Community Perception on the Impact of Community-Based Wildlife Conservancies on Pasture Resources in the Lake Bogoria Landscape, Kenya

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Abstract

Community wildlife conservancies provide vital biodiversity values and ecosystem services that sustain livelihoods in arid and semi-arid lands, as they are habitats for endemic flora and fauna, provide pasture for livestock, and have eco-tourism potential. This study examined the impact of establishment of Kiborgoch, Chuine and Irong' conservancies on pasture resources for Endorois community's livestock within the semi-arid Lake Bogoria landscape in Baringo County. The study was conducted from December 2022 to February 2023 and questionnaires were administered to 100 household heads, sampled using stratified sampling technique. Moreover, key informant interviews and focus group discussions were held with officials from the three conservancies and relevant wildlife and livestock authorities. Grass, shrubs and tree leaves constituted pastures. The Spearman's rank correlation and Pearson's Chi-square test indicate a weak non-significant relationship between establishment of the community wildlife conservancies and pasture availability, based on communities' perceptions ($\rho = 0.122$, $p = 0.226$; $\chi^2 = 3.763$, $df = 4$, $p = 0.439$). The communities did not feel the impact of conservancies' establishment on forage availability, attributing this to invasion by Prosopis juliflora and Acacia mellifera and overgrazing within the conservancies. Hence, future studies should apply integrated ecological assessment methods to provide empirical assessments

Keywords: Community Wildlife Conservancies, Pastoral Livelihoods, Pasture Availability, Invasive Species, Lake Bogoria Landscape

Introduction

Approximately 70-90% of Earth's natural grasslands, savannas and other similar natural ecosystems, are used by man (IPCC, 2019). Grasslands, comprising approximately 40% of the Earth's land area, provide the critical ecosystem service of forage provision for agropastoral livestock production (Sun *et al*., 2022). Grasslands are found most commonly in semi-arid areas (28% of the Earth's grasslands) and arid areas (19%), hence these arid and semi-arid rangelands have rich natural pastures that give them comparative advantage over other areas, in terms of livestock and wildlife production (Squires *et al.*, 2018). Rangelands cover 60% of Africa's land mass (Mganga *et al*., 2015). Sub-Saharan Africa has the largest proportion of its land in grassland, covering 14.5 million km², and the most expansive watersheds (Squires *et al.*, 2018). These grasslands in Sub-Saharan Africa (and in other tropical and subtropical areas) are known as the savannas (Petermann & Buzhdygan, 2021).

Originally, indigenous African communities of pastoralists, hunter-gatherers and farmers had elaborate systems for managing natural resources, as did other local communities in other parts of the world (Roe *et al.*, 2009). With the advent of colonialism, centralized American approach to resource management – where pristine wild areas were set aside for human recreational purposes – was introduced on African landscapes, with land ownership being transferred to the state from traditional local authorities (ibid.). When Kenya gained independence in 1963, there was a robust network of protected areas owned by local Government and the State (King *et al.*, 2015). About 90% of the country's land set aside for national parks and reserves is found in arid and semi-arid zones (Barrow & Mogaka, 2007). These ASALs account for approximately 90% of the country's wildlife population (GOK, 2012).

In Sub-Saharan Africa, a shift from the colonial centralized approaches to management of natural resources back to more devolved traditional approaches – broadly known as Community-Based Natural Resource Management (CBNRM) – began in the 1980s (Roe *et al.*, 2009). These devolved models entail management of forests, land, wildlife and water by local institutions, in a collective and collaborative manner, for the benefit of the locals. In Kenya, the first few wildlife conservancies were established in the 1990s (King *et al.*, 2015). Currently, approxiamtely 65% of Kenyan wildlife is found on communal and private land, outside the confines of State protected areas (ibid.). In Baringo County, 163,700.35 hectares of land have been designated for wildlife conservancies (BCCA, 2021a). Besides Kiborgoch, Chuine and Irong', other registered and unregistered conservancies have been established within the county over time (BCCA, 2021b). These include Kiplombe, Kamgoin, Kiborit, Kabarion, Kaptuya, Kimng'ochoch, Morop Tambaras, Ruko, Ngenyin, Sinibo Geopark, Simot, Sinende, Releng, Chepkirong, Kureswo and Ng'ing'in (ibid.).

