

Role of Pastoralism in Land Regeneration, Water Management and Climate Change Adaptation in Nigeria: A Historical Perspective

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Abstract: Pastoralism plays a role in nutritional, socio-economic and cultural needs of Nigerians. High cost of food importation and decline in resources to improve the nutritional standards made it essential to reduce dependency on imported produce in the country. However, pastoralists face serious problems in search of wetland and floodplains, on which they rely solely for food and water, especially during the dry season. Pastoralists are also being deprived of grazing land for reasons such as forest reserves, nature conservation and mining. They also need water for their animals and as such, its management is as important as the pastures. Hence, climate change affects the lives and activities of the pastoralist both directly and indirectly, despite their ability to easily adapt to climatic changes such as floods and droughts. High population pressure and higher demand for arable land are also threats to the pastoralist which prompted their utilization of marginal lands. This leads to constraints in grazing land, resulting in over grazing of the available ones and communal clashes that causes destruction of human and animal lives and as well as valuable properties. The literature reviewed in this article indicates that pastoralists develop rangelands ecosystems within extreme climates. It sustains the provision of goods and services to humanity and makes the soils more fertile by sequestering atmospheric carbon. SWOT-Analysis was conducted to reveal the strengths, opportunities and weaknesses of pastoralism as a system practiced in Nigeria and the way forward.

Keywords: Pastoralists, land tenure, land regeneration, water management, climate change and adaptation.

INTRODUCTION

Nigeria is the most populous country in the sub-Sahara African and largest in West Africa. It has an estimated population of over 198 million dwellers [1] occupying its land mass of approximately 923,773 Km². Nigeria enjoys a tropical climate with distinct wet and dry seasons. The pattern of rainfall in the south is bimodal while in the north it is unimodal. Ayoade [2] in an effort to explain rainfall seasonality, viewed rainfall it as the distribution pattern of rainfall on monthly basis in a defined geographical region at a given time scale and described rainfall variability as a function of space and time. The pattern and duration of the rainy season determines vegetation cover as well as agricultural systems practiced in different ecological zones. The highly varied climatic and soil conditions favour a

diverse crop and livestock production that contribute to Gross Domestic Product (GDP) of the country.

Agriculture in general contributed between 31.2% and 39.2% of the total GDP between 1986 and 1988 of which livestock accounted for about 20%. Recently, the contribution of the livestock industry to the Nigeria's GDP rose from 37.38% in 2002 to 41.91% in 2006 [3]. Transhumance is a major feature of pastoral production strategy, occasioned by seasonal alteration in the availability of fodder and water, especially in the major livestock producing areas, as well as the avoidance of *trypanosomiasis* in the high risk areas [4]. Nigerian livestock industry constitutes a very important national resource with a great deal of untapped potentials. Domestic livestock species contribute significantly to the nutritional, socio-economic and

cultural requirements of Nigerians, which can be put into productive use [4]. This could help to avoid importation of food, especially animal products into the country.

The dwindling national economy and high cost of importing food makes it imperative to turn to local producers for the bulk of the domestic supply. As a result of concern about the overall worsening of food production and nutritional situation in Nigeria, the World Bank offered to assist the country in accelerating local food production through utilization of flood plains and wetlands (*Fadama*) for dry season irrigated agricultural production. This opportunity itself posed additional challenges to pastoralist activities, owing to the fact that they rely on the same floodplains and wetlands during dry season for their livestock's food and water. It is against this background that this review was conducted to demonstrate the contribution of pastoralist in promoting land regeneration in Nigeria, water management and adaptation to climate change. In addition, SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis of pastoralist activities was conducted in order to serve as data source for policy makers and other stakeholders.

THE CONCEPT OF PASTORALISM AS A LAND-USE SYSTEM

Pastoralism is practiced in over 100 countries by an estimated 100-200 million people [5] on 25 per cent of the world's land area [6]. In recent times, there are an estimated 500 million pastoralists worldwide, majority of them in developing countries, where they face many development and poverty challenges [7]. Pastoralism is an extensive livestock production in the rangelands, practiced worldwide as a response to such unique ecological challenges. The ways different societies respond to those challenges have much in common, especially in relation to land. .

