Science World Journal Vol. 20(No 3) 2025 https://dx.doi.org/10.4314/swj.v20i3.14
www.scienceworldjournal.org
ISSN: 1597-6343 (Online), ISSN: 2756-391X (Print)
Published by Faculty of Science, Kaduna State University

Full Length Research Article

EMPOWERING COMMUNITIES AND ENGAGING STAKEHOLDERS FOR SUSTAINABLE LAND MANAGEMENT: ADVANCING LAND DEGRADATION NEUTRALITY IN KATSINA STATE, NIGERIA

*W.M. Ibrahim, C. Ndabula, O.F. Ati, G.K. Adamu

Department of Geography, Federal University Dutsin-Ma, Katsina State, Nigeria

*Corresponding Author Email Address: miwaheeda@fudutsinma.edu.ng

ABSTRACT
This study evaluated the extent to which local communities and key stakeholders understood, supported, and were prepared to implement Sustainable Land Management (SLM) practices that contribute to Land Degradation Neutrality (LDN). A mixed-methods approach adopted, incorporating household surveys, key informant interviews, and focus group discussions in selected communities across Katsina State, Nigeria. The findings revealed that while awareness of land degradation had increased among community members, significant gaps remained in technical knowledge, access to resources, and institutional coordination. Stakeholder engagement remained fragmented, and although traditional knowledge played an important role, it was rarely integrated into formal SLM strategies. The findings highlighted the importance of inclusive, community-led strategies in empowering local stakeholders, enhancing institutional capacity, and addressing the complex socio-ecological conditions of the region. By capturing local perspectives and evaluating institutional dynamics, the research offers practical guidance for policymakers and development practitioners for shaping more effective and sustainable pathways toward land degradation neutrality in the semi-arid part of Katsina State and other similar dry-land contexts.

Keywords: Land Degradation, Sustainable Land Management, Land Degradation Neutrality

INTRODUCTION

The United Nations Convention to Combat Desertification UNCCD (2015) defines land degradation as "a reduction or loss of the biological or economic productivity and complexity of rain-fed cropland, irrigated cropland, or range, pasture, forest, and woodlands as a result of land uses or from a process or combination of processes arising from human activities" (Winowiecki, Vagen, and Huising 2016). Undoubtedly, land is a complex combination of biodiversity, soil, and water that interact to produce goods and services that lay the foundation for long-term livelihoods and peaceful inter-human cooperation. Despite growing awareness and numerous initiatives aimed at restoring degraded lands in Nigeria and across the globe, many local communities especially in semi-arid regions like Katsina State continue to struggle with the harsh realities of land degradation. Because of this, the livelihoods, security, and health of an estimated 3.2 billion people are in danger due to land degradation despite this (Global Environmental Facility {GEF}, 2020).

Among other socioeconomic problems, land degradation reduces land productivity and damages ecosystems. It also leads to migration and limiting development. According to Bai et al. (2008), restoring degraded land is costly and can lead in the loss of goods and many other potential environmental, social, economic, and non-material benefits that are vital to society and development. If the damage is severe, the land may stop providing a range of ecosystem functions and services. A 2017 study by the UNCCD titled "The Land is Our Home, Our Future" asserts that up to 1.4 trillion dollars in economic benefits can be generated through sustainable land management. We are ultimately motivated to defend our houses by this powerful statement (GEF, 2020).

National and regional estimates of land degradation differ significantly, despite persistent international efforts to prevent, lessen, and reverse land degradation. With detrimental effects on food security and the livelihoods of populations that depend on land, land degradation continues to be a significant environmental concern for the agricultural sector globally (Montanarella et al. 2016). This issue was highlighted in *"The 2030 Agenda for Sustainable Development,"* which was adopted by the UN General Assembly in 2015 includes 17 Sustainable Development Goals (SDGs) and 169 associated targets. Target 3 of SDG 15 specifically seeks to "achieve a land degradation-neutrality by 2030, combat desertification, and restore degraded land affected by drought, floods, and desertification."

Because agriculture-based SLM approaches may offer cross-cutting contributions to the three main LDN success indicators, it is technically possible to achieve LDN in agricultural settings. However, several obstacles still hinder the widespread adoption of these sustainable land management (SLM) techniques by agricultural land users. As noted by Akhtar Schuster et al. (2011), a wide range of players, from national land administrators to local land users, have an impact on decisions about land management. Progress toward LDN may be sluggish in the absence of an enabling environment where SLM and restoration efforts have a higher probability of being conducted successfully (Akhtar-Schuster et al. 2011). Particularly in a semi-arid region of Katsina, the chances of achieving land degradation neutrality are still quite low.

MATERIALS AND METHODS

Description of The Study Area

The study area is located in Katsina State, Nigeria, in a semi-arid region. From a geographic perspective, it is located between longitudes 9°00'0" and 9°15'0" East and latitudes 12°30'0" and 13°30'0" North. The semi-arid zone of Katsina State, which roughly lies between latitudes 13°00'0" and 13°30'0" North and longitudes 7°00'0" and 8°00'0" East, includes this site (see Figure 1).

