World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(REVIEW ARTICLE)

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Pastoralists and farmers conflict in Benue state: Changes in climate in northern Nigeria as a contributing factor

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World Journal of Advanced Research and Reviews, 2023, 17(03), 325–344

Publication history: Received on 24 January 2023; revised on 06 March 2023; accepted on 09 March 2023

Article DOI: https://doi.org/10.30574/wjarr.2023.17.3.0402

Abstract

Studies show that the skirmish betwixt Fulani pastoralists and farmers is primarily a dispute over water and land use. A need for increased agricultural production and expanded grazing pastures has increased the demand for land. This conflict stands out because of the boldness of the combatants and various proposed explanations for the cause of this conflict. While farmers complain of farm encroachment, herders complain of farmers encroaching on grazing reserves and blockage of grazing routes. The rainfall pattern in Nigeria is not helping the situation, which has been on a downward trend as of 2016 due to the adverse effects of climate change, mainly drought and desertification ravaging the northern part of Nigeria. These warrants investigating individuals, especially agro-pastoralists Fulani, who move from the north to Nogoa and other parts of Nigeria, resulting in resource contestation and causing conflicts with host communities threatening the relative peace in many parts of the country. This journal integrates experts interviews and systematic evidence assessment of a reflexive form of evidence focused literature review by examining multidimensional migration motivations, combing through research papers selected from a comprehensive climate database on the influence of adverse effects of climate change on people's sustenance, leading to migration to the middle belt and southern Nigeria. Key findings showed that climate change adverse effects in northern Nigeria influence migration to other parts of the country indirectly, i.e., by upsetting other drivers of migration, such as economic, socio-demographic, and political aspects. The information in this study is crucial to support decision-makers in strategic policies and implementations on curbing climate change and volatile internal migration leading to resource contestation and conflict before these destabilise the state.

Keywords: Conflict, Climate Change, Desertification, Drought, Farmers, Pastoralists, Northern Nigeria.

1 Introduction

This study focuses on climate change adverse effects of drought and desertification in northern Nigeria as the trigger of violent conflict between internal migrants, especially the Fulani herders and host community farmers in Nigeria. It brings to cognisance conflict-sensitive adaptation to the effects of climate change that needs the government's involvement. Broad emphasis was laid on the conflict-prone Nigeria concerning adverse climate change effects, mainly drought and desertification, and why it exacerbates conflict.

Nigeria has a total area of 923,768 km^2; 910,768 km^2 is land, while 13,000 km^2 is water, with an agricultural land area of 694,501 km^2, of which northern Nigeria the main crux of this paper covers 660,000 km^2. (See Figure 1). (Amusan et al., 2017; The World Bank, 2023). The Hausa and Fulani are the predominant ethnic groups. The Hausa–Fulani identity came into being as a direct result of the migration of Fulani people to Hausa land around the 14th century and their cultural assimilation into the Hausa society (Amusan et al., 2017).

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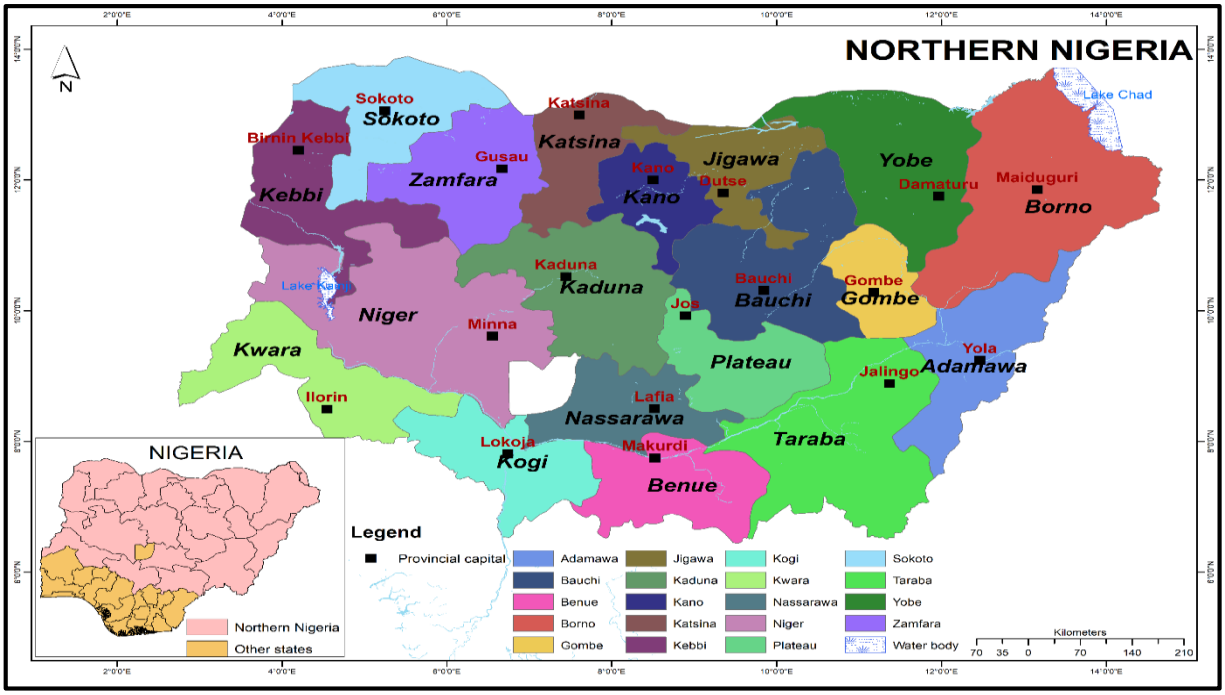

Figure 1 Map of the nineteen northern states of Nigeria.
Source: (Author, 2022).

Extreme climate event continually impacts water access and quality within northern Nigeria, with lakes and rivers drying up, significantly affecting the water supply for pasture and crop production (Joshua, 2021). Climate change has resulted in an uncontrolled migration of herders from northern Nigeria to the southern parts. Climate change has aided Fulani pastoralist migration, escalating conflicts between Fulani pastoralists and farmers (Oli et al., 2018). Conflicts have had a significant impact on places like Jos and Benue (Randall, 2015). Due to insufficient rainfall, which has depleted pastures in the sending areas, the Fulani people have been forced to migrate to host communities. Randall (2015) states that whenever Fulani pastoralists face harsh climatic conditions that cause pasture depletion, they migrate to grazing areas in the middle belt and southern regions. (Ubelejit, 2016). The rainfall patterns are favourable for pastoralists, with Benue State receiving an average of 1141mm annually. Benue State recorded the lowest annual rainfall in 2003, with an average annual rainfall of 65.65mm (Ikezue and Ezeah, 2017).

It is common for Fulani herders to move from the north down to the south in search of greener pasture yearly (Maiangwa, 2017). Such migration is used as an adaptation for their survival and flocks. However, it threatens the receiving communities, resulting in contestation for resources, pressure on land, and socio-cultural and religious differences (Muhammed et al., 2015).

The connection betwixt climate change and migration has lately attracted public scrutiny. This has been echoed in growing news reports concerning climate-induced migration or displacement for the past ten years (Ayantunde et al., 2015). The escalating conflict between Fulani herders and non-Fulani farmers in Nigeria has threatened Nigeria's security, stability, and peace. Violent clashes have recorded a projected death toll of approximately 2,500 individuals as of 2016 (Ayantunde et al., 2015), threatening to become serious as the Boko Haram insurgency in the north-eastern parts of Nigeria. Nigeria's federal and state governments have responded poorly to this crisis. Since the early 1990s, Nigeria has experienced a steady increase in conflicts related to natural resources. Clashes between farmers and herders have become increasingly concerning, with one incident leaving 40 people dead following an attack by the Fulani herders in Enugu state in 2016 (BBC News, 2016). In the real sense, these conflicts have caused a severe humanitarian problem, with tens of thousands being displaced and thousands dead. Benue, one of the hardest-hit states, reported over 1,878 deaths in 12 local governments between 2013 and 2016 (Iji, 2021). Adding to the regional tension, approximately 62,000 people were displaced in the Benue, Kaduna, and Plateau states between 2015 and 2017(International Crisis Group, 2017). With the absence of internally displaced person camps, many out-of-place populations try to find shelter in rural communities that are already strained regarding resources.

The conflict between the farmers and herders in Nigeria has continued to be the most predominant resource-contestation conflict in the country, stemming from the unpropitious effects of climate change-droughts and

desertification ravaging the sending region (Sobczak-Szleck and Fekih, 2020). The results are often magnified when viewed from a gendered perspective. For instance, widows are often evicted from their farmlands by their relatives following the death of their husbands (Vinke et al., 2020). Women and girls are often socially and economically disenfranchised because of these conflicts, making them even more vulnerable to economic and social exploitation (Vinke et al., 2020).