Community-based conservancies and ecotourism enterprises, implemented through partnerships between the public and private sectors, could encourage local community goodwill for sustainable management and conservation of wildlife and other natural resources in Kenya (GOK, 2011). These Indigenous peoples and Community Conserved territories and Areas (ICCAs) are recognized under Aichi Target 11 of the Convention on Biological Diversity (CBD) as ecosystems containing significant ecological services and biodiversity values (King *et al.*, 2015). Baringo County, a predominantly a pastoral and agropastoral arid and semi-arid region, has a mix of private and communal land ownership systems, where communal grazing is practiced in conservancies (Akivaga, 2024).

In Kenya, community-based conservancies practice grass banking and rotational grazing in order to sustain mixed herds of livestock and wildlife through droughts (Western *et al*., 2015). In the Maasai Mara landscape, Enonkishu Conservancy has had positive impact on pasture resources: the grazing plan blocks within the conservancy were found to be 24% higher in terms of rangeland health than control samples outside the conservancy (Tyrrell *et al*., 2024). Similarly, in planned grazing areas within Northern Rangelands Trust Conservancies, vegetation cover increased (a 17% increase in Normalized Difference Vegetation Index was recorded), and species diversity, species richness, and herbaceous vegetation foliar cover increased by 45–234% (Odadi *et al*., 2017). In agreement, 95% of respondents in Samburu and Isiolo stated that the planned grazing within the Northern Rangelands Trust Conservancies led to increased availability of pastures, especially during droughts (Wato *et al*., 2025). These case studies show that the community-based conservancy model has worked in other dryland landscapes in Kenya. This study sought to establish whether the model has worked in Lake Bogoria landscape. In particular, the study was undertaken to document impacts of establishment of community wildlife conservancies on pasture availability and quantity in the Lake Bogoria landscape.

Materials and Methods

The Study Area

The study area, Lake Bogoria landscape, is situated within the semi-arid Baringo South (Marigat) and Mogotio sub-counties, within Baringo County, in the western part of Kenya (Figure 1). The region experiences temperatures ranging from 18°C to 39°C (CCB *et al*., 2007) and mean annual rainfall of 1035 mm (Herrnegger *et al*., 2024). The drainage area is open to the north, on the gently sloping Sandai plains, covered by sand, gravel and quaternary silt (BCG, 2018). Vegetation within the area includes shrubs, trees and herbaceous plants (Herrnegger *et al*., 2021). Some of the shrubs include *Acalypha fruticose*, *Boscia anguistifolia*, *Grewia bicolor*, and *Maerua angolensis* (Ogendi & Ondieki, 2020). Tree species within the landscape are *Ficus capensis*, *Ficus sycomorus*, *Acacia nubica*, *Acacia tortilis*, *Acacia reficiens*, *Acacia mellifera*, and the genera *Combretum*, *Commiphora* and *Terminalia* (Wechuli *et al*., 2016). The herbaceous plants include the African wild basil *(Ocimum gratissimum*), while the major pasture grasses include Maasai love grass *(Eragrostis superba*), African star grass (*Cynodon nlemfuensis)*, red oat grass *(Themeda triandra*), and buffelgrass (*Cenchrus ciliaris*) (Nyambari *et al*., 2024).

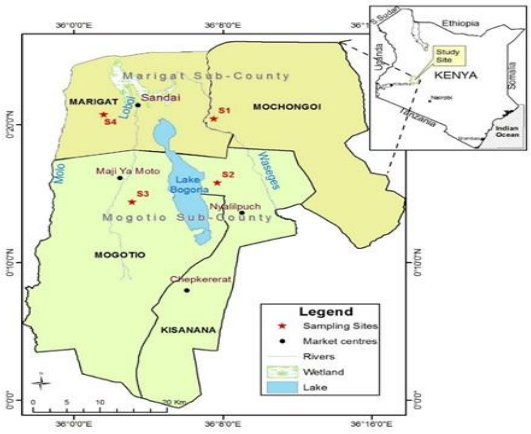

Figure 1: Map of the study area

A key constituent of the landscape is Lake Bogoria National Reserve Ecosystem (LBNRE), which has been designated by BirdLife International as an Important Bird Area with about 370 bird species, 13 of which are globally threatened and 8 regionally threatened, and acts as a significant stopover point for northern bird migrants (LBNR, 2020). One of the most spectacular wildlife phenomena globally is the unique large congregation of the near-threatened lesser flamingos (*Phoeniconaias minor*) on Lake Bogoria's freshwater points and shoreline (Schagerl, