THE IMPACTS OF LAND TENURE SYSTEMS ON RANGELAND PRODUCTIVITY, HEALTH AND RESOURCE USE CONFLICTS IN NORTHERN TANZANIA

ELIENGERASIA GODLIVING KOKA

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EXTENDED ABSTRACT

Worldwide, rangelands comprise the largest land use, estimated to cover about 25% of Earth's land surface. Rangelands cover at least 10 million km^2 of the earth's land surface and are estimated to cover about 66% of the land surface in Africa. Although there are variations among countries, for example rangeland cover 44% in Uganda, 65% in Ethiopia, in Tanzania 74%, and 80% in Kenya. Land tenure in rangeland is often categorized as private, communal, open access, and state rangeland. Conflict in rangelands can happen between different groups like pastoralists and other pastoralists, pastoralists and crop growers, crop growers and rangelands management, pastoralists and rangelands management and boundary conflict, although conflict between pastoralist and crop growers is common in many areas in Tanzania. The study aims to assess the impact of land tenure change on rangeland health, productivity and resource use conflicts.

Two rangelands from different tenure system were selected. Data on vegetation, above ground biomass, soil organic carbon (SOC), species composition, and diversity were collected from 90 rectangular plots (20 x 50 m) distributed randomly in selected rangelands managed under open access and communal management. Perceptions on resource use conflicts and drivers were assessed through a semi-structured interview with 180 households from six villages. An independent *t*-test was used to compare differences in vegetation biomass, species diversity, and Soil Organic Carbon (SOC) between open access and communal rangelands. Two Way Cluster Analysis (TWCA) was used to assess plant species assemblage in both rangelands. Descriptive analyses were used to assess trends in resource use conflicts in the two rangelands.

Results show that the herbaceous biomass and Soil organic carbon were significantly ($P<0.001$) higher in communal rangelands than in open access rangelands. The abundance, richness and diversity of woody plant species were significantly higher in communal than open access rangelands. In herbaceous plant species there is no significantly difference in richness, diversity and evenness between communal and open access area. Three unpalatable species in communal and six unpalatable species in open access were identified. Alien invasive species such as *Calotropis procera* and *Prosopis juliflora* were found in open access but absent in communal rangelands. Communities perceived that resource use conflicts were significantly higher in the open-access than communally managed rangelands; there were three main forms of conflict and five main drives of conflict in study area. Also, the results show that trends of conflict were high in open access area compared to communal rangeland area. Generally, Communal rangeland was healthier and productive than open access area in terms of aboveground biomass, Soil organic carbon, species composition and palatability of species.

DECLARATION

I, Eliengerasia Godliving Koka declare to the senate of Sokoine University of Agriculture that this dissertation is my own original work done within the period of registration and that it has neither been submitted nor being concurrently submitted in other institution.

_____ _____

Eliengerasia G. Koka **Date**

(MSc. Candidate)

The above declaration is confirmed by;

_____ _____

Dr. Charles J. Kilawe **Date**

(Main Supervisor)

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DEDICATION

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LIST OF ABBREVIATION AND ACRONYMS

E	Easting
Ha	Hectare
m	Meter
Min	Minute
Mm	Millimeter
N	Northings
Cm	Centimeters
DBH	Diameter at breast height
FAO	Food and Agriculture Organization of the United Nations
SUA	Sokoine University of Agriculture
SOC	Soil Organic Carbon
°C	Centigrade
Km	Kilometer
Kg	Kilogram

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Grazing is an important use for rangelands, but rangelands are not defined by grazing (Swette and Lambin, 2021). Besides producing forage for domestic and wild animals, a range can provide timber, minerals, natural beauty, and recreational opportunities. Rangelands are lands on which the indigenous vegetation is predominantly grasses, grass-like plants, forbs, or shrubs and are managed as a natural ecosystem (Ghobadi and Moameri, 2021). Worldwide, rangelands comprise the largest land use, estimated to cover about 25% of Earth's land surface (Zerga, 2015). The major rangeland types in world are grasslands, desert shrublands, savanna woodlands, forests, and tundra (Di Virgilio *et al.*, 2019). Each of these rangeland types has several unique plant associations that host a variety of different biota depending on the climate, soils, and human influences (Biggs and Huntsinger, 2021; Di Virgilio *et al.*, 2019). The type of rangeland must be considered when planning management activities because they differ in precipitation, soils, and terrain, therefore, management practices that work well in one region may be unsuitable for another region (Wang *et al.,* 2020). Rangeland management is a professional field whose aim is to ensure a sustained yield of rangeland products while protecting and improving the basic range resources of soil, water, plant and animal life (Kutugata, 2020).

Rangeland degradation is a decrease in plant species diversity, plant height, vegetation cover and plant productivity (Tarii, 2021). Recently, degradation in rangeland has also come to mean deterioration in ecosystem services and functions, such as decreased water and soil conservation, recreation values and carbon balance (Tarii, 2021; Zerga, 2015). Major causes of rangeland degradation are loss of perennial grass cover and increase in annuals, unpalatable forbs and bush cover, conversion of rangeland to cropland, wood

harvesting and over-grazing (Musa *et al*.,2016). Rangeland restoration includes the creation and preservation of nature environments, resulting in increased plant biodiversity, a reduction in the number of endangered plants species, and a reduction in weeds and invasive species (Zerga, 2015). Ecological restoration aims to recreate, initiate, or accelerate the recovery of an ecosystem that has been disturbed (Papanastasis, 2017). Common disturbances in rangeland include intense grazing, invasive species, and fires (Atkinson and Bonser, 2020; Tessens, 2021). Restoration activities may be designed to replicate a pre-disturbance rangeland ecosystem or to create a new ecosystem where it had not previously occurred (Vaughn, 2011).

Land tenure in mostly Africa country is usually portrayed as either customary/traditional, or state/statutory (Cotula *et al.*, 2004). Customary land tenure is characterized by its largely unwritten nature, is based on local practices and norms, and is flexible, negotiable and location specific. Customary systems are usually managed by a land or village chief, traditional ruler or council of elders. In this context, “traditions” are continuously reinvented to back conflicting claims of different social groups. State systems of land tenure are usually based on written laws and regulations, on acts of centralized or decentralized government agencies and on judicial decisions (Cotula *et al.*, 2004). Land acquisition and tenure for rangelands in Tanzania is mainly based on birth-rights, close family ties, land acquired from village governments and purchased lands (Selemani, 2014). More than 50 % of rangeland lands have been acquired through inheritance based on birth-rights or close family ties (Kadigi *et al.*, 2007). Land tenure refers to the ownership or holding (*tenere*=to hold, Latin) of the many rights and responsibilities associated with a parcel of land (Herrera and Da Passano, 2006). These rights may include the right of access to the land, the right to control products from the land, the right of succession, the right of transfer and the right to determine changes in land use (FAO,

2002; Herrera and Da Passano, 2006). Importantly, land tenure also encompasses obligations to maintain the land. Land tenure arrangements may be formal (recognized by the state) or informal (traditional or customary) and throughout the world they take a myriad of forms (Bohannan, 2018).

Resource use conflicts in Africa rangelands are very common (Thebaud and Batterbury 2001). Drivers of conflict vary from place to place but in Africa increase in human and livestock population raise a serious competition and conflicts over land resources (Selemani, 2014). In Tanzania, the number and type of conflicts have been increasing and hostility has been intensified over the last decades, often leading to violence, loss of life and food insecurity (Mwamfupe, 2015; Shemwetta and Kideghesho, 2000). The rapid increase in human population and livestock in Tanzania has raised a demand of land for grazing and crop production, which inevitably has led to land use conflicts (Selemani, 2014). Conflict can occur between pastoralists and other pastoralists, pastoralists and farmers, farmers and rangelands management, pastoralists and rangelands management and boundary conflict, although conflict between pastoralist and crop growers is common in many areas in Tanzania (Fernandez-Gimenez and Le Febre, 2006; Saruni *et al.,* 2018).

1.2 Objectives

1.2.1 Main objectives

To assess the impact of land tenure system on rangeland health, productivity and resource use conflicts.

1.2.2 Specific objectives

1. To assess the impact of land tenure system on rangelands health and productivity, and
2. To assess the impact of land tenure system on conflict rapprochement

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CHAPTER TWO

MANUSCRIPT ONE

2.0 THE IMPACTS OF LAND TENURE SYSTEMS ON RANGELAND PRODUCTIVITY AND HEALTH IN NORTHERN TANZANIA

Eliengerasia G. Koka[1], Alfred K. Chitiki[1], Ismael Selemani[2], Urs Schaffner[3], Charles J. Kilawe[1]

[1]Departments of Ecosystems and Conservation, College of Forestry, Wildlife and Tourism, Sokoine University of Agriculture, P. O. Box 3010, Morogoro, Tanzania.

[2]Department of Animal, Aquaculture and Range Sciences, College of Agriculture, Sokoine University of Agriculture, P. O. Box 3004, Morogoro, Tanzania.

[3]CABI, Delémont, Switzerland.

ABSTRACT

This study investigated the impact of land tenure system on rangeland productivity and health. Data on vegetation above ground biomass, soil organic carbon (SOC), species composition, and diversity were collected from 90 rectangular plots (20 x 50 m) distributed randomly in selected rangelands managed under open access and communal management. In each plot, one sub-plot (10 x 10 m), and five sub-sub-plots (0.5 x 0.5 m) were established in the center of the main plot. An independent *t*-test was used to compare differences in vegetation biomass, species diversity, and Soil Organic Carbon (SOC) between open access and communal rangelands. Two Way Cluster Analysis (TWCA) was used to assess plant species assemblage in both rangelands. Results show that the herbaceous biomass, SOC, and the richness of woody plant species were significantly ($P<0.001$) higher in communal rangelands than in open access rangelands. Alien invasive shrubs such as *Calotropis procera* and *Prosopis juliflora* were found in open access but absent in communal rangelands. Communal rangeland was healthier and productive than open access area in terms of aboveground biomass, Soil organic carbon, species composition and palatability of species.

Keywords: Drylands; Restoration; Simanjiro; Invasive species, Land tenure

2.1 INTRODUCTION

Rangelands cover about 10 million km^2 of the earth's land surface (Getabalew and Alemneh, 2019), and are estimated to cover about 66% of the land surface in Africa, although there are variations among countries. For example, rangeland cover 106 056 km^2 (44%) in Uganda, 717 600km^2 (65%) in Ethiopia, in Tanzania 699 364 km^2 (74%), and 4 642 943km^2 (80%) in Kenya (Cotula *et al.,* 2004; Mwilawa *et al*., 2008). Rangelands comprise the biome, providing ecosystem services and provide the greatest benefit to society when are used for multiple purposes (Ramoelo *et al*., 2015; Yahdjian *et al.*, 2015). Rangelands support the livelihoods of millions of people (Lund, 2007; Maczko *et al.,* 2004), however, the increasing population together with land-use change has resulted in much of these ecosystems being degraded. Rangeland health is the degree to which the integrity of the soil and ecological processes of rangeland ecosystems are sustained. Rangeland health can be measured by soil organic carbon, species composition and diversity. Rangeland productivity is measured by above ground biomass.

Land tenure is the relationship that individuals and groups hold for land and land-based resources, such as trees, minerals, pastures, and water. Land tenure rules define how property rights to land are allocated, transferred, used, or managed in a particular society (Essougong and Teguia, 2019; Sylivester, 2013). However, the issues related to how land rights are distributed and used is normally complex. According to FAO (2002), land tenure systems in rangeland is often categorized as private, communal, open access, and state (FAO, 2002). Communal rangeland is formed when more than one village contributes an amount of land to form one area potential for grazing (Awgachew *et al*., 2015). The right of commons exists within a community where each member has a right to use independently the holdings of the community. For example, only members of the community (community members from villages forming the rangeland) have the right to graze cattle on a communal rangeland (FAO, 2002). Communal rangelands are governed

by rules and regulation for grazing and have leadership committees and in some cases possessed a certificate of land and resource ownership (Allreke Wählhammar, 2020; Namubiru-Mwaura, 2014). In the contrary, the Open-access are areas where specific rights are not assigned to anyone and no one can be excluded and therefore, resources are free access to all (FAO, 2002). In addition, there is no rules or regulations governing the rangeland resources and the certificate of ownership is individual (Flintan *et al.*, 2019). An important difference between open access and communal systems is that under a communal system non-members of the community are excluded from using the common areas (FAO, 2002; Namubiru-Mwaura, 2014).

It is argued that a change in land tenure system from open access to communal land ownership and management would restore the rangelands' integrity (Awgachew *et al.*, 2015; Flintan *et al.*, 2019; Mwamfupe, 2015). Under communal land tenure, villages share resources such as grazing area and water, jointly implement village land use plans (Selemani, 2014; Senda *et al.*, 2020). Flintan *et al.*, (2019) showed that communal rangeland management in Ethiopia has contributed to better rangeland health, productivity, and conflict resolution. Similar findings were reported in Kenya where the management of rangeland was improved, livestock production increased, and reduced pastoralist mobility in communal rangelands (Boone *et al.*, 2005; Kihiu & Amuakwa-Mensah, 2015; Serneels and Lambin, 2001). In Tanzania, it is well understood that communal rangelands are being practiced (Flintan *et al.*, 2019; Selemani *et al.*, 2012; Selemani, 2014) but there is inadequate information that shows if the change in land tenure system results in the improvement of the rangeland health and productivity, therefore, this paper assessed the impact of land tenure system on rangeland health and productivity. The result of this paper will help land planer, policymakers, decision-

makers and other stakeholders on understanding the best ways of managing grazing land resources for effective policies implementation and restoration of rangelands.

2.2 METHODOLOGY

2.2.1 Study Area Description

This study was conducted in Simanjiro District in Northern Tanzania. The district is found between latitude 3°52’ and 4°24’ South and 36°05’and 36°39’ East (Fig. 2.1). The district receives an annual rainfall of 650 mm per year while its average daily temperature varies between 18-35°C. The district covers an area of about 19 928 km^2 and most of which is covered by open woodland and grassland vegetation (Nyaruhucha *et al.,* 2006). The main economic activities in the area include livestock keeping, farming, and hunting. Pastoralism in the district is practiced in the open-access rangelands and few communal and private rangelands (Mosha *et al.,* 2018).

Like in many other areas, land tenure in the rangelands of Simanjiro is changing from open access to communal ownership or private. In 2017 three villages namely Nyumba ya Mungu, Lemkuna, and Ngorika formed communal rangeland known as Iltoto (see Fig 2.1). The villages set aside about 2,000 ha of land for dry season grazing and approved a land-use plan and by-laws that facilitate effective management of the rangeland. Iltoto rangeland is managed by the rangeland management committee and ward executive office of Nyumba ya Mungu whereby there are five representatives from each village. In additional in Iltoto rangeland there is exclusion of grazing during the rainy season (April to August) and grazed during the peak of the dry season (September to March).

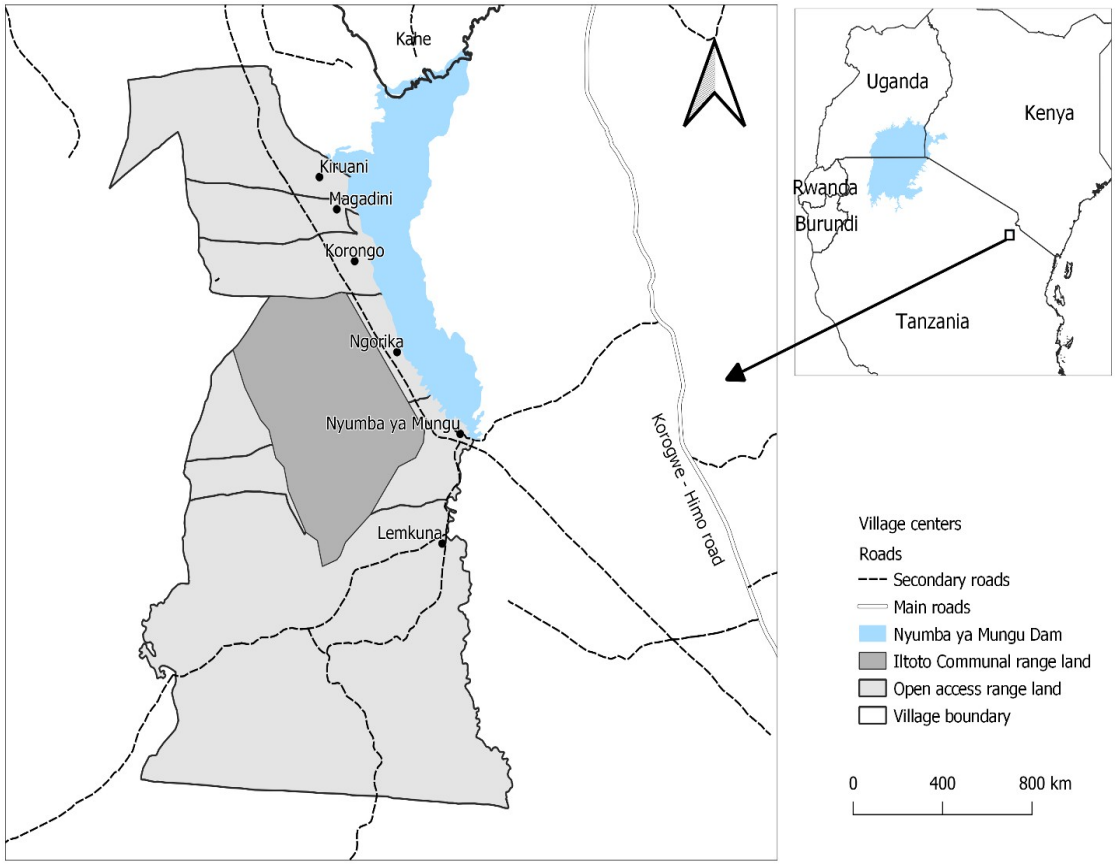

Figure 2.1: A map of the study area showing rangelands under open access and communal land tenure

2.2.2 Study Design

Two rangelands were purposively selected. The first rangeland was under open access and the second one under communal management. The rangelands are located in one area to avoid differences that may be associated with climate, soils, topography, or grazing regime. The sub-villages that have contributed land to the formation of rangeland were a basis for the stratification. On each rangeland, 45 rectangular plots (20 x 50 m) were randomly established making 90 total plots. On each main plot (20m x 50 m), one sub-plots (10 x 10 m), and five sub-sub-plots (0.5 x 0.5 m) were made were established at the center of the main plot.

2.2.3 Data collection

The abundance, species composition, stem DBH (Diameter at breast height), and height for all trees with dbh ≥10 cm was recorded on each main plot, and those with dbh 10< and 5≥ were recorded on sub-plot, and those with DBH< 5cm and grasses were recorded on each sub-sub plot, loose soil samples were collected at 0-15cm depth from main plots. Soil sampling was collected from five points (four cardinal points and center of the plots) to form a composite sample to determine Soil Organic Carbon (SOC). On each sub-sub plot disc pasture meter (60cm) was used for estimating and comparing the aboveground herbaceous biomass of two selected rangelands. This equipment relates the settling height of an Aluminum disc to the standing crop of the herbaceous layer (Harmse *et al.,* 2019; Trollope & Potgieter, 1986).

2.2.4 Data Analysis

Above ground herbaceous biomass at a plot level was computed using the equation Y = 0.004 + (0.5652*x) (Selemani et al., 2013). Where Y= biomass (kg/ha) and x= disc height (m). The above-ground biomass of woody plant was computed using the equation B= 0.1603* dbh$^{\wedge 2.3396}$ Where B= biomass (kg/ha) and dbh= diameter at breast height (cm). The Soil organic carbon was determined by Walkley-Black wet oxidation method (Nelson & Sommers, 1996). Plant species identified from 90 plots in two rangeland systems were entered in MS Excel and grouped into two broad categories (herbaceous plant species and woody plant species) to obtain plant species composition and abundance. The data were entered in PCORD Version 6 software (MjM Software, Gleneden Beach, Oregon, U.S.A) to calculate plant species diversity (Shannon's diversity *H'*, Simpson *D*', and Evenness *E'*) at a plot level. An independent *t*-test was used to compare differences in aboveground biomass, Soil organic carbon, species richness, and diversity between sample plots in open

access and communal rangelands. Two Way Cluster Analysis (TWCA) was used to assess plant species assemblage in both rangelands.

2.3 RESULTS

2.3.1 Rangeland productivity

The result shows that above-ground herbaceous biomass was significantly ($P<0.001$) higher in communal rangelands than in open access rangelands (Fig. 2.2a). On average, the communal rangeland yields five times higher aboveground herbaceous biomass than open access areas. On the contrary, the above-ground biomass of trees and shrubs was higher in open access than in communal rangelands, but the difference was not statistically significant (Fig. 2.2b).

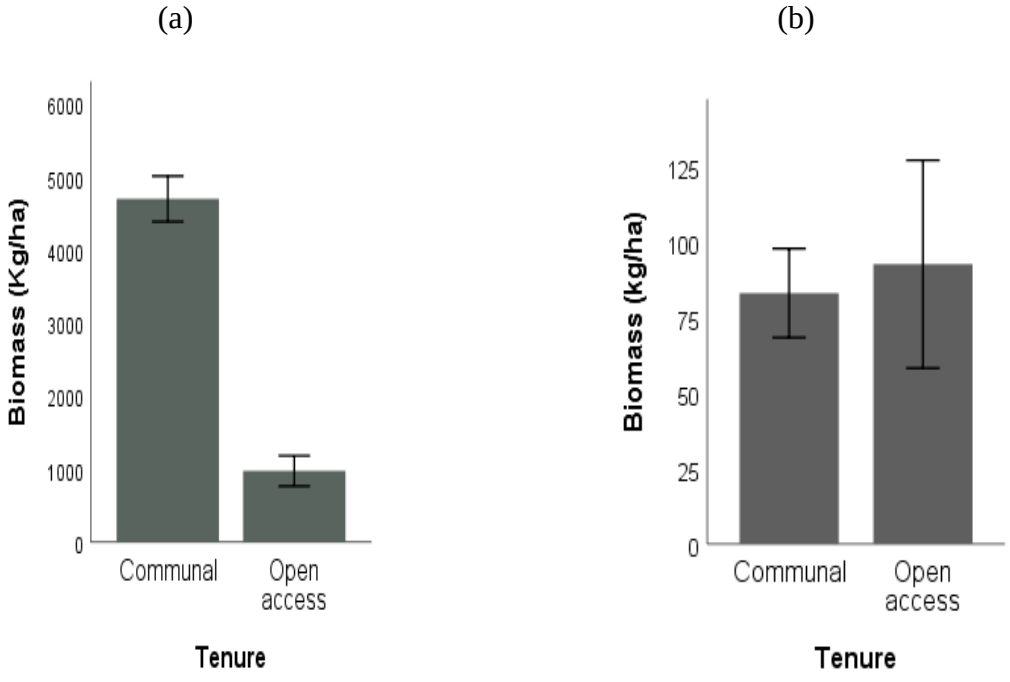

Figure 2.2: The aboveground biomass for (a) herbaceous plant species (b) woody plant species in open access and communal rangelands

2.3.2 Rangeland health

The results show that communal rangelands were healthier than the open access rangelands in terms of soil fertility and vegetation composition. The SOC was significantly higher in communal rangeland than open access (Fig. 2.3). A total of 51 woody plant and 25 herbaceous plant species where identified (appendix 1 and 2). Furthermore, the abundance and diversity of woody plant species were significantly ($P<0.05$) higher in open access rangelands than communal rangeland (Table 2.1). Generally, the dissimilarities of plots in open access were smaller than those in communal rangelands (Fig. 2.4). Some species such as *Ceonotirs nepetifolia*, *Conyza bonariensis Cymbopogon afronardus, Justicia procumbens* and *Solanum incanum* were abundant in communal but absent in open access. On the other hand, *Achyranthes orthacantus, Adenia globose, Conyza stricia, Cucumis dipsaceus, Harpachne schimperi, Hetropium indicum, Momordica foetida, Ocimum basilicum* and *Sporobolus dives* were abundant in open access but absent in communal rangeland (Appendix 1). Alien invasive shrubs such as *Calotropis procera* and *Prosopis juliflora* were dominant in open access but absent in communal rangelands.

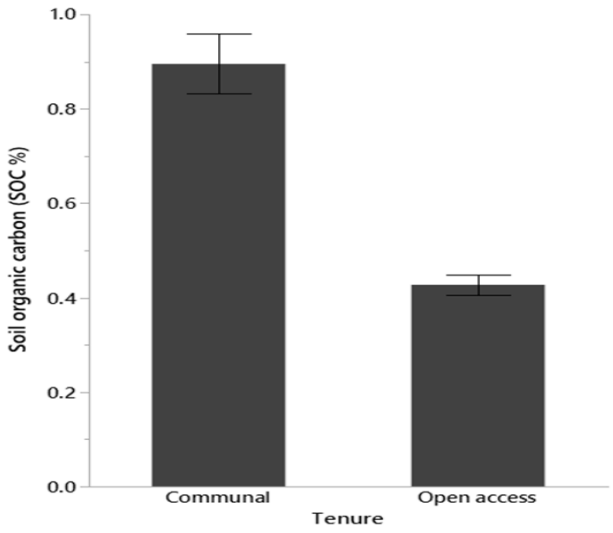

Figure 2.3: Soil Organic Carbon (percent) in open access area and communal rangeland

Table 2.1: The species diversity, richness, and evenness in communal and open access rangelands

		Communal	Open access			
	Variable	**Mean**	**Mean**	**Standard error**	**t-Ratio**	**Prob>|t|**
Woody plant species	Abundance	118.95	40.15	0.351	3.247	0.002*
	Richness	7.96	10	0.566	4.798	0.005*
	Evenness	0.82467	0.82578	0.025947	-0.043	0.966
	Shannon	1.87404	1.65629	0.075053	-0.043	0.005*
Herbaceous plant species	Richness	3.71	3.54	0.44	2.922	0.559
	Evenness	0.71851	0.68937	0.05252	0.555	0.58
	Shannon	0.93629	0.88344	0.09362	0.565	0.574

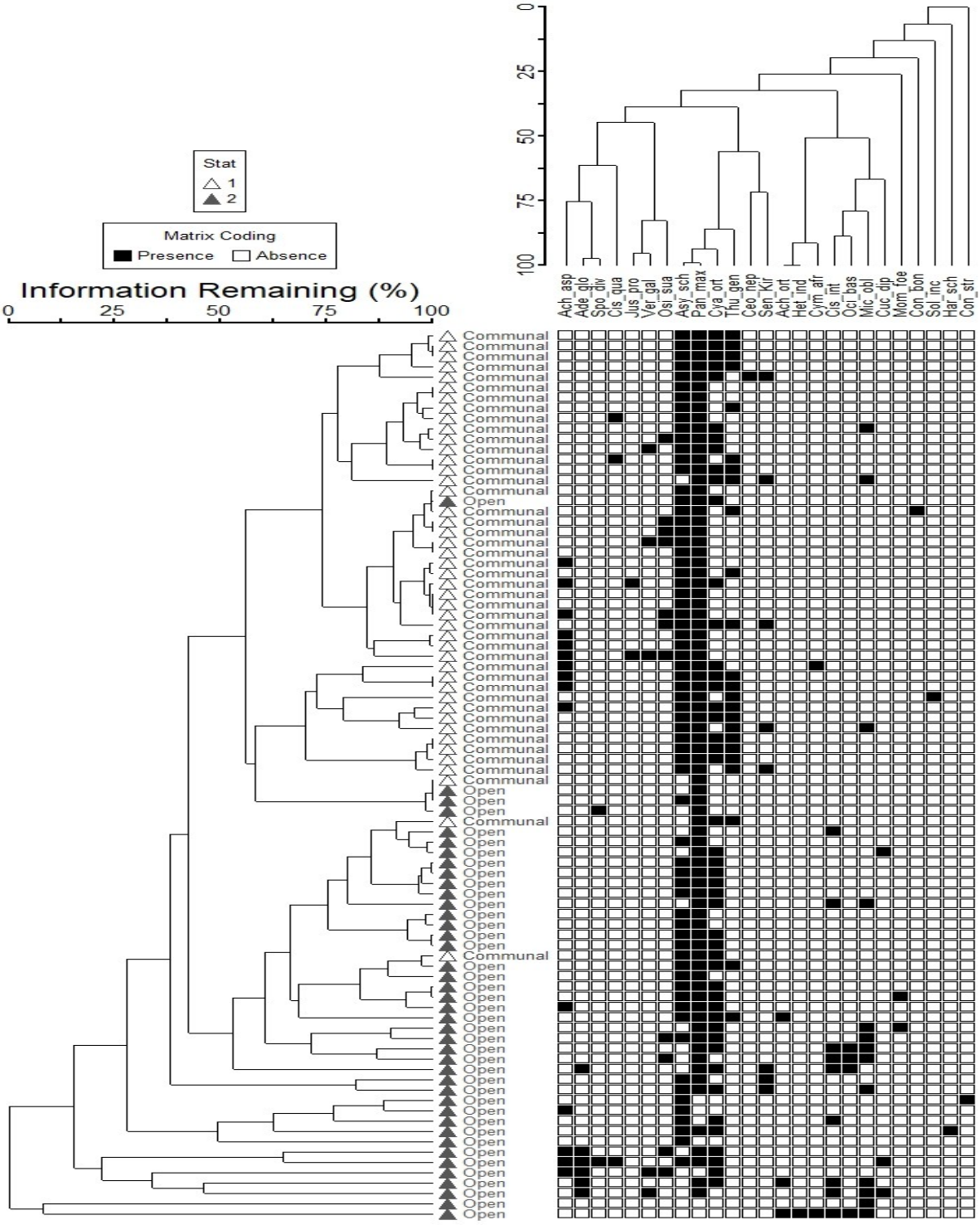

Figure 2.4: Two Way Cluster Dendrogram generated through PC-ORD Version 5 based on Sorensen measures, showing the distribution of 25 plant species in two stations and three plant communities

The result show that there are three unpalatable species in communal and six unpalatable species in open access namley *Adenia globosa, Sansevieria Kirkii, Solanum incanum, Cymbopogon afronardus Heliotropium indicum* and *Momordica foetida*. Two invasive species found in open access area are unpalatable. *Prosopis juliflora* fruits are palatable but leaves are not eaten by animals and *Calotropis procera* is unpalatable and toxic to animals.

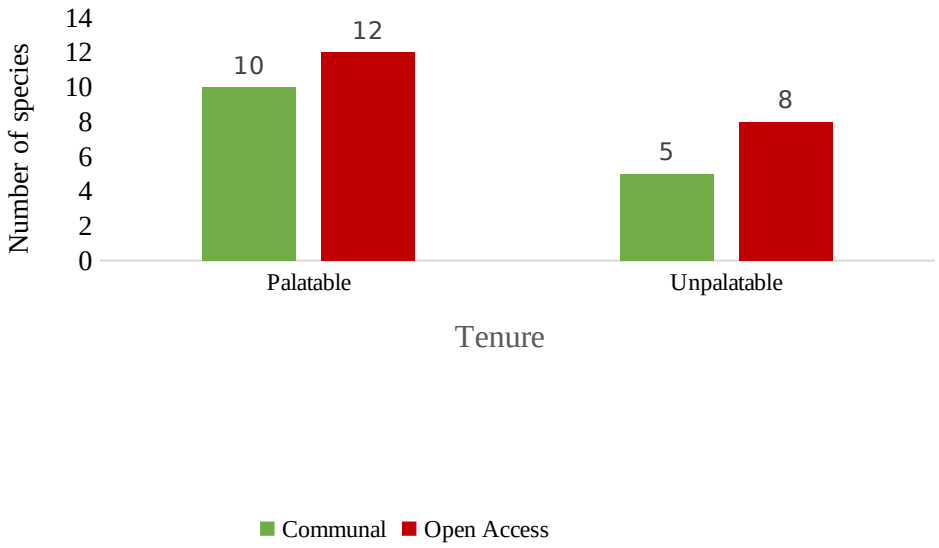

Figure 2.5: Palatability of Herbaceous plant species in communal rangeland and open access area.

2.4 DISCUSSION

The low herbaceous above-ground biomass found in the open-access rangelands might be due to continuous grazing which reduces inputs of soil organic matter, increase soil erosion and grass degradation. High above ground biomass in communal rangeland may be due to exclusion of grazing during the rainy season (April to August) and grazed during the peak of the dry season (September to March). Rotational grazing in communal rangelands allows the restoration of herbaceous biomass and soil. Other study by Wang *et al.*, (2019) reported that many restoration practices have been implemented, grazing exclusion is one of the most effective methods to restore degraded grasslands.

Another factors for higher herbaceous biomass could be the regulated number of livestock which reduces heavy grazing. Study by Tessema *et al.,* (2016) report that in Ethiopia heavy grazing reduces seed production of grass species by affecting the allocation of resources for reproduction through reducing active surface areas for photosynthetic processes, as well as through direct removal of flowers and seeds. Furthermore, low above-ground biomass in open access is due to the abundance of invasive species such as *P. juliflora* and *C. procera*. *Prosopis* which are very aggressive invader that suppress herbaceous vegetation (Khandelwal *et al.,* 2015). Although, other studies by Gilo and Kelkay, (2017); Selemani *et al.,* (2013) contradict with this finding they show that above ground biomass in communal rangeland to be lower than open access area.

The slightly higher above ground biomass of woody plant species in open access area in this study can be linked with an observed reduction in herbaceous plant species aboveground biomass of open access area (see figure 2.2 a and b above) since trees have negative effects on grass and herbs species due to competition and decreased light intensity for grass and herbs species. High above ground biomass of woody plant species is one of indicator of degraded rangeland, this is supported by different studies Rubanza *et al.,* (2007) and Tefera *et al.,* (2007) who report that suppression of grasses by woody species leads to a decline in grazing capacity in rangeland, Increases in woody species, accompanied by a decrease in herbaceous production and changes in species composition, are characteristic of poor rangeland management and the idea that an increase in woody vegetation has often been associated with heavy grazing.

Higher soil organic carbon promotes soil structure which led to greater physical stability. This improves soil aeration, water drainage, retention, reduces the risk of erosion and nutrient leaching (Wiesmeier *et al.,* 2019). Low soil organic carbon in open access might

be due to an increase in disturbance from human activities such as cultivation, soil mining in Korongo Village. According to result, low above ground biomass on herbaceous was observed on open access area and this might be strongly influenced by low soil organic carbon. Managed rotational grazing which is done in communal rangeland increase soil organic carbon and soil organic matter because rotational grazing encourages plants growth and hence increased the rate of nutrient recycling through decomposition of deeper roots. Those roots are continually sloughed off to decompose in the ground, boosting soil biomass and sequestering carbon from the atmosphere (Abberton *et al.,* 2010).

Species abundance of trees and shrubs in communal is high compare to open access area although there is high species richness in open access area compare to communal rangeland. Heavy grazing pressure in open access area seems to be directly proportional to encroachment of new woody plant species, high above ground biomass of woody plant species and low abundance of herbaceous in open area. The studies by Rubanza *et al.,* (2007); Selemani *et al.*, (2013) report that heavy grazing pressure in these areas appears to be source of new woody plant species and reduce production of aboveground biomass of grass in the area and vegetation cover.

Presence of invasive species in open access rangelands led to reduction of grass cover which reduces above-ground biomass. This is supported by Mehari, (2015) who report that abundance of *P. juliflora* appears on grazing lands, reduces grass cover and thereby affects stocking density and in severe cases, it can form impermeable dense thickets. Lastly the result show that there is no significance difference in species diversity in two rangelands this might be due to same micro climate, homogeneous physical structure and similar grazing histories, species diversity should perhaps not be expected to demonstrate much variation.

2.5 Conclusion and recommendations

2.5.1 Conclusion

Communal rangeland was healthier and productive than open access area in terms of aboveground biomass, Soil organic carbon, species composition and palatability of species. Results show that low above ground biomass and soil organic carbon in open access area may be attributed to heavy grazing pressure, although the total biomass in communal rangeland is not large compare to other country in Africa like Kenya and Ethiopia. *Barleria argentea*, *Grewia tenax* and *Vachellia tortilis* are dominant tree and shrub species in both rangelands while *Panicum maximum* And *Asystasia schimperi* are dominant grass and herbs species in both rangelands. The study has found two invasive species in open access area which are *C. procera* and *P. juliflora* which result to low aboveground biomass in open access area.

2.5.2 Recommendation

Rotation grazing and long-term grazing exclusion may be required to see an improvement in biomass production. Land carrying capacity studies should be carried out to determine appropriate land carrying capacity of rangelands in order to maintain the right numbers of livestock that would not put excessive pressure on the available grazing resources. Since the open access area is affected by invasive species the study recommends that the process of removing invasive species should implemented in order to prevent the spread of invasive species to communal rangeland. In addition, this study recommended that communal rangelands system should be adopted to other pastoralist area which don’t use this kind of land tenure system and proper land use planning is recommended to reduce conflict.

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CHAPTER THREE

MANUSCRIPT TWO

3.0 THE PERCEIVED AFFECTS OF LAND TENURE SYSTEMS ON CONFLICTS RAPPROCHEMENT IN COMMUNITY RANGELANDS A CASE STUDY OF NORTHERN TANZANIA.

Eliengerasia G. Koka[1], Alfred K. Chitiki[1], Ismael Selemani[2], Urs Schaffner[3], Charles J. Kilawe[1]

[1]Departments of Ecosystems and Conservation, College of Forestry, Wildlife and Tourism, Sokoine University of Agriculture, P. O. Box 3010, Morogoro, Tanzania.

[2]Department of Animal, Aquaculture and Range Sciences, College of Agriculture, Sokoine University of Agriculture, P. O. Box 3004, Morogoro, Tanzania.

[3]CABI, Delémont, Switzerland.

ABSTRACT

The main objective of this paper was to assess the perceived effects of change in land tenure system on conflicts rapprochement and specific objective were to (a) determine existing forms and drivers of conflicts (b) perception of land tenure system in conflict rapprochement (c) assess trends of conflicts in communal rangeland and open access area. The manuscript is based on a study that adopted a cross-sectional research design whereby data were collected from 180 randomly selected respondents from two rangelands under different tenure system. The primary data were collected through semi-structured questionnaire and key informants' interviews, secondary data were gathered from government reports (Nyumba ya mungu ward offices). Quantitative data were analysed using the Statistical Package for the Social Science (SPSS) version 26.0. Descriptive statistical analysis was carried out for quantitative data. Generally, study results show that the conflict rapprochement in the management of communal rangeland was significance difference to open access area *(P= 0.001)*. There were three main forms of conflict namely among pastoralist, pastoralist and crop growers and boundary conflict. The main drive of conflict in study area is farm raiding by cattle, sand mining, farming in rangeland and encroachment by other pastoralists. Also, the results show that trends of conflict were high in open access area compared to communal rangeland area.

Key words: Conflicts, Land tenure, Rangeland

3.1 INTRODUCTION

Rangeland covers great parts of the world and is home-based for many people worldwide. Tanzania has a total land area of about 88.6 million hectares of which over 74% are rangelands (Mwilawa *et al*., 2008). Most of rangeland areas in Tanzania are covered by grassland, dense thicket, woodland and gallery forests (Selemani, 2014). Though high variation in vegetation types exists because of high differences in climate, soil characteristics and management conditions, most rangelands share common degradation challenges associated with anthropogenic activities (Awgachew *et al*., 2015). The consequences of human-based activities lead to climate change, that affects rangeland condition (McCollum *et al*., 2017). Rangelands have different tenure system some are private owned land and other owned by the communal. Communal rangeland is formed when more than one village contribute the amount of land to from one area potential for grazing (Awgachew et al., 2015). In Tanzania, communal rangeland is practiced in Simanjiro, Kiteto, Bahi, Chamwino and Kondoa districts. Land policy promote and ensure secured land tenure system that encourages optimal use of land resources and facilitate broad based social and economic development without upsetting or endangering the ecological balance of the environment (Land Policy 1999: 5 section 2.0). Land tenure is a set of rules that define the rights of access by people to particular natural resources, also is the form of social endorsement of these relationships(Herrera and Da Passano, 2006). The land tenure system in a given authority comprises the set of possible bases on which land may be used. As such, this range includes rural and urban tenures and ownership, tenancy and other arrangements of land use (Allsobrook, 2021).

Conflict is difficult to define, because it occurs in many different situations. Conflict in rangelands can happen between different groups like pastoralists and other pastoralists, pastoralists and crop growers, crop growers and rangelands management, pastoralists and rangelands management and boundary conflict, although conflict between pastoralist and

crop growers is common in many areas in Tanzania (Fernandez-Gimenez and Le Febre, 2006; Saruni *et al.,* 2018). Areas such as Kilosa, Mvomero, Ulanga, and Kilombero Districts in Morogoro, Kilindi and Handeni in Tanga Region, Mbarali District in Mbeya, Kiteto in Manyara, Rufiji and Mkuranga in Pwani, Kongwa in Dodoma and Hai in Kilimanjaro are disposed to farmers-pastoralists clashes (Mwamfupe, 2015).

Land pressures grow leads to conflict between different land users, Example in Kiteto District alone, more than 34 lives were lost to these conflicts between 2013 and 2015 (Flintan *et al.,* 2019; Mwita *et al.,* 2017). Insecure access to grazing lands, a lack of land use planning and continued encroachment of grazing areas by crop farmers and investors pushed pastoralists in land use with no clearly demarcated grazing areas. Sustainable Rangeland Management is determined to improve the implementation of Village land use plan (Communal rangeland) in rangelands, in order to contribute to better sustainable management of them and the resolution of land use conflicts (Mwita *et al.*, 2017). Different study proposes change of land tenure system from open access to communal system as a means to conflict rapprochement in community rangelands since it involves formulate bylaws for controlling livestock populations, provision of essential services such as water in order to minimize movement, land use plans to minimize resource use conflicts between different land users (Mwita *et al.*, 2017; Saruni *et al.*, 2018; Selemani, 2014; Selemani *et al., 2012)*. The main objective of this paper was to assess the perceived effects of land tenure system on conflicts rapprochement in northern Tanzania. The result of this paper will help land use planer and decision makers and other stakeholders on understanding the best ways of managing grazing land resources for effective policies implementation in dealing with land conflict and restoration of rangelands.

3.2 METHODOLOGY

3.2.1 Study Area

This study was conducted in Simanjiro District in Northern Tanzania. Simanjiro District is one of the six districts of the Manyara Region of Tanzania. It is bordered to the north by Arusha Region, to the north east by Kilimanjaro Region, to the south east by Tanga Region, to the south by Kiteto District, to the south west by Dodoma Region and to the west by Babati Rural District (Mosha *et al.*, 2018). The district headquarters are located in Orkesumet. The district is found between latitude 3°52’ and 4°24’ South and 36°05’and 36°39’ East (Fig.3.4).The district has an annual rainfall of 650 mm per annum highly seasonal with dry season (June -October) and wet season (November-May) while its temperature varies between 18-30°C. The district covers about 19 928 km^2 and most of its area is covered by open woodland and grassland vegetation (Nyaruhucha *et al.*, 2006*)* with 178 693 number of people according to census 2012 . The area lies within the Maasai Steppe with an area of 20 591 km^2 of which 600 km^2 of the entire steppe is a fertile land for agriculture while 12 682 km^2 is covered by game controlled areas and game open areas and the rest is a hilly area (Nyaruhucha *et al*., 2006).

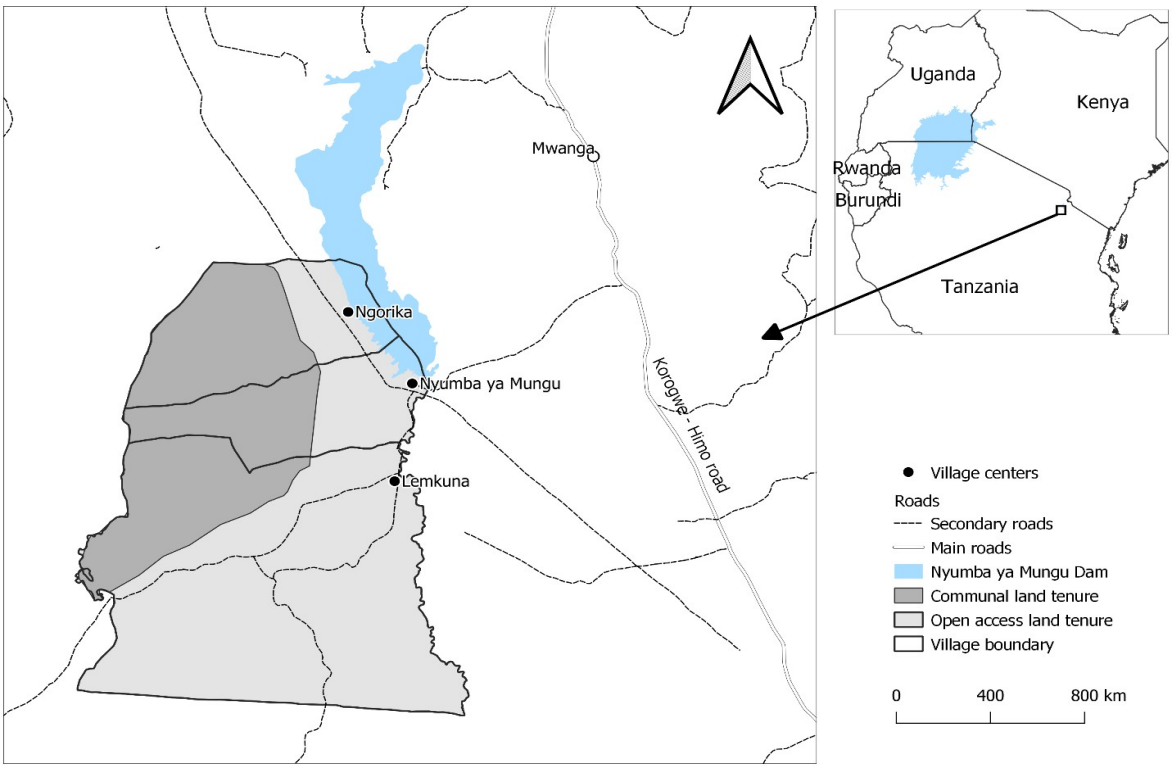

Figure 3.1: A map of the study area showing rangelands under open access and communal land tenure

3.2.2 Study Design

The study was done in two rangelands which are communal and open access area, Communal rangeland is Iltoto which was formed by an association of three village Nyumba ya Mungu, Lemkuna, and Ngorika in 2009 and Open access area village are Kiluani, Magadini and Korogo. Iltoto rangeland villages set aside about 2000 ha of land for dry season grazing and approved a land-use plan and by-laws that facilitate effective management of the rangeland and Iltoto rangeland have certificate for registration from Simanjiro District office, by-laws are enforced by a team of five members from each village and also only member of the communal rangeland are allowed to graze. In open access area it different in management, there is no by-laws and regulation and member from another village can graze in rangeland and certificate of ownership is individual (Flintan *et al.,* 2019). The ethnic groups' main economic activities in the area include livestock keeping, farming, and fishing activities.

A cross-sectional research design was adopted for this study. The design allows collection of both qualitative and quantitative data in a short period of time. Six villages were purposively selected, three from communal ownership namely Lemkuna, Ngorika and Nyumba ya mungu and Korongo, Magadini and Kiluani from open access area. Simple randomly sampling was used to obtain 30 respondents from each village.

3.2.3 Data Collection

In order to address the research questions, both primary and secondary data were collected. Structured questionnaire was used to collect data on perceptions, drivers, forms and trends of conflicts. Key informants' interview was conducted with the village's chairperson and five representative committee members to collect information on trends of conflict in study area.

3.2.4 Data Analysis

The primary data from questionnaire were coded and entered in a statistical package for Social Sciences (SPSS) computer program version 26.0 where descriptive statistic like crosstabs and frequency were performed to determine forms and divers of conflict in the study area.The output tables were exported to excel spread sheet from SPSS were derived in order to present result in form of table for easy interpretation. The qualitative information obtained from the interviews household and direct observation was transcribed through content analysis.

3.3 RESULTS

3.3.1 Perception of land tenure system in conflict rapprochement

The conflict rapprochement in the management of communal rangeland was significance difference to open access area, 78% (N=180) of respondents perceived that there were

resource use conflicts in open access rangelands whereas only 22 % of respondents perceived conflicts in communal rangelands (Figure 3.5).

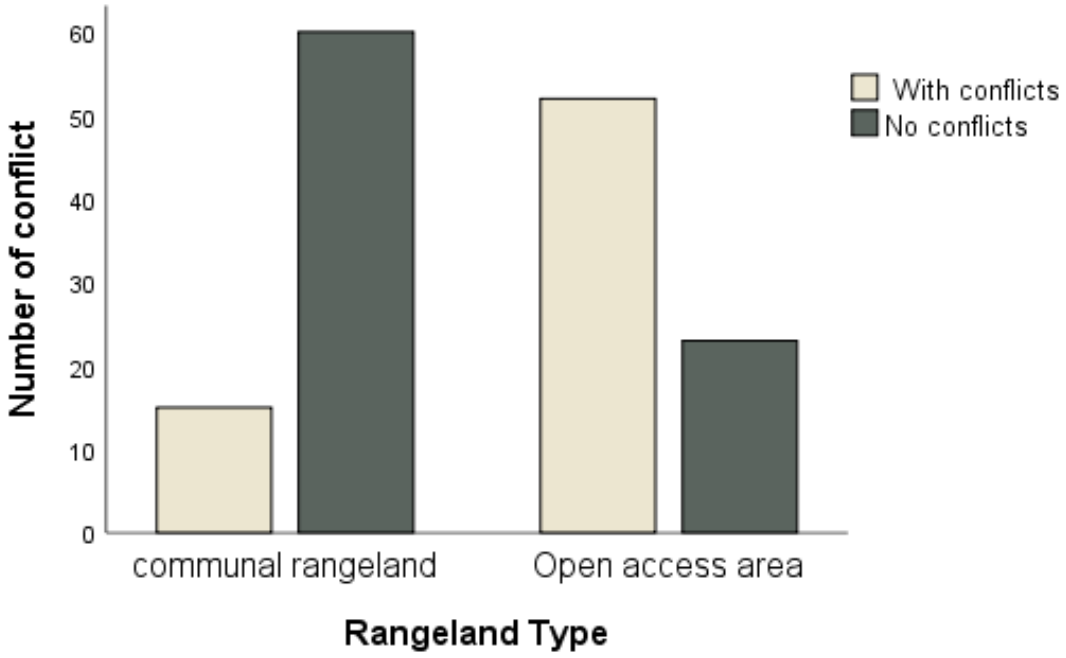

Figure 3.2: Respondents perception of conflicts in communal rangelands and open access

3.3.2 Forms and drivers of Conflicts in the Study Areas

This study revealed that there were three type of conflict in study area which are: Among pastoralists, Pastoralist and crop growers and Boundary conflict in both rangeland as shown in table 3.2 below. Also, in study area we identify 5 causes of conflict see table 3.1 below. The drivers include Cattle going into the farms, extraction of soil in the grazing area, Farmers cultivating in rangeland, Lack of enough space for grazing, encroachment by pastoralists from other village. The study findings showed that leading driver of conflict in both rangelands is when encroachment by other pastoralists.

Table 3.1: Forms and drivers of Conflicts in communal and open access rangelands

		Tenure	
		Communal	**Open access**
Forms of conflicts	Among pastoralists	44%	56%
	Pastoralists and crop growers	14%	86%
	Boundary conflict	14%	86%
Causes of conflict	Farm raiding by cattle	9%	91%
	Sand mining	0%	100%
	Farming in rangelands	0%	100%
	Pasture and water	0%	100%
	Encroachment by other pastoralists	30%	70%

3.3.3 Trends of the conflicts in communal rangeland and open access area

The graph shows the rate to which change of land tenure system reduce conflict in study area over a 13 years period from 2009 to 2021. Overall, trends of conflict were high in open access area compare to communal rangeland after changing rangeland system in 2017 (Figure 3.6).

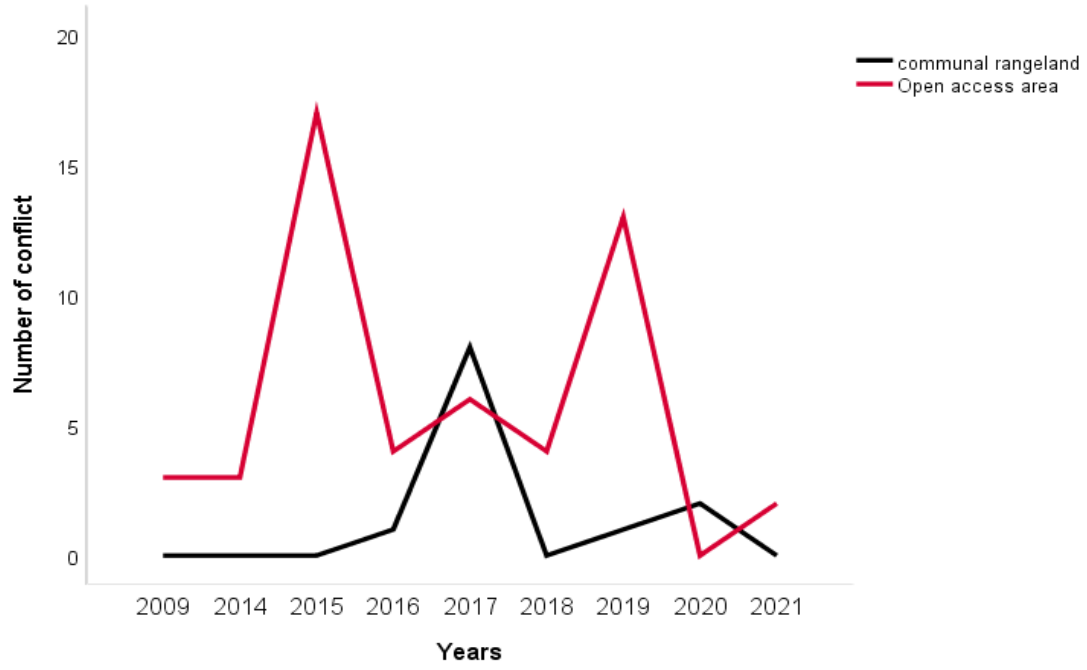

Figure 3.3: Trends of the conflicts in communal rangeland and open access are

3.4 DISCUSSION

Results found a higher number of conflicts in open access villages compared to communal rangeland villages. According to respondents from communal rangeland villages since they adopt a communal system number of conflicts was reduced due to strong institutions which enforce the regulations developed in a participatory manner. The study is supported by Agrawal, (2000) who proposed participatory management as an innovation that could resolve conflicts by involving local communities. Flintan, (2020) reported that communal systems of governance allow livestock to have access rights over a wide area of rangeland shared with other members of a group or from different groups, so all can benefit from and manage the high variability and uncertainty in resource availability. The findings, however, contrast with Mwamfupe, (2015) who reported that there have been changes to communal land tenure regimes which have, in turn, led to tensions and legal conflicts between farmers and herders. This contradiction may be associated with the size of study areas, the previous studies centered only on one land tenure management system while this study involves two land tenure management systems (Open access area and communal rangeland) in a different area and the quality of communal depends mainly on quality of managing the institution.

Literature shows that there are different divers and forms of conflicts in rangeland community (Mussa *et al.,* 2017), but in this study we identified three type of conflict in study area which are: Among pastoralists, Pastoralist and crop growers and Boundary conflict in both rangeland as shown in table 3.1 above Similarly, Saruni *et al.,* (2018) identified three type of conflicts which are farmers versus pastoralists over village boundaries, farmers versus pastoralists over livestock routes, farmers versus farmers over land in Kilosa and Kiteto. Extraction of soil in the pasture area which is done at Korongo and Magadini village result the conflict between pastoralists and mining people since the hole created by extraction on soil cause death of animals, reduce amount of grasses and

lead to soil destruction in grazing area and this happened in open access area because there is no by-laws like in Communal rangeland were other activities should not continue in grazing area. 2015 and 2016 before changing land tenure system villages the communal rangeland was facing high number of conflicts between them since they share boundary in their traditional grazing area which was managed by each village. In 2017 there was high number of conflicts in communal rangeland than in open access because this was when Iltoto rangeland get permit from government. Respondents said that communal system reduce number of conflicts and there was equality between villages this is supported by (Flintan, 2020) who reported that communal systems of governance allow them to have access rights over a wide area of rangeland shared with other members of a group or from different groups, so all can benefit from and manage the high variability and uncertainty in resource availability.

3.5 Conclusion and Recommendation

Land tenure change in study area have positive impact in conflict rapprochement since the result report that there was large number of conflict and ongoing conflict in open access area compare to communal rangeland, it difficult to solve their conflict because they don't have legal rangeland ownership and when other villages come to graze in rangeland they cannot resolve the conflict. In communal rangeland they own rangeland legally and they have by-laws and regulation which they use in rangeland management, when the conflict happened, they start solving by using traditional customs and norms when it fails, and use government rules to solve the conflict. In additional overall trends in conflict between these two rangelands is high in open access area than in communal rangeland this show that the change of land tenure system in community rangeland has impact in conflict resolution. Therefore, this study recommended that communal rangelands system should be adopted to other pastoralist area which don't use this kind of land tenure system and proper land use planning is recommended to reduce conflict.

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CHAPTER FOUR

4.0 CONCLUSION AND RECOMMENDATION

4.1 Conclusions

Based on the findings from this study the following conclusions are made;

i. The results show that communal rangeland was healthier than the open access rangelands in terms of soil fertility and vegetation composition.

ii. The aboveground biomass of herbaceous species recorded in the study area was lower due to shortage of rainfall in 2020 and 2021.

iii. The study has found two invasive species in open access area which are *Calotropis procera* and *Prosopis juliflora* which result to high above ground biomass of woody plant species in open access area and low above ground biomass of herbaceous.

iv. The abundance and diversity of woody plant species were significantly ($P<0.05$) higher in communal than open access rangelands while in grass and herbs there is no significant difference.

v. The study identifies that there is high number and trends of conflict in open access area villages compared to communal rangeland villages.

4.2 Recommendation

Based on the results from this study and experiences from other studies, it is recommended that;

i. *Prosopis juliflora* and *Calotropis procera* should be removed in invaded grazing land because it has several impacts and can change grazing land to dense forest.

ii. Land carrying capacity studies should be carried out to determine appropriate land carrying capacity of rangelands.

iii. Communal rangeland should be adopted or introduced to other area in Tanzania in order to reduce conflict and increase rangeland health and productivity.

APPENDICES

Appendix 1: List of woody species in communal and open access area

Tenure					
Communal rangeland			**Open access area**		
Scientific name	**Vegetation form**	**Counts**	**Scientific name**	**Vegetation form**	**Counts**
Barleria argentea	Shrub	502	*Barleria argentea*	Shrub	321
Grewia tenax	Shrub	468	*Grewia tenax*	shrub	236
Vachellia tortilis	Tree	459	*Triumfetta rhomboidea*	shrub	129
Vachellia mellifera	Tree	368	*Abutilon angulatum*	shrub	120
Balanites aegyptiaca	Tree	338	*Balanites aegyptiaca*	Tree	115
Abutilon angulatum	Shrub	267	*Grewia bicolor*	shrub	101
Cordia ovalis	Shrub	263	*Vachellia mellifera*	Tree	97
Sida acuta	Shrub	221	*Sida acuta*	shrub	91
Grewia bicolor	Shrub	205	*Boscia salcifolia*	Tree	72
Vachellia seyal	Tree	187	*Vachellia tortilis*	Tree	72
Maerua triphylla	Shrub	181	*Commiphora lindensis*	Tree	52
Delonix elata	Tree	140	*Maerua triphylla*	shrub	48
Commiphora africana	Tree	130	*Cordia ovalis*	shrub	47
Boscia salcifolia	Tree	123	*Commiphora trothae*	Tree	45
Commiphora lindensis	Tree	114	*Vachellia seyal*	Tree	39
Salvadora persica	Tree	100	*Commiphora africana*	Tree	37
Indigofera arrecta	Shrub	76	*Salvadora persica*	Tree	34
Commiphora trothae	Tree	61	*Delonix elata*	Tree	33

Steculia africana	Tree	52	*Calotropis procera*	shrub	23
Adenia globosa	Shrub	41	*Grewia similis*	shrub	16
Maerua kirkii	shrub	35	*Prosopis jurifrola*	Tree	15
Grewia similis	shrub	26	*Boscia kirkii*	Shrub	11
Vachellia brevispica	Tree	23	*Boscia salicifolia*	Tree	11
Cordia ovalis	Shrub	19	*Cordia sinensis*	Tree	9
Vachellia mellifera	shrub	17	*Vachellia rovumae*	Tree	8
Vachellia robusta	Tree	15	*caparis tomentosa*	shrub	7
			Cyathula		
Boscia salicifolia	Tree	14	*orthacantha*	shrub	7
Triumfetta rhomboidea	shrub	12	*Cordia ovalis*	Shrub	5
Vachellia rovumae	Tree	10	*Hybiscus*	shrub	5
Croton satropholdes	Tree	7	*Vachellia brevispica*	Tree	5
Barleria argentea	shrub	6	*Indigofera arrects*	Shrub	4
Maerua kirkii	Shrub	6	*Maerua kirkii*	shrub	4
			Commiphora		
Grewia bicolor	Shrub	5	*ugogensis*	Tree	3
Vachellia gerrardii	Tree	5	*dobera lorauthflolia*	Tree	3
Maerua triphylla	Shrub	4	*Adenia globosa*	shrub	2
Capparis tomentosa	shrub	3	*Boscia angustifolia*	Tree	2
Euphobia candelabrum	Tree	3	*Sterculia africana*	Tree	2
Cordia sinensis	Tree	2	*Vachellia gerrardii*	Tree	2
Grewia tenax	Shrub	2	*Adansonia digitata*	Tree	1
Vachellia seyal	Shrub	2	*Capparis tomentosa*	shrub	1
Vachellia trifora	Tree	2	*Capparis tomentosa*	Shrub	1
Capparis tomentosa	Shrub	1	*Commiphora edulis*	Tree	1
Erythrina caffra	Tree	1	*Cordia ovalis*	Tree	1

Grewia tembensis	shrub	1	*Erythrina caffra*	Tree	1
Maerua paviflora	shrub	1	*Euphobia kirkii*	shrub	1
Rourea orientalis	Shrub	1	*Grewia tenax*	Shrub	1
Sterculia africana	Tree	1	*Maerua kirkii*	Shrub	1
			Maerua parvifolia	shrub	1
			Terminalia sericea	Tree	1
			Vachellia robusta	Tree	1
			Vachellia trifora	Tree	1
Total		**4520**			**1819**

Appendix 2: List of herbaceous species in communal and open access area

Tenure					
Communal rangeland			**Open access area**		
Scientific name	Vegetation form	Counts	Scientific name	Counts	Vegetation form
Panicum maximum	Grass	4213	*Panicum maximum*	858	Grass
Asystasia schimperi	Herb	1185	*Asystasia schimperi*	257	Herb
Thunbergia gentianoides	Herb	549	*Cyathula orthacantha*	180	Climber
Cyathula orthacantha	Herb	544	*Adenia globosa*	85	Climber
Achyranthes aspera	Herb	121	*Sensevieria Kirkii*	79	Herb
Osimum suave	Herb	92	*Osimum suave*	63	Herb
			Microglossa		
Sensevieria Kirkii	Herb	63	*oblongifolia*	59	Herb
Vernonia galamensis	Herb	32	*Cucumis dipsaceus*	58	Climber
Justicia procumbens	Herb	25	*Achyranthes aspera*	53	Herb
Ceonotirs nepetifolia	Grass	24	*Sporobolus dives*	50	Grass
Microglossa oblongifolia	climber	19	*Ocimum basilicum*	49	Herb
Solanum incanum	Herb	18	*Cissus integrifolia*	48	Climber
			Achyranthes		
Cymbopogon afronardus	Climber	15	*orthacanth*	32	Herb
Cissus quadrangularis	Climber	6	*Vernonia galamensis*	24	Herb
			Thunbergia		
Conyza bonariensis	Herb	2	*gentianoides*	11	Herb
			Cymbopogon		
			afronardus	10	climber
			Harpachne schimperi	6	Herb
			Hetropium indicum	5	Herb

		Momordica foetida	2	Climber
		Cissus quadrangularis	1	Climber
				Herb
		Conyza stricia	1	
Total	**6908**		**1931**	

Appendix 3: Data collection form

Location: _____ Elevation: **_____ Eastings _____**

Northing: **_____ Type: _____ Plot no: _____**

Disc height H1 _____ H2_____ H3_____ H4_____ H5_____

Sub Plot	Species Name		Vegetation form	Db H (cm)	Height (m)
	Scientific name	Growth form			

Appendix 4: Questionnaire for Household

1. General Information

Enumerator's name.……

Date ……. Region ……..… District ……

Ward …… Village name ……...

Respondent's Name: ……

Gender …… Age..…….…….

Highest level of education attained

1=No formal education 2=Adult education 3=Primary education 4=Secondary

5=Other (Specify)…….....

Economic activities: i. ……. ii. ……..……iii. ……

2. 0 LIVESTOCK KEEPING

2.1 Do you have livestock? (a) Yes (b) No ☐

2.2 If “yes” in question 7 above please fill the table below

S N	Type of Livestock	Quantity	Grazing area	
			Communal	Others
1	Cow			
2	Goat			
3	Sheep			
4	Donkey			
	Others;			

2.3 Is your rangeland capable of providing food to your livestock throughout the year? (Yes/No)

2.3 If No where do you graze during the scarce seasons? ……

…….

3.0 RANGELANDS HISTORY AND MANAGEMENT

3.1 Did you experience any change in land tenure system? ☐

3.2 From which land tenure system to which system? .....

……

3.3 What were the reasons?

i. ……

ii. ……

iii. ……..

iv. …….

3.4 Are there any challenges facing livestock keeping before and after changing land tenure system? (a) Yes (b) No

3.5 If “yes” in question 3.4 what are the challenges?

Before

i. ……

ii. ……

iii. ……

iv. ……

v. ……

After

i. ……

ii. ……

iii. ……

iv. ……

v. ……

3. 6 How are you managing your rangelands? ……

3.7 Who is responsible in managing the available rangeland? ……

3.7 How often do you Meet?.....

3.8 What Issues are you discussing?

i……...

ii……

iii…….

3.8 How do you rate your relationship with a rangelands management?

(a) Good (b) Fair (c) poor

3.9 State reasons for your answer:

……

3.10 Does the change in tenure system favour implementation of agriculture practices in your village?

(a) Yes (b) No

3.11 If "yes" in question 4.10 how? ……..

3. 12 Is there any management intervention within the rangeland areas? (*Prescribed burning, enrichment planting, natural regeneration)*

……

4.0 COMMUNITY INVOLVEMENT

4.1 Are you are aware of the communal rangelands?

4.2 How do you understand communal rangeland? ……

4.3 Do you think is important to have/establish communal rangelands in your village? (Yes/No)

4.4 Reasons to your answer in 4.3? …….

4.5 What hindering the establishment of communal rangelands in your villages? ……

4.6 Are you involved in any Village Land Use Management Committee? (1) Yes (2) No

4.7 Are villagers participated to approve land use plan at the village general assembly?

(a) Yes (b) No

4.8 Have you ever involved in developing regulations and bylaws on how to use your village land before and after adopting Communal rangeland? (a) Yes (b) No

4.9 Are the village leaders involve you in communal rangeland agreement on sharing grazing land resources? (1) Yes (2) No

4.10 If "yes" in question (2.4) above how are you involved?

……

……

5.0 TRENDS OF CONFLICTS

5.1 Any conflicts between land users within the past years in your village?

(1) Yes (2) No

5.2 If “Yes” to question 5.1 above, state the year conflict (s) occurred? ……

5.3 Which groups were involved?

(a) Pastoralists and other pastoralists?

(b) Pastoralists and crop growers?

(c) Crop growers and rangelands management?

(d) Pastoralists and rangelands management?

(e) Others (specify) ……

5.5 What was the causes of conflict?

……

5.6 What was the impact of the conflict?

……

5.7 State conflict resolutions mechanisms used in the village

(a)…….....

(b).....

(c).....

5.8 Which one are effective in solving the conflicts, and why?

(a)……

(b)……

(c)……

5.9 How do you think the rangeland situation will look in the future?

……..

Appendix 5: Checklist for in-depth interviews

1) What are the economic activities conducted in your villages?

i…… ii. ……. iii……..

iv…….. v. ……

2) How many livestock kippers do you have in your villagers?

3) How many livestock do you have in your village?

i. Cow…….

ii. Goat ……

iii. Sheep ……

iv. Donkey ……

v. Others……..

4) What is the size of the grazing areas you have in your village?..... Map? …….

5) Do you have any regulations and bylaws governing the available range lands? …….

6) How villagers involve in developing regulations and bylaws on how to use this village land? ……

7) How the villagers participate in developing grazing land management plan?

……

……

8) How does village understand communal land tenure system?

……

9) Who manages rangelands? ……

10) What is rangeland management structure? ……

11) How do management operate? ……..

12) How it is managed before adopting new land tenure system and after adoption?

……..

13) How the village benefits from communal land tenure management?

……

14) 3. 12 Is there any management intervention within the rangeland areas? (*Prescribed burning, enrichment planting, natural regeneration)*

……

Year	**Type of conflict**	**Reasons for the conflict**	**Areas involved**	**Impact of the conflict**	**How was it solved?**
2011					
2012					
2013					
2014					
2015					
2016					
2017					
2018					
2019					
2020					

15) Any boundaries conflicts in your village before adopting communal rangelands system?

16) State number and types of conflicts per year for the last ten years

……

17) State the status of the communal rangeland regarding the following (please tick):

Status	**Very good**	**Good**	**Bad/low**	**Not change with initiation of the Communal land use plan**
Forage quality				
Invasive species				
Soil fertility				

Livestock health				