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Indigenous Knowledge Systems and Rangeland Governance in Northern Tanzania

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Abstract

The article examines the role of indigenous knowledge (IK) systems in the governance of common-property rangeland resources among pastoral communities in Northern Tanzania. It draws on the political ecology approach to examine the role and state of indigenous knowledge on rangeland governance in the changing socio-cultural, political and ecological context. It employs qualitative methodology to capture the narratives from the indigenous people. Using purposive (non-probability strategy) technique the study obtained a sample of 50 interviews and life histories combined, and four focus group discussions from four research sites. Findings indicate that forms of indigenous knowledge—such as rangeland rituals and cosmologies, rangeland zonation, livestock taxonomy, water communism and pastoral mobility—regulate and maintain a harmonious relationship between indigenous people and the wider ecosystem. The article concludes that IK should be recognized as an integral component of local resource governance. Also, indigenous rangeland cooperatives should be formed to help the sustainability of IK systems and settling emerging rangeland disputes.

Keywords: *indigenous knowledge, rangelands, common-property resources, pastoralism, political ecology.*

Introduction

Historically pastoral communities have relied on indigenous knowledge to manage their environments and maintain resilience. This form of knowledge production has often been ignored in the academic sociology and anthropology, as well as in policy circles (Sirima, 2015). Still, there is scanty information regarding the role and the state of indigenous knowledge (IK) on rangeland management in the changing socio-cultural, political, economic and ecological context. This article intends to underscore the state of pastoralists of the Ngorongoro Conservation Area (NCA)[1] in Northern Tanzania, and their indigenous knowledge systems in governing livestock rangelands.

Recently, indigenous-dedicated organizations and scholars indicate that there are more than 370m indigenous people around the globe (Lanzano, 2013: 1;

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[1]The Ngorongoro Conservation Area (NCA) is a multiple land use between Maasai indigenous and wildlife conservation, whereas the Ngorongoro Conservation Area Authority (NCAA) is a government parastatal managing the NCA.

Sirima, 2015: 4; Godana et al., 2016). While there is a fiery debate regarding issues of inclusion versus exclusion on indigeneity within the academic anthropology (Lanzano, 2013), IFAD (2012a) indicates that there are four definite clusters of indigenous communities in Tanzania such: the Maasai, Hadzabe, Akie, and the Barbeig.

Some scholars uphold that indigenous traditional land contains about 80% of the global biodiversity, and that the indigenous people in these areas hold a profound holistic and locally ingrained knowledge of their environment (Blaser, 2012: 1; Bruyere et al., 2016: 2). Out of that fraction, indigenous pastoral communities aggregate more than 50% of the global indigenous land (IFAD, 2012b; Sirima, 2015). These communities rely on pastoralism partly as a foundation of their livelihoods,[2] and partly as an accessory for human-ecological interaction.

Some scholars on pastoralism such as Galaty and Johnson (1990), Fratkin (2001) and Mapinduzi (2003) argue that Africa comprises of one-half of the global pastoralists. Fratkin (2001), for instance, attest that about 13m Africans are preponderantly pastoralists. These communities occupy grassland/ savannah and semi-arid areas where rainfall is sporadic.

In the African region, Tanzania has the third prime livestock figures after Ethiopia and Sudan, with 25m cattle (98% of which are indigenous breeds), accompanied with 16.7m goats, 8m sheep, 2.4m pigs, and 36m chickens. Moreover, traditional breeds dictate the Tanzania livestock sector (URT, 2015). The short horn Zebu is the most prevalent cattle strain in the nation. Equally, Tanzania National Livestock Policy (2006: 1) indicates that the country is endowed with plenty natural resources, which include land, forage and a large livestock resource base. Out of the total 94m hectares of land, 60m hectares are potential for rangelands in Tanzania (ibid.: 2).

Evidence from the literature suggests that indigenous pastoral rangelands in East Africa, and Tanzania in particular, are unsustainable (Fratkin, 2001; Oba, 2012; Mwamfupe, 2016) due to continuous contravention by other users with vested interests that leads to the diminishing of pastoral commons. In the region, indigenous pastoralists occupy open rangelands that are significantly potential for large number of wild animals (Veccaro, 2013). In most cases the presence of wildlife parks alongside indigenous communities has caused resource conflicts between local people and wildlife conservation authorities, tourist operators, international conservation NGOs and private interest groups (Nelson et al., 2007).

The genealogy of the occupancy of indigenous people in the area now covering the NCA predates the modern era. Evidence from paleontological

[2]Indigenous pastoral livelihoods here connote capabilities, resources and knowledge practices significant for addressing the needs pastoralists, including food, healthcare, land tenure, rangeland productivity, and livestock productivity.

and archaeological findings suggests that pre-human hominids existed in the area not less than 3.5m years back (UNESCO, 2012). It is said that the first indigenous people to reside in the area were Datog hunter-gathers and the present-day Hadzabe of Lake Eyasi (Olenasha, 2007, 2013; Veccaro, 2013). The indigenous Maasai pastoralists are recent occupiers as there is evidence demonstrating that while they have inhabited the area for at least 2,000 years, they kept circumnavigating in-between the Serengeti wider rangelands and partly the Ngorongoro highlands until the 1950s (Homewood & Rodgers, 1990).

