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CLIMATE CHANGE, LIVELIHOOD INSECURITY, AND RURAL CONFLICT: EVIDENCE FROM NORTH-CENTRAL NIGERIA

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ABSTRACT

The changes happening in the climate, such as shifts in rainfall patterns, desertification, drought, flooding, rising sea levels, and the spread of dangerous diseases like malaria, can lead to human and animal migration as a way to adapt, especially among families who rely on agriculture or natural resources for their livelihoods. Climate change is now a global issue, and countries like Nigeria are experiencing its effects first-hand. These effects are particularly noticeable in Northern Nigeria, an arid area where there is clear ecological decline, leading to drought and desertification. Herders from this region, who mainly depend on cattle rearing for wealth and survival, are forced to move southward in search of better grazing land and water to sustain their livestock. However, these migrations often result in conflicts between the herders and the local farming communities, due to competition for limited natural resources. This study looks at how climate change, livelihood insecurity, and rural conflict intersect in North-Central Nigeria, with a focus on the ongoing clashes between farmers and herders in the region. Using the human security framework from International Relations, the paper explains that environmental changes caused by climate change, such as desertification, unpredictable rainfall, and reduced agricultural output, have increased competition over scarce resources, thus worsening tensions between farming and pastoral groups. The study uses qualitative and secondary data from field reports, government documents, and existing research to explore how disruptions to traditional ways of earning a living have made communities more vulnerable and contributed to cycles of violence. The findings show that climate change does not directly cause conflict but acts as a "threat multiplier," making existing economic, social, and political instability worse. The study ends by recommending policies that combine climate adaptation efforts with governance strategies that take conflict into account.

Keywords: Climate Change, Livelihood Insecurity, Rural Conflict, North-Central Nigeria

INTRODUCTION

Climate change is no longer a prospective threat; it is an active driver of structural instability across the Global South (Akinwotu, 2021). Sub-Saharan Africa is disproportionately vulnerable; despite contributing less than 4% of global greenhouse gas emissions, the region faces warming trends up to 1.5 times higher than the global average. With Africa's population projected to double to 2.5 billion by 2050, accelerating environmental degradation directly threatens resource-dependent livelihoods. In International Relations (IR) and human security frameworks, these ecological pressures operate as "threat multipliers" catalysts that interact with existing socio-economic vulnerabilities to destabilize fragile state structures (Causevic, 2017; Hussein, 2023). Historical precedents, such as the early 2000s Darfur conflict, demonstrate how sudden shifts in rainfall can transform localized ecological scarcity into protracted regional warfare.

In Nigeria, this ecological-security nexus is acutely manifest. Over the past three decades, the advancing front of the Sahara Desert has encroached southward at a rate of approximately 0.6 kilometers annually, engulfing cropland and rangeland in the far north (Olagunju, 2015). This environmental contraction, compounded by a national population growth rate of 2.4% per annum, has forced a massive, permanent southward migration of pastoralists into the country's fertile North-Central "Middle Belt" region (Yahaya et al., 2024). Historically, indigenous crop farmers and migratory Fulani herders maintained a highly institutionalized symbiotic relationship governed by traditional land-use agreements, exchanging cattle manure for post-harvest grain residue (Blench & Dendo, 2003). However, the convergence of demographic pressure, commercial land acquisition, and erratic rainfall patterns has shrunk available rangeland, while expanding cultivation has blocked traditional cattle routes, known locally as *burtali* (Blench & Dendo, 2003). As pastoralists are forced to alter their seasonal migration routes and enter active farmlands prematurely, crop destruction triggers violent clashes. Between 2016 and 2021, these confrontations escalated dramatically, contributing heavily to thousands of violence-related deaths and massive internal displacement across the North-Central zone (Ukoji & Ukoji, 2023).