The selected study sites share a climate similar to that of entire northern region of Katsina State, with only slight variations due to differences in latitude as "AW" by Koppen's climatic classification. This tropical climate type has distinct wet and dry seasons. With

lows of about 180°C, December, January, and February are frequently the coldest months. When the warm, humid tropical marine air mass and the hot, dry tropical continental air mass meet, the state experiences rainfall. The wedge-shaped tropical maritime air mass gets thinner toward the north. Accordingly, rainfall steadily increases and gets heavier as the ITCZ travels north over the study area in May, peaking in August (El-Tantawi and Saleh, 2013).

The ancient kingdoms of Daura and Katsina have combined politically and geographically to become Katsina State. These regions belonged to the first Hausa kingdoms. Northern Nigeria's Sudan Savannah is where the region is situated. In the north is bounded by the Niger Republic through Maradi and Damagaram. Zamfara to the west, Jigawa and Kano to the east, and Kaduna State to the south are its main neighbors, as seen in Figure 1 below. Since its establishment in 1987, Katsina State has witnessed profound political, cultural, social, economic, and environmental transformations. Traditional administrative systems like District Councils have been restructured into Local Government Areas to align with modern governance frameworks. Social and cultural norms have evolved alongside growing educational opportunities and demographic shifts. Economically, the state has seen changes in agricultural practices, trade dynamics, and employment patterns. Environmentally, land use changes and climate variability have significantly impacted natural resource management and livelihoods across the state

A small percentage of the population comprises Christians and Maguzawas (animistic Hausas), while the majority are Muslim Hausa and Fulani by ethnicity. In parts of the state, there are extensive grasslands known as the Hausa High Grasslands. The state's terrain consists of gently sloping plains, rising from approximately 360 metres in the northeast around Daura to about 600 metres in the southwest near Funtua (Amina, 2015).

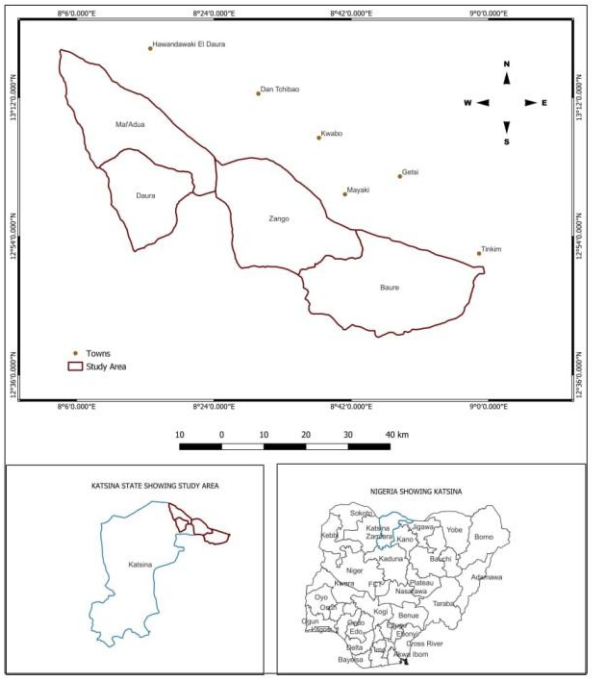

Figure 1: Study Area showing Katsina State and Nigeria
Source: GIS LAB FUDMA, 2024

METHODS OF DATA COLLECTION AND ANALYSIS

As required for this research, both primary and secondary data sources were utilized. Primary data were collected through field observations, interviews, and questionnaires, while secondary data were obtained from relevant publications, newspapers, and textbooks. A multi-stage sampling process was used in all four study sites to ensure a representative and methodical selection of study sites and participants. In the semi-arid region of Katsina State, critical sites experiencing severe land degradation were initially selected using purposive sampling to capture variations in land degradation trends, the study area was stratified into different land-use types (farmlands, pasture lands, and settlements) using stratified sampling to ensure unbiased representation of community perspectives, random sampling was used to select households and stakeholders for the questionnaire administration. Key individuals and organizations in land management were identified through stakeholder mapping. Semi-structured interviews and focus groups were conducted to gather information on roles, responsibilities, and levels of awareness.

To assess their knowledge of and proficiency with SLM activities, questionnaires were distributed to farmers, local communities, and other stakeholders. This research focused on increasing awareness of land degradation, sustainable practices, and adoption barriers. The knowledge of key stakeholders regarding land management and land degradation neutrality was assessed and enriched through focus group discussions supplemented by survey data. Technical skill in SLM and LDN was evaluated through interactive techniques and scenario-building activities. Furthermore, experts in agriculture, environmental management, and policymaking were selected by expert sampling to participate in focus groups and key informant interviews. This collection of sampling methods produced a thorough dataset for evaluating the region's Land Degradation Neutrality (LDN).

RESULTS AND DISCUSSION

In the study area, local people's knowledge, and ability to implement Land Degradation Neutrality (LDN) varies greatly. Many communities have a profound awareness of the negative impact that land degradation has on their means of subsistence, especially those that are directly reliant on agriculture and pastoralism. They can identify indicators such as shrinking pastureland, reduced crop yields, and declining soil fertility. Nevertheless, despite this understanding, there is frequently insufficient ability and funding to efficiently implement sustainable land management techniques. According to the research, their capacity to implement more resilient agricultural practices is hampered by a lack of financial resources, limited access to technology, and limitations in their understanding of conservation measures.

Awareness of Land Degradation Neutrality (LDN)

Community members' awareness of Land Degradation Neutrality (LDN) differs greatly. Although some people, especially those working in agriculture and natural resource management, may understand the fundamentals of land degradation and its effects, there is often limited knowledge of LDN as a distinct term. Many community members are more familiar with urgent issues that directly affect their daily lives and agricultural productivity, such as soil erosion, vegetation loss, and water scarcity. However, the community may not fully comprehend or actively discuss the concept of LDN, which aims to strike a balance between restoration and degradation processes at the landscape level.

Science World Journal Vol. 20(No 3) 2025 https://dx.doi.org/10.4314/swj.v20i3.14
www.scienceworldjournal.org
ISSN: 1597-6343 (Online), ISSN: 2756-391X (Print)
Published by Faculty of Science, Kaduna State University

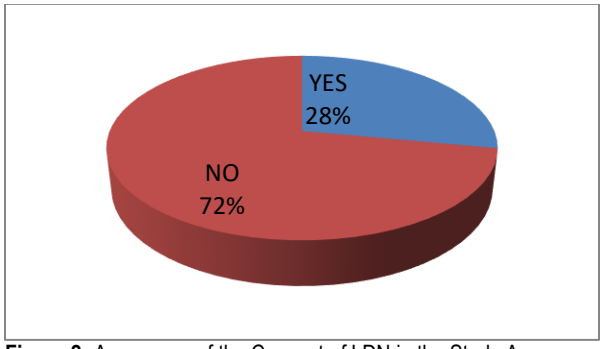

Figure 2: Awareness of the Concept of LDN in the Study Area
Source: Fieldwork, 2024

Figure 2 illustrates the awareness of the LDN concept among community members in the study area. The statistics clearly show that many of them are unfamiliar with the concept. This will have significant impacts on both the local economy and the environment. Without proper awareness, community members may not fully understand the significance of sustainable land management practices, such as afforestation, soil conservation, and sustainable agriculture, if they are not properly informed. As a result, unsustainable land use practices may exacerbate the problems of soil erosion, biodiversity loss, and land degradation.
Additionally, because degraded lands are less able to support different ecosystems and sequester carbon, it undermines attempts to mitigate climate change and preserve biodiversity. This contradicts the findings of Feng et al. (2022), who reported that the concept of land degradation neutrality is known to people in China's rural areas.
Katsina experiences a hot, semi-arid climate characterized by low rainfall and frequent droughts, particularly in its northern regions. The natural mechanisms that stop soil erosion are weakened by this little precipitation. Less organic matter returns to the soil as a result of decreased vegetation growth, which impairs the soil's fertility and moisture-holding capacity. Elevated temperatures have the potential to hasten evaporation, further desiccating the soil and increasing its vulnerability to wind erosion. According to a respondent from Zango LGA:
"One of the main causes of land degradation in our area is poor climatic conditions. Prolonged droughts reduce soil moisture, which results in the loss of vegetation cover and makes the soil more vulnerable to erosion by wind and water, which degrades the land." (KII, 2024)

Causes of Land Degradation

Overgrazing: According to some respondents, one of the main causes of land degradation in the study area is overgrazing, which happens when cattle graze an area more intensively than the vegetation can support. Overgrazing exposes the soil to wind and water erosion by removing too much plant cover. As a result, gullies and rills may form, soil fertility may be lost, and soil compaction may occur. The productivity of the land can be further decreased by overgrazing, which can also result in changes in the species makeup of plants, favoring less appetizing and frequently invading species. In the end, over grazing can turn formerly fruitful grazing grounds into arid, degraded regions, endangering pastoralists' livelihoods and accelerating desertification. This is consistent with research conducted by Abenu et al. (2023) in the Kuje area council of Abuja on smallholder farmers' perceptions of the drivers of land degradation and its effects on their livelihoods. They found that one of the main causes of land degradation is overgrazing of livestock.

Urban Expansion: According to some respondents, urban growth in Katsina may contribute to land degradation through several mechanisms. As the state's cities and towns expand, there is a greater need for residential, commercial, and industrial space, which causes woods, natural habitats, and agricultural lands to be turned into built-up regions. In turn, this can worsen problems including land degradation, desertification, and soil infertility by causing soil compaction, erosion, and plant cover loss.

Deforestation: Deforestation also contributes to land degradation in the study area, as the removal of trees exposes the soil to wind and water erosion by eliminating its natural protective cover. The result is the loss of fertile topsoil, which is necessary for agricultural productivity and plant growth. By interfering with the natural water cycle, deforestation lowers groundwater levels and raises the possibility of desertification. In addition to destroying habitats for a variety of plant and animal species, tree clearance reduces biodiversity. Additionally, deforestation can exacerbate climate change by reducing the region's capacity to absorb and store carbon dioxide, thereby contributing to global warming. One indigenous respondent from Daura remarked:
"In contrast to more contemporary energy options like gas or electricity, many impoverished households use firewood and charcoal for heating and cooking since these resources are more readily available and reasonably priced. This forces us to remove trees, which affects the stability of the local temperature, soil quality, and water retention" (FGD, 2024).

Poor Farming Practices: The respondents stated that unsustainable crop planting methods can have a major impact on land deterioration. The extensive use of monoculture cultivation, in which the same crop is planted year after year on the same plot of land without any fallow or rotational seasons, can eventually deplete soil nutrients and organic matter, resulting in land degradation. The land is deprived of vital organic matter when crop wastes are removed after harvest rather than reincorporated into the soil, which lowers the soil's fertility and water-holding capacity. Heavy machinery or excessive plowing are examples of improper tillage techniques that can cause soil erosion and compaction, further damaging the land. The issue of land degradation in the study area can be made worse by inadequate crop rotation plans, a lack of intercropping or cover cropping strategies, and the exposure of the soil to wind and water erosion during off-seasons.

Pollution: One of the main causes of Katsina's land degradation is pollution. Industrial activities such as mining and manufacturing can release hazardous pollutants into the air, water, and soil, contaminating the land and rendering it unsuitable for agriculture or other purposes. Ineffective waste management practices can lead to soil and groundwater contamination, ultimately reducing land productivity. This includes the careless disposal of both liquid and solid trash. Chemical fertilizers and pesticides used excessively in agriculture have the potential to contaminate soil and water, leading to the accumulation of toxic substances and the degradation of land quality. Air pollution from vehicle emissions and other sources can also lead to soil acidification, which reduces soil fertility and accelerates land degradation.

Science World Journal Vol. 20(No 3) 2025 https://dx.doi.org/10.4314/swj.v20i3.14
www.scienceworldjournal.org
ISSN: 1597-6343 (Online), ISSN: 2756-391X (Print)
Published by Faculty of Science, Kaduna State University

Prevalence of Land Degradation

Katsina State experiences widespread land degradation, affecting a significant portion of its land area. The findings of this study show that various forms of degradation, including soil erosion, desertification, and loss of vegetation cover, affect over 68% of the state's total land area. Large tracts of agricultural land are being lost to increasing desert conditions, making the northern portion of the state, which is in the Sahel region, especially susceptible to desertification. These places have severe land degradation, with some sections being totally unusable for human habitation or agricultural purposes (Plate 1). This is consistent with the results of James et al. (2018), who evaluated Katsina State's environmental sensitivity to desertification and found that more than 70% of the state's land area is impacted by vegetation loss, soil erosion, and desertification, with the northern region being especially vulnerable.

Plate 1: Degraded land in the Zango Local Government Area, Katsina State.
Source: Fieldwork, 2024

Changes in the Quality of Land in the Study Area

Over the past five years, residents of Zango, Daura, Mai'adua, and Baure have observed notable declines in soil quality, directly affecting agricultural productivity. One of the most pronounced changes is the substantial loss of fertile topsoil due to erosion. In Zango and Baure, increased wind erosion and sand deposition have stripped the land of its nutrient-rich layer, making it difficult for farmers to cultivate staple crops. In Daura and Mai'adua, water erosion, particularly during intense seasonal rains, has led to severe gully formation and topsoil depletion, further degrading arable land.

The lack of adequate vegetation cover across these areas has exacerbated soil erosion, reducing the soil's capacity to retain moisture and nutrients. Farmers now face declining crop yields and have become increasingly reliant on chemical fertilizers to sustain production. However, this heavy dependence on artificial inputs has further disrupted the natural nutrient cycles and microbial activity of the soil, leading to long-term soil degradation and reduced land productivity in the study sites.

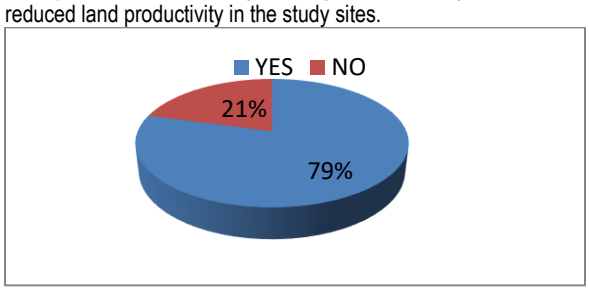

Figure 3: Community Perception of Land Quality Changes in the Study Area
Source: Fieldwork, 2024

The residents' perceptions of the land quality in their community during the last five years are shown in Figure 3. It is evident from the figure that many community members have observed alterations in soil quality over time. Agriculture, being the primary source of income for many in the study area, can also contribute significantly to environmental challenges. Food insecurity, decreased incomes, greater poverty, and economic hardship for the communities might result from the substantial fall in crop yields caused by erosion and pollution destroying valuable topsoil. This corroborates the findings of Murtala et al. (2020), who also note that residents of Katsina state have observed alterations in soil quality that have an impact on their farming operations.

Nonetheless, the study acknowledges that community members have identified several factors leading them to believe that the land's quality has changed over time (Figure 4). They predicted that the formerly fertile topsoil had thinned and become less productive, necessitating greater chemical fertilizer inputs to maintain crop yields that are still below historical levels. In addition, the soil has hardened and compacted, which has decreased its capacity to hold onto water and promote strong root development. The loss of beneficial soil microbes and salinization are among the problems they believe have resulted from an alteration in the chemical equilibrium of the soil.

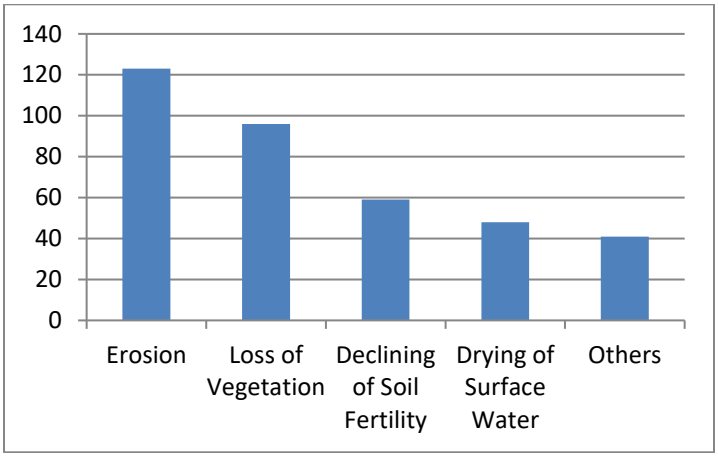

Figure 4: Community-observed changes in land quality over time
Source: Fieldwork, 2024

Community members in Zango, Daura, Mai'adua, and Baure have observed several changes that indicate worsening land degradation, as illustrated in Figure 4. One of the most significant changes reported across the study sites is soil erosion, which manifests differently depending on the location. In Zango and Baure, wind erosion is particularly severe due to sparse vegetation cover and frequent dust storms, leading to the gradual stripping away of the topsoil. In contrast, Daura and Mai'adua experience more water-induced erosion, where seasonal runoff accelerates sedimentation and gully formation, reducing land productivity.

In addition to soil erosion, community members across these areas have reported declining soil fertility, with farmers in Mai'adua and Baure specifically noting reduced crop yields due to nutrient depletion. Additionally, surface water sources have dried up, especially in Zango, where seasonal streams no longer sustain agricultural needs. The loss of vegetation has been widely reported, particularly in Daura, where deforestation for fuelwood has exacerbated land degradation. Poor soil retention capacity is

Science World Journal Vol. 20(No 3) 2025 https://dx.doi.org/10.4314/swj.v20i3.14
www.scienceworldjournal.org
ISSN: 1597-6343 (Online), ISSN: 2756-391X (Print)
Published by Faculty of Science, Kaduna State University

another key concern, making it difficult for farmers in all four areas to sustain agricultural activities without reliance on fertilizers.

These findings align with James et al. (2018), who assessed Katsina State's environmental sensitivity to desertification and identified vegetation loss, soil erosion, and declining soil fertility as key indicators of land degradation. The dynamics observed in Zango, Daura, Mai'adua, and Baure confirm that these processes are actively reshaping the landscape, necessitating urgent land management interventions.

Severity of Land Degradation

In Baure, land degradation has reached critical levels, with severe topsoil erosion and rapid desert encroachment rendering vast agricultural fields unproductive. Farmers in this area report some of the highest levels of soil infertility, which has compelled many to abandon traditional farming. Similarly, in Mai'adua, the effects of overgrazing and unsustainable farming practices have stripped the land of its once fertile topsoil, accelerating the spread of desertification. The loss of vegetation cover has left the soil exposed to wind erosion, worsening its aridity and making it increasingly difficult to sustain agriculture.

In Daura, land degradation is exacerbated by declining groundwater levels and contaminated surface water sources, leading to a severe water scarcity crisis. Households struggle to access clean drinking water, and agricultural activities suffer due to unreliable irrigation. Meanwhile, in Zango, the degradation of land is evident in the loss of biodiversity and increasing environmental fragility, making the area more vulnerable to natural disasters such as floods and prolonged dry spells.

Collectively, these localized impacts paint a dire picture of escalating land degradation across the study sites. As illustrated in Figure 5, community members overwhelmingly express growing concern over the deteriorating landscape, recognizing that the situation is rapidly worsening. The combined effects of desertification, water scarcity, biodiversity loss, and soil erosion have severely disrupted traditional livelihoods, forcing many to reconsider their means of survival. Without urgent intervention, the balance of the ecosystem in these areas will continue to destabilize, making the region increasingly susceptible to environmental shocks and long-term degradation.

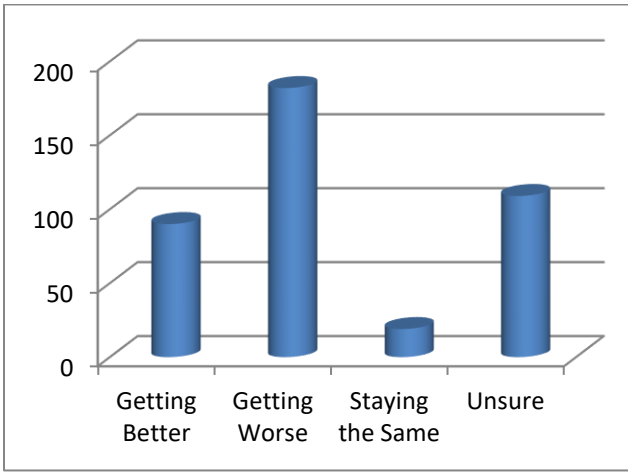

Figure 5: Community perceptions of the severity of land degradation
Source: Fieldwork, 2024

Figure 5 presents community members' perceptions of the extent of land degradation in the study area. As is evident, a sizable portion of respondents believed that land degradation was worsening and that, if left unchecked, may result in what are these issues, need to be highlighted. When compared to prior years, the respondents informed the researcher that the number of items they receive from their farmland has significantly decreased. Due to local land degradation, the ground now needs more fertilizer to produce crops than it did previously.