Pastoralists' livestock and land

Fostering investments in sustainable livestock development as well as in equitable and secure access to land for rural poverty reduction is recognized by the International Fund for Agricultural Development (IFAD) as a key goal to be achieved through its projects and programmes [8]. Equitable and secure access to land is a critical factor for the rural poor, especially livestock owners, who depend on agriculture and animal-related activities for their livelihood. Having secure access to land for agriculture and pastoral activities reduces their vulnerability and enhances their opportunities to invest in land for agriculture and livestock activities. Pastoral livestock use a variety of feed sources including pastures, harvested and woody crops, fallows, stubbles, mown prairies, fruits, forests, trees, heath lands and even roadsides and urban margins. This requires adequate access rights and often presents unique challenges to upholding those rights [4].

The uniqueness of pastoral lands

The land occupied by pastoralists is often referred to as rangelands. Rangeland ecosystems have largely evolved in places of climate extremes and high climatic uncertainty. Rangeland ecosystems provide many goods and services to humanity, including provision of food and fibre, regulation of water supply and sequestration of carbon [4]. Rangelands are sometimes defined in ecological terms as land on which the indigenous vegetation is predominantly grasses, grass-like plants, forbs or shrubs that are grazed or have the potential to be grazed, and which is used as a natural ecosystem for the production of grazing livestock and wildlife [9].

However, the benefits to humanity from the world's rangelands are under threat in many countries due to land degradation. Degradation of rangelands is a major global concern, although it is poorly understood. This lack of understanding has contributed to poorly-informed interventions and policies that have sometimes exacerbated degradation. Rangelands are subject to conversion to crop cultivation, over-exploitation by livestock, over-extraction of woody biomass and increased aridity due to both climate change and extraction of water. These factors of degradation are driven by population growth, growing demand for food and other products, changes in management technologies and a range of policy and institutional factors. Policy failures can, in turn, be attributed to a combination of weak resource rights and governance, weak influence capacity of rangeland stakeholders and insufficient or inaccurate data, information and knowledge [10]. Policy failures can also be attributed to misunderstanding of the concept of pastoralism or its deliberate portrayal as a form of backwardness. Herd mobility is crucial for sustainable management of rangelands, yet mobility has frequently been condemned as archaic [4]. Many rangelands depend on wildfire for their maintenance, yet pastoralists are criticized when they use fire as a management tool to renew pastures and to combat pests [25]. Evidence shows that the value of pastoralism and rangelands in most countries is greatly underestimated, and conversion of rangeland resources to other uses can have greater costs than benefits when measured across the entire system [11]. Yet despite evidence that converting rangeland to cropland is one of the most significant drivers of land degradation, overwhelmingly, many countries still focus attention on crop farming to the detriment of the health of rangelands. However, it has been observed that where mobility and customary institutions for local governance remain effective, rangeland degradation is scarce [12].

PASTORALIST COMMUNITIES IN NIGERIA

Historical Background

Pastoralism is a system of managing livestock and land for economic benefit and ecological

sustainability. A particular tool is the management of herd mobility, often over vast distances. Pastoralism is, to a large extent, an adaptation to ecological and climate variability (although, pastoralists face other sources of unpredictable circumstances, particularly, markets and political influences). Rangeland climate has strong seasonal variability that limit resource access and availability, likewise it also shows extreme inter annual variability [4]. Pastoralists are widely spread in most industrialized countries such as Australia, China, Europe, and the United States of America etc. However, the concept of pastoralism is less developed in Nigeria as it depends on a double imperative; extensive land use and freedom of movement.

According to Blench [13], Nigeria has a restricted inventory of cattle pastoralists with the most numerous and wide spread group being the Fulbe (Fulani) who lived between Senegambia to Western Sudan regions and expanded westwards from the Gambia River, over the last one thousand years. The Fulbe are now pressing the limits of the territory that can be exploited through nomadic pastoralism, both in terms of available pasture east of their original homeland in the Futa Toro in the Republic of Guinea, and south to the limits of the tsetse belts [13].

Two features of their present society reflect this; extensive sedentary life style and increase in conflict with the agrarian societies on whom they have traditionally depended for their supply of staple food for themselves and their animals. The Fulbe and the arable farmers have an interdependent relationship, based on the exchange of dairy products for grain, and a market for the animals, which be periodically sold to provide cash for domestic purposes, such as buying cloth or marriages [13]. Moreover, in many regions, Fulbe management strategies depend on access to cereal crop residues - something arable farmers readily permit for perceived advantages of manure as fertilizer.

