

# **An Assessment of Sedentary Pastoralists Perception of Climate Change in and around Forest and Grazing Reserves of Semi-arid Areas of Northern, Nigeria**

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## **Abstract**

The study was aimed at assessing the Sedentary Pastoralist perception of Climate Change in and around Grazing and Forest Reserves in Semi-Arid Area of Northern, Nigeria: A total of 125 questionnaires were administered in five selected grazing and forest reserves of the study area using an accidental sampling method. The data for this study were generated using questionnaire administration and interview with community leaders (*ArDOS*). The data generated were analyzed using descriptive statistics in form of percentage and narrative form. The study shows that 42.20% of the respondents are of the view that deforestation and over-cultivation were the major factors influencing climate change. However 36% of the respondents further confirmed that the increase in the emergence of dry years was the major indicator of climate change, followed by the late onset of rainfall with 27.2%. Furthermore, 44% and 40% of the respondents admitted that climate change has significantly and partially affected water availability while 52% and 41.6% reported having noticed that climate change has significantly and partially affected the availability of pasture resources. This study concluded that human environmental intervention such as deforestation, over-cultivation among others were major factors influencing the rate of climate change in the area. The study further recommended that pastoralist should adopt to develop more resilient practices locally to cope with the impact of climate change, provision of solar and wind-powered boreholes as alternative waters sources to the sedentary pastoralists as well as the need for the desilting of degraded surface water bodies to make them more productive.

**Keywords:** *Sedentary Pastoralist, Climate Change, Forest/Grazing Reserves, Semi-arid.*

## Introduction

For a long in history, livestock production has been a leading socio-economic activity among rural dwellers. According to Yaro, Sule and Adamu (2020), livestock production is one of the most important and fastest-growing sectors of the household economy in most part semi-arid regions of Nigeria and Sub Saharan. Pastoralism involves the movement of herders and their livestock from one part of the land to another in search of water and pasture to rear the animals (Ingawa et al., 1989; FMA&RD, 2017; Abdullahi, Daneyel and Aliyara, 2015 in Yaro *et al.*, 2020).

Sedentary pastoralists are a group of people that poses the lifestyle of rearing of animal and food crop production in communities where they live. The pastoralists are generally known to be moving from one location to another but the sedentary ones restricted themselves from such movement. This group of pastoralists developed some mitigation and adaptive strategy against the movement in search of water and pasture resources.

Livestock production is among the major economic activities, it is a source of 40% of the income derived from the agricultural production sector in Nigeria (Gefu, 1992).

This study observed that pastoralism, especially sedentary pastoralism, like other agricultural production systems has been affected by climate change. By affecting the availability of water and pasture resources, climate change has also impacted the livelihood of pastoralists.

The literature on climate change and its associated impact is an important step to climate change adaptation and mitigation (Debela *et al.*, 2015; Debela *et al.*, 2019). Pastoralists use mobility to quickly respond to resources fluctuations in dryland areas (Overseas Development Institute 2009). Abubakar and Yamusa (2013) argued that climate change causes environmental challenges such as drought in the semi-arid zone of Nigeria and in turn creates a negative impact on livestock herders which leads to conflict on natural resources, food insecurity, loss and socio-economic instability. This clearly shows the need for adaptations to climate change.

The adaptations can be local or regional with planned and without planning and can involve adjustments through a variety of practices and ways to mitigate the change (Pauw 2013; Teka *et al.*, 2013; Deressa *et al.*, 2009; Bryan *et al.*, 2009 in Yaro *et al.*, 2020).

There is very little documented baseline data and information on the perception to change among the sedentary pastoralists in the study area due to many factors such as low education and awareness. This paper sought to find out the perception of sedentary pastoralists on factors influencing climate change, signs and impact of resources available as well as the coping strategies. The knowledge of climate change among the sedentary pastoralists would improve their adaptive capacity and inform decision-making processes.

## Material and Methods

### The Study Area

The study area is located between latitudes 10°N to 13°N and longitudes 07°E to 12°E (Figure 1). The study was conducted in and around five forest and grazing reserves located in the semi-arid areas of five States

of Northern Nigeria: Yobe, Bauchi, Jigawa, Kano and Katsina. The forest and grazing reserves are inhabited by sedentary pastoralists. Being semi-arid, rainfall is irregular and erratic.