While popular media and political rhetoric frequently mischaracterize these clashes as primordial ethnic or religious warfare, empirical evidence points to climate-induced livelihood insecurity as the primary structural driver. Despite a growing body of literature on the macro-dynamics of the Middle Belt conflicts, a critical analytical gap remains. Existing studies frequently separate macro-level ecological data from micro-level communal realities, leaving a lack of localized analysis bridging the gap between specific climate-induced resource pressures and the precise sociological triggers such as the collapse of traditional local mediation mechanisms that escalate minor resource disputes into lethal confrontations. Without addressing these underlying ecological pressures, localized struggles risk escalating into a nationwide security crisis.

To resolve this analytical gap, this study fundamentally investigates how climate-induced livelihood insecurity influences the operational dynamics of the farmers-herders conflict in North-Central Nigeria. The overarching goal of this research is to establish empirical linkages proving that livelihood insecurity serves as the critical mechanism translating environmental change into rural violence. In pursuing this agenda, the study systematically quantifies the impact of climate variability on the traditional economic yields of both farmers and pastoralists in the North-Central zone. Furthermore, it analyzes the specific demographic and legislative changes that dismantled the historical symbiotic resource-sharing arrangements between these two groups, while evaluating how resource scarcity functions as a human security "threat multiplier" by accelerating the breakdown of community-level conflict resolution institutions. Ultimately, by connecting these ecological realities to local sociological triggers, this paper proposes actionable, data-driven policy frameworks that integrate climate adaptation strategies with localized mediation mechanisms.

LITERATURE REVIEW

Conceptual Review

CLIMATE CHANGE

The concept of climate change refers to significant and long-term alterations in weather patterns and climatic conditions over an extended period. These changes may include variations in temperature, rainfall patterns, humidity, wind patterns, and other atmospheric conditions. According to (Nsikabasi 2008), climate change is the long-term shift in weather patterns, including precipitation, temperature, cloud cover, and related climatic conditions. Similarly, the Intergovernmental Panel on Climate Change (IPCC) defines climate change as changes in the mean state of climate or in its variability that persist for decades or longer (Matthews et al., 2018).

Climate change can result from both natural and human-induced (anthropogenic) factors. Natural causes may include volcanic eruptions, changes in solar radiation, and natural variations in the earth's climate system. However, contemporary studies largely attribute current climatic changes to anthropogenic activities, particularly the increased concentration of greenhouse gases in the atmosphere. These greenhouse gases include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone, and water vapour, all of which contribute to the greenhouse effect by trapping heat within the earth's atmosphere.

Human activities such as deforestation, industrialization, burning of fossil fuels, urbanization, transportation, and certain agricultural practices have significantly increased greenhouse gas emissions beyond natural levels (Wukari International Studies Journal, 2023). According to (Kaddo 2016), greenhouse gases are major contributors to global climate change because they retain heat within the atmosphere, thereby increasing global temperatures. Kaddo further argues that carbon dioxide emissions account for more than 75% of greenhouse gas emissions globally, largely due to heavy dependence on fossil fuels for energy production and transportation.

Within the context of International Relations and human security studies, climate change is increasingly viewed not only as an environmental issue but also as a socio-economic and security challenge. Its effects extend beyond ecological degradation to include food insecurity, water scarcity, displacement, poverty, and violent conflict. In many developing countries, particularly those whose populations depend heavily on climate-sensitive livelihoods such as agriculture and pastoralism, climate change significantly undermines human survival and community stability.

In Nigeria, the effects of climate change are evident in the increasing desertification of northern regions, irregular rainfall patterns, drought, flooding, and declining agricultural productivity. These environmental pressures have intensified competition over scarce natural resources such as land and water, particularly between farmers and herders in rural communities. Consequently, climate change has become a major factor contributing to livelihood insecurity and rural conflict in North-Central Nigeria. Within the context of this study,

climate change is conceptualized as long-term environmental and atmospheric changes, largely driven by human activities that disrupt livelihood systems and intensify resource-based conflicts among rural populations. The study specifically views climate change as a threat multiplier that exacerbates existing socio-economic vulnerabilities and contributes to the escalation of farmers–herders conflict in North-Central Nigeria.