Extent of Land Degradation

There is concerning and pervasive land degradation in the research area. Sand dunes are creeping on once-fertile plains, rendering them unusable, and desertification has consumed vast areas, especially in the northern regions. Gully and ravine formations have spread throughout the state as a result of soil erosion by unsustainable farming methods, excessive grazing, and deforestation (Plate 2). Reduced fertility, nutrient depletion, and loss of organic matter are signs of soil degradation, which has spread widely and negatively impacts agricultural output. Deforestation has exacerbated the issue, disrupted natural equilibrium, and decreased the area's susceptibility to erosion. In their work on desertification prediction modelling in Jibia Local Government Area of Katsina state, Falaki et al. (2020) found that the northern part of the state is significantly affected by desertification, leading to widespread land degradation. This finding supports the results of the present study.

Plate 2: A Degraded Land in the Baure Local Government Area
Source: Fieldwork, 2024

Effects of Land Degradation

Across all study sites, land degradation has deepened economic hardship, reinforcing a vicious cycle of poverty and environmental decline. Farmers face mounting difficulties in sustaining their livelihoods, as they often lack the resources needed to invest in sustainable land management practices.

According to the residents of the research area specifically in Baure, land degradation has had a severe impact on agricultural productivity, as intense overgrazing and deforestation have stripped the land of its natural vegetation, leaving the soil highly susceptible to erosion. The resulting loss of soil fertility has led to significant declines in crop yields, forcing many farmers to abandon their fields. Livestock health has also declined due to the scarcity of quality grazing land, resulting in meat and dairy production, which further strains local food supplies.

Meanwhile in Mai'adua, unsustainable farming practices and continuous land use without proper soil conservation techniques

have exacerbated soil degradation, reduced moisture retention capacity and making the land increasingly arid. This has led to stunted crop growth, which has directly impacted food security, with households struggling to produce enough food to sustain themselves. Farmers in the area face dwindling income opportunities, as declining yields make it difficult to invest in better farming techniques or alternative livelihoods. In Daura, the effects of land degradation are closely linked to water scarcity, as declining groundwater levels and contaminated surface water sources reduce the availability of water for both irrigation and domestic use. The inability to access reliable water sources has further reduced agricultural output, increasing dependence on expensive food imports, and raising the cost of living for residents. Limited economic opportunities have compelled many farmers and herders to migrate in search of better conditions, often resulting in socioeconomic instability. Finally in Zango, deforestation and loss of vegetative cover have accelerated soil erosion, leaving the landscape highly vulnerable to desertification. The loss of biodiversity in the area has disrupted natural ecosystem functions, making the land less resilient to environmental shocks such as droughts and floods. This has led to chronic food shortages, increasing poverty levels, and making it harder for farmers to recover from failed harvests.

Farmers find it more difficult to break free from their fragile status as a result of the ensuing economic suffering, which feeds a vicious cycle of poverty and environmental deterioration.

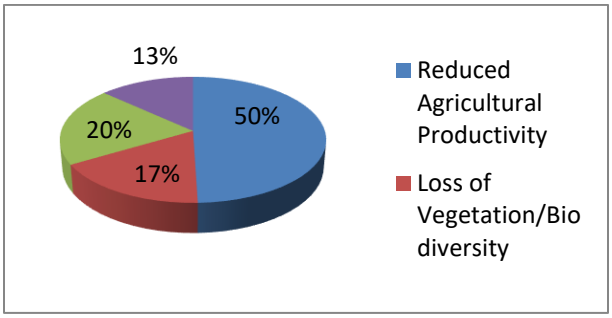

Figure 6: Effects of Land Degradation
Source: Fieldwork, 2024

The consequences of land degradation in the study area are shown in Figure 6 clearly illustrates that land degradation has multiple consequences that significantly impact the community. The majority of respondents (50%) indicated that land degradation reduces agricultural productivity leading to several adverse impacts on the population. Increased soil erosion (20%), loss of vegetation and biodiversity (17%), and decline in water quality (13%) follow. This adds to the city of Katsina's fast urbanization and rural-urban migration. Many people may be compelled to relocate to metropolitan regions in search of better living conditions and alternate work options when rural areas become more uninhabitable owing to soil erosion and land degradation. As resources and services fail to keep pace with the influx of people, rural-to-urban migration can strain urban infrastructure, increase the growth of informal settlements, and intensify social tensions in cities. Additionally, farmers and pastoralists, whose livelihoods are mostly dependent on land, are directly competing with one another. Farmers require fertile soil for crop production, whereas pastoralists depend on vast grazing land for their livestock. Their overlapping needs frequently result in conflicts over water access, grazing rights, and land use. These disputes have the potential to turn violent, especially when resources are even more limited due to drought or other adverse weather conditions. This aligns with the findings of Feldt et al. (2020) in a study conducted in Cameroon, which highlighted that land scarcity can lead to conflicts between farmers and herders.

Community Engagement in LDN Initiatives

Community engagement is vital for promoting Land Degradation Neutrality (LDN). Effective community participation in LDN efforts requires involving local communities in decision-making, awareness-raising, and implementation of LDN initiatives. This strategy ensures that communities understand the potential benefits and the importance of sustainable land management practices.