According to Blench [13], the factors preventing Fulbe Southern expansion remain controversial, but it is likely that attempts to move out of the semi-arid region would have resulted in major losses from the trypanosomoses. Then human population densities were low, while wild animal numbers were high. This would have created a high level of tsetse challenge for the non trypanotolerant zebu owned by the Fulbe [14]. After the pacification of the Nupe hinterland and the establishment of Raḡa as the capital of the Fulbe in the 1820s, pastoralists began to move down to the low-lying pastures along the Niger River [15]. They even pressed further into the derived savannah of northern Oyo [16]. More attractive, however, were the high altitude grasslands, since disease risks were lower and pastures more palatable for the zebu. The Fulbe began to settle in the plains around the Emirate of Bauchi and moved up onto the grasslands of the Jos Plateau. A parallel expansion in

Cameroon at the same time led to the gradual colonization of the grassy uplands and humid savannas throughout the nineteenth century [17]. Thereafter, after four decades these pastoralists began to move westwards again and to colonize the Mambila and Fali Plateaux [18].

Pastoralism and pastoralist movement

In Nigeria and other countries, pastoralists are the people behind the system, managing and protecting the land and profiting from livestock. Their culture is inseparable from their herding strategies and is central to the way they govern their natural resources [4]. Pastoralist systems vary considerably across countries in the globe. However, they share some certain characteristics, most notably, their mobility. Whether transhumant or nomadic, the practice allows pastoralists to overcome ecologically diverse and difficult conditions they encounter over the course of the year. Their movements may be linked to seeking resources, escaping from seasonal diseases, conflicts or natural disasters, to taking advantage of periodic opportunities such as markets or political events or managing uncertainty about the availability of pasture [19].

Mobile pastoralism is highly suited to the management of rangelands and provides both economic and environmental benefits. Mobility contributes to ensuring access to fodder, water supply and shelter, avoiding external problems like drought, disease and conflict, and selling products in volatile markets. It is a flexible, adaptive and appropriate strategy to manage variable environments. Livestock mobility is not an end in itself, but a means for effective rangeland management and is a key tool in preventing and managing risks. However, mobility has a deep social and cultural influence among pastoralist communities and is often central to their identity and relationships. Pastoralists connect between lands where aridity or altitude limits the use options with more humid or lower altitude areas that may be shared by many other users [4].

Pastoral mobility is influenced by the condition of essential resources and infrastructure, including water points, livestock tracks, pastures and campsites. Degradation or loss of these facilities can greatly compromise mobility. Pastoralist land tenure systems need to secure such natural and artificial infrastructure while maintaining flexibility in their use. Mobility is threatened by numerous factors, including access to social, educational, health, security, or legal services. Securing governance for effective tenure of pastoral lands sometimes has to address a wide range of interrelated challenges to achieve success [4]. The mobility of pastoralists over large tracts of land is fundamental for pastoral production and their livelihoods, in particular, in arid and semi-arid areas - where mobility is also an adaptation strategy vis-à-vis climate change and it's increasing related constraints.

When the rights to ways are not regulated and/or guaranteed, a situation of conflict may arise between nomadic and sedentary groups [19].

Pastoralism land rights, tenure and risk management

Risk management is deeply rooted in the pastoralist way of life and explains many of the unique features of the system. These features are often seen as barriers to strengthening governance of tenure. Risk management strategies may have implications for governance, including perceptions of rights over livestock and their products. Care must be taken to ensure that securing tenure and strengthening governance does not inadvertently undermine the capacities to manage risk [4]. Uncertain and irregular availability of resources for pastoralists has led them to develop complex systems of resource management, regulated by customary norms that reflect this complexity [19].

Pastoralists maintain a complex web of rights over different resources within a landscape, sometimes asserting these rights infrequently. As a result, losing land and other rights is a common risk for pastoralists and communally managed lands without title are an easy target for land grabs and acquisitions. Land can be taken from pastoralists for many purposes, including cultivation on different scales, mining concessions, hunting reserves and natural conservation areas such as parks, game reserves etc. Pastoralists can also annex land from other pastoralists through the process of privatization and fencing, with harmful consequences for the wider pastoral landscape and economy [20].

Past efforts to transform the pastoral sector have inadvertently contributed to poverty, land degradation and weakening of tenure and governance. Strengthening access rights to land and resources, on the other hand, can help to overcome these setbacks and is essential to improve pastoral food security and sustainable development. However, policy makers often lack data on the contribution of pastoralism to national economy because mobile pastoralists are poorly visible to official statistics, or because such data are gathered in the market place and governments are not adequately investing in appropriate markets development and maintenance [21]. There are also intrinsic benefits to strengthening pastoral tenure. Stronger tenure can help to consolidate pastoralist identity and promote respect and awareness, inside and outside pastoral communities. It can contribute to pastoralism being perceived as a desirable livelihood, which can encourage the return of educated youths with new ideas and resources in countries where population is a major threat to pastoralism such as Nigeria [4].