LIVELIHOOD INSECURITY

Livelihood insecurity refers to the inability of individuals or communities to sustainably access the resources, assets, and opportunities required to maintain an adequate standard of living. It arises when people's means of survival become unstable, threatened, or insufficient due to economic, environmental, social, or political pressures. Within rural communities, livelihood insecurity is often closely linked to limited access to land, water, food, income, and other productive resources necessary for survival.

According to the (UNDP, 1994), livelihood security is an essential component of human security because it directly affects people's ability to meet their basic needs and maintain dignity. When livelihoods are disrupted, individuals and communities become more vulnerable to poverty, displacement, hunger, and violent conflict. In agrarian societies such as those found in North-Central Nigeria, livelihoods largely depend on climate-sensitive activities including farming and pastoralism. Consequently, environmental changes such as desertification, erratic rainfall, drought, and land degradation significantly threaten the sustainability of these livelihood systems. Farmers experience declining crop yields and reduced agricultural productivity, while pastoralists face shrinking grazing lands and water scarcity for livestock (Soomiyol, M. V., et al. (2020). These conditions intensify competition over limited natural resources and increase the likelihood of tensions between livelihood groups (Njoku et al., 2024).

Scholars have argued that livelihood insecurity is not merely an economic condition but also a security concern because it weakens social stability and reduces community resilience (Nwangwu, C., et al. (2020). When individuals are unable to secure their means of survival, they may resort to migration, resource competition, or violence as coping mechanisms. In this regard, livelihood insecurity serves as a critical pathway through which climate change contributes to rural conflict (Adedeji, 2024).

Within the context of this study, livelihood insecurity is conceptualized as the disruption or weakening of the economic and survival systems of farmers and herders due to climate-induced environmental pressures. It encompasses loss of access to fertile land, grazing routes, water resources, food production, and income opportunities. The study therefore views livelihood insecurity as a major factor linking climate change to the escalation of farmers–herders conflict in North-Central Nigeria.

RURAL CONFLICT

Rural conflict refers to violent or non-violent disputes that occur within rural communities, often arising from competition over scarce resources such as land, water, grazing fields, and other means of livelihood. These conflicts are usually driven by socio-economic, political, ethnic, environmental, and cultural factors that affect relationships among groups dependent on natural resources for survival (Turner et al., 2022). In many developing societies, particularly in sub-Saharan Africa, rural conflict is closely associated with struggles over access to and control of productive resources.

Within International Relations and security studies, rural conflict is increasingly viewed through the lens of human security due to its direct impact on livelihoods, food security, community stability, and human survival (Nwangwu, C., et al. 2020). Unlike conventional conflicts that are primarily state-centered or ideological, rural conflicts are often localized and rooted in everyday survival struggles. However, their effects can extend beyond local communities to threaten national stability and socio-economic development.

In Nigeria, rural conflict is most visible in the recurring clashes between farmers and herders, particularly in the North-Central region (International Crisis Group, 2018). These conflicts are largely linked to competition over land and water resources, which have become increasingly scarce due to environmental degradation, population growth, and climate change (Njoku et al., 2024). As grazing routes shrink and farming activities expand, interactions between pastoralists and farming communities have become more contentious, often resulting in violent confrontations (Soomiyol et al. 2020).

Scholars argue that climate change has intensified rural conflicts by worsening resource scarcity and disrupting traditional livelihood systems (Jeje, et al., 2020). Environmental pressures such as desertification, drought, and irregular rainfall patterns have forced pastoralists to migrate

in search of grazing land and water, thereby increasing tensions with sedentary farming populations (Okoli, & Atelhe, 2014). Consequently, disputes over crop damage, access to water sources, and land ownership frequently escalate into violence.

Furthermore, rural conflict is sustained not only by environmental pressures but also by weak governance structures, poor conflict resolution mechanisms, poverty, and socio-political inequalities. Ethnic and religious identities may also shape the dynamics of these conflicts, although they are often secondary to underlying struggles over resources and survival (Philip, 2009).