The paper is structured as follows. Section 2 discusses the literature on climate change. It provides information on anthropogenic (human activities) elements as contributing agents to climate change, delves into the cattle herding system in Nigeria, the correlation of climate change adverse effects with migration, resource contestation and conflict and the Conceptual framework illustrating the pathway to climate change-related conflict. Section 3 explains the method and conceptual framework adopted for this study and the data collection method. Section 4 present the results from the interview. Section 5 discussed a multifaceted understanding of the phenomenon affecting this region in its real-life context. While section 6 concludes and recommends.

2 Literature Review

2.1 Anthropogenic (human activities) elements as contributing factors to climate change

Even though drought is avoidable if adequate measures are implemented, it can be argued that human activities contributed to climate change in northern Nigeria because of poor land use in the form of over-cultivation, overgrazing, deforestation and bush burning. Classifying drought as an environmental catastrophe also hinges on how individuals and governments have been managing the environment before its occurrence, and it puts into consideration population pressure on landed properties. Concerning northern Nigeria, the vast majority of individuals are pastoralists or sedentary subsistence farmers. Their agricultural actions, such as grazing, cultivation, bush burning, wood cutting and poor irrigation contribute in one way or another to drought. These traditional farming patterns have led to an increase in demand for land for agriculture, leading to the breakdown of traditional controls on land use and creating a volatile environment because of limited resource contestation. For example, according to (Orubebe, 2020), the livestock population in Kebbi and Sokoto states (approximately 103,500 km^2) of roughly 14 million, with a considerable animal population putting pressure on the pastures in the area because of overgrazing, which is one of the causes of the drought experienced in northern Nigeria.

As noted by Olokooba et al., (2020), overgrazing in northern Nigeria is much more destructive, leading to drought, in essence, causing areas that would typically have been preserved for grazing to be affected. In doing so, pastoralists focus on the limited grazing resources at their disposal. Grazing the limited grass beyond recovery without adequate measures to replenish the grass in preparation for the next pastoral season. According to Audu and Linus (2018) and Nunez (2019), livestock is allowed to eat all available scrap of eatable vegetation they can find, leaving no room for pastures to recover from droughts, leading to overgrazing as animals, especially goats, notorious for grazing the remaining grasslands and browse shrubs and trees ferociously and destructively. In this circumstance, pastoralists contributed by lopping off leaf-bearing branches and cutting down trees to feed their animals during drought, and the subsequent compulsion from overgrazing, over-browsing [to the detriment of the environment] and lopping of vegetation for dried hay or straw for cattle and other livestock lead to the obliteration of the capacity of plants to revive. During the catastrophic 1969-1973 Sahelian drought, it was the only food source for livestock in these areas and was the most intense (Satoh et al., 2021; Macaulay, 2014). Overcultivation of the climatically marginal parts, especially an increase in cultivation in areas with less rainfall, is another critical human factor regarding the desertification of northern Nigeria. Satoh et al., and Macaulay elaborated further, stating that approximately 60, 000 households have abandoned this area, destroying agricultural activities in the marginal areas of Lake Chad, turning it into the 'dust bowl' due to the current drought in this region, and there are no programmes in place to address the problems.

According to Shiru et al., (2018), deforestation resulting from the uncontrolled cutting of wood for firewood and charcoal, construction and other domestic and industrial uses is another major cause of drought and desertification in northern Nigeria. From 2000 to 2020 Nigeria experienced a net change of -1.47 million hectares (-6.1%) in tree cover (Eze, 2018), affecting up to 450,000 and 600,000 hectares per year, leading to planning by the government of reforestation, with the main purpose of planting trees on 32,000 hectares of land in this region. If achieved, it will go a long way in curbing drought and desertification problems in the north. (Abaje et al., 2013) estimated that the average annual firewood use rate per person in the Metropolitan Kano region was approximately 0.39 m^3. According to Satoh et al., (2021) and Macaulay (2014), 70% of this firewood is from chopping down trees in the forest in this region. The annual demand for firewood is estimated to be approximately 50 –55 million m^3 in the country, with 90% required for

poles and firewood, while the other 10% is meant for industrial requirements (Eze, 2018). The demand for firewood in Nigeria's semi-arid and arid zones was approximately 250% higher than the sustainable firewood yield of the country's remaining forests, and the demand has recently been compounded by Nigerians turning to firewood and charcoal as gas prices surge (Nwilo et al., 2020).

These speculative figures regarding the demand and supply of firewood offer a rough estimation of how devastating this problem is and how so many woody species that flourish in northern Nigeria have come under extreme population pressure. Massive deforestation is happening in the northern part of the country to feed the demand for fuelwood at a time when the ecosystem is already vulnerable to climate change. According to Mohammed (2015), farmers are also under financial pressure because of drought and are forced to make a living by selling wood sourced from trees on their farms. Because of these factors, persistent tree felling ultimately renders the land unable to regenerate greenery and trees. Except for specific regions, such as the Kano close-settled zone, where tree stocks are outlawed, all other areas are susceptible to being preyed on by vested interests for financial gains (Mohammed, 2015; Uba, 2022).

Widespread human-oriented bush burning is a practice that fans the flames of climate change in northern Nigeria. Burning of this sort is deliberately set off by local pastoralists who set fire to dry grassland, hoping to grow fresh grass to provide the pasture for their animals. Because of the rising population and the increase in intensity and frequency of the burning, this inappropriate ancient practice threatens the regeneration of the land and the environment. Uncontrolled tree-cutting and repeated burning cause the land to degrade gradually. Fires destroy natural habitats along with the soil's topmost layer. Bushes and trees prevent soil erosion and recycle different nutrients in the soil, with their foliage, by providing fresh humus. Excessive chopping of trees for cooking disturbs the soil cover, leading to a higher rate of dangerous sand deflation, and it also leaves the exposed soil susceptible to water and wind erosion (Nwite, 2014).

Land usage patterns in northern Nigeria's semi-arid and arid regions show a vicious, unforgivable cycle of repeated misuse (Dimick, 2014). Vegetation and land resources in this region have been overexploited over the years, causing tree cover and soil fertility to be depleted. When soil fertility decreases, more land is required to compensate for the reduced yields, which become overexploited again due to the increasing animal and human population (Maker, 2016). This worsens over time until it eventually results in desertification. It has disastrous effects on people and the environment in the long run (LeBlanc, 2021).

2.2 Climate change as an upshot of two key factors (drought and desertification)

Drought is the second-most expensive weather phenomenon after hurricanes and is defined as a period of below-normal precipitation in a particular area or region (Adamo et al., 2022). Further, Adamo et al. stated that a lack of sufficient precipitation, such as rain or snow, can cause decreased soil or groundwater moisture, reduced stream flow, crop damage, and general water scarcity.
Drought is one of the utmost vigorously researched meteorological events, and various fundamental happenings have been highlighted for its occurrence. According to Bukari et al., (2021), the causes of drought are split into four foremost groups of temporal scales of interest;

- First, the research identified droughts as local manifestations of irregularities in the large-scale atmospheric flow.
- Second, research has expounded on the dynamic connections between the leading drought time scope and worldwide sea-surface temperatures [SST] and other tropical phenomena, such as the El Niño/Southern Oscillation [ENSO].
- Third, droughts have been ascribed to land-surface feedback development and increased greenhouse gases [CO_2], primarily from human actions.
- Fourth, drought is clarified as naturally occurring nonlinear connections in the air (Piguet et al., 2011; McLeman, 2013; Nash, 2019; Ginty, 2021 for an in-depth discussion).

The relative degree to which drought affects global and regional parts, both natural and human-made, has yet to be unravelled. According to (Furini, 2019), drought can be attributed primarily to the shortage and failure of rain-bearing monsoon winds from the Atlantic Ocean into the region. Drought is affecting northern Nigeria, and the postulation is that land degradation because of human activities could alter northern Nigeria's surface boundary conditions to enhance atmospheric environments favourable to the manifestation of drought (Furini, 2019). According to (Napogbong et al., 2021), numerous records of drought incidences in Northern Nigeria that resulted in famines were reported, such as the droughts of 1903 and 1911–1914. Also, other droughts happened in 1919, 1924, 1935 (Tarhule

and Woo, 1997), 1951–1954, 1972–1973 (Cohn, 1975), 1984–1985, 2007 and 2011 (Olagunju, 2015). Climate change's adverse effects have lately exacerbated the state of affairs (Napogbong et al., 2021).