There are distinct wet and dry seasons; the dry season lasts from November to May while the wet season commences from June and ends in October with the rainfall concentrated between June and September. Temperatures range between 21-28°c in the harmattan period while in the hot season the range is from 34-40°c (Olofin, Nabegu and Dambazau, 2008; Abdulazeez, Adamu and Ibrahim, 2018). The nature of rainfall distribution creates water and pasture deficit conditions that promote extensive livestock grazing activities to ameliorate the deficit (Yaro *et al.*, 2020).

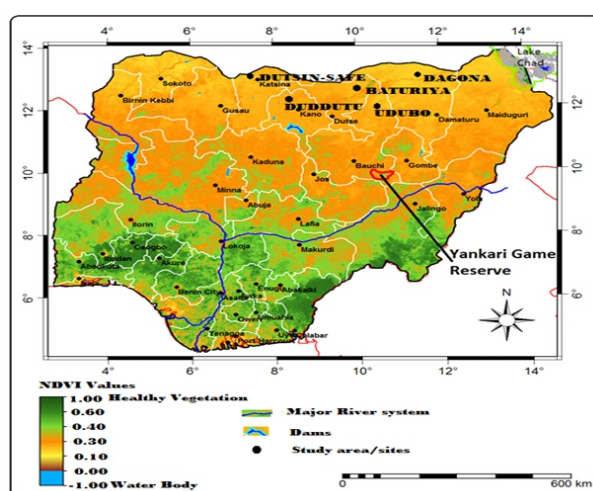


Figure 1: The map of study area showing the selected sites

### Data collection processes

The study purposively selected five sedentary places (*Mashekari*) of pastoralists across five states of the study (Table 1). It began with reconnaissance surveys in the study sites to gain familiarity with them. Snowball sampling was adopted in selecting respondent sedentary pastoralist households. Community leaders (*ArDOS*) were used to identify suitable respondents. Interviews were carried out with the

leadership of *Miyetti Allah, FulDan* and *Kautal Hore* in the selected study sites. The overall sample size for the study was 125 sedentary pastoralist households. Twenty-five questionnaires were administered in each of the selected Forest and Grazing Reserves. The result of the study was presented in Tables, percentages and plates as well as the narrative statements and incorporated in the result where necessary.

**Table 1: List of Study Sites**

S/No	Study Sites Name	LGA/State	No. of Questionnaires administered
1	Udubo Grazing Reserve	Gamawa/Bauchi	25
2	Dagona Forest Reserve	Bade/Yobe	25
3	Baturiya Forest Reserve	Kirikasamma/Jigawa	25
4	Dudduru Forest Reserve	Gaya/Kano	25
5	Dutsin Safe Forest Reserve	Jibia/ Katsina	25
<b>Total</b>			<b>125</b>

A semi-structured questionnaire was prepared and used for the survey. The questionnaire comprised of questions on household's knowledge on the factors exacerbating climate change, its impacts and the coping strategies. Some issues observed during the survey related to climate change and adaptation by herders not captured in the questionnaire were channelled to the leadership of the pastoralist's cultural groups

(*Miyetti Allah, FulDan and Kautal Hore*) for answers.

### Results and Discussions

#### Sedentary Pastoralist Perception on Factors Exacerbating Climate Change

Many studies have shown that human-environmental interventions induce climate change. The opinion of the respondents was

sought on the factors that induce climate change at the local scale within the study sites and the result was presented in Table 2. From the result, 42.4% of the respondents opined that deforestation and over-cultivation respectively were responsible for

climate change. This implies that the rate of cutting down of trees for wood fuel and over-cultivation of land gave way to the occurrence of climate change and another climate-related event such as desertification.