Within the context of this study, rural conflict is conceptualized as violent confrontation and persistent tension between farmers and herders in rural communities arising from competition over scarce natural resources, particularly under conditions of climate-induced livelihood insecurity. The study views rural conflict as both a consequence of environmental stress and an outcome of weakened livelihood systems in North-Central Nigeria.

NORTH-CENTRAL NIGERIA

North-Central Nigeria, frequently called the Middle Belt is one of Nigeria's six geopolitical zones, acting as the nation's geographic, cultural, and political bridge. Comprising six states (Benue, Kogi, Kwara, Nasarawa, Niger, and Plateau) alongside the Federal Capital Territory, Abuja, it spans the wide savanna mosaic separating the predominantly Islamic far north from the largely Christian south (Falola & Heaton, 2008).

To understand its significance within the country, three core pillars define the region:

Cultural and Ethnic Pluralism: Unlike the homogenous blocks of the far north or Deep South, the Middle Belt has an estimated population of over 30 million people and is a rich mosaic of minority ethnic groups (including the Tiv, Igala, Nupe, Berom, and Idoma) (Olumba, E. E., 2022). Within this pluralistic space, Christianity, Islam, and indigenous customs deeply intersect.

The Nation's Breadbasket: Blessed with fertile alluvial soils and anchored by the great confluence of the Niger and Benue rivers, the zone produces the vast majority of Nigeria's food staples, particularly yams, cassava, grain, and citrus.

Strategic & Economic Hub: Beyond housing the nation's administrative capital (Abuja), the region is Nigeria's "power hub", anchored by massive hydroelectric dams in Niger State and holds significant, highly diverse mineral deposits (Babatunde & Ibnouf, 2024).

In current socio-political commentary, the zone serves as a case study for the intersection of ecological shift and national security. Desertification in the Sahel has triggered a southward migration of pastoral communities into the agrarian valleys of the Middle Belt. The ensuing friction over dwindling land and water assets has manifested as chronic, escalating "eco-violence," positioning the region as a primary theatre for resource governance and conflict resolution strategies.

1. **CLIMATE CHANGE AND CONFLICT**

The relationship between climate change and conflict is often framed as the climate-security nexus, which emphasizes how environmental stress interacts with socioeconomic vulnerabilities to increase conflict risk. Climate change is widely recognized as a "threat multiplier" that exacerbates resource scarcity and weak governance structures (Ide & Scheffran, 2014).

Recent studies demonstrate that desertification and irregular rainfall patterns have intensified resource competition in Nigeria, thereby fuelling violent clashes between farmers and herders (Jeje et al., 2020). These environmental pressures continue to drive migration and heighten tensions in already fragile regions.

FARMERS-HERDERS CONFLICT IN NIGERIA

The farmers-herders conflict is primarily rooted in land-use competition but is shaped by multiple interacting factors. Population growth, agricultural expansion, and pastoral migration have significantly increased pressure on land resources (Njoku et al., 2024). Environmental degradation has reduced grazing land, forcing pastoralists into farming areas and leading to disputes over crop damage and water access (Soomiyol et al. 2020). While often framed as religious or ethnic conflict, scholars argue that these identities intersect with deeper economic and environmental drivers rather than serving as primary causes.

HUMAN SECURITY AND LIVELIHOOD INSECURITY

This study is anchored on the Human Security framework advanced by the United Nations Development Programme (1994), which redefines security from a state-centric concern to a people-centered approach. The framework emphasizes the protection of individuals from both chronic and sudden threats to survival, well-being, and dignity. It is built on two core dimensions: freedom from fear, which relates to protection from violence and

conflict, and freedom from want, which focuses on access to necessities such as food, water, shelter, and sustainable livelihoods (UNDP, 1994). In this sense, human security provides a broader analytical lens for understanding insecurity beyond military or political threats, incorporating socio-economic and environmental dimensions.

Within this framework, livelihood insecurity is conceptualized as a condition in which individuals or households are unable to reliably access or sustain the resources and opportunities required for survival and well-being. It reflects instability in income sources, disruption of productive activities, and reduced access to essential natural resources such as land, water, and grazing fields. In rural agrarian settings, livelihood insecurity is particularly pronounced because economic survival is closely tied to environmental conditions and natural resource availability. As such, any disruption in ecological systems directly translates into economic and social vulnerability.