Desertification has been described as "the greatest environmental concern of our time," and climate change is making it worse, according to McSweeney (2019). Over two billion people's food security and way of life are at risk because of desertification, often associated with the Sahara's wind-tossed sand dunes or the Kalahari's immense salt pans in Africa (McSweeney, 2019). As posited by (Hosseinizadeh et al., 2017), the vegetation cover of the northern states of Nigeria has depleted significantly within 32 years, with 49.3% of vegetation cover lost between 1984 and 2016, and the uppermost loss in vegetation occurred in Borno State, trailed by Yobe and Sokoto. According to Hosseinizadeh et al., (2017), desertification has worsened the problem of food security, as its consequence is so much conspicuous in the agricultural sector, leading to farmland degradation that affects pastoralists and farmers due to insufficient water supply, as most sources have shrunk or dried up. Furthermore, attributing desertification to population growth is, in a genuine sense, correct; according to Maker (2016), sustaining the growing population is connected with serious environmental repercussions such as deforestation, soil degradation, pollution and a loss of biodiversity that increase desertification of the disturbed land. Understanding the connection between desertification and population explosion needs more research, as no well-developed concept yet offers a conceptual framework connecting population growth and desertification. Notwithstanding those issues of development concerning measures to address desertification are being neglected, based on the generalisations that population and poverty are the root causes of desertification; that is, humans cause the alteration of dry lands into the desert on an extraordinary scale around the globe, with grave consequences, according to (Liu et al., 2018), In this regard, adequate measures must be implemented to address northern Nigeria's desertification.

According to data gathered by (Wu et al., 2015), approximately 580,841 km^2 of the 927,892 km^2 entire land area of the Nigeria landscape is prone to severe desertification. Affected are mostly thirteen northern states. Desertification also worsens existing socio-political, economic, and cultural aspects of development operations in northern Nigeria. Considering its effect on the region's ecosystem and soil, as natural pastoral rangeland becomes scarcer, the cordial relationship that existed in the past between the Fulani pastoralists and host community farmers has now turned sour, resulting in frequent conflict, particularly in relation to what is term as an invasion of the crop farms of the host community farmers by the Fulani pastoralist's grazing their livestock on their farms. According to Um et al. (2017), environmental threat management strategies could be effective. However, the Nigerian government lacked wherewithal concerning the scope and degree of ecological damage.

The growing demand for land is putting an enormous strain on the natural resources in northern Nigeria, and this is because of the country's increasingly large population, which keeps growing at 2.58%, projected to be approximately 791,000,000 in 2100, according to Liu et al. (2018), even though currently there is no current data on the Nigerian populace. The planned census that will give an accurate picture of the population is fixed for some time in 2023. Buttress further by Liu et al., (2018), the damming of rivers, spiralling water use, the extension of cropland at the detriment of the forest, augmented use of irrigation and fertilisers, and more automobiles are all causal factors from human activities. So is the strident upsurge in using coal, oil, and gas and rapid proliferation in the atmosphere of methane and carbon dioxide, greenhouse gases, and the over-reliant on fossil fuels.

Succinctly, drought and desertification are identical worldwide environmental issues facing northern Nigeria, and rapid drought and desertification encroachment affect mainly thirteen out of the nineteen northern states (Yuan, Shen, and Wang, 2018). Of the 909,890 km^2 of the country's land area, approximately 580,841 km^2, accounting for 63.83% of the entire land, has been encroached on by desertification, compounded by drought lately due to lack of rain and areas affected are in the northern part of the country. Desertification is triggered by poor land use, unsustainable grazing practices, deforestation, and consumption pressures due to the population explosion (Rossi, 2017). Studies on the impact of drought undertaken by Wu et al. (2015) and Oladipo (1993) suggested that the impact of drought on agriculture, health, water resources, and land meant for planting crops is enormous in northern Nigeria. Thus far, no effective programme is in place to address drought incidences, and the problems it brings that affect people's lifestyles (Azong, 2020).

Drought and desertification directly or indirectly impact all facets of human life in northern Nigeria (Napogbong et al., 2021). Azong (2020) noted that agricultural production could not exist because of desertification. According to Rossi (2017), the estimation of agrarian production loss to desertification based on particular categories of land and areas across the biosphere was used to determine comprehensive global figures; these add up to 42 billion USD concerning yearly income lost to land degradation due to drought and desertification. Because of the raging inflation, this figure has been adjusted to 64 billion USD, of which approximately 35 billion USD was lost from rangeland productivity, 12

billion USD from rain-fed agriculture, and 17 billion USD from irrigated land (Azong, 2020). Drought and desertification are a consequence of multifaceted interrelationships between social and natural systems. In reality the causal factors are equally interdependent; they strengthen one another and simultaneously have a feedback outcome that hastens the entire development (Afolabi, 2016). These two foremost factors are the added failure of individuals of power and the government of the day to develop suitable mitigation measures.

2.3 The correlation of climate change adverse effects leading to migration, resource contestation exacerbating pastoralist and farmer's melee

Climate change has contributed to the migration of Fulani pastoralists, escalating conflicts between Fulani pastoralists and farmers (Maley and Vernet, 2015). The conflicts have significantly affected places such as Jos and Benue. The Fulani people have been forced to migrate to host communities because of inadequate rainfall, which has depleted pastures in the sending areas (Abugu and Onuba, 2015; Waziri, 2020). As Maley and Vernet (2015) postulate, whenever Fulani pastoralists experience harsh climatic conditions that result in the depletion of pastures, they migrate to areas conducive for grazing in the middle belt and southern regions. Adverse effects of climate change have been experienced in the last two decades. From 2010 to 2011, climate change in Northern Nigeria was reported to be responsible for the death of over two million cattle (Abugu and Onuba, 2015). The most affected regions were the north-eastern regions occupied by the Fulani pastoralists (Abugu and Onuba, 2015). Climatic changes have also led to the southward expansion of the desert, which significantly affects the Fulani pastoralists as they are forced to migrate in large numbers to new regions with pastures for their cattle (Abugu and Onuba, 2015; Waziri, 2020). The migration of the Fulani pastoralists has resulted in the escalation of conflicts with the host community farmers due to encroachment on their farmlands (De Haan et al., 2016).

2.4 Water resources contestation

The Fulani relies entirely on public water founts, such as rivers, dams, cattle ponds, creeks, hand-dug wells and springs, for themselves and their livestock (Alimba, 2014). Inadequate water stock is a significant constraint on livestock production and a driving factor for pastoralists' transhumance to the southern part of Nigeria (Alimba, 2014; Okello et al., 2014). What used to be seasonal has become a permanent sojourn in host communities because of the adverse effects of climate change, drought and desertification currently experienced in northern Nigeria (Okello et al., 2014). The results of less or no rain throughout the year in some northern states of Nigeria because of adverse effects of climate change caused a massive decline in agricultural production. Because the region heavily depends on agriculture, income was also affected. As agrarian production generates income, when these are affected, they turn out to be key determinants for out-migration from the affected areas to conducive areas suitable for agro-pastoralist activities.

The conflict between farmers and herders was first recorded during the West African Sahelian drought and famine from 1968 to 1974. Since this period, northern Nigeria has been predisposed to the impacts of climate change, such as drought and desertification in this region (Alimba, 2014). The "seasonal migration" is triggered because pasture and water for cattle become scarce during this period and can only be found in a few different places, mainly areas rich in farming, the middle belt and the southern part of Nigeria. It is almost impossible to rule out the possibility of a climate conflict since nearly two-thirds of Nigeria's north-eastern and north-central states are at risk of being affected by the adverse effects of climate change-drought and desertification. Whenever the Fulani pastoralist moved south in search of water and pasture for their cattle, they invaded host communities' farmlands and determined to protect their crops from being made a mess of by the herders and their herds; conflict ensued (Alimba, 2014; Okello et al., 2014). It is imperative to understand that climate change affects farmers as well. Climate change has forced farmers to enlarge their farming areas, encroaching on reserved areas for herders such as the Fulani to graze their animals. This is one reason the Fulani feel justified when their livestock encroached on farmers' farmland. As Muhammed et al., (2015) noted, with water and fertile land resources at stake, there has always been competition between migrating Fulani herders and host communities' farmers, leading to conflicts. Most of the clashes between the Fulani herders from the north and farmers in the middle belt and the south have always been interpreted as religious or ethnic clashes between the Christian farmers and the Muslim Fulani herders. Gaining control of vital natural resources has always been the leading cause of conflicts between these two groups in Nigeria because the Fulani herders are always resulting to force to have access to what they lack in the sending region (water and fertile land for pasture) (Muhammed et al., 2015). Other than the scarcity of resources and environmental degradation caused by climate change, there has been the rise of "conflict entrepreneurs" who seek to use socio-economic and political factors to escalate further the hate and tension among the Fulani herdsmen and local farmers for their selfish gain leading to the disturbance of relative peace enjoyed between communities for years (Okeke, 2014).