The NCA was formed in 1959 after the removal of the indigenous Maasai from the Serengeti National Park following blazing campaigns supported by international conservation NGOs, after they were guaranteed to acquire and utilize the adjacent Ngorongoro highlands rangelands, where the conservation of wild animals was to be reconciled with the rights, needs and livelihoods of the Maasai in a manifold land use context (Olenasha, 2015). The Maasai were promised to benefit from the ecosystem services and earnings gained from preserving wildlife animals in a harmonious coexistence. However, this has never been realized as the conservation authority prescribed restrictive bylaws preventing them from accessing key critical rangelands areas (Nelson et al., 2007; Humphries, 2012).

Indigenous Knowledge (IK): A Contested Theme

The debate on indigenous knowledge and its epistemological status in relation to conventional scientific knowledge appeared in the academic literature in the 1980s, both in the social and natural sciences (Ronoh, 2010: 2; Lanzano, 2013: 1). According to Lanzano (2013), the debate became much more prevalent in the political arena, especially in the landscape of development aid and ecological conservation. This debate has been grounded over the dichotomy between western representations of the so-called scientific knowledge vis-à-vis indigenous knowledge.

The concept of indigenous knowledge was first used by a group of anthropologists as an attempt to build a basis for the recognition of cultural diversity in the practice of development aid and management of local natural resource (Lanzano, 2013). The debate became popular in the 1990s among scholars interested in environmental issues, and in the link between culturally driven behaviour and ecological balance (Ronoh, 2010). For many scholars, the concept was a tool to challenge euro-centrism of knowledge and to acknowledge the positive role of non-western traditional indigenous knowledge systems. For instance, Hobart (2009: 1) argues as follows: detract

> *What is signally absent in most public discussion of development are the ways in which the knowledge of the peoples being developed are ignored or treated as mere obstacles to rational progress. In order for them to be able to progress, these peoples have first to be*

> *constituted as 'underdeveloped' and ignorant. Conversely, without such under-development and ignorance, the West could not represent itself as developed and possessing knowledge.*

This line of thinking asserts that there is some form of knowledge (scientific knowledge), which version itself to be powerful than other forms of knowledge (in this case indigenous knowledge) across the globe. This representation of western scientific knowledge has informed the nature of knowledge practices on contemporary ecological management. As Sirima (2015) argues, there is a narrow recognition of indigenous knowledge roles in current conservation planning and practices.

There is no universally accepted definition of indigenous knowledge. Many scholars defined it in different ways; and have used many terms interchangeably to connote IK such as 'indigenous technical knowledge' (Oba, 2012), 'indigenous ecological knowledge' (Sirima, 2015), 'local knowledge' (Horbart, 1993), 'indigenous cultural expressions' (Ronoh, 2010), 'traditional environmental knowledge' (UNEP, 2008), 'rural knowledge', and 'indigenous traditional knowledge'. In terms of meaning and definitions, these terms overlap, and in many cases refer to the same thing. However, to avoid contradictions, some scholars and practitioners have sometimes labelled this knowledge as 'traditional' or 'local' knowledge. Yet, the concepts of tradition and locality have been equally controversial. Anthropologists, in particular, have insisted on the historicity and construction of the notion of traditions and interpreted the term local as the direct production of large-scale social relations (Lanzano, 2013). Therefore, practices of knowledge emanating from the 'natives' and/or the indigene of a particular locality are denoted in this case as IK.

Ghosh and Sahoo (2011) define IK as a totality of knowledge practices oriented on indigenous cumulative experiences in confronting situations and difficulties in many aspects of life. Principally IK differs from scientific knowledge in its methodology: indigenous knowledge is said to be empirically rooted in day-to-day life experiences, whereas scientific knowledge is tested through the so-called scientific methodologies (ibid.).

In this study, IK is defined as a knowledge practice that has progressed over time through a series of experimentation in everyday life in relation to the resources/material conditions of a particular culture in a given locality. IK is usually unique and culture-specific, and indigenous people use it to manage resources such as grazing lands and other common property resources. Among the Maasai IK is accumulated through observation and real-life experiences (through traditional teachings and environmental explorations, as well as traditional social control mechanisms) to preserve rangelands. One of the most important elements of IK systems and practices is in the governance of rangeland.

Unpacking the Concept of Rangeland

Globally, rangelands cover 24% of the world land area (Godana et al., 2016: 1). According to the World Bank (2007 as cited in Godana et al., 2016), 200m people and 50% of the world livestock population depend on rangelands, a majority of which is found in developing countries. Rangeland scholars such as Mwangi and Ostrom (2009) and Homewood and Rodgers (1990) demonstrate that rangelands ecosystems hold 40% of Africa's landmass, and support nearly 50% of the continent's population.

In a general sense, rangelands are defined as grasslands that are browsed by domestic livestock. The term rangeland is sometimes used interchangeably with pasture land. Not every piece of land is a rangeland: a rangeland has a certain quality grasses and topographical classification and culturally defined identities for grazing livestock or wildlife. What is unique about rangelands that are used by pastoralists to graze animals is that the lands are culturally connected to the livelihoods of the pastoral community; and constitute of values and norms that mediate the interaction between pastoralists and their environments. It is argued that rangelands typically contain low precipitation, narrow soil and low nutrient cycling (Ngaido, 2010).

Rangelands encompasses an interplay of aspects such as climate, the convenience of grass nutrients, water resources, herbivores (livestock or wild animals) and human population (VPO, 2014; Mwangi, 2016). The constitution of all these aspects forms a rangeland's ecosystem that becomes complex and hence requires a careful management to regulate access and utilisation of rangeland resources.

Rangeland management connotes initiatives that are necessary for the governance of rangeland resources (Ostrom, 2009). Rangeland scholars ascertain two types of rangeland management. One is based on 'modern' management, which is popularly termed as 'integrated rangeland management', 'sustainable rangeland management' or 'participatory rangeland management' (Hardin, 1968; Homewood & Rodgers, 1991; Ngaido, 2010; Godana, et al., 2016). The other is 'indigenous traditional rangeland management' (Ostrom, 1993; Ronoh, 2010; Bruyere et al., 2016). The former is generally based on modern land management planning of which the range is commercialized, and in many cases are privatized for the pursuit of profit. The latter is based on common access, communal management, and traditional governance of rangeland resources.

Rangelands in Tanzania have been managed through IK mechanisms (UNEP, 2008). However, since independence the rangeland management discourse and pastoralism has been largely inclined by modernization ideology (VPO, 2014). The view has been that traditional pastoralism and indigenous traditional management of rangeland tend to be unproductive and environmentally unfriendly. This thinking stresses that livestock keeping has to be taken in conjunction with 'modern development' through land titling, enclosure of the

commons, and the establishment of permanent settlements (Hardin, 1968; Fratkin, 2001; VPO, 2014).

There have been initiatives in Tanzania to settle nomadic pastoralists and modernize their rangelands (Ndagala, 1982; Fratkin, 2001). One of the first initiatives was the establishment of the Range Development and Management Act of 1964, which wanted to keep, advance and develop grazing land through a number of statutory schemes (VPO, 2014). This Act initially stated rangelands of Tanzania as "range development areas." For every range development zone, a Range Development Commission (RDC) was established as custodians for rehabilitation, conservation, development and improvement of the natural resources of the range development area. Recently in 2014, the government formulated guidelines for sustainable management and utilization of rangelands under the Vice President Office. Although grounded on government efforts to ensure pastoral transformations, these initiatives seemed alien from traditional and/or indigenous rangeland management systems. Currently, most of the lands that used to be the playground for nomadic indigenous pastoralists are being taken by investors, game parks, agriculturalists and human settlements (Fratkin, 2001; Ronoh, 2010; Oba, 2012).

The Political Ecology Approach: A Conceptual Framework

This paper adopted the political ecology approach as a framework to explore the role of pastoralists' IK on rangeland governance. The political ecology approach is centred on the idea of a 'politicized environment'; and is used to understand the politics of environmental change in the third world countries, and more importantly among indigenous communities in relations to local knowledge and practices. It is utilized in the analysis of the circumstances leading to local patterns of resource use and control so as to understand the continuous struggles between indigenous communities and the broader structural dynamics. It emphasizes the importance of asymmetries/irregularities of power, the unequal relations between different actors in illuminating the interactions between pastoralist's traditional knowledge systems and the environment. This approach also helps to bring out the political strategies of differing stakeholders—e.g., the government, multinationals, and game reserve rangers—act on the encroaching of pastoralists' traditional rangeland resources, and their views of IK practices on rangeland management.

Through the political ecology approach, we attempt to explain how politics of conservation affects the cultural and ecological organization of indigenous pastoral communities through government policies. Policies such as those on investment, wildlife conservation, agriculture, environmental, and so forth seems to threaten the existence of nomadic pastoralism as well as common property rangelands resources, which in turn restrains pastoralists from

acquiring grazing/pasture lands, that ultimately results to forceful sedentary pastoralism.

Moreover, the study dwells on the manner in which ecological modernization initiatives—such as privatization of pastoral commons, enclosure, and individualization of rangelands—affect indigenous mobility in rangelands. Modernization of rangelands entails the commercialization of communal pasture land owned by pastoralists, which together with enclosure and emphasizing on individual title deeds means excluding the majority of pastoralists from accessing rangelands.