Environmental benefits from secure governance of tenure

According to IFAD [19], pastoralists are often marginalized by society and their rights and interests are consequently not always reflected in policies and legislation, although they make a significant contribution to the national economy. They are often in a politically and legally weak position due to their limited visibility and lack of information about their rights. At the same time, pastoralists are wrongly considered the main cause of land degradation. But, in the contrary, sustainably managed rangelands provide many high-value environmental services that are enjoyed not only by the pastoralists themselves, but also the neighbouring communities, the nation and global society at large [4]. The global population benefits when pastoralism captures and stores large amounts of carbon in rangeland soils, contributing to mitigation of climate change [7]. The biodiversity on which pastoralism depends is also valued by others and pastoralists have many opportunities to capture some of these benefits, including tourism and public income earnings. For example, pastoralists in several African countries currently receive significant income from ecotourism on their lands, which supplement their income from livestock production and provide further incentives for sustainable management of their land [7].

THE ROLE OF PASTORALISTS IN NIGERIA

Pastoralists and land regeneration

According to SoilsForLife [22], Healthy soils are essential for healthy plant growth, human nutrition, filtration portable water and a landscape that is more resilient to the impacts of drought or flood. Healthy soil helps to regulate the Earth's climate and stores more carbon than all of the world's forests combined. Maintaining soil health is critical for biodiversity - a handful of fertile soil contains more microorganisms than human beings that have ever lived. Two-thirds of Earth's species live beneath its surface. Soil organisms contribute a wide range of essential services to the sustainable function of all ecosystems. They act as the primary driving agents of nutrient cycling, regulate the dynamics of soil organic matter, soil carbon sequestration and greenhouse gas emission. They also modify soil physical structure and water regimes; enhance the amount and efficiency of nutrient acquisition by the vegetation and plant health. These services are not only essential to the functioning of natural ecosystems but constitute an important resource for the sustainable management of agricultural systems [23]. The carbon content of the soil is one of the key indicators of its health and is a master variable that controls many of other processes. It is the carbon content of soils that largely governs their capacity to absorb, retain and supply moisture within the soil and to sustain active plant growth. Every one gram of carbon in the soil can retain up to eight grams of water [22].

Pastoralism as an extensive livestock production in the rangelands is one of the most sustainable food systems on the planet. It plays a major role in safeguarding natural capital across a quarter of the world's land area, although in many developing countries this stewardship has been eroded by decades of underinvestment and misdirected development. Rangeland ecosystems are grazing dependent. Sustainable pastoralism maintains soil fertility, soil carbon, regulates water pest and diseases, conserves biodiversity and improves fire management. Grazing lands cover five billion hectares worldwide and sequester between 200-500 kg of carbon per hectare per year, playing a leading role in climate change mitigation [7]. Livestock, cattle and goats in particular have often been painted as the enemies of sustainable land management in Africa. However, a closer look shows that when well managed, livestock can be one of the most powerful agents of land regeneration and prosperity for livestock keepers. In fact, well managed large herds of cattle, goats and sheep bring benefits to soil and plants that cannot be achieved by plants on their own; livestock, for instance, cycle nutrients and enrich the soil with manure [24].

Pastoralists and water management

Determining who will have access to water resources and when, is a key tenure issue for pastoralists. Regulations over timing of access and number of animals are based on clearly defined roles, responsibilities, rights and priorities, which require sophisticated management institutions [4]. Due to the predominant reliance on lands with low biological productivity and high variability, pastoralists require access to vast areas of land to ensure they have resources for their herds. Fodder and water are the most significant resources for pastoral livestock management. Pastoralists consume wild fruits, seeds, tubers, barks, gums and leaves. They also use many species of tree for fodder, shade, fencing, construction and fabricating household furniture and tools. When pastures are not efficiently grazed by sufficient livestock it can lead to a form of degradation called under grazing which is as severe as overgrazing and very difficult to reverse. Using the market to adjust livestock numbers and adjustment to climatic variability is seldom efficient, but instead, use of mobility to optimize their use of resources across the landscape and to avoid degradation [25] appeared to be the best approach.

Pastoralist and adaptation to climate change

Pastoralists are among the people most affected by climate change, and this has major implications for pastoral tenure. They also historically appeared to be the most adaptable of people. Pastoralism may have emerged in some parts of the world as a direct adaptation to historical periods of climate change, yet the adaptive capacity of pastoralists is being eroded. Many pastoralists have limited access to government services and have low literacy rates,

poor access to health care and security. These lead to decline in their adaptive capacity and resilience. Existing adaptation strategies may reduce risk in the medium term, but addressing fundamental development needs may be essential to enable pastoralists adapt to climate change in the long term [4].