Migration from northern Nigeria to other parts of Nigeria that encourages people to leave their villages due to drought and desertification adds to the destabilising impacts of urbanisation, creating communal feuds, especially between the

Fulani pastoralists and host community farmers (Alimba, 2014; Okello et al., 2014). Also, it is vital to nail on the current happenings in northern Nigeria (e.g., Boko Haram insurgency, which is well pronounced in Borno State) as an offshoot of the socio-economic and political ramifications of the environmental degeneration of northern Nigeria. Places people vacated due to the adverse effects of climate change were suddenly occupied by this terrorist group, used as a base to launch their terrorist activities on people and the state. And the places people are migrating to have been overstretched, leading to increased competition for scarce social and economic resources in areas migrated to by the insurgency (Okeke, 2014). According to Genyi (2014), the problem is further aggravated by the porous borders of African countries like Chad and Niger with northern Nigeria state boundaries that allow migrants from these countries, putting an added burden on the meagre resources of northern Nigeria affected by climate change that are not yet enough to sustain livelihoods.

Climate change, resource contestation and the skirmish problems betwixt the Fulani herders and local farmers in Nigeria were allowed to fester on as a result of inadequate and ineffective responses of the government concerning the adverse effects of climate change in northern Nigeria, and this has further diminished the natural resources; such as water and fertile land for farming, leading to loss of livelihood, poor economic growth, and poor living conditions (Genyi, 2014). The lack of an appropriate government initiative to respond to the effects of climate change, particularly in the north, has also triggered serious political instability for the state as a result of the Fulani pastoral community and farmers' fracas that has led to the issue of recording deaths every day from these skirmishes. Climate change has affected the economic lives of Fulani pastoralists because they have lost some of their livelihood [cattle herding] due to drought—a period when an area or region receives less precipitation than normal. Inadequate precipitation, whether rain or snow, can cause decreased soil moisture or groundwater, reduced stream flow, crop damage, and a general water shortage. As a result, there will be famine and widespread food scarcity—a condition characterised by malnutrition, starvation, epidemics, and increased mortality (Onapajo, 2012). Climate change has forced Fulani herders to migrate due to severe drought and desertification, resulting in social fragmentation; the same is true for host community farmers who have been displaced from their farming lands as a result of these conflicts, affecting peaceful coexistence, property destruction, and lack of order (Abbass, 2012). Minor squabbles have existed for decades but have never been as pronounced as today. Because of the severe loss of livelihoods caused by the adverse effects of climate change in the north, the recent impacts of these conflicts appear to be more prominent than those in the past. These conflicts are rapidly spiralling out of control, posing a significant challenge to the state (Alimba, 2014). The relative peace of the past is no longer present, and the competition for resources caused by climate change's effects has harmed the previous harmony and cooperation (Okello et al., 2014). With the current volatile situation, adequate programmes to address the issues of herders and farmers are required. Previously, the two groups had a friendly relationship. Farmers exchanged grazing lands for the care of their animals with herders. According to (Abbass, 2012), climate change caused the two groups to attack each other due to competition for available resources, raising the question of how the Fulani herders and farmers conflict began. According to Ducrotoy et al., (2018), this conflict arose when the pursuit of one group's goals began to impact the other groups' goals. The two's harmonious relationship soured when planting crops made it difficult for Fulani herders to access pasture and water sources, and the crisis was prolonged because of a lack of efforts by the government to address the situation and listen to both sides' arguments. For instance, it is common to hear the Fulani herders being accused by the farmers of the many lives lost in their community and crops they destroyed; on the other hand, the Fulani herders accused the farmers of rustling their herds and, at the same time, not been allowed access to resources; water pasture areas to graze their livestock. However, the burning issue is not being addressed, which is the adverse effects of climate change ravaging the sending region, leading to the belief that the state arbitration structure always favours and is on the farmer's side when conflicts are reported. Also, it has been reported that farmers encroach on reserved grazing lands, leading to the disappearance of grazing lands and water sources. This implies that farmers also play a part in causing herder-farmer conflicts, which cannot be attributed to just one group. It is imperative to understand that the bane of these conflicts is climate change adverse effects left unchecked for years in the northern part of Nigeria by the government that must be holistically addressed urgently to curb these conflicts.

2.5 Cattle herding structure in northern Nigeria

In Nigeria, cattle herding is practically entirely dominated by the Fulani people. The Fulani are known in Nigeria for their nomadic pastoral lifestyle (Farauta et al., 2012). Initially, pastoral communities (the Fulani) were restricted to the edges of the desert until the beginning of the twentieth century, when they started migrating and settling in other regions (Haider, 2019). Studies have shown that herding is not a choice but a necessity for the Fulani community, a daunting task that requires access to pasture and water resources. Without pasture and adequate water resources, it is extremely challenging, and it is the bane of the current volatile situation between the Fulani and people in the middle belt and southern part of Nigeria due to contestation for these resources (Haider, 2019). For instance, approximately

75% of nomadic pastoralists believe that herding is increasingly becoming strenuous because of a lack of access to pasture. A typical Fulani cattle herd is approximately 80 to 100 cattle (Farauta et al., 2012). They maintain a well-balanced species of cattle: milkers, beefers, carriers, breeders, and stock beautifiers. The lyre-horned and slow-maturing Sokoto Red cow is among the most common cows reared by Fulani pastoralists (Shehu, 2018). Compared to Sokoto Red, the white Fulani cow has a higher milk and beef yield compared to other breeds (Gursoy, 2020). However, the Sokoto red breed is more resistant to harsh environmental conditions than others, making it the most reared. All the cattle belonging to individual family members are herded together (Dimelu et al., 2016). In the Fulani, community herding is dominated by youths, although most Fulani men herd cattle past middle age. Most decisions concerning grazing are made entirely by older adults' community members (Farauta et al., 2012). The months of October to December mark the beginning of the herding season, since it is the end of the rainy season and the beginning of the dry season (Haider, 2019). During this time, the Fulani herders move their flocks' southwards of the country (Ologeh et al., 2021). Between January and February (harmattan season), the Fulani move their herds to regions with stable water sources: the country's middle belt and southern part (Gursoy, 2020). The most challenging months for the herders and their cattle are March and April, since it is the hottest time in the grazing calendar, prompting them to herd their cattle in the evenings and nights (Haider, 2019). May and June mark the beginning of the northward movement of cattle herds, which marks the end of the dry season, and vegetation appears (Ologeh et al., 2021). This period lasts up to September, which marks the rainy season's peak and is often characterised by more milk production, cattle breeding, and short grazing hours (Dunn, 2018). This is the best period for herding. Unfortunately, this period coincides significantly with arable crop production, making this period a volatile period in which the farmer-herder conflict is much more pronounced (Gursoy, 2020).

According to Malthus's philosophy, drought and desertification are unavoidable consequences of human arrogation and the alteration of nature to exist (Haider, 2019; Gursoy, 2020; Farauta et al., 2012). The unbridled speedy increase in the human population and the need to feed the population might eventually exceed the carrying dimensions of our present resources. Even at this, efforts should be geared towards curbing the rapid drought and desertification issues currently being experienced. New scientific innovation and the government's willingness to implement effective programmes will play a significant part in bringing this to fruition (Dunn, 2018).

2.6 Conceptual framework of climate change-related migration conflict

The convoluted path to climate conflict can be illustrated using the conceptual framework adopted for this paper. (See Figure 2).

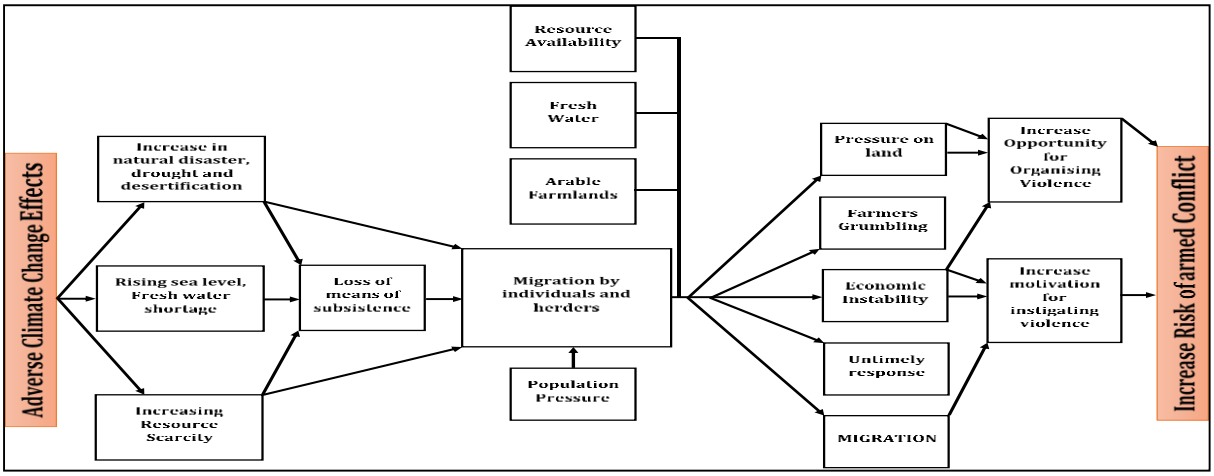

Figure 2 Conceptual framework illustrating the pathway to climate conflict.
Source: (Adapted from Furini, 2019).