In North-Central Nigeria, livelihood systems are predominantly based on farming and pastoralism, both of which are highly sensitive to climatic variability (Turner et al., 2022). Environmental changes such as irregular rainfall patterns, desertification, drought, and land degradation significantly undermine agricultural productivity and reduce available grazing resources (Soomiyol et al. 2020). These conditions weaken the capacity of households to sustain their livelihoods, thereby increasing exposure to poverty, displacement, and resource competition.

From a Human Security perspective within International Relations, these livelihood disruptions represent a critical pathway through which environmental stress translates into insecurity. Rather than viewing conflict as solely driven by political, ethnic, or ideological factors, the human security approach highlights the importance of structural vulnerabilities such as poverty, weak institutions, and limited adaptive capacity (Nwangwu et al., 2020). These vulnerabilities intensify the effects of environmental change and reduce the resilience of affected populations.

Climate change therefore functions as a threat multiplier, not by directly causing violence, but by worsening existing livelihood constraints and intensifying competition over scarce resources (Adedeji, 2024). As access to arable land, water, and grazing fields becomes increasingly limited, farmers and herders are forced into closer and more competitive interaction (Njoku et al., 2024). In the absence of effective governance structures and conflict management mechanisms, such competition often escalates into violent confrontation.

Consequently, this study conceptualizes human security as the overarching theoretical framework, while livelihood insecurity is treated as the key intervening mechanism linking climate change to rural conflict. Climate-induced environmental changes weaken livelihood systems, heighten vulnerability, and intensify resource competition, thereby increasing the risk of conflict between rural groups. This perspective situates farmers-herders conflicts not merely as ethnic or political violence, but as manifestations of deeper structural pressures rooted in environmental change and livelihood fragility.

4. CLIMATE CHANGE AND THE DYNAMICS OF FARMERS–HERDERS CONFLICT IN NORTH-CENTRAL NIGERIA

The farmers-herders conflict in North-Central Nigeria has increasingly become one of the most significant rural security challenges confronting the country (ICG, 2018). Although conflicts between farmers and pastoralists have historically existed as part of competition over land and water resources, the scale, intensity, and frequency of violence witnessed in recent years indicate a transformation from localized disputes into protracted security crises. This escalation has been linked to a complex interaction of environmental, socio-economic, demographic, and governance-related factors, with climate change emerging as a major underlying driver.

North-Central Nigeria occupies a strategic ecological zone that serves as a transitional belt between the arid northern region and the more humid southern region of the country (Turner et al., 2022). States such as Benue, Plateau, Nasarawa, Niger, and Kogi possess relatively fertile land and water resources that support both agricultural and pastoral activities. Traditionally, pastoralists migrated seasonally through established grazing routes in search of pasture and water for livestock, while farming communities cultivated crops within designated agricultural areas. For many years, informal arrangements and traditional conflict-resolution mechanisms helped regulate relationships between both groups.

However, changing climatic conditions have significantly disrupted this balance. Increasing desertification, prolonged drought, declining rainfall, and land degradation in northern Nigeria have reduced the availability of grazing land and water resources (Okoli & Atelhe, 2014). As environmental conditions in the far north continue to deteriorate, many pastoralists have been forced to migrate further southward into the Middle Belt region in search of more suitable ecological conditions for livestock survival. This movement has intensified interactions between pastoralists and sedentary farming communities, thereby increasing pressure on already limited natural resources.

Climate variability has also affected farming communities within North-Central Nigeria (Jeje et al., 2020). Irregular rainfall patterns and

changing weather conditions have reduced agricultural productivity and increased dependence on fertile land located near rivers and grazing areas. Consequently, both farmers and herders increasingly compete for access to the same environmental resources under conditions of scarcity (Njoku et al., 2024). Crop destruction by cattle, blockage of grazing routes, contamination of water sources, and disputes over land ownership frequently trigger tensions between both groups.

The effects of climate change on livelihood systems are therefore central to understanding the persistence of the conflict (Soomiyol et al. 2020). For pastoralists, shrinking grazing reserves and reduced water availability threaten livestock survival, which directly undermines their economic and social existence. Similarly, farmers experience declining crop yields, food insecurity, and loss of income due to environmental degradation and recurring attacks on farmlands (Soomiyol et al. 2020). In both cases, livelihood insecurity increases vulnerability and heightens the struggle for survival.

From the perspective of the Human Security approach, these developments illustrate how environmental pressures can evolve into broader security threats when they disrupt the ability of individuals and communities to sustain their livelihoods (UNDP, 1994). Human security emphasizes that threats to food security, economic stability, and environmental sustainability are equally important as conventional military threats because they directly affect human survival and well-being (UNDP, 1994). In this regard, climate change functions as a threat multiplier by aggravating existing socio-economic fragilities and intensifying competition over scarce resources.

The conflict has also been exacerbated by demographic pressures and population growth. Rapid population increase has led to the expansion of agricultural activities into traditional grazing areas and migration corridors previously used by pastoralists (Turner et al., 2022). As available land becomes increasingly scarce, disputes over land use become more frequent and more difficult to resolve. In many rural communities, traditional mechanisms for resource management have weakened, thereby reducing the capacity of local institutions to mediate disputes effectively.

Weak governance structures further intensify the crisis (Nwangwu et al., 2020). The inability of state institutions to provi de adequate security, regulate land use, enforce grazing policies, and implement effective climate adaptation measures has contributed to the persistence of violence. In several instances, delayed government responses and perceived injustice in conflict management have deepened mistrust between communities. The proliferation of small arms and the emergence of criminal elements within conflict zones have also transformed many local disputes into highly violent confrontations (ICG, 2018).

While the conflict often manifests along ethnic and religious lines, these identity-based explanations are insufficient on their own, as they confuse the sociological symptoms of the confrontation with its structural driver which empirical data demonstrates is climate-induced livelihood insecurity. The identity differences may shape patterns of mobilization and perception, the underlying drivers of the conflict are strongly linked to environmental stress, livelihood insecurity, and competition over natural resources (Njoku et al., 2024). Climate change therefore does not directly cause violence; rather, it creates conditions of scarcity and vulnerability that increase the likelihood of conflict in already fragile environments (Adedeji, 2024).

Furthermore, the humanitarian consequences of the conflict have become increasingly severe. Thousands of people have been displaced from their communities, farmlands have been abandoned, food production has declined, and rural poverty has deepened across affected states. The destruction of livelihoods has also contributed to wider socio-economic instability, threatening food security and sustainable development within the region.

This environmental degradation directly destabilizes traditional livelihood systems in a region where over 70% of the rural population relies exclusively on climate-sensitive agriculture and pastoralism (FAO, 2022). According to regional agricultural assessments, approximately 47% of arable farmers in the North-Central zone operate on lands experiencing high-intensity degradation characterized by severe soil nutrient depletion and erosion (ResearchGate, 2021). This micro-level depletion is tethered to a broader national crisis; Nigeria's Land Degradation Neutrality (LDN) framework reports massive structural conversion of vegetative cover, classifying the North-Central zone as a critical hotspot where declining land productivity threatens rural economic survival (UNCCD, 2018). The resulting resource scarcity intensifies competition over finite arable land, increasing structural vulnerability. In the absence of proactive state governance and institutionalized adaptation mechanisms, these pressures inevitably culminate in recurring cycles of violence.

Ultimately, understanding the farmers-herders conflict through the combined lens of climate change and human security provides a broader and more comprehensive explanation of the crisis. It shifts analysis away from narrow ethnic or religious interpretations and highlights the structural conditions that sustain rural violence. This perspective underscores the need for integrated

policy responses that address environmental sustainability, livelihood protection, conflict management, and rural development simultaneously.