**Table 2: Sedentary Pastoralist Perception of Human factors inducing Climate Change**

Study sites	Sedentary Pastoralist Views on Human factors inducing Climate Change									
	Defores- tation	%	Over- cultivation	%	Bush burning	%	Over- grazing	%	Others	%
Udubo Grazing Reserve	10	8.0	12	9.	2	1.6	0	0	1	0.8
Dagona Forest Reserve	12	9.6	8	6.4	1	0.8	3	1.8	1	0.8
Baturiya Forest Reserve	10	8.0	10	8.0	1	0.8	0	0	4	3.2
Dudduru Forest Reserve	8	6.4	14	11.2	1	0.8	2	1.6	0	0
Dutsin Safe Forest Reserve	13	10.4	9	7.2	1	0.8	1	0.8	1	0.8
<b>Total</b>	<b>53</b>	<b>42.4</b>	<b>53</b>	<b>42.4</b>	<b>6</b>	<b>4.8</b>	<b>6</b>	<b>4.8</b>	<b>7</b>	<b>5.6</b>

### Sedentary Pastoralist Perception on Climate Change

Sedentary herders were asked about their perception of rainfall variability. The perception of the pastoralist on rainfall pattern and duration as well as the rate of potential evapotranspiration were sought across the selected study sites. The result of the study in Table 3 shows that four major

events were reported by the pastoralist as indicators of climate change based on their knowledge. The events are the increase in the emergence of more dry years (36%), late onsets of rainfall (27.2), early cessation of rainfall (20%) and high rate of potential evapotranspiration (16.8%). From the result, it is concluded that rainfall events variability were the major indicators of

climate change as reported by the respondents. These scenarios according to the *Ardos* interviewed seriously affects the availability of pasture and water resources for animals and the livelihood of the pastoralist. They further added that the

situation has triggered animals' mortality across the study area (Plate 1) and resulted in the adoption of non-cost effective coping strategies and the situation became worst when there is the occurrence of the drought event.



**Plate 1: Livestock mortality one of consequences of climate change to Pastoralism  
Credit to Microsoft Encarta Premium 2019**

This study agrees with Dawha (2014) which reported inconsistency and decline in the number of rainfall days coinciding with early cessation of rainfall in Nigeria affect crop and livestock production especially in the Northern part of the country. Yaro *et al.* (2020) quoting Abdullahi *et al.* (2015) and Derner *et al.*, (2008) argued that the effect of

climate change often resulted in clashes and conflict between the arable farmers and the pastoralist which has serious socio-political and economic implications. Therefore, there is a need for prompts action in this regard through capacity building on adaptation strategies to climate change both in the short and long terms.

**Table 3: Sedentary Pastoralist Perception on Climate Change**

Perception of Climate Events Variation	No. of Respondents	%
Increase in the emergence of more dry years	45	36
Late-onset of the rainfall	34	27.2
Early cessation of the rainfall	25	20
High rate of PET	21	16.8
<b>Total</b>	<b>125</b>	<b>100</b>

### Sedentary Pastoralist Perception on Impact of Climate Change on Water Availability

The availability of water surface water resources such as ponds, lakes and rivers constitute one of the most important sources for the pastoralist. Any small change in the availability of surface water will be easily felt by the pastoralists, particularly in the semi-arid regions. The result shows the views of the respondents on the extent of the impact of climate change on water resources availability.

From the result 44% were of the view that climate change significantly affects water availability, 40% reported partial effect, 4% perceived no effect while 25% of the respondents reported having no idea or

knowledge (Table 4). It is evident from the result that climate change was affecting the availability of water for livestock feeding this can be attributed to the high rate of evaporation especially in *Bazara* which significantly affected most of the surface water bodies such as rivers and streams. This implies that frequent dryness of the surface water bodies could be an indicator of climate change locally.

Chadi, Abdulhamid, Rilwanu and Sule (2019) argued that excessive dryness of the water sources such as *Lalalo* and *Bingi* was among the major constraints to indigenous water management which are climate-induced. Other factors identified that are responsible for the change in surface water bodies include siltation of the surface water

bodies. This shows the need for desilting of such water bodies as well as providing alternative water sources, particularly from solar and wind-powered boreholes. Sule (2017) observed that solar powered and wind boreholes were installed in Udubo grazing reserve by the National Livestock Development Project to provided water at

ease to the pastoralists in the area. The study further observed the excessive and frequent dryness of the surface water bodies enforced pastoralists to resort to unsustainable hand-dug wells, which are usually prone to drying up especially during the dry season (*Bazara*) as shown in plate 2.