Based on this framework, climate change contributes to the loss of livings for individuals, farmers and herders through increased drought and desertification. Climate change has led to the loss of valuable resources for farmers (land and water sources) and herders (loss of pasture and water sources). The availability of these resources influences the migration decision of individuals, including herders, which often translates to pressure and competition for finite resources and conflicts (Dunn, 2018). This conceptual framework put forward a novel perception of how resource scarcity can trigger clashes, contrary to the standard explanation that conflicts betwixt farmers and herders are ethno-religious. The postulation by Dunn (2018) suggests that the most crucial problem posed by future climate change for

humans is agricultural yield, mainly in the world's tropical and semitropical regions. Additionally, (Kangdim et al., 2022) noted that food production in these regions would be challenging due to the temperature rise caused by climate change. This will lead to a decline in food production and significant increases in food prices, with noteworthy sociopolitical consequences currently being experienced in northern Nigeria.

3 Research Methods

Rudiments of methodical evidence evaluation, purposive sampled semi-structured interviews, and focus group discussions were used to analyse climate change adverse effects and understand individuals' migration aspirations and activities in Nogoa, Makurdi Benue State, Nigeria. Stress, shocks, resource contestation, conflicts and security issues were highlighted and examined.

3.2. Study site

Nogoa, Makurdi, Benue State, Nigeria (the receiving region) was chosen as the study site (see Figure 3). Nogoa was selected for inclusion in the study because it is home to a sizeable population of internal migrants from northern Nigeria. Its position as migrants' destination was established in 2016 by the Ministry of Environment and Local Government Officials assigned to the administration of Nogoa and the welfare of internal migrants. Their presence in Nogoa resulted in major clashes with the host community people. As a result, many lives were lost. Deteriorating environmental conditions, desertification, and soil degradation have led Fulani pastoralists from Northern Nigeria to change their transhumance routes. Access to pastureland and watering points in the Middle Belt became essential for pastoralists migrating from the northern part of the country.

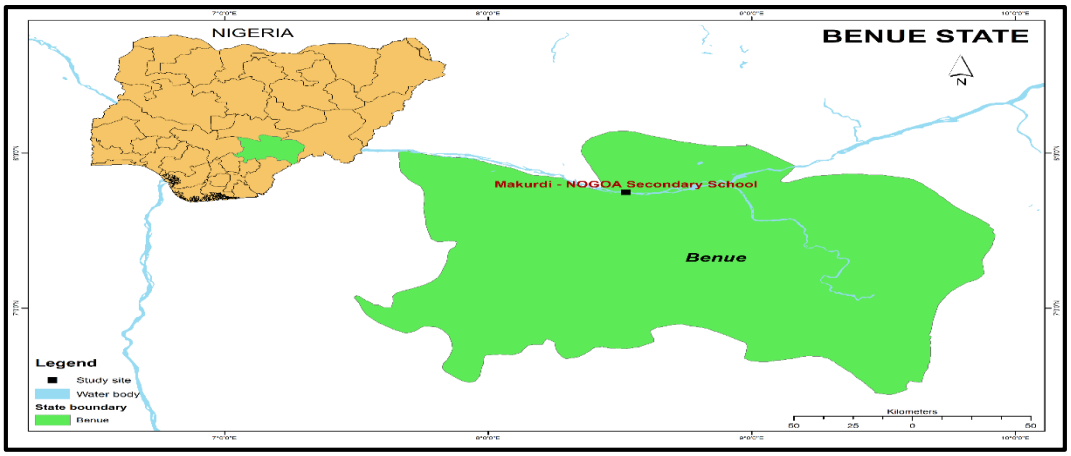

Figure 3 Study site; Nogoa-Makurdi, Benue state. Source: (Author, 2021).

According to Animashaun et al., (2020) research conducted from 1991 to 2016, the rainfall pattern in Nigeria has been erratic, with seasonal variability due to climate change. It shows a rapid downward trend in 2016, particularly in northern Nigeria (Figure 4).

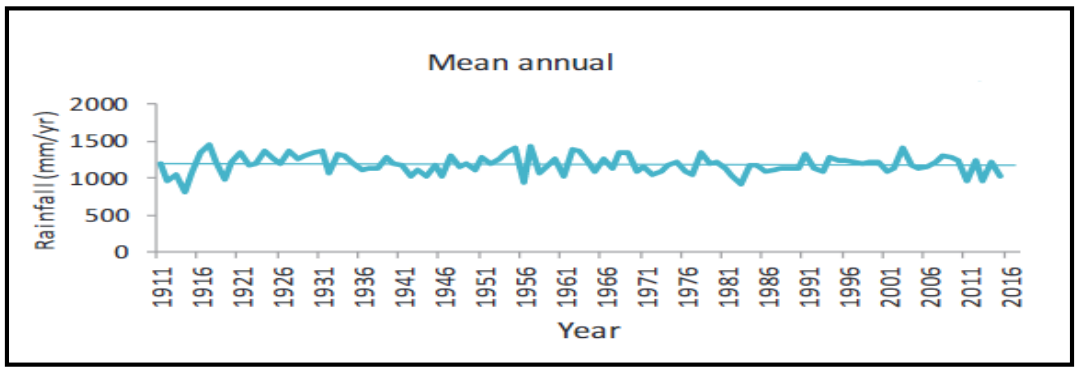

Figure 4 Annual rainfall variability for Nigeria - 1911 to 2016. Source: (Animashaun et al., 2020).

While the northern areas are the most affected and experiencing a decline in rainfall, some coastal regions of Nigeria in the south are experiencing an increase in rainfall events (IPCC 1996; NEST, 2003; Odjugo, 2006; Akpodiogaga and Odjugo, 2017; Ogungbenro and Morakinyo, 2014). This research presents clear evidence of the adverse climatic situation that northern Nigeria is facing. Obioha (2008) stated that the north-eastern parts of Nigeria are significantly changing to an arid environment.

According to Madu (2016), northern Nigeria has more significant spatial variation in vulnerability to climate change than the southern region. Thirteen out of thirty-six Nigerian states that experience high vulnerability are all in the country's northern area and are identified in (Table 1 and Figure 5 below).

Table 1 Vulnerability to climate change by the states in Nigeria.

State	**Geo-political zone**	**Vulnerability index** NB: The lower value indicates more vulnerability
Sokoto	North west	2.11
Kebbi	North west	2.27
Bauchi	North east	2.87
Kaduna	North west	3.06
Gombe	North east	3.08
Kano	North west	3.08
Jigawa	North west	3.12
Yobe	North east	3.14
Katsina	North west	3.20
Borno	North east	3.25
Zamfara	North west	3.54
Plateau	North central	3.87
Niger	North central	4.03
Taraba	North east	4.70
Adamawa	North east	5.22
Ebonyi	South east	5.33
Nassarawa	North central	5.50
Cross river	South-south	5.54
Kwara	North central	6.76
Akwa Ibom	South south	7.16
Kogi	North central	7.34
Ekiti	South west	7.70
Bayelsa	south-south	7.79
Delta	South- south	8.21
Edo	South south	8.65
Benue	North central	8.86
Osun	South west	9.17
Ogun	South west	9.68
Ondo	South west	9.71
Abia	South east	9.79
Oyo	South west	10.29
Imo	South east	11.26
Anambra	South east	11.33
Rivers	South south	11.64
Enugu	South east	12.68
FCT	North central	16.51