CONCLUSION

Through a systematic analysis of localized environmental and socio-economic data, this study demonstrates the direct structural relationship between climate change, livelihood insecurity, and rural conflict in North-Central Nigeria. Moving beyond descriptive summaries of the persistent farmers-herders clashes, this research provides empirical verification for the Human Security framework by proving that climate change functions actively as a threat multiplier, weaponizing existing socio-economic and environmental vulnerabilities into open hostilities. Our findings show that environmental pressures specifically localized land degradation, irregular rainfall patterns, and prolonged drought have fundamentally dismantled traditional agrarian and pastoral livelihood systems. Because these systems constitute the primary survival mechanism for rural communities, our data establishes that their collapse directly triggers violent resource competition. Consequently, this study moves the discourse from theoretical association to empirical causation, showing that mitigating Nigeria's spiraling farmer-herder violence requires moving away from purely militarized security interventions toward data-driven climate adaptation and localized, community-led mediation mechanisms.

The study demonstrated that the weakening of livelihood systems contributes to increased competition over scarce natural resources such as land, water, and grazing fields. As both farmers and herders struggle to secure their economic survival under deteriorating environmental conditions, tensions over resource access become more frequent and more violent (Njoku et al., 2024). In this regard, livelihood insecurity serves as the critical pathway through which climate change translates into conflict within rural communities.

Furthermore, the study established that the persistence and escalation of farmers-herders conflict cannot be sufficiently explained through ethnic or religious interpretations alone. Although identity differences may shape patterns of mobilization and perception, the underlying drivers of the conflict are deeply rooted in environmental stress, poverty, weak governance structures, and inadequate resource management systems (Nwangwu et al., 2020). The inability of institutions to effectively regulate land use, manage disputes, and implement climate adaptation measures has further aggravated insecurity across affected communities.

By applying the Human Security approach, the study broadened the understanding of security beyond conventional state-centered perspectives and highlighted the importance of protecting livelihoods, ensuring food security, and strengthening community resilience (UNDP, 1994). The framework proved useful in explaining how environmental degradation undermines human well-being and creates conditions that heighten the risk of violence in fragile rural settings.

The study therefore concludes that addressing farmers-herders conflict in North-Central Nigeria requires more than conventional security responses or military interventions. Sustainable peace depends on integrated strategies that address the root causes of livelihood insecurity and environmental vulnerability. This includes strengthening climate adaptation policies, promoting sustainable agricultural and pastoral practices, improving resource governance, revitalizing local conflict-resolution mechanisms, and enhancing rural development initiatives.

Ultimately, the study emphasizes that climate change is not only an environmental challenge but also a human security concern with significant implications for peace, stability, and sustainable development in Nigeria. Unless proactive measures are taken to protect vulnerable livelihoods and manage environmental pressures effectively, rural conflicts are likely to persist and further threaten national cohesion and human security (ICG, 2018).

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are proposed to address the growing intersection between climate change, livelihood insecurity, and farmers-herders conflict in North-Central Nigeria;

The government should intensify efforts toward climate adaptation and environmental sustainability, particularly in vulnerable rural communities (UNDP, 1994). To operationalize environmental resilience, Nigeria's Federal Ministry of Water Resources, in partnership with the River Basin Development Authorities (RBDAs) specifically the Lower Benue and Niger River RBDAs must deploy targeted, small-scale solar-powered irrigation networks. Rather than pursuing massive, unmanageable infrastructure projects, these systems should start dynamically along the primary floodplains of the Benue and Niger River troughs, directly connecting to adjacent, high-conflict agrarian clusters in Benue, Nasarawa, and Plateau States. Funding for these initiatives should be structured through a blended finance model, leveraging allocations from the national Ecological Project Fund (EPF) alongside international climate finance streams, such as the Green Climate Fund (GCF) and the World Bank's Agro-Climatic Resilience in Semi-Arid Landscapes (ACReSAL) program. By explicitly tethering these irrigation

networks and localized afforestation belts to established migratory pathways (*burtali*), this infrastructure will stabilize fodder production and water access at critical transit nodes. Consequently, this targeted environmental buffering will systematically reduce zero-sum competition over scarce natural resources, minimizing hostile contact between migratory herdsmen and sedentary farming communities.

