought-resistant cultivars and precision farming techniques, can boost production and sustainability (Lipper et al., 2014). Investments in climate-smart agriculture, backed by policy changes and foreign funding, can assist smallholder farmers in adapting to changing circumstances, increasing food supply, and lowering vulnerability (FAO, 2013). By promoting the diversification of crops and integrating agroforestry practices, farmers can enhance their resilience to climate change impacts. These strategies also improve soil health, water management, and overall ecosystem sustainability in agricultural landscapes.

In addition, using climate change to diversify agricultural outputs, such as cultivating high-value crops adapted to changing climate conditions, provides economic benefits and better nutritional results (Sowunmi & Akintola, 2010). By seizing these possibilities, Nigeria may improve its food security and resistance to the negative consequences of climate change.

6.0 Discussion of Findings

The analysis of climate change and food security in Nigeria reveals a complex and multifaceted relationship. The adverse effects of climate change on Nigeria are evident, with higher temperatures, fluctuating rainfall, rising sea levels, floods, droughts, desertification, land degradation, and biodiversity loss all contributing to reduced agricultural productivity. These changes have led to decreased crop yields, increased food insecurity, and heightened vulnerability for millions of Nigerians dependent on agriculture.

Also, it was revealed that regional disparities in Nigeria's climate vulnerability are significant, with the north being more susceptible to climate change effects than the south. The drying of Lake Chad exemplifies the severe environmental stress in the north, exacerbating drought and rising temperatures. The northeast and northwest regions, in particular, are experiencing intensified desertification and deforestation, which further degrade the land and impair agricultural productivity.

The study found out that Nigeria's diverse ecological zones present unique climate conditions and agricultural challenges. The south, characterized by tropical rainforests, receives significantly more rainfall than the arid north, where savannas dominate. This geographic diversity influences agricultural practices and productivity. Southern Nigeria enjoys a longer rainy season, from February to November, compared to the north, where it lasts from April to October. The variation in climate conditions necessitates tailored adaptation strategies to address region-specific vulnerabilities.

It was evident that adopting drought-resistant cultivars and precision farming techniques, farmers can enhance productivity and sustainability. Investments in climate-smart agriculture, supported by policy reforms and international funding, can help smallholder farmers adapt to changing climatic conditions, thus boosting food supply and reducing vulnerability.

And diversifying agricultural outputs by cultivating high-value crops suited to new climate realities offers economic and nutritional benefits. Such diversification can enhance resilience and contribute to food security. Overall, while climate change poses significant

challenges to Nigeria's food security, strategic adaptation and sustainable agricultural practices offer pathways to resilience and improved livelihoods for millions of Nigerians.

7.0 Conclusion and Recommendations

In Conclusion, the intricate connection between climate change and food security in Nigeria poses substantial concerns that demand immediate attention and action. Nigeria, like many other nations, is suffering the negative consequences of climate change, such as rising temperatures, irregular rainfall patterns, droughts, floods, and desertification. These environmental changes have a direct influence on agricultural production, freshwater supplies, energy security, and general economic stability.

To address the issues caused by climate change and improve food security in Nigeria, the following recommendations were made:

i. To boost climate resilience and production, the government should support the use of sustainable agriculture methods such as agroforestry, crop diversity, and soil conservation techniques.
ii. Conduct awareness campaigns and educational initiatives to help farmers, policymakers, and the general public understand the effects of climate change and support sustainable practices.
iii. The government should also invest in climate-resilient infrastructure, such as irrigation systems and water harvesting techniques, to reduce the impact of droughts and floods on agriculture.
iv. Support climate-smart agricultural research and innovation, such as the creation of drought-tolerant crops and robust animal varieties to adapt to Nigeria's changing environment.
v. Increase the ability of government agencies, agricultural extension services, and local communities to effectively monitor and respond to climate change consequences.
vi. Collaborate with regional and international partners to secure climate finance, technology transfer, and knowledge sharing to help with climate change adaptation and mitigation efforts.

References

Abdulkadir, A., Lawal, A. M., & Muhammad, T. I. (2017). Climate change and its implications on human existence in Nigeria: A review. *Bayero Journal of Pure and Applied Sciences*, 10(2), 152–158. https://doi.org/10.4314/bajopas.v10i2.26

Adejuwon, J. O. (2004). Impact of climate variability and change on crop yield in Nigeria. *Climatic Change*, 68(1-2), 101-120.

Akinboade, O. A., Ziramba, E., & Kumo, W. L. (2013). The impact of climate change on food security in South Africa: Evidence from panel data analysis. *African Development Review*, 25(4), 391-402.

Anyorigya, D. A. (2022, March 1). Climate change: Eight facts on Africa from IPCC report. *CNR Citi Newsroom*. Retrieved from https://citinewsroom.com/2022/03/climate-change-eight-facts-on-africa-from-ipcc-report/

Behnassi, M. (2019). The water-energy-food nexus and climate perspective: Relevance and implications for policy-making and governance. In M. Behnassi (Ed.), *Climate change, food security and natural resource management: Regional case studies from three continents* (pp. 1–18). Springer Nature.

