



Indigenous Rangeland Management Practices and Resource Use Patterns by Agro-pastoralists in Nanton District, Ghana

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Abstract

Indigenous knowledge plays a pivotal role in the sustainable management of rangeland and the use of rangeland resources. The study was conducted with the main aim of identifying some indigenous rangeland and herd management strategies employed by agro-pastoralists in the area. Data were collected from 98 agro-pastoralists in 25 communities selected at random using structured questionnaires which contained a checklist of questions regarding indigenous rangeland and herd management practices. The study showed that the majority of the farmers (63%) practiced free grazing followed by rotational (31%) and zero-grazing (6%) systems. Majority of the farmers (77.6%) do not practice any form of herd management techniques. Whilst 12.2% practiced herd splitting, 10.2% confined their younger herds in enclosures during the rainy season where they are offered supplementary feeds. Among the factors responsible for rangeland degradation in the district were bush burning, deforestation, drought, and over-grazing. Traditional rangeland conservation practices adopted by farmers to conserve rangelands in the area were; early burning, no burning, and no felling of economic trees such as *Adansonia digitata*, *Vitellaria paradoxa* and *Diospyros mespiliformis*.

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Apart from the Fulani tribe who are pure pastoralists and do not necessarily have rights to own lands across the communities, all other farmers have unlimited access to other rangeland resources besides grazing their animals. These results suggest that a lot more effort and education are needed to enlighten farmers on the consequences of open grazing as majority of them are engaged in the practice.

Keywords: Rangeland; Sustainable management; Rangeland degradation; Agro-pastoralists; Indigenous rangeland management.

1. Introduction

Effective monitoring, evaluation, and implementation of good rangeland policies are vital for sustainable management and use of rangeland resources [29]. It is estimated that rangelands cover about 54% of the global terrestrial surface and are made up of seven different biomes namely: deserts and xeric shrublands, flooded grasslands and savannas, Mediterranean forests, woodlands and scrub, montane grasslands and shrublands, temperate grasslands and shrublands, tropical and subtropical grasslands, and tundra [27, 20].

In Africa, rangelands occupy some 43% of the total land area, which is about 5.1 million square miles. Rangelands serve as a vital source of livelihood for indigenous farmers and pastoral communities and play a pivotal role in climate change mitigation [10]. Ghana is believed to have an estimated land area of 23,884,245 hectares out of which 57% is used for agricultural purposes. Although only 4.9% of agricultural households are said to engage in livestock production in Ghana compared to 74% who practiced mixed farming, the livestock sector continues to play a pivotal role in providing livelihood support, especially for the rural population [18].

The spate of rangeland degradation especially in developing countries has been a grave concern to rangeland scientists and pastoral communities as it affects important ecosystem services such as water and food including other range resources that support the livelihoods of rural communities [30]. Although the causes of rangeland degradation are believed to be complex in nature, inappropriate knowledge of rangeland management and poor land use policies formulated by states coupled with climate change are thought to be some of the underlying causes globally [5]. The role of indigenous knowledge in the management of rangelands has played a pivotal role in sustaining rangeland resources, especially in rural communities in developing countries. Studies indicate that indigenous knowledge in rangeland management especially in Africa has played a vital role in the sustenance of rural livelihoods among pastoralist households [14, 9]. Research in Africa indicates that many pastoralists across the continent have adopted numerous indigenous rangeland management practices such as herd splitting and rotational grazing among others for maximum productivity of their grazing lands [20, 9, 25]. Despite the enormous contributions of indigenous rangeland management in ensuring judicious resource use, the concept faces many constraints such as interference in the leadership structure of farmer organizations by state institutions and the inability of these administrative bodies to formulate policies such as bye-laws and the provision of facilities such as water ponds to regulate grazing and maximize outputs [9].

Research on indigenous rangeland management has been ongoing for decades in different parts of Africa including Ghana [25, 26, 9]. Work done by [17] in Ghana looks at the role of indigenous knowledge in the

management and conservation of biodiversity in general. [2] researched the use of indigenous education in Ghanaian society in the management of forest resources. However, the scope of the subject matter is limited to the indigenous management of biodiversity in general and therefore failed to address specifically traditional rangeland management and resource exploitation strategies in Ghana, especially in the study area.

The Nanton district is among the 14 administrative districts in the Northern region of Ghana. Characteristically, the northern part of Ghana experiences a shortage of livestock feed and water, especially during the dry season because the major sources of feed for livestock in the entire northern sector are natural vegetation and crop residues and the Nanton district is no exception. Consequently, the unavailability of feed and water resources all year round is a major hindrance to livestock production not only in Nanton but the entire northern sector of Ghana which eventually affects livelihoods [15]. The objectives of this study were to; (i) identify some indigenous rangeland management practices employed by farmers to manage rangelands in the area, (ii) identify indigenous herd management strategies used by farmers to manage their herds in the district, and (iii) identify factors that facilitate rangeland degradation in the area.

2. Materials and methods

2.1. The study area

The Nanton district is one of the sixteen Metropolitan, Municipal and Districts Assemblies in the Northern region of Ghana created in 2018 with the Legislative Instrument (LI, 2347). The district was carved out of the Savelugu -Nanton District Assembly as one of the 38 newly created and upgraded district assemblies in Ghana in 2018 with Nanton as the district capital [24]. The district is located between latitude 9° 28' N and 10° 08' N and longitude 0° 39' W and 1° 02' N (see Figure 1 below). The district experiences a unimodal rainfall regime which starts from around May to October each year. The annual rainfall figures range between 1000-1150mm with peaks in August and September each year [28]. *Average annual temperatures during the day are usually above 35°C except around February to November when daily temperatures sometimes fall below 20°C at night. The vegetation is basically guinea savannah characterized by small to medium-height trees such as Adansonia digitata, Vitellaria paradoxa, Anogeissus leiocarpus and Diospyros mespiliformis [11]*

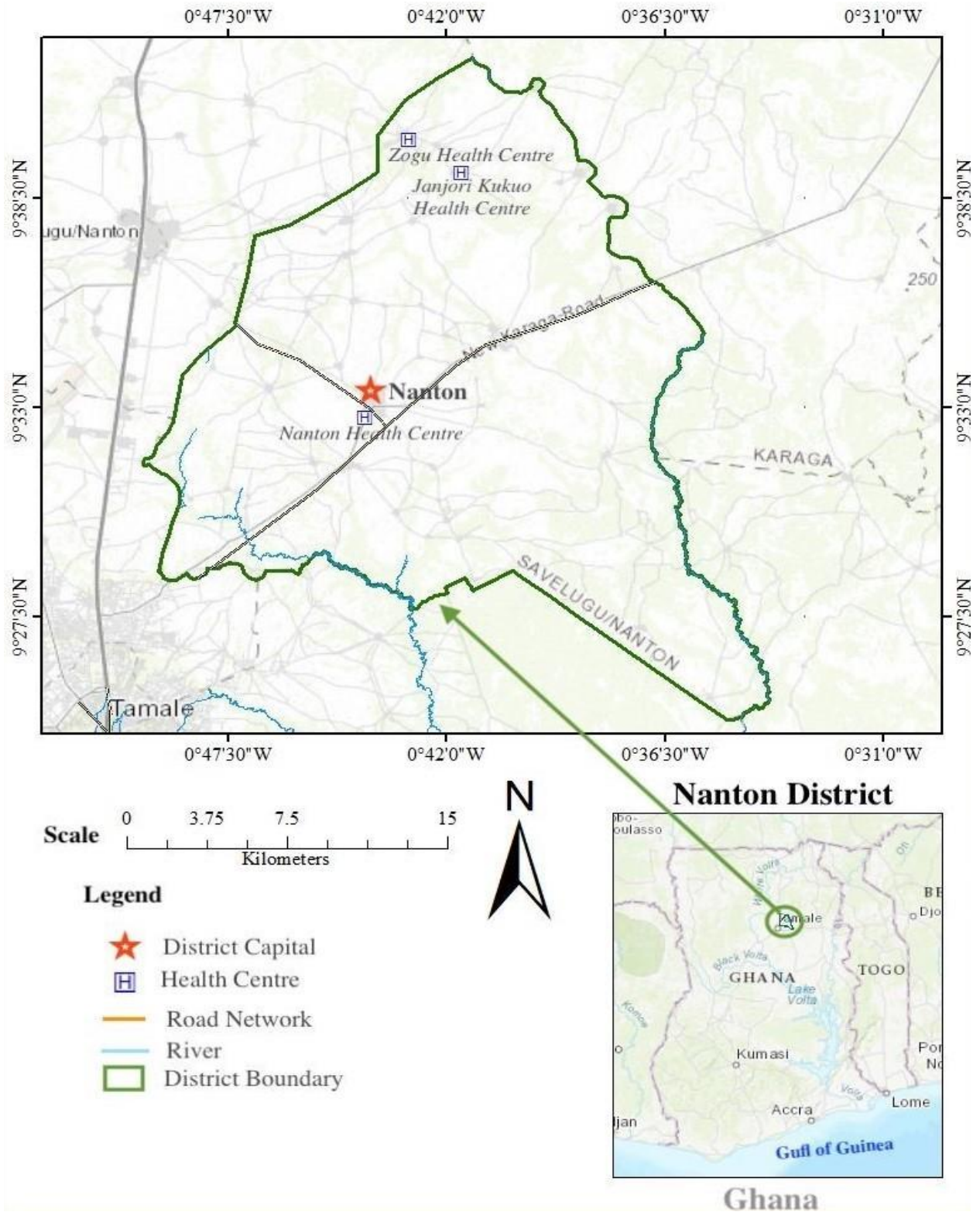


Figure 1: Map of the Study area.

2.2. Reconnaissance survey

A reconnaissance survey was conducted prior to data collection by visiting about 25 villages that were randomly selected to take part in the study. The purpose of the visit was to meet opinion leaders in the selected villages to

discuss our intentions to conduct the study and to ask for their approval. During our interactions with the inhabitants, we assured them of their personal safety and privacy regarding any information they may provide during data collection. This preliminary survey also afforded us the opportunity to acquaint ourselves with the road network in the district to facilitate the data collection.

2.3. Data collection and analysis

Structured questionnaires were designed and administered randomly to 98 interview participants in 25 communities in the district to solicit information. A checklist of questions regarding the indigenous rangeland management strategies, livestock management systems, herd management systems and rangeland resources exploitation patterns were contained in the questionnaires as indicated in (Supplementary material Appendix I). The questions were read to the participants and translated into the local language (Dagbani) through an interpreter where necessary. On average, about 25 minutes were spent on each participant depending on how quickly he or she responded to our questions. Participants for the interview were mainly peasant agro-pastoralist household heads who voluntarily partook in the survey because they were willing. All the questionnaires were retrieved from the participants and all the responses were coded. The coded data were then analyzed using the Statistical Package for Social Sciences (SPSS), 2021 version, and the results were presented using descriptive statistics.

3. Results

3.1. Demographic characteristics of participants

Majority of the participants interviewed (51.0%) did not have any form of formal education. Some of them (40.8%) however had some formal education and a few of them (8.2%) had non-formal education respectively. Respondents within the age group (31–40) constituted the majority and those who were (60+) were in the minority. Most of the respondents (95.9%) were males, whilst (4.1%) were females.

3.2. Farming systems practiced and major sources of income

Three main farming systems were practiced by respondents in the study area. These systems were mixed farming, crop farming, and pastoralism. Among these farming systems, mixed farming constituted the majority (52: 73.5%) followed by crop farming (34: 16.3%) and pastoral system (12:10.2%) respectively. The study also showed a myriad of sources from which respondents gain their income. Some of the major sources of income for local households in the area were; the sale of livestock, the sale of crops, and the sale of livestock, crops and charcoal respectively (see Figure 2 below).

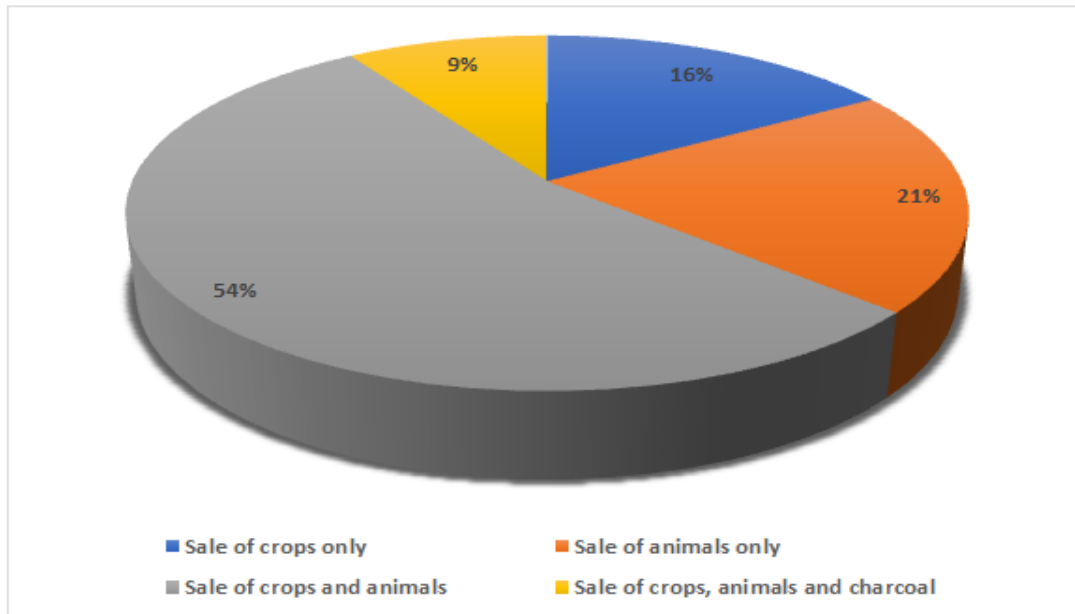


Figure 2: Major sources of income for households in Nanton district.

3.3. Land ownership characteristics and resources exploitation patterns

The study revealed three main forms of land ownership in the area. These include private or individual ownership, family inheritance, and stool or customary ownership where chiefs or other elders in the community are the custodians of the land. Majority of the respondents indicated their lands are customarily owned (73.50%). Whilst (16.3%) indicated that they own their lands by inheritance, (10.2%) claimed their lands are privately owned. The mode of range resource exploitation varied dramatically from community to community according to the results of the survey. Whilst (82.6%) of the respondents claimed that they have rights to harvest other rangeland resources besides grazing, (17.4%) claimed they required permission from the custodians of the land before they can harvest other rangeland products because they do not own the land.

3.4. Indigenous rangeland management strategies

The study uncovered three main traditional rangeland management systems practiced by livestock farmers in Nanton district. Majority of the farmers (63%) claimed they practiced free grazing, a system where the herd moves freely in search of pasture in the range. On the other hand, a few of the farmers (31%) practiced rotational and practiced zero-grazing (6%) systems respectively. The farmers also highlighted a myriad of factors that militate against the successful management of rangelands in Nanton district. Among the factors enumerated were; uncontrolled bush burning and severe drought. Majority of the respondents however believed that a combination of two or more of these factors contributes significantly to poor rangeland management in Nanton district.

3.5. Livestock and herd management systems

Farmers in the district practiced three main livestock management systems. These include the semi-intensive

system, the extensive system, and the intensive system. Majority of the farmers practiced the semi-intensive system (62.2%), whilst (23.3%) and (14.3%) practiced the extensive and intensive systems respectively. On herd management techniques, majority of the respondents (77.6%) claimed that they do not practice any form of herd management. They instead move their entire herd on a daily basis in search of good pasture and water for the herd. Whilst (12.2%) indicated that they split their herds according to age and season, (10.2%) said they sometimes confine the younger herds in enclosures, especially in the rainy season while the adult herds are moved into pastures for grazing.

3.6. Factors accounting for rangeland deterioration in Nanton

The study revealed a myriad of factors respondents claimed are contributing immensely to low rangeland productivity in Nanton district. Among the factors mentioned were; bush burning, deforestation, drought, erratic rainfall pattern, and over-grazing. Majority of the respondents (32.7%) believed that uncontrolled bush burning was the major contributing factor to low rangeland productivity in Nanton district. Whilst (22.4%) and (20.4%) claimed that all the above factors and severe drought are responsible for low rangeland productivity, 10.2%, 8.2%, and 6.1% of them mentioned deforestation, erratic rainfall pattern, and over-grazing as the factors responsible for low rangeland productivity in Nanton district.

3.7. Traditional rangeland conservation practices in Nanton

The study identified a total of five (5) traditional rangeland conservation practices which the farmers claimed they employed in the fight against rangeland degradation in Nanton district. According to the farmers, these measures are very important in sustaining rangelands in the area over the years even though they are sometimes not followed to the latter. These measures are often enforced by the traditional authorities in various villages across the district to ensure that rangeland resources are sustainably managed and utilized as indicated below in (Figure 3).

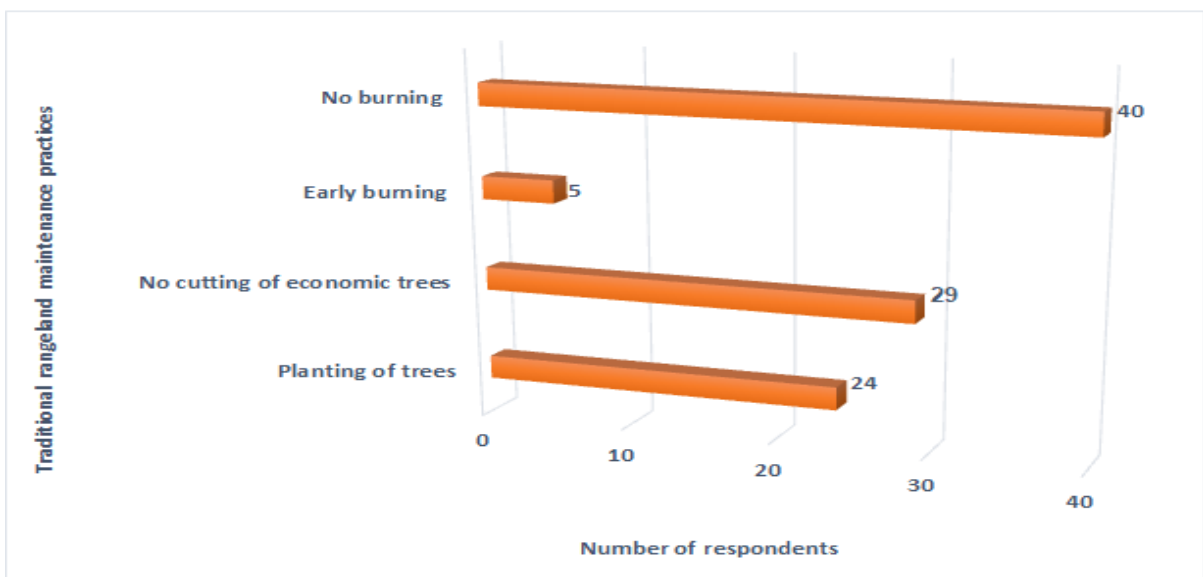


Figure 3: Traditional rangeland conservation practices in Nanton.

4. Discussions

The demographic characteristics of respondents indicated that majority of them fall within the active age brackets of 30+ years. Those who were 60+ years were few but seemed to have good knowledge about rangeland management practices than the younger generation. Males also constituted the majority whilst females were in the minority because males are usually considered heads of households in the area. Majority of the respondents were illiterates even though a few had formal and informal education but they could not proceed to the tertiary level. In related studies, [20, 22, 19] found that most indigenous farmers in Africa do not often have any form of formal education.

According to [6, 16], the major source of income for most small-scale farmers in Sub-Saharan Africa is the sale of crops and livestock. Similarly, in the present study, most of the farmers obtained their livelihoods from diverse sources. Although majority of respondents obtained their income from the sale of crops and livestock, others earn income from non-agricultural sources such as charcoal burning.

Lands in the area are largely customarily owned even though there are a few instances where lands are privately owned or inherited by some of the indigenes. Available research findings on land ownership in previous studies carried out in different parts of Ghana and elsewhere in Africa directly reflect the outcome of the current study [4, 13]. Similarly, work done by [20] in the Afden district in the Somali state of Ethiopia showed that individual ownership of lands among pastoralist communities rarely exists.

The mode of rangeland resources exploitation in this study rarely varied from one community to another. Besides the general grazing of livestock, most of the farmers are permitted to harvest any products from the rangeland. This is attributable to the fact that most of the informants are natives of the area and therefore own lands privately or by inheritance. Those who do not have the right to harvest other products from the rangeland are the pure pastoralists such as the Fulani tribes who are merely settlers and therefore require permission from the custodians of the land before they can harvest any auxiliary rangeland products. Reports from previous studies in many developing countries presented by [8, 12] indicate that pastoralists do not have clear property rights over the lands they occupy because the lands are customarily, privately, or government-owned.

The system of keeping livestock in the area varied according to species. Majority of cattle farmers were identified with the semi-intensive system because they believe it is cost-effective. However, farmers who keep other livestock species such as goats and sheep mostly practiced the extensive system because they believe that it is not labour and cost intensive. The intensive was rarely practiced by the respondents because they generally believed that it is both labour and capital-intensive [1, 3].

Majority of farmers in the area practiced the open grazing system where the herd moves freely in search of pasture and water. This can be attributed to the abundance of vast grazing lands in the area. A few others however practice rotational and zero-grazing systems. These systems of grazing directly reflect the major grazing styles of most pastoralists and agro-pastoralists in Sub-Saharan Africa as reported by [25] in different African states and [20] in the Afden district in the Somali state of Ethiopia.

The practice of dividing the herd according to age, sex, and seasonal characteristics, otherwise known as herd splitting is one of the known strategies used by pastoralists in Sub-Saharan Africa to ensure effective and efficient management of herds and rangelands as reported by [9] in the Oromia National Regional State in southern Ethiopia and [25] across different African states. In consonance with the above findings, although majority of the farmers do not practice herd splitting and seasonal migration, some of them claimed they sometimes split the herd according to age, especially during the rainy season so that special care can be given to the younger ones.

Multiple factors were mentioned by informants as those responsible for the rapid deterioration of rangelands in the area in this study. Among them were; over-grazing, deforestation, drought, and bushfires. Many respondents however contended that uncontrolled bush burning was the major factor responsible for rapid rangeland degradation. Others however believed that a combination of these factors contribute to rangeland degradation in the area. In related studies, [21, 5, 23] indicated that rangeland degradation is exacerbated by a multiplicity of factors which include overgrazing, deforestation, bushfires, and climate change.

Most of the participants in this study claimed they have adopted a number of measures which included no burning, early burning, and the avoidance of over-grazing as part of efforts to maintain rangelands in the area. In a similar vein, the application of these measures to fight against rangeland degradation in Sub-Saharan Africa has been mentioned in studies conducted by [7] in Kenya and [20] in afdem district of Sitti zone, Somali state in Ethiopia.

The findings of this study have to be seen in light of some limitations. Firstly, getting an adequate sample size for the study was constrained by long distances between communities in the study area which requires effective and efficient means of transport to commute them. Secondly, the lack of available data on indigenous rangeland management practices in northern Ghana as a whole posed a challenge to obtaining secondary data and good literature for the study. Future researchers wishing to embark on similar studies in the area should abreast themselves of these and other related limitations.

5. Management implementations

The results of this study clearly demonstrate that the Nanton district has great potential for large-scale production of livestock due to the presence of vast rangeland. However, the widespread application of the free grazing system by almost all agro-pastoralists coupled with the lack of forthright herd management systems has relegated the area to the background.

Again, the lack of local grazing bye-laws in the area by the local authorities makes the area prone to rangeland degradation. The level of awareness of rangeland degradation and efforts to combat it however remains very high among the participants but a lot more needs to be done in terms of public education and sensitization. It is recommended that; (i) local grazing bye-laws should be formulated and implemented by the local authorities to regulate open grazing in the area, (ii) further research in the area should aim at assessing the impacts of free grazing in the area.

6. Ethics Statement

The study was carried out in accordance with the ethics guidelines of the University for Development Studies, Tamale. All the methods designed for data collection were approved by the Faculty of Natural Resources and Environment's Ethics Committee of the University. The authors held brief discussions with the informants prior to data collection to seek their consent and to explain to them the purpose of this study. All informants were assured of their personal safety and anonymity regarding any information provided.

7. Conflict of interest

The authors of this study have declared that there is no competing interest regarding the study.

8. Data and material availability

The data and other materials collected including the questionnaires with a checklist of questions have been included in the manuscript.

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Supplementary materials

Appendix I

QUESTIONNAIRES TO ASSESS INDIGENOUS RANGELAND MANAGEMENT

PRACTICES AND RESOURCE EXPLOITATION PATTERN BY AGRO-PASTORALISTS IN NANTON DISTRICT IN NORTHERN REGION, GHANA

Dear interviewee, we are researchers from the University for Development Studies who are embarking on a study to assess indigenous strategies used by agro-pastoralists to manage rangelands and how you exploit rangeland resources in this area. our main aim is to provide data for academic purposes but not to incriminate anyone in this study. Whatever information you provide here will only be used for the intended purpose. This survey is conducted in strict accordance with the laid down rules and regulations of the university. The questionnaires are to be filled out anonymously and all information contained in them shall be kept strictly confidential. Thank you for your support and cooperation.

Q1. Name of Community.....

Q2. Gender. 1. Male 2. Female

Q3. Age of respondent

1. 20 –30 2. 31 – 40 3. 41 –50 4. 51- 60 5. 61 and Above

Q4. Educational status of the respondent

1. Illiterate 2. Primary school 3. Junior high school 4. Senior high school 5. Tertiary
6. non-formal education

Q5. What farming system do you practice?

1. Mixed farming 2. Crop farming only 3. Pastoral system only

4. Others specify.....

Q6. Apart from farming what other job (s) do you do?

1. Petty trading 2. Charcoal burning 3. Others specify.....

Q7. Mention your main source(s) of income

1. Sale livestock only 2. Sale of crops only 3. Sale of both livestock and crops
4. Others specify.....

Q8. Who owns the land you are grazing your animals/farming on?

1. It is my own land 2. It is a family land/inheritance 3. It is owned by the chief of the community
4. It is owned by the government 5. Others specify.....

Q9. Do you have separate lands purposely for grazing?

1. Yes 2. No

Q10. Apart from grazing your animals/farming, what other resources do you exploit from your rangeland?

1. Wood products/tree fruits 2. Minerals harvesting 3. Hunting
4. I am not permitted to harvest anything 5. Others specify.....

Q11. Do you require permission from any authority before you can harvest any rangeland resources? 1.

- Yes 2. No

Q12. Do you have adequate water supply throughout the year? 1. Yes 2. No

Q13. Apart from rainfall, what other sources (s) of water are available for your

livestock and crops?

1. No other sources 2. Dam 3. Irrigation systems 4. Other specify.....

Q14. Is the rainfall pattern good and adequate in your area?

1. Yes 2. No

Q15. What livestock management system do you practice?

1. Intensive system 2. Semi-intensive system 3. Extensive system

Q16. How do you manage rangelands traditionally in your area?

1. Free grazing
2. Rotational grazing
3. Zero grazing
4. Others specify.....

Q17. How do you manage your herd/flock to ensure maximum utilization of the rangeland?

1. I split the herd based on age, sex, and of type animals
2. I migrate the entire herd daily
3. Others specify.....

Q18a. Do rangelands in this community produce to their maximum?

1. Yes
2. No

Q18b. If no, what do you think accounts for the low productivity of rangelands in this community?

1. Deforestation
2. Over-grazing
3. Drought
4. Bush burning
5. Erratic rainfall pattern
6. Others specify.....

Q19. What are some of the bye-laws regarding grazing in this area?

1. No bye-laws
2. No burning
2. No open grazing
3. No harvesting of fodder

Q20. Do you envisage any improvement in the range condition in the near future?

1. Yes
2. No

Thank you very much for your time.