Methodological Approach

The data used in this paper were generated from a study conducted between April and May 2017 among the indigenous Maasai pastoralist of the NCA. The study had four research wards: Alailelai, Nainokanoka, Oloirobi and Enduleni. The study population consisted of traditional elders, community members, rangeland scouts, NCA management, ward livestock officers, the Ngorongoro pastoralist council, community seers, and diviners. The researcher was able to conduct 50 in-depth interviews and life histories combined with various categories of respondents from the four research sites. Also, the researcher conducted one FGD in each of the selected wards that comprised of a range of 6-8 participants, consisting mainly of elders and traditional leaders.

Interviews were grounded on an interview guide that comprised of open-ended questions based on objectives of the study and the research questions. The guide was framed in such a way that participants could be probed further and more deeply to acquire thick layers of information and the underlying meanings of the indigenous knowledge practices. The participants were interviewed independently, and responses documented/recorded accordingly. Interviewees were accessed in their natural setting (*bomas*) or offices, and respective household settings.

Focus group discussions (FGDs) were conducted with the traditional leadership of the selected wards. The choice of this method was due to the fact that it allowed participants of similar backgrounds or experiences to agree or disagree with each other about the role of indigenous knowledge on rangeland management, and also provided historical insights into how traditional leaders makes sense of a range of livelihood options, and the inconsistencies and variations that existed in their community about rangelands in the current situation (Morgan, 1988; Mason, 2002). The FGDs were executed by organizing traditional elders/council of elders at the village's traditional meeting points (*iloipi* in Maasai) in every ward. FGDs were conducted mainly during afternoons so as to allow elders to perform their livestock chores during the mornings and evenings. Inter-group heterogeneity and intra-group homogeneity was adhered to balance with the argument that a group context

is a crucial arena for social encounter whereby multiple asymmetrical realities and subjectivities are expressed (Kitzinger, 1994 in Humphries, 2012).

Narratives from life histories were crucial to this study because of the need to understand the nature of indigenous knowledge systems from a historical perspective and the changing nature of livelihood strategies in the current context. It also helped to supplement in-depth interviews. Observation was adopted as a method of data collection throughout the data collection session. This was an important method for the researcher to capture the livelihood strategies of the indigenous pastoralists and rangeland management systems. Apart from enabling the researcher to observe a number of key issues in the target population, it also helped in establishing a working relationship with the respondents.

Qualitative data were analysed manually using the thematic analysis method. In-depth interviews, narratives, and FGDs were audio-recorded and transcribed. After transcription, the researcher organized the data into extracts depending on the patterns and association of transcripts so as to allow easy retrieval and categorization of emerging themes. In the process of extraction of data, provisional categories were recognized and refined into themes.

Findings and Discussion

Forms of Indigenous Knowledge on Rangeland Governance

Rangeland Rituals and Cosmologies

Narratives from the interviews and FGDs demonstrate that rangelands are the hotspot for Maasai rituals and spiritual practices. As a foundation of indigenous livelihoods in NCA, rangeland encompasses the linkage between societal spirituality/sacredness and ecological arrangements. It was observed that the Maasai people hold a strong belief system grounded on practical experiences with nature, and safeguard it through traditional seers and diviners. One participant during in-depth interviews had the following to share:

> *"We use our day-to-day practical experience to manage environments. A herder is bound by circumstances to learn about the nature of grasslands to ensure adequate grazing to his livestock and productivity. We dedicate some places for rituals and spirituality so us to protect the productivity of rangelands and our livestock"* (IDI/Male/Alailelai Ward/April, 2017).

In line with the above excerpt, it was noted that rangeland rituals involve a scheme of traditional knowledge on spiritual cosmology aimed at maintaining rangeland productivity and societal livelihood. These rituals originate from the knowledge that usually rangeland faces seasonal variability and at some point, fail to deliver enough forage and resources required by the pastoralist. As a means to maintain rangeland productivity, rituals are performed symbolically to show the societal attachment to environmental problems and ensure the

spiritual duality between the community and the construction of nature. During one FGD, an elder had the following opinion:

> *"Rangelands are part of our life and we perform cultural rituals in the mountains and catchment areas. These rituals are done as prayers and cleansing for our rangeland and sometimes done as rites of passage for our youth"* (FGD/Elder/Nainokanoka Ward/April, 2017).

The research identified several rangeland sacred locations within the NCA. These included, to mention only a few, the following:

(a) The Olorok Lukunya Mountain (around Kimba area just a few kilometres from Ngorongoro Serena Lodge). This site is said to be crucial for sacrificing goats and conducting rangeland prayers for cleansing purposes.
(b) The Ngorongoro crater plains, which are said to be a vital hub for rangeland rituals, especially rain-making rituals and animal-health rituals.
(c) The Olmoti crater and Empakaai crater, Oldoinyo Lengai and Kirim.
(d) The Emunge river, Lolmalasin Mountain, as well as the Ngorongoro Crater rim.

These sites hold a symbolic significance for the Maasai indigenous belief system. They are centres through which worship and prayers for good fortunes are conducted to ensure that the society gets comfort and assurance from the gods.

It was observed that rangeland rituals are occasional depending on the nature of climatic conditions and pronouncement from the spiritual diviner, the *Oloiboni*. Participants attested that when an acute climatic change happens, the community automatically organizes rituals to make sacrifices and pray. The following excerpt narrates the art of rain making rituals as was described by one elder during life histories interview:

When our rangelands face a dearth of rainfall we usually have to take some measures to address the problem. We would organize some rituals to make rain fall. The ritual team usually comprises of women without blemish (young women who have not engaged in adultery) who would dress in black attires, signifying the colour of God as Maasai believe that God is black. Singing songs (such as 'Gracious black God, don't get mad at us, hear our praise and prayers'), and headed by a selected team of key warriors and rangeland scouts as well as one prominent elder, consult the Oloiboni (diviner) and give some instruction on what should be done, then they prepare a convoy to the nearest ritual site in the rangeland or the known mountain prayer sites. They usually accompany themselves with some ingredients that Oloiboni deemed relevant and useful to the task at their disposal. These in most cases include leaves of the Oreteti tree (a renowned fig tree for blessing and cleansing rituals). The team would perform the ritual at the site by either slaughtering a goat and pour some herbal concoctions to the rangelands as directed by the spiritual guardian. Then as the team takes off from the site, I tell you the rain will fall on the same day and we get water and grasses abundantly" (Life history/Elder/Oloirobi Ward/April, 2017).

Box 1: The Art of Rain Making

The above narrative entails a rich knowledge on rain-making rituals as part of practices ensuring rangeland sustainability among the Ngorongoro Maasai. These local practices are often ignored in both scholarly works on natural resource management, as well as in government policy documents. In modern scientific knowledge these practices are viewed as primitive due to their ignorance of ecological dynamics (Horbart, 1993).

Rangeland conservationists construe rangeland rituals as a disruption of wildlife ecosystems (Homewood & Rodgers, 1990). Interviews and FGDs revealed that the NCAA have banned the indigenous people from accessing critical rangeland ritual sites such the Ngorongoro crater rim. Although this might have a reasonable conservation rationale, it has ruined a key sociological issue of community-environment attachments.

Rangeland rituals can also take a different form; it is not necessary that a team has to go to a ritual site. There is another way round such as doing it at the *bomas* (cattle kraals) so as to allow livestock and people to be part of the undertaking. The following narrative summarizes the practice.

Box 2: The Olokorr Ritual (Rangeland Cleansing and Rainmaking)

You can hardly control droughts; it just happens as God wishes. But we customarily do some initiatives to control it. Normally we organize a group of rangeland scouts and Murranis who would go and consult the Oloiboni for moral and spiritual guidance. They take cows and local brews mixed with fresh bee honey as adorable gifts to the Oloiboni. He then counsel and sometimes ask them to go and take some soil samples from Olmoti crater (a place with good climatic condition), from water sources (Emunke river), then take on the way Oreteti (leaves of a fig tree for blessing and ritual decoration), Eseki (a tree for forgiveness seeking), Misigiyo (leaves of a tree prominent for livestock health), then we prepare a rangeland ritual for the whole village. This ritual is a bit different from those we practice in the rangeland sites or rituals places like the mountain. This is peculiar because it is practiced at the centre of every cattle kraal where warriors prepare ritual fire and distribute to each of the households in the boma. The ritual start at the evening when cattle arrive at home. Young boys are instructed to sing all around the boma *while Murranis are making fire in strict abidance to the diviner's instruction. We put a small portion of the soil from the Olmoti crater into the fire and some parts of the Misigiyo leaves on the fire. Mind you, we brought enough leaves for the number of huts found at the kraal. Then we all run singing around the fire in the middle of the kraal, and then the whole boma would come out for the distribution of the ritual concoction given by Oloiboni. Also, every woman would take a small portion of ritual fire to their houses to light their home fires. This ritual would last for a week long, with women singing praise rangeland songs each and every night, asking God to hear the prayers. As we do this, we expect rainfall and our rangelands productivity. Normally a huge rainfall follows suit* (Life history/Elder/Alailelai Ward/April, 2017)

Rangeland rituals mediate the interactions between indigenous people and their environments, as well as their natural resources. Despite the fact that rangeland rituals are an important form of indigenous knowledge for managing rangelands, it was observed that the effectiveness of these rituals is dwindling. Some rangeland ritual sites have been encroached, while access to some have been restricted. Also, the role of the Oloiboni as a key custodian of community beliefs and rituals is also lessening due to decreased trust from the youth. One elder had the following opinion:

> *"Young people are losing societal morality. Many of them have engaged into incoming religions such as Christianity. They no longer have much trust to our culture, especially consulting Oloiboni as a spiritual guardian. Things are changing rapidly because we used to have a strong belief system that was not compromised, but I see many changes now. You can't control them"* (IDI/Elder/Endulen Ward/April, 2017).

In the same line of thinking, participants were of the opinion that due to diffusion of conservation activities within the NCA, rangeland rituals faces many challenges.

Livestock Taxonomy

It was ascertained that livestock classification and naming are one of the indigenous grazing management mechanisms. The splitting of livestock into separate herds in their characteristics such as age, sex, animal health, type of the stock and productivity forms a pattern for herd taxonomy among the indigenous Maasai. This splitting of herds is a symbolic means of maintaining resilience and adaptation by considering the nature of herds and their environment.

According to the participants, cattle are spilt into various categories such as milk cows, which comprise of calving and pregnant animals and their young; bulls and other big stocks special for meat; calves, weak or sick animals; and small stocks such as goats and sheep. Each of these categories are grazed in a particular rangeland so as to avoid overgrazing and livestock instabilities. One participant had the following opinion regarding rangeland taxonomy:

> "*The division of livestock is significant for maintaining efficiency in pasturing. … there are power struggles among livestock in the rangeland, so we use our skills and experience to avoid this so as to improve productivity. There is some livestock with poor health: we give them serious and close care; and so they need to be located in a specific place for grazing. Small stocks like calves and goats that can hardly mix with large stocks in the rangeland are also placed in a specific grazing zone that is normally nearby to home.*" (IDI/Male/Oloirobi Ward/April, 2017).

The above narrative relates to what some rangeland scholars have argued that herd taxonomy results in augmented 'niche specialization' and decreased struggle among livestock over forage resources in common-pool rangelands (Niamar, not dated; Oba, 2012). Livestock taxonomy is in line with the division of labour among the people in the community to cover the wide range of pastoral chores.

Pastoralists herd assortment and splitting are means used to sustain the long-term efficacy of rangelands to assure viable output at a minimal cost, and in some cases to improve degraded rangelands.

Rangelands Zonation

Empirical evidence shows that rangeland zonation as a form of indigenous knowledge is broadly based on the division and management of communal rangeland in an equitable and sustainable manner. It is closely related to livestock taxonomy. Whilst livestock taxonomy is more based on splitting herd according to their characteristics, rangelands zonation implies an act of dividing forage land into different grazing zones with varied identities to maintain the efficiency of grasslands and avert overgrazing, as well as

adapting to acute climatic conditions. Rangeland zonation is rooted in a deep indigenous knowledge on environmental geographies and indigenous plant science. This was illustrated with one respondent:

> *"We divide grassland in accordance to the nature of grasses and topography of the land. This is important for us to flexibly manage our livestock forage and productivity. The classification of rangeland depends on the climatic condition and decision-making by elders."* (IDI/Community member/Endulen Ward/April 2017).

The quotation above is also underlined by Ronoh (2010: 14), who argues that rangeland forms a crucial component in pastoralists' perceptions. The symbolic layout of this landscape is redolent of the variety of Maasai place-naming, which refer to the quality or type of grazing, the purity and freshness of water, and the general suitability of an area to the pursuit of pastoralism. The success of every herder hinges upon his knowledge of the landscape, its ecology, and his livestock.

Both interviews and focus group discussions strongly illuminated the fact that Maasai systems of grazing zonation combine key foraging assets that are categorized as foraging social networks (*iloopololi* in Maasai language). These social networks form a mosaic of foraging sites of various characteristics that allow the indigenous people to organize access and withdrawal of rangeland resources through reciprocal social networks. One rangeland scout had the following opinion:

> "*Around our settlements (bomas), each clan poses control of a small protected grassland that would be used as an alternative for calving small stocks and deprived animals due to harsh climatic conditions. These lands are communally shared among clan members and neighbourhoods as a grazing network*" (IDI/Rangeland Scout/Oloirobi Ward/April, 2017).

In relation with the above narrative, a participant had the following opinion during a FGD:

> "*The establishment of informal grazing social networks is to ensure that zonation of land for grazing is executed in a requisite manner to allow each community member to access rangelands smoothly and also control and sanction those who violate the norms governing the access and withdrawal of grassland resources*" (FGD/Elder/Nainokanoka Ward/April, 2017)

These social networks are potentials for managing rangeland through a series of local meetings and institutional norms that ensure that the governance of rangeland resources is harmonised with rangeland dynamics. It was established that rangeland zonation is based on two dimensions of communal land management. One is on topographical zonation (this is a zonation of rangeland based on the geographical configuration of land and the nature of grasses dominant in the zone). The second is based on the seasonality of a rangeland: whether wet rangelands, dry rangelands or drought

rangelands. The classification and zonation of rangelands are rooted in indigenous knowledge of ecological resources and the nature of climatic variability. Dry rangelands are accessed during the rainy season when there is an abundance of water such that rain pools (*ilturot/isilangen* in Maasai) have enough water for livestock and human consumption. This was attested by participants during interviews, and one participant had the following experience to share:

> "*Every forage social network has its own direction of grazing. Grazing zones depend solely on the natural identity of the land. There are mountainous places, plains, slopes, ridges, elevations, rims, canyon, lowlands, and places with river banks. Mountainous places are grazed during the dry season, and lowlands are grazed during the wet season. There are good grasses which are healthier to livestock in the dry lowlands but they usually last for a short period due to the seasonality of the areas. So, we often rely on these areas in short period of time, especially when water for livestock is plentiful*" (IDI/Male/Alailelai Ward/April, 2017).

The above narrative reveals that indigenous system of rangeland zonation has got key structures that depicts the mutual interaction between pastoral adaptation, ecological inconsistency, communal organizations of land management and local decision-making structures (Oba, 2012: 2). Zonation entails harmonizing with rangeland ecosystem and establishing mutual networking and dynamism in foraging activities. In the researched sites rangeland zonation was rampant in every village as the indigenous people see zonation as a means of maintaining ecosystem flexibility while ensuring an equitable grazing mechanism. It was noted that there was a comprehensive system of zoning compatible to most of the research sites, which called *alalili* or *olokeri* system of forage management.

Alalili is a form of land use whereby a portion of land with specific cultural significance is reserved for over a period of time so as to be utilized during acute climatic conditions. Participants attested that the designation of land as *alalili* is relative to the importance attached to a particular foraging zone. The existence of good quality grasses, the presence of rangeland ritual sites, and the historical attachment of the area qualify a rangeland to be canonized as *alalili*.

Every sub-village in the researched sites had its own *alalili***.** For instance, villages in the Oloirobi ward had reserved lands for future use, including the following places (as named in Maasai language) *Olokeri lendoinyo olepaswa, Irkisaing'ol, Olokeri lol-lesirkandei,* and *Noomboyo-olokeri ledoinyo olekodoki*. In Alailelai ward there were *Olokeri lol-kitehoni*, *Olokeri lal-lailelai, Olokeri lol-sendui, Olokeri lemoleliani,* etcetera. Categorically, elders canonize *alalili*: most of the identified reserved places during data collection had existed for many years. Participants revealed that the zonation of reserved lands was done by their ancestors during time immemorial, and they contain great symbolic

meaning for the existence of their community. The following excerpt describes the formation of *alalili* range zone:

> *"Our forefathers had sought and decided that we must have certain protected areas and the traditional norms and control system to help us during hard times. This land is called* alalili*, literally meaning a cursed land because elders canonize such places and institute taboos that constrain people from grazing their livestock in the range until the opening period. When a person breaks the taboo, he will die or his livestock will die according to the curse instituted"* (IDI/Male/Alailelai Ward/April, 2017).

The researcher observed that the continuous indigenous system of reserving forage zones is conducted on a seasonal basis. In every year, especially during the wet season (*alari*), the land is portioned and restricted/protected for about 8 months, depending on the nature of the climatic conditions, usually from November to June when rainfall, water and forage are abundant in the lowlands. From June, which is normally the end of rainfall season (*kurum-ari*), the *alalili* are opened for all: both small stocks and deprived livestock that need a close care. The cycle then continues until another rainy season.

FGDs indicate that the closure and opening of *alalili* are governed by elders who summon traditional assembly meetings to discuss the nature of grasslands to decide on the opening and closure of the reserved land. Rangeland scouts (*Irmurrans*) are responsible for the protection of *alalili*. They conduct periodic and daily patrols to protect reserved rangeland. The following excerpt summarizes the process of *alalili*:

> "*The formation of* alalili *take place under the guidance of elders who really know the history of the place better and the nature of grasses and species found in that rangeland. This is crucial to us because species composition is symbolically important for the health of our animals and special cultural preservation of the range sites. A prominent elder who oversees* Murrans *and range scouts call an assembly meeting. Then they discuss and agree on the closure of* alalili*. After the meeting, the* Murranis *go all around the village to announce that the* alalili *has been officially closed for 8 months until the dry season. During the entire period of the enclosure, rangeland scouts safeguard the* alalili*, protecting it against encroachment, and check on the status of grasses, and perform rituals. The time of opening takes place after a meeting to officiate the opening of the* alalili *rangeland.*" (IDI/Rangeland scout/Nainokanoka Ward/April, 2017)

Life histories show that the protection of traditional preserved areas ('*olokerri/alalili*') in the Ngorongoro Conservation Area (NCA) in the past was done through the use of cursing by elders. If elders curse an area, all community members will internalize the taboo and refrain from grazing their livestock in the area until the day of the opening of the preserved areas. However, it was noticeable that due to social transformations, and especially changes in the social organization, the rangelands are protected by traditional scouts who are selected

from the Morani,[3] and supervised by a village or ward rangeland committee. When a person deviates from the rules of the rangelands or *alalili*, he will face severe punishments, ranging from corporal punishment to giving out a bull in addition to apologizing to the traditional assembly and community guardians.

Pastoral Mobility

Among the indigenous people of the NCA, livestock mobility goes hand in hand with the seasonal variability of the rangelands. Mountainous places of Olmoti crater rim and Empakaai crater were visited during the dry season by the indigenous of the Alailelai ward. Ngorongoro crater highlands forest is visited during the dry season by the indigenous of the Nainokanoka and Oloirobi wards. The Maash rangelands and Irpirro rangelands are visited by the Endulen indigenous on a periodic basis.

Participants attested that pastoral mobility is one of the crucial IK mechanisms for communal management of rangeland resources. It was observed that livestock or herd mobility has many symbolic functions for the pastoralists. One of the main functions is that it helps livestock keepers to avert erratic climatic conditions and manage risks in the rangelands. Moreover, herd mobility enables livestock keepers to maintain the quality of grasses and to evade overgrazing. However, other factors like quality and quantity of water and grasses, location of salt licks, saline water, dew, excessive heat, lack of shade and wild ungulates, circumventing pests and diseases, side-stepping destruction to crops, closeness to marketplaces, family labour handiness, cultural gatherings, territorial boundaries, and social relations with neighbours establish a constant mobility into livestock keeper's activities. One participant had the following observation:

> *"It helps us to flexibly adapt and mitigate impacts related to changes in climatic conditions as well as overgrazing. You know if we all concentrate in a single rangeland zone there is a possibility of inefficiency grazing and poor productivity of the range and animal health. The nature of our production system is difficult without mobility"* (IDI/Endulen/April, 2017).

Indigenous pastoral communities, and the Maasai in particular, have been labelled for centuries as nomadic people (Ndagala, 1982; Oba, 2012). This characterization emanates from the fact that indigenous pastoral land had no limits: they were diverse and broad. This enabled the indigenous pastoralists to maintain a cycling of forage resources without compromising ecological arrangements and sustainability of the ecosystem.

However, currently the NCAA has restricted livestock to enter the forest highlands of Olmoti, Empakaai and Ngorongoro craters. Narratives from the

[3]These are male Maasai warriors who have undergone the rites of passage from youth to young adults where they are trained in tribal customs and the arts of war, including courage, strength and endurance.

near past show that the residents of Oloirobi ward were able to access salt licks for their livestock from the Ngorongoro crater rim. These salt licks are said to motivate livestock breeding as well as milk. This restriction has posed many challenges to the foundation of indigenous livelihoods.

Water Communism

Just like forage lands, waters is a communal property among the Ngorongoro indigenous pastoralists. It is owned collectively by customary indigenous institutions and knowledge that govern the utilization of water resources in the area. Water system within the NCA is derived from small rivers and rainfall pools, as well as from locally made boreholes. In essence, water is one of the very scarce resources in the NCA. However, local communal utilization and mutual support ensure sustainable use of water resources.

Rules and norms are in place to safeguard the utilization of water. Rangeland scouts oversee the equitable use of water and punishes those who violate the water norms. This was illustrated by one participant as follows:

> *"….it is our role to protect water sources and pipes, to control them from mismanagement and deal with deviants of the rangeland norms. We normally do patrols around the boreholes. When we find someone misusing it, we punish him severely and sometime slaughter his goat as a punishment"* (IDI/Rangeland Scout/Alailelai Ward/April, 2017).

To ensure sustainability of water resources, the indigenous Maasai take turns in taking livestock to water centres. For instance, if ten *bomas* have to take their livestock to a water pond for a single day, other *bomas* have to wait for the next day to avoid congestion and overuse of water for a single day. This cycling of water use ensures an egalitarian and mutual use of water on a sustainable basis. One participant had the following to share:

> *"In our village we have only a single borehole, which is literally not enough to sustain the entire village livestock. To enable a harmonious utilisation of it, we exchange the days of taking livestock to the borehole. This helps us to refrain from overuse of the water resource"* (IDI/Morani/Oloirobi Ward/April, 2017).

Therefore, forms of indigenous knowledge are crucial for rangeland management among indigenous pastoral communities. However, there is currently a diminishing role of IK due to dynamics in the ecological and political use of rangeland resources. The disintegrating community culture and collectiveness caused by globalization and other exogenous factors are leading to changing roles and functions of the IK on rangeland management.

Conclusions

This study generally demonstrated that there is a strong base of indigenous ecological knowledge among the Maasai indigenous pastoralists of the

Ngorongoro district. This knowledge is pertinent for endogenous management of common-pool rangelands and conservation of wildlife within the NCA. The forms of IK mediate a harmonious relationship between people and ecosystem by defining and regulating resource use in a sustainable manner. However, there is a declining use of IK due to pressure imposed by political and ecological dynamics into indigenous lifestyles. The government and environmental conservation authorities should earnestly recognize and integrate the role of IK at the policy level, as well as in the management and governance of natural resources, especially common-pool property resources, so as to ensure the sustainability of this knowledge base. Findings attested the relevance of indigenous knowledge in the current situation, and the need to formalise indigenous knowledge system which is crucial to a sustainable management of local natural resources among pastoralists in Northern Tanzania.

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