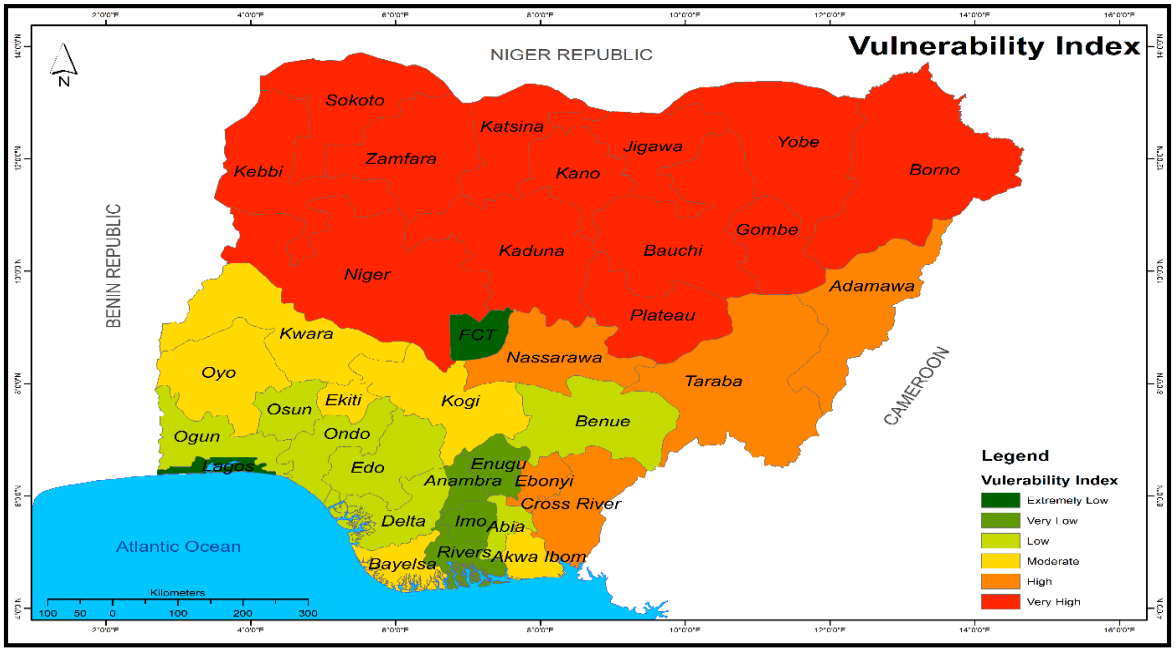

Figure 5 Map of Nigeria identifying patterns of climate change vulnerability in each state. Source: (Adapted from Madu, 2010; 2016).

The findings of Madu also show that the northern region of the country is experiencing a heightened climatic change compared to the southwestern zone, which is the least vulnerable. According to geo-political zones in Nigeria, the vulnerability pattern shows that the northwest zone, with an average index of 2.91, is the most susceptible, followed by the northeast (3.71) and north-central (7.55) zones. The southwest geo-political zone has an index of 11.89, followed by the south-east (10.08) and south-south (8.17). It is the same pattern in rural areas, with rural areas in the north having higher degrees than the southern region (Madu, 2016). In reality, climate change challenges do not stop at national borders; the main reason it requires joint action and cross-border cooperation to solve the problem.

3.3. Data Collection

Data were collected from experts from the Ministry of Environment and Local Government Officials in Nogoa Makurdi, Benue State, Nigeria, through interviews and focus group discussions that were purposive (non-probability sampling method), and were analysed using ***NVivo 12***. In this study, the use of NVivo 12 aided the qualitative analysis by creating coding frames to represent the main subjects and patterns found in the feedback transcripts. Repeated or dominant feedback is cross-examined by comparison to identify the odd feedback. NVivo assists in the organisation, analysis, and visualisation of mixed media and unstructured information by providing tools for classifying, sorting, and arranging your data in ways that allow themes and patterns to be identified. It aids in determining what is involved in the phenomenon—climate change-induced migration for adaptation or process—as well as their relationships and potential causal pathways through analysis by building a cogent visual narrative. NVivo is an excellent tool for conducting literature reviews because it allows the researcher to organise and manage sources in a single location.

Nogoa is a migratory destination for people, including Fulani aggro-pastoralists and farmers from various parts of northern Nigeria, because of the availability and abundance of two vital natural resources to sustain lives: fertile land and water. Table 2 below comprehensively summarises the number of interviews and focus groups conducted.

Table 2 Respondent characteristics for the in-depth interviews and discussions.

Location	In-depth semi-structured interview with…	Participants
Nogoa	Local Government Officials	4
Nogoa	Ministry of Environment Officials	4
Nogoa	Ministry of Environment Officials (Focus Group Discussion)	6
Nogoa	Local Government Officials (Focus Group Discussion)	7

Notably, the interview questions contained hypothetical questions on planned responses to stress, shocks, resource contestation and conflicts due to the adverse effects of climate change. These severe droughts and desertification led to

a food crisis and destroyed lifestyles in the sending region (Altieri and Nicholls, 2017). Respondents were asked how migrants made decisions concerning their well-being when they were being attended to by experts assigned to manage their welfare in Nogoa. Additionally, these experts were presented with questions concerning the contestation of resources with migrating individuals, including pastoralists-farmers in the host community. Specifically, respondents were asked:

1. What are peoples' experiences regarding severe droughts, desertification, and food shortages in the sending region?
2. What do individuals and agro-pastoralists who move to the host community do where they are now to sustain life unavailable at their place of origin?
3. What are the direct effects of climate change in the sending region?

Participants were recruited to the focus groups after the individual interview when asked if they would like to participate in further study. The selection was limited to ten people for two focus group discussions (Cianconi et al., 2020).

4 Results

Climate change adverse effects in northern Nigeria influence migration to other parts of the country indirectly, i.e., by upsetting other drivers of migration, such as economic, socio-demographic, and political aspects. How and in what way climate change sways migration hinges on socio-economic and geographical contexts, demographic characteristics, and the type and duration of migration. A vast body of literature pointed to the relationship between climate change and migration in this regard. This study contributes to the literature by determining that climate change causes migration, notably concerning recent happenings in Nigeria. The likelihood that adverse effects of climate change trigger migration should be recognised concerning any future discourse on people's climate change-related survival capabilities when faced with harsh conditions such as drought and desertification.

4.1 Changes in the ecological environment (at the place of origin) that worsen food and water insecurity and destabilised political settings

During the interview, respondents were asked about the negative effects of climate change, sustenance, water supply, and resource contestation; most of the respondents from the interviews and focus group discussion (MEO-Ministry of Environment and LGO-Local Government Official) emphasised survival, lack of water, food and shelter, and pasture for flocks in migrants' various sending regions. The main reasons migrants decided to move to the host community, leading to the competition for resources that are critical for the survival of lives (Figures 6, 7 and 8). According to NVIVO, these figures are referred to as word trees. A word tree help identify keywords and phrases in data analysis and displays themes and findings.

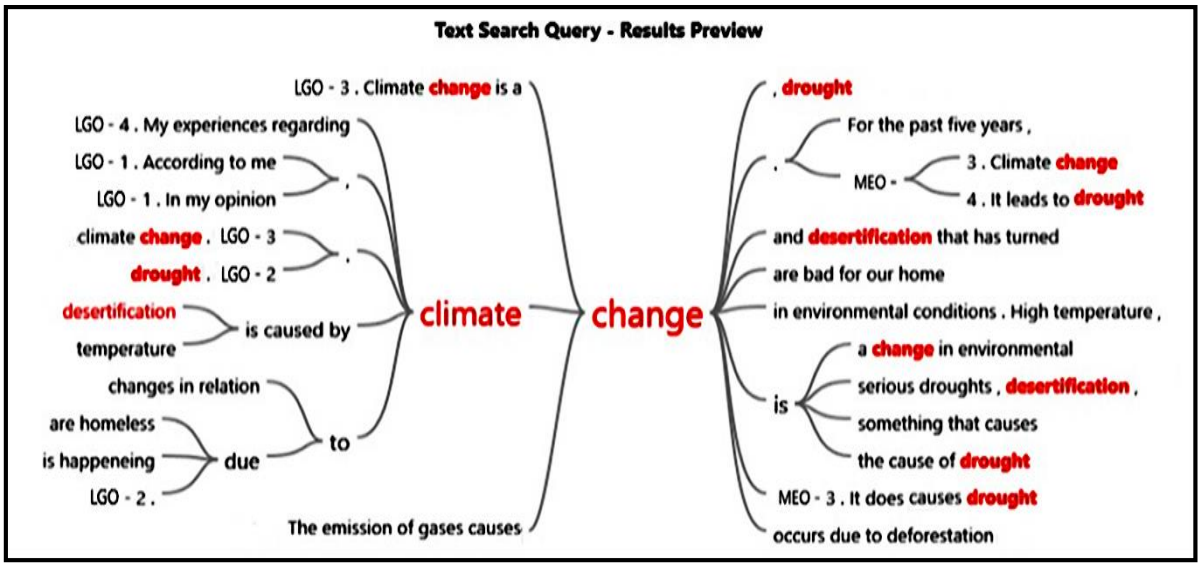

Figure 6 Responses of experts on the impact of climate change.
Source: (Author, 2021).