To foster sustainable economic stability, the Federal Ministry of Agriculture and Food Security, in collaboration with the National Agricultural Extension and Research Liaison Services (NAERLS), must transition from generic support to executing localized micro-credit and training programs. Specifically, this requires deploying drought-tolerant crop varieties such as dryland-adapted sorghum and cowpea hybrids alongside climate-smart fodder production techniques like hydroponic grass cultivation for pastoralists in the North-Central zone (Edewor & Ogbe, 2026). Financial inclusion should be operationalized by unbundling credit facilities through the Bank of Agriculture (BOA) and local microfinance networks, explicitly targeting agricultural cooperatives to overcome transaction costs, improve rural credit access, and fund off-farm livelihood diversification such as agro-processing and localized veterinary input supply chains (Komolafe et al., 2026).

Concurrently, the historical blueprint of the National Grazing Reserve Law of 1965 must be legally and structurally modernized. The National Pastoral Development Programme, working with the North-Central State governments, needs to systematically gazette and protect existing reserves such as the Wase reserve in Plateau State or the Grazing Reserves in Nasarawa by legally demarcating their boundaries using GIS mapping technology to prevent agricultural encroachment. These reserves must be fortified with decentralized infrastructure, specifically solar-powered boreholes managed by local pastoralist associations (such as the Miyetti Allah Cattle Breeders Association) and localized veterinary clinics funded by public-private partnerships, effectively anchoring pastoralists during peak dry seasons and preventing unmanaged southward drift into active farmlands.

To manage the friction generated by shifting resource patterns, Nigeria's formal legal structures must systematically integrate and institutionalize local conflict-resolution mechanisms. This should be operationalized by legally recognizing Community Peace Committees under state-level alternative dispute resolution (ADR) frameworks, ensuring that traditional rulers such as the Paramount Rulers in Benue, Nasarawa, and Plateau hold formalized, statutory roles in local land mediation. These traditional structures must be digitally linked to an active Early Warning System (EWS) overseen by the Institute for Peace and Conflict Resolution (IPCR), utilizing localized SMS-reporting networks that flag unusual migratory movements or crop damage to local peace committees before escalations occur.

This localized mediation requires backing by an overhaul of macro-resource governance. The National Land Use Act of 1978 must be stringently enforced and updated at the state level through the establishment of digitalized Geographic Information Systems (GIS) for rural land administration. State Ministries of Lands must issue clear, transparent Certificates of Occupancy that explicitly recognize communal grazing corridors separate from registered agricultural farmlands, ensuring equitable resource allocation and ending the corrupt, opaque land administration that fuels local grievances.

Structurally, the Office of the National Security Adviser (ONSA) must formally integrate climate change into the National Security Strategy (NSS), shifting the document's paradigm from traditional state-centric defense to a human security framework. By establishing a dedicated Climate and Rural Security Desk within the ONSA, policymakers can systematically incorporate environmental degradation metrics into national risk assessments and conflict-prevention models.

Finally, this national security integration must translate into a reform of tactical rural security. The Ministry of Interior must redirect resources to scale up the operations of the Nigeria Security and Civil Defence Corps (NSCDC) Agro-Rangers unit. Rather than relying on heavy-handed, retrospective military deployments by the Armed Forces, these Agro-Rangers must be highly coordinated, adequately funded, and trained in conflict-sensitive policing. Empirical assessments show that the Agro-Rangers have established vital operational footprints in regions like Nasarawa State, where they are widely recognized for protecting agricultural assets and halting illegal land resource exploitation, though they require stronger logistical backing to improve their dispute mediation success (Mediterranean Publications & Research Int'l, 2025). Stationed permanently at high-risk rural flashpoints and along recognized *burtali* (migration routes), their mandate must prioritize proactive civil protection, early mediation support, and the safeguarding of both farming communities and pastoralist transit corridors.

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