De Blasi, S. (2019). Environmental migration and conflict in West Africa. *Security Distiller*. Retrieved from https://thesecuritydistillery.org/all-articles/environmental-migration-and-conflict-in-west-africa

Ebele, N. E., & Emodi, N. V. (2016). Climate change and its impact on the Nigerian economy. *Journal of Scientific Research & Reports*, 10(6), 1–13. https://doi.org/10.9734/JSRR/2016/25162

Edeh, H. O., & Gyimah-Brempong, K. (2015). Climate change and agricultural productivity in Nigeria: Implication for food security. *Journal of Environment and Earth Science*, 5(3), 32-39.

FAO (2013). *Climate-smart agriculture*: Sourcebook. Food and Agriculture Organization of the United Nations.

Fasona, M. F., Adeonipekun, P. A., Agboola, O., Akintuyi, A., Bello, A., Ogundipe, O., & Omojola, A. (2020). Drivers of deforestation and land-use change in Southwest Nigeria. In W. L. Filho (Ed.), *Handbook of climate change resilience* (pp. 475–498). Springer Nature.

Haider, H. (2019). *Climate change in Nigeria: Impacts and responses*. Institute of Development Studies.

Intergovernmental Panel on Climate Change, (2014). *Climate change 2014: Synthesis report. Contribution of Working Groups I, II, and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*.

IPCC (2022). *Climate Change 2022: Impacts, Adaptation, and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.

Lieberman, B., & Gordon, E. (2018). *Climate change in human history, pre-history to the present*. Bloomsbury Academic.

Lipper, L., Thornton, P., Campbell, B. M., Baedeker, T., Braimoh, A., Bwalya, M., ... & Torquebiau, E. F. (2014). *Climate-smart agriculture for food security*. Nature Climate Change, 4(12), 1068-1072.

Madu, I. A. (2016, May 23–24). Rurality and climate change vulnerability in Nigeria: Assessment toward evidence-based rural development policy. Paper presented at the 2016 Berlin Conference on Global Environmental Change, Freie Universität Berlin.

Morano, M. (2018). *The politically incorrect guide to climate change*. Regnery Publishing.

Nwafor, J. C. (2007). Global climate change: The driver of multiple causes of flood intensity in Sub-Saharan Africa. *Environment and Natural Resources Research*, 2(3), 42-51.

Olabisi, L. S., Dendi, A., & Folayan, J. A. (2017). Climate change, food security and nutrition in Nigeria. *Climate Policy*, 17(4), 457-471.

Olagunju, K. O., Fakayode, S. B., Babatunde, R. O., & Adeniyi, S. T. (2015). Climate change and food security in Nigeria: An empirical analysis. *Environment, Development and Sustainability*, 17(5), 1223-1240.

Oliveira, B., De Moura, A. P., & Cunha, L. M. (2019). Increasing pulse consumption to improve human health and food security and to mitigate climate change. In P. Castro, A. M. Azul, W. L. Filho, & U. M. Azeiteiro (Eds.), *Climate change-resilient agriculture and agroforestry ecosystem services and sustainability* (pp. 21–36). Springer.

Onwutuebe, C. J. (2019). Patriarchy and women vulnerability to adverse climate change in Nigeria. *SAGE Open*. https://doi.org/10.1177/2158244019825914

Panshak L. (2023). Climate change and the sustainability of food security in Nigeria. *ResearchGate*.

Parenti, C. (2018). Environment-making in the Capitalocene: Political ecology of the state. In J. W. Moore (Ed.), *Anthropocene or Capitalocene? Nature, history and the crisis of capitalism* (pp. 166–184). Kairos PM Press.

Sarkar, A., VanLoon, G. W., & Watson, D. (2019). Introduction. In A. Sarkar, S. R. Sensarma, & G. vanLoon (Eds.), *Sustainable solutions for food security: Combating climate change by adaptation* (pp. 1–26). Springer.

Shrivastav, A. (2019). *The science and impact of climate change*. Springer Nature.

Skullerud, R. (2018). Climate change impacts on hunger. *World Food Program*.

Sowunmi, F. A., & Akintola, J. O. (2010). Effect of climatic variability on maize production in Nigeria. *Research Journal of Environmental and Earth Sciences*, 2(1), 19-30.

Sule, B., Ibrahim, B. S., & Adamu, M. Y. (2022). The politics of regional security threats. *SINERGI: Journal of Strategic Studies and International Affairs*, 2, 45–71. https://doi.org/10.17576/sinergi.0201.2022.04

The United Nations. (2019). Deadlier conflicts, climate change threaten cross-border herding in West Africa, delegates tell Economic and Social Council, Peacebuilding Commission. Washington: The United Nations.

United States Global Change Program. (2013, March 2). *Global climate change impacts in the United States*. Retrieved from https://downloads.globalchange.gov/usimpacts/pdfs/global.pdf

USAID. (2019). *Climate risk profile: Nigeria*. Washington: USA.

USAID. (2022). *Nigeria: Climate projections and impacts*. Washington: USA.

von Bertalanffy, L. (1968). *General System Theory: Foundations, Development, Applications*. New York: George Braziller.

World Bank Group. (2021). *Nigeria: Current climate, climatology*. World Bank Group.