**Table 4: Views of Pastoralist to the impact of Climate Changes on Water Availability**

Views	Number of Respondents	%
Climate change significantly affect water sources	55	44
Climate change partially affect water sources	50	40
Water sources not affected by climate change	05	4
I don't know	15	12
<b>Total</b>	<b>125</b>	<b>100</b>



**Plate 2: Pastoralist providing water for their cattle from a hand-dug well  
(Adopted from Yaro *et al.*, 2020)**



### Pastoralist Perception on the Impact of Climate Change on Pasture Resources Availability

Derner *et al.*, (2008); Shiawoya and Tsado (2011); Yaro *et al.* (2020) argued that forages are among the most important resources for livestock particularly the ruminant animals. Shiawoya and Tsado (2011) further argued that about 97% of the Nigeria ruminant animals are dependent on forage and fodder crops, which are widely spread across all the ecological zones and mostly in semi-arid areas with limited rainfall. To this end, the perception of sedentary pastoralists was asked on the impact of climate change on the availability of pasture resources.

About 52% of the respondents admitted to having noticed a reduction in the diversity of some plant species in the semi-arid areas (Table 5). Notable among these species are *Echinochloa pyramidalis (Roba)* *Pennisetum pedicellatum (Kansuwa)* and *Vetiverianigrita (Jema)* among others. Among the tree species that were noticed to

have reduced in diversity are *Kirya (Prosopis Africana)*, *Rimi (Ceiba pentendra)* and *Kurna (Ziziphusspinachrist)* among others. A similar situation was also observed by Yaro *et al.* (2020) in some selected communities of Dutsin-Ma Local Government Area. It is however reported by the leaders (*ArDOS*) that they notice the decline of natural pastures due to climate change saying different species of plant have gone extinct. The studies indicated that 41.6% of the respondents revealed that climate change partially affects the availability of pasture resources while none of the respondents reported that pasture resources not affected by climate change (Table 5).

The majority of the leaders (*ArDOS*) are of the view that the establishment of cattle colonies, restoration of encroached grazing and forest reserves will help pastoralists to cope with the decline and reduction of pasture resources in the study area.

**Table 5: Views of Pastoralist to the impact of Climate Changes on Water Availability**

Views	No. of Respondents	%
Climate change significantly affect the availability of pasture	65	52
Climate change partially affect the availability of pasture	52	41.6
Pasture resources not affected by climate change	00	00
I don't know	08	6.4
<b>Total</b>	<b>125</b>	<b>100</b>

### **Sedentary Pastoralist Coping Strategies to Climate Change**

Over the last decades, sedentary pastoralists adopted more way to cope with the impact of climate change. Yaro *et al.* (2020) reported that change in the grazing stock from grasses and shrubs force pastoralists to have alternative sources of fodder for the livestock, especially in the dry season. The result of the study shows that more than 90% of the pastoralists engaged in herding around the marginal forest and grazing reserves as well as other marginal lands (plate 3).

The result further revealed that 83% of the respondents' practised the purchase of crop residues from farmers after harvesting the farm produce while 19% of the respondents bought semi and processed animal feed to supplement the other feeding sources. Studies of Dawha (2014); Rabe (2018) and Yaro *et al.* (2020) have confirmed that rainfall frequency and distribution generally affect agricultural production and the nature of the vegetation which in turn affected the availability of the pasture resources for livestock to graze.



**Plate 3: Pastoralist grazing around marginal lands within the study area  
Adopted from Yaro *et al.* (2020)**

## Conclusion

This study concluded that human environmental intervention such as deforestation, over-cultivation among others were major factors influencing the rate of climate change in the area. The several effects of climate change on water and pasture resources availability were revealed by the study. The reduction and disappearance of some plants species were among the indicators of climate change which adversely affected pastoralists and their means of livelihood. The study observed evidence of climate change manifestation which needs to be properly monitored, mitigated and addressed. It is worth noting that research like this would serve as a background for further studies.

## Recommendations

The study recommended that

- Regular capacity building and enlightenment campaigns on climate change mitigation should be given to pastoralists.
- Cattle colonies should be established particularly in the semi-arid areas to reduce resource competition between farmers and pastoralists.
- Encroached forest and grazing reserves should be restored to tackle the conflict between herders and

farmers.

- Pastoralist should adopt to developed more resilient practices locally to cope with the impact of climate change
- The study further recommended the provision of solar and wind-powered boreholes as alternative waters sources to sedentary pastoralists.
- There is a need for the desilting of degraded surface water bodies to make them more productive.

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