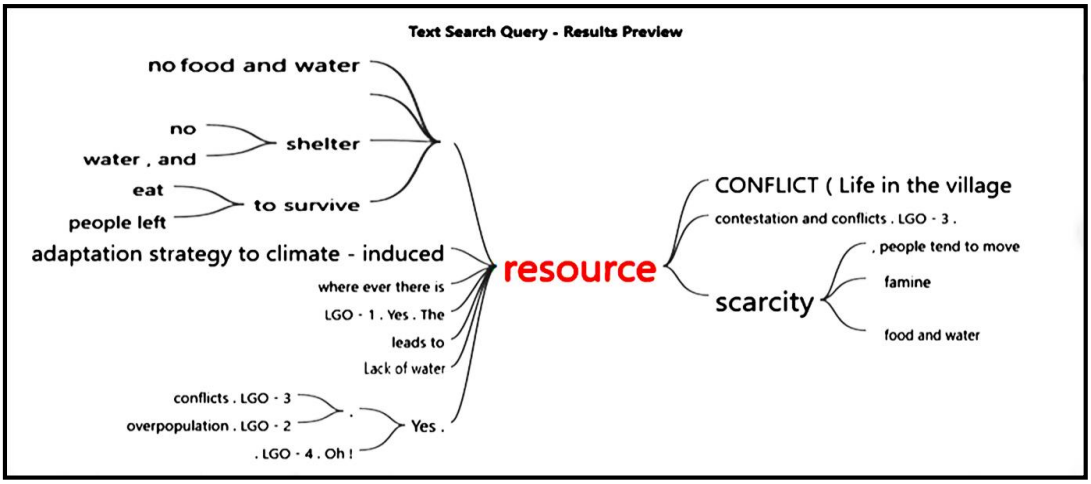

Figure 7 Review of the lack of food and water-vital reasons for migrating. Source: (Author, 2021).

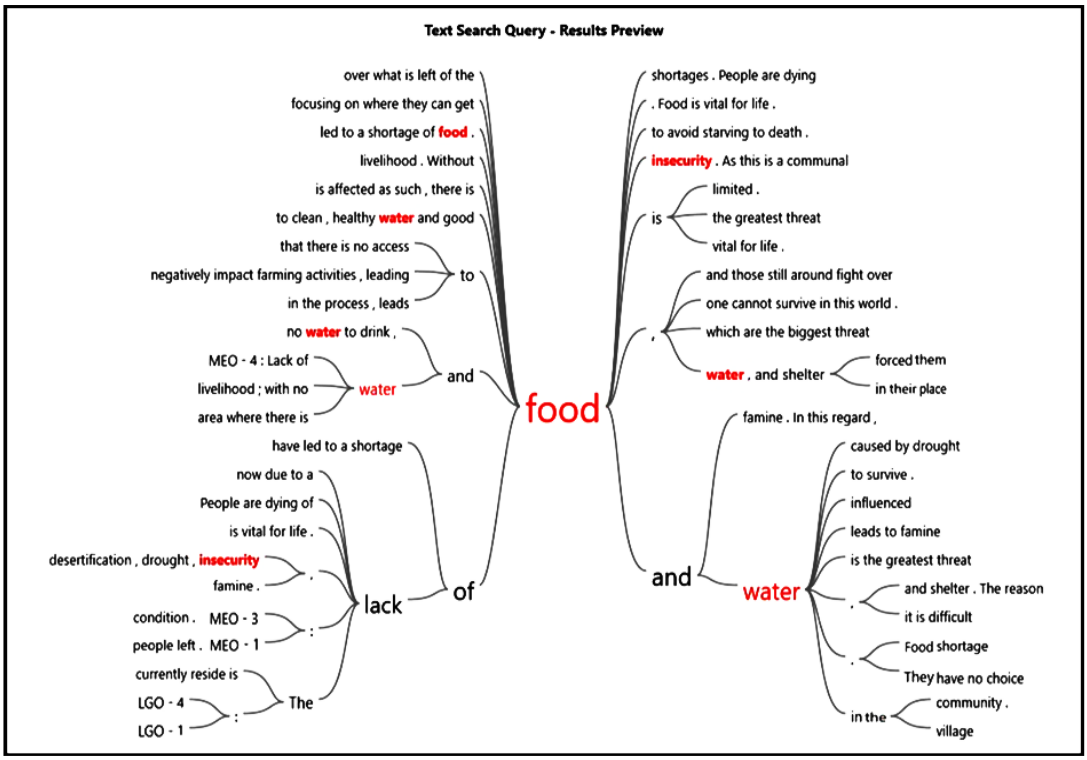

Figure 8 Identification of resource contestation as the bane of conflicts between host community people and migrants. Source: (Author, 2021).

According to four respondents in quotes:

MEO-4 – Ministry of Environment Official in Nogoa. To survive in their place of origin is difficult. There is a shortage of water and food. Dunes have covered the migrant's abode. As a result, they cannot survive in those conditions.

MEO-3 – Ministry of Environment Official in Nogoa. The biggest threat to the sustenance of life in the villages they came from is a lack of water and food to sustain livelihoods.

LGO-1 and LGO-2 – Local Government Officials in Nogoa. In unison, food and water are scarce to come by in migrants' villages (the sending regions), so they have no option but to move to where they are now, or they die of starvation staying in their villages.

It is clear that a lack of food and water were the primary reasons for these migrants leaving the sending region for the host community, implying that migration was used as an adaptation strategy to diversify and support their livelihoods. Droughts and desertification have devastated the migrant's area, reducing the quality and productivity of crop yields and livestock needed to sustain livelihoods, resulting in famine, undernutrition, and social unrest, all expected outcomes of food insecurity in the region from which these migrants came from, which has serious consequences for people personally and for a country's ability to rise out of poverty.

Furthermore, these respondents (FGMEO-1, FGMEO-4—Focus Group Ministry of Environment Officials and FGLGO-2, FGLGO-4 and FGLGO-5—Focus Group Local Government Officials, during the discussion were of the same views concerning the bane of the problems between Fulani pastoralists and farmers and the host community with their statements. The relentless tussle between host community people and the migrants is due to two primary resources: water and land"- resource contestation leading to insecurity. See Figure 9 for a visual illustration of their responses.

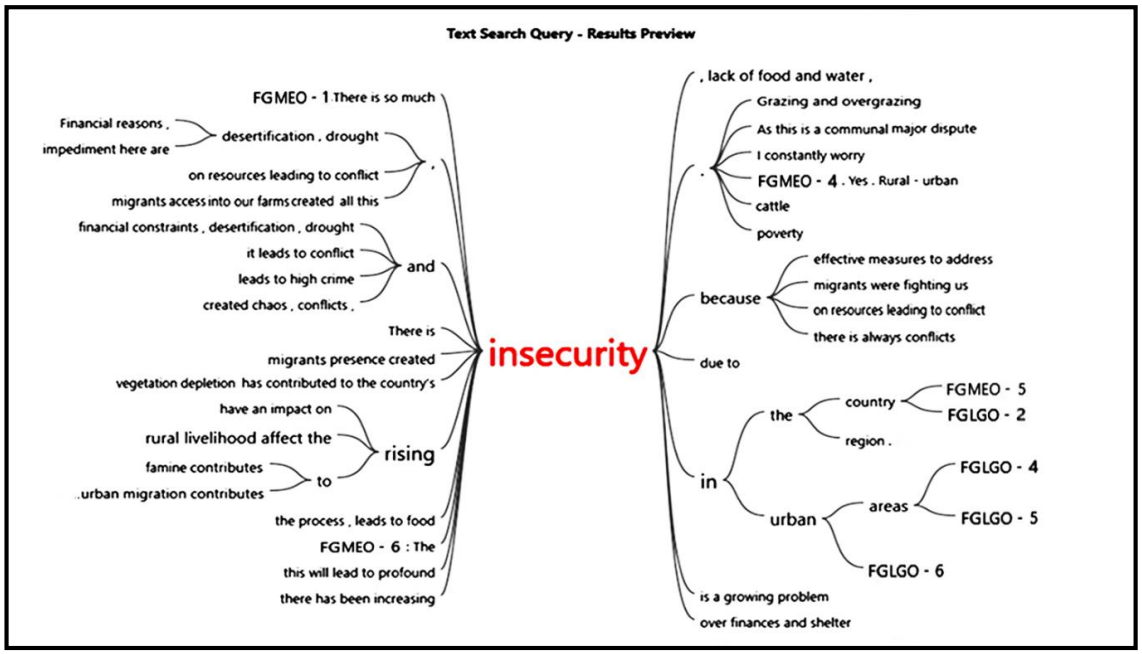

Figure 9 Resource contestation (Water and fertile land) resulting in conflict; the summation is insecurity for the state. Source: (Author, 2021).