According to the research's conclusions, the study area's community members stated in an interview that they are not involved in any LDN-related initiatives. Without community involvement, new practices and regulations may encounter resistance due to a lack of local ownership and buy-in. Disengagement may exacerbate land degradation, especially if unsustainable land management practices continue. Additionally, disregarding local communities' expertise and experience may lead to the deployment of solutions that are unfeasible or culturally incorrect, which will lessen their effectiveness.

"We are not a part of any LDN-related initiatives. Not even our leaders are involved. This makes it challenging for us to comprehend the idea" (KII, 2024).

Community Involvement: The successful implementation of LDN projects relies on engaging local communities and utilizing their traditional knowledge, labour, and resources. Ensuring community ownership and participation fosters the long-term sustainability and resilience of LDN initiatives.

"No community decision involves us or consults us. Because of this, we find it challenging to comprehend any new initiatives that are presented to us. We would have given the government or any other stakeholder advice on how to properly adopt land degradation neutrality if we had been consulted" (KII, 2024).

Partnerships and Collaboration: Forming partnerships with NGOs, research institutions, international organizations, and the private sector can support the achievement of LDN by providing additional resources, expertise and innovative solutions. Sharing best practices and knowledge from other nations and regions is another benefit of collaboration.

Economic Constraints on the Adoption of LDN Practices

Financial constraints may significantly hinder community members' adoption of Land Degradation Neutrality (LDN) initiatives. Due to financial constraints, many smallholder farmers and rural communities struggle to access essential tools and technologies or to invest in sustainable land management practices. For communities with limited resources, the upfront expenses of adopting LDN practices—such as buying better seeds, fertilizer, or irrigation systems—can be unaffordable. A preference for short-term gains over long-term sustainability may result from the perceived short-term economic benefits of unsustainable land use practices outweighing the long-term benefits of implementing LDN.

Science World Journal Vol. 20(No 3) 2025 https://dx.doi.org/10.4314/swj.v20i3.14
www.scienceworldjournal.org
ISSN: 1597-6343 (Online), ISSN: 2756-391X (Print)
Published by Faculty of Science, Kaduna State University

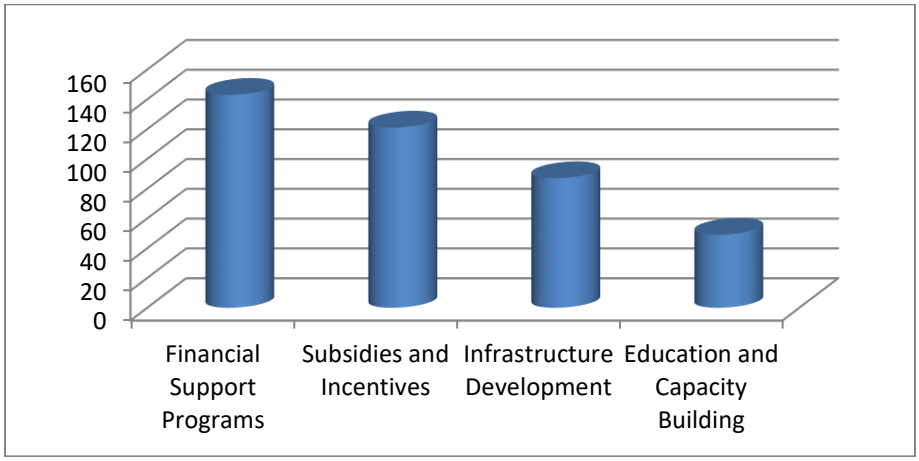

Figure 7: Strategies to Overcome Economic Constraints on the Adoption of LDN
Source: Fieldwork, 2024

Figure 7 illustrates the strategies proposed to overcome the economic barriers to the adoption of Land Degradation Neutrality (LDN) in the study area. The graph indicates that the effective approach to overcoming financial barriers to LDN adoption is through the provision of financial assistance programs, subsidies, and incentives from the government and other relevant stakeholders. These initiatives can give farmers and herders the financial support needed to purchase improved seeds, fertilizer, and irrigation systems, and implement other sustainable land management practices. This could enhance the economic viability of these practices, encouraging wider adoption and ultimately leading to greater productivity and improved land health.

Additionally, funding from private sector groups, international organizations, or public-private partnerships can support government activities and spur the larger-scale implementation of LDN projects. The findings of Allen et al. (2020), who provided an enabling environment and numerous benefits for land degradation neutrality, are not supported by this. They found that educating the public is the most effective way to overcome financial barriers to LDN adoption, as it helps people recognize the benefits of the concept.

Conclusion and Recommendation

Adopting a socio-ecological framework is necessary for effectively implementing Land Degradation Neutrality (LDN) initiatives in Katsina State. The complex relationships between social, economic, and ecological factors that contribute to land degradation necessitate a holistic approach that goes beyond straightforward technological solutions. The socio-ecological framework provides a comprehensive perspective for understanding and addressing these interconnected dynamics. By integrating social and environmental components, this framework offers a comprehensive approach that addresses land management while also boosting community resilience, encouraging equitable participation, and ensuring sustainable resource use.

This study supports a model that, when proposing a socio-ecological framework relevant to the researched area, takes into account the unique socio-economic problems of Katsina, such as poverty, limited access to sustainable technologies, and inadequate governance structures. This strategy would promote a sustainable balance between land use and community development, allowing for locally generated solutions that are consistent with ecological realities. By incorporating LDN activities into this integrated framework, the region may ultimately promote sustainable livelihoods, increase its resilience to climate change, and create an atmosphere that supports long-term ecological restoration and economic stability. Therefore, a crucial tool for achieving LDN in a just and effective way is the socio-ecological framework.