Climate change increases the variability inherent in their environment, resulting to more drastic events like drought, flood or blizzard. The absolute extent of the rangelands change as weather patterns change are evident with some pastoral lands turning drier and perhaps more challenging to access. Meanwhile, other pastoral lands may get wetter and could come under greater pressure to convert to other uses. However, rather than costly investments in technical solutions, strengthening pastoralists' rights to enable them manage climate variability better may be an alternative [26].

PASTORALISM IN NIGERIA AND THE DANGER OF EXTINCTION

Many agrarian countries in Africa, Nigeria inclusive, are experiencing high population growth with an accompanying increased demand for arable land. The need to provide food of both crop and animal origin to meet ever growing demands necessitates opening up of lands, hitherto uncultivated including marginal lands. In many cases, especially where high population densities have led to overcrowding of existing farm lands, agricultural intensification has inevitably resulted. This kind of population-driven agricultural intensification often necessitates the adoption of certain farming techniques such as irrigation procedures and the adoption of agro-chemicals or improved organic farming techniques. Farm lands that were left to fallow for natural regeneration of the soil nutrients are fast disappearing so are grazing lands which have traditionally been provided for dry season grazing by pastoralists [4].

LESSONS LEARNED- SWOT ANALYSIS OF PASTORALISM IN NIGERIA

Strengths

1. Contribution to the GDP of the Country. Example 20% as at 1990, 37.38 in 2002 and 41.91% in 2006.
2. Provision of food and fibre.
3. Regulation of water supply.
4. Carbon sequestration.
5. Enhancing soil fertility by increasing organic matter and manure contents of the soil.
6. Cycling of nutrients and transport of seed (seed dispersion).
7. Use of the livestock for traction.
8. Conversion of marginal lands to fertile lands through regeneration process.
9. Keeping a variety of livestock species to harness a wider range of ecological niches and also buffer against uncertainty.
10. Contributes to mitigation of climate change.

Weaknesses

1. Extensively sedentary nature of the system.
2. Lack of clear understanding of the actual causes of rangeland degradation.
3. Over exploitation of livestock.
4. Over extraction of woody and non-woody biomass.
5. Increased aridity due to over extraction of water.

Opportunities

1. Tropical climate with distinct dry and wet seasons.
2. Rainfall variability with bimodal and unimodal types in the south and north respectively.
3. Vegetation cover and agricultural system practiced in the different ecological zones.
4. Secure land tenure and governance.

Threats

1. Rapid population growth and pressure on land.
2. Trypanosomiasis disease.
3. Utilization of wetlands (*fadama*) and flood plains solely for dry season irrigated agricultural production.
4. Unsecure land tenure for pasture and grazing lands.
5. Disappearance of livestock routes.
6. Lack of social services such as schools, hospitals, markets etc.
7. Extreme poverty among the pastoral family.
8. Conflicts with the agrarian societies.
9. Lack of secure access to land for pastoral activities enhances their vulnerability.
10. Restriction in livestock mobility.
11. Climate change and variability.
12. Under-grazing of pasture and rangelands.
13. Lack of the clear understanding of the actual causes of rangeland degradation.
14. Conversion of rangelands to crop cultivation.

CONCLUSIONS

The role of pastoralism in providing environmental and ecological services (such as land regeneration, water management, climate change adaptation etc) cannot be over emphasized. Many factors militate against the successful realization of these roles. Some of these factors are internal (weaknesses), while others are external (threats). To curb the menace of these negative factors, there is the dire need to properly utilize the strengths and opportunities available.

RECOMMENDATIONS

- The pastoralists should be given land use rights to enable them manage such land for pasture development or practice livestock integration as the case may be.
- More Grazing Reserves should be created while the existing ones surveyed, mapped, gazetted and properly managed.
- For the pastoralists to be encouraged to patronize the grazing reserves; pasture, veterinary and other

social services such as schools, hospitals etc. should be provided in strategic areas.

- Cattle routes should be surveyed, mapped, gazetted and protected.
- To ameliorate the land use conflicts that may arise between the farmers and the pastoralists, certain percent of the Fadama land should earmarked specifically for grazing.
- In cases of actual land use conflicts, community leaders such as the Ardos and traditional rulers should continue to mediate in conflict resolution between the various land users.
- Farmers should be encouraged to keep livestock in order to further enhance the understanding between crop and livestock farming.

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