The New Economics of Migration empirical evidence posited that migration is an adaptation strategy people use to diversify and support their livelihood strategies (Buis, 2020; Adejuwon et al., 2019; Mayans, 2020). It is evident that these migrants used migration as an adaptation strategy to escape the adverse effects of climate in the sending region by migrating to the host community for survival. According to respondents, it is evident that migrants understand the situation they find themselves in the sending regions and are aware of why migrants vacated their place of origin, which has been decimated by drought and desertification (Mayans, 2020). Climate change migration incorporates these three vital components: adaptive, maladaptive, and survival migration, classified as a conceptual schema of climate change migration. (Adejuwon et al., 2019; Mayans, 2020) noted that "when people no longer have access to necessities of life, such as water, food, shelter, or physical security critical for survival, they adapt by switching livelihood systems or migrating for greener pastures", accordingly leading to security issues that arise "when the capacity of the receiving communities are stretched to a tipping point where interactions and relations become conflictual rather than cooperative" (Adejuwon et al., 2019; Mayans, 2020). They further noted that the consequence of an influx of migrants into the host communities depends on the carrying capacity of the receiving communities in terms of the ability to make room for the inflows at any point in time. (Buis, 2020; Adejuwon et al., 2019).

In exploring climate change vulnerability, Ayodeji (2020) highlighted it across sectors using impacts and coping capacity indicators. It brings to attention five security parts: vulnerability to climate change creates significant problems, particularly in Africa. These are water, energy, food security, migration and natural hazards (Ayodeji, 2020). Also, the report highlighted that climate change would alter the template of precipitation, not excluding the frequency of droughts, storms and floods. It shows that these changes are already showing and are apparent concerning the amplification of aridity in subtropical regions and desertification in the Sahara, which northern Nigeria is close to.

5 Discussion

This article is essential in understanding the concept of climate change and its relation to the conflict between farmers and herders in Nigeria. As Adekunle (2019) posited, climate change can be defined as the irreversible observable variation in the climate within a specific period. Climate change can be caused by biogeographical processes (natural) and anthropogenic processes (human-induced). The nonavailability of pasture and water in the sending region lies in the climate-induced degradation of pasture in the country's far north, which has forced herders south. According to findings, the damage to farmers' crops wrought by herders' indiscriminate grazing is attributed to conflict (Abdulhamid et al., 2019). Also, the impacts of Fulani pastoralists-farmers conflicts caused by deteriorating environmental conditions such as drought and desertification, as revealed by this study, included loss of crops, reduced productivity, loss of lives, increased prices of agricultural products, and increased poverty.

The hazard of global climate change is of concern, as crop production is currently seriously affected by climatic variables such as drought, desertification, flooding and sea level rise, compromising food security worldwide (Clowes, 2021). According to Cline-Cole and Maconachie (2016), climate change's consequences on vulnerable societies are of concern. Climate change affects many populations in various geographical areas, with variable threats to the public health of individuals. Models concerning how the global climate has evolved over the years can help with scientific research to provide the background and the technical know-how to reduce its adverse effects (Hoi Yee Fu, 2020; Sedano and Molini, 2020).

Respondents shared the same views on the bane of problems between Fulani pastoralists and farmers and the host community, which is water and land, that leads to resource competition and escalates insecurity in the region. According to findings, resource contestation is a major concern, leading to resource conflict a destabilising phenomenon that policymakers must address to reduce the insecurity between farmers and pastoralists. Reduced conflict risk will keep squabbles over these natural resources—water and land—from escalating into full-fledged wars. Overall, this article suggests a more political framing of resource scarcity that focuses on how resources are distributed among various needs and uses, people, and social classes. This necessitates a policy emphasis on land and resource rights and access and distributional issues centred on equity and justice.

6 Conclusion and Recommendation

The primary objective of identifying climate change as the cause of migration leading to conflicts in other parts of Nigeria, especially betwixt the Fulani herders and farmers in Nigeria, was established. The farmer-herder conflict in Nigeria has been recognised as a threat to the security and peaceful cohabitation of citizens and the orderliness and economic livelihoods of the people. The scarcity of environmental resources because of climatic change has triggered the migration of the Fulani herders to farmers' territories. At the same time, farmers have expanded their farmlands to grazing fields while seeking arable lands following the effects of climate change (Kangdim et al., 2022). This has led to herder-farmer conflicts. How this issue is handled has played an influential role in heightening the crisis. Even though the pastoralists believe that the government seems to approve of the persecution of the Fulani herders, this is discovered not so. It is paramount to understand that adverse climate change effects cause migration from northern to southern Nigeria, creating a conflict between farmers and pastoralists contesting resources in the host community.

To facilitate adaptation, the government must provide innovative climate interventions, especially in the Sahelian areas prone to climate change impacts. This includes improved silage and forage, crop diversification, land range management, and agricultural systems based on Nigeria's National Adaptation Strategies and Plan of Action for climate change. Also, media houses must be tasked with maintaining professionalism when reporting overarching crises. Climate change-induced resource scarcity and conflict are major concerns for policymakers. Former US Secretary of State John Kerry raised the alarm on the issue, pointing out that 'If nothing is done, and humans do not respond effectively to the problems of climate change globally, in the next few years people will be fighting wars over resources; water and land' (Haider, 2019). In the Nigerian context, this is already happening between herders and farmers, the bedrock of the nation's food supplies (Haider, 2019; Gursoy, 2020; Farauta et al., 2012; Kangdim et al., 2022). Now it is the time to nip the situation in the bud before it drastically spiralled out of control. Nigeria will continue experiencing these deadly conflicts should it fail to respond to this issue decisively and effectively. Even though some solutions may not yield immediate results, federal and state authorities must take the necessary actions to curb these conflicts. One of the probable solutions to this conflict is strengthening security for farming and herding communities (Kangdim et al., 2022). The essence of this action is to ensure that the government sustains campaigns against rural banditry and cattle rustling that the Fulani pastoralists attributed to one reason for the conflict and encourages communication and

collaboration of local authorities with these groups and searches and repossession of firearms, particularly automatic rifles. Both the state and the local government can engage the two groups in strengthening conflict mediation, reconciliation, resolution, and peacebuilding initiatives, especially in areas most affected by the conflict. Also, the government can establish grazing reserves or ranches in each state, where herders can safely move their cattle without contact with farmers, thereby minimising the friction between the farmers and the herders (Kangdim et al., 2022). Also, it would be appropriate to work in tandem with the Great Green Wall Initiative for the Sahara and the Sahel, which is meant to restore areas experiencing drought and desertification, such as Nigeria's northern belt.

Numerous technical measures can be implemented to combat the effects of drought-like conditions and eventual desertification. Farauta et al., (2012) and Kangdim et al., (2022) advocated for short-term mitigation measures such as strategic irrigation, drought relief, dissemination of drought information, construction of stock ponds, boreholes, and new wells, bringing down livestock numbers during periods of drought, planting of crops such as millet according to Yenwong-Fai (2012), that does not strain the local water supply, and weather modification efforts using cloud seeding measures. Other long-term mitigation measures, such as the diversion of water resources from water-rich areas to water-deficient areas prone to drought, water impoundments, breeding plants with drought tolerance, soil evaporation reduction, water harvesting, improved agricultural and cultural practices, alternate crops, and microclimate modification through the alteration of surface albedo at a large scale with the help of vegetation (Yenwong-Fai, 2012). Large-scale irrigation, and minimum tillage, can also help. Establishing an effective early-warning drought system and early relief measures in advance can also help. Actions such as sand dune stabilisation, afforestation, livestock management, rational rangeland, water resource management, and development could all be used to control desertification to an acceptable degree. Actions such as responsible land usage, planned farming, and reclamation can also help ensure the area's ecosystem is not harmed.

Concerning the increase in the frequency and severity of drought and desertification, and other dangerous events in connotation with the projected global warming and upshots of climate change, the establishment of national programmes to address the problems of drought and desertification is important. The lack of coherent policy to respond to drought and desertification would continue to make the society ever more susceptible (Ajibo, 2018). Inexpertly drawn up or non-existent government assessment and response to drought and desertification could affect the state's economic development. (Yenwong-Fai, 2012; Odoh and Chilaka, 2012; Grossmann, 2018). As discussed in this paper, experts' findings show that a well-planned preparation and application of a united drought-desertification policy and planning implementation are needed to alleviate human miseries and augment the economic security in Nigeria.

Compliance with ethical standards

Acknowledgments

The author acknowledged the immense contribution of Dr Alexandre Nobajas, who has been much helpful in the direction to follow, and providing purely technical help and writing assistance.

Disclosure of conflict of interest

No conflict of interest.

Funding

The design of the study, collection, analysis, and interpretation of data and, in writing, the manuscript was personally funded.

Availability of data and materials

Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.

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