A key step toward achieving land degradation neutrality in Katsina State is the development and enforcement of a well-rounded land-use policy that brings together agriculture, forestry, and livestock management under a unified, sustainable approach. Such a policy should promote practices like agroforestry and conservation agriculture that not only boost productivity but also help preserve the environment. To make these strategies more accessible and relatable to local communities, practical demonstration plots should be established in various ecological zones across the state. These would serve as hands-on learning centers where farmers, pastoralists, and other land users can see the benefits of integrated land management in action.

Equally important is the creation and empowerment of community-based natural resource management committees. These local bodies should be trusted with the authority to guide land-use decisions and support the implementation of LDN strategies at the grassroots level. With the right training and resources, these committees can play a vital role in promoting sustainable land practices and resolving land-related conflicts, particularly between farmers and herders. Building their capacity will help strengthen community ownership of land restoration efforts and foster long-term stewardship of the environment.

REFERENCES

Abenu et al. (2023) Abenu, A., Yusufu, F. A., & Sahabo, M. M. (2023). Smallholder Farmers' Perceptions on Drivers of Land Degradation and its Impact on their Livelihoods in the Kuje Area Council of Abuja, Nigeria. Journal of Applied Sciences and Environmental Management, 27(6), 1203-1206.

Akhtar Schuster et al. (2011), Akhtar, M., Safdar, M. E., Li, X., & Rasul, G. (2022). Assessing land degradation neutrality potential in the context of ecological and socioeconomic factors in Pakistan. Land Use Policy, 118, 106123. doi:

10.1016/j.landusepol.2022.106123

Allen et al. (2020), Allen, C., Metternicht, G., Verburg, P., Akhtar-Schuster, M., da Cunha, M. I., & Santivañez, M. S. (2020). Delivering an enabling environment and multiple benefits for land degradation neutrality: Stakeholder perceptions and progress. Environmental science & policy, 114, 109-118.

Amina, 2015). Amina, I., (2015) Households' Vulnerability and Adaptation to Water Scarcity in Rural Areas Katsina state, Nigeria. Diss. University of Nairobi Kenya.

Bai, D.L., Dent, L. and Olsson, M.E. (2008). Proxy Global Assessment of Land Degradation.

Soil use and Management. 1475-2743.

El-Tantawi and Saleh, 2013). El-Tantawi, A.M. and Saleh, H. (2013) Impacts of Rainfall and Growing Season Changes on Food Crops Yield in Katsina, Northern Nigeria. Katsina Journal of Natural and Applied Sciences Vol. 3 No. 2.

Falaki et al. (2020) Falaki, M. A., Ahmed, H. T., & Akpu, B. (2020). Predictive modeling of desertification in jibia local government area of katsina state, Nigeria. The Egyptian Journal of Remote Sensing and Space Science, 23(3), 363-370.

Feldt et al. (2020), Feldt, T., Karg, H., Kadaouré, I., Bessert, L., & Schlecht, E. (2020). Growing struggle over rising demand: How land use change and complex farmer-grazier conflicts impact grazing management in the Western Highlands of Cameroon. Land Use Policy, 95, 104579.

Feng et al. (2022), Feng, S., Zhao, W., Zhan, T., Yan, Y., & Pereira, P. (2022). Land degradation neutrality: A review of progress and perspectives. Ecological indicators, 144, 109530.

Global Environmental Facility {GEF}, 2020). GEF, (2020). Global Environment Facility (GEF): Land Degradation Neutrality. Available at www.thegef.org Retrieved on 24-04-2020 at 2300hrs.

James et al. (2018), James, G. K., Jega, I. M., Halilu, A. S., Olojo, O. O., Oyewunmi, A. S., Shar, J. T., ... & Isah, A. (2018). Assessment of environmental sensitivity to desertification in Katsina State, Nigeria. Environ Ecol Res, 6(6), 545-55.

Montanarella et al. 2016). Montanarella, L., Pennock, D.J., McKenzie, N., Badraoui, M., Chude, V., Baptista, I., Mamo, M., Yemefack, M., Singh Aulakh, M., Yagi, K., and Young Hong, S. (2016). World's soils are under threat. *Soil, 2*(1), 79-82.

Murtala et al. (2020), Murtala, A. M., Weli, V. E., & Arokoyu, S. B. (2020). Implications of climate change for rural resource elements in Katsina State. J Climatol Weather Forecast, 8(1), 250.

UNCCD (2015) UNCCD. 2015. *Decision 3/COP.12. Integration of the Sustainable Development Goals and targets into the implementation of the United Nations Convention to Combat Desertification and the Intergovernmental Working Group report on land degradation neutrality*.

UNCCD (2017) United Nations Development Programme (UNDP). (2017). *Annual Report 2017*. New York: United Nations Development Programme. Available at: https://www.undp.org

Winowiecki, Vagen, and Huising 2016). Winowiecki, L., Vågen, T.-G., and Huising, J. (2016). Effects of land cover on ecosystem services in Tanzania: A spatial assessment of soil organic carbon. Geoderma 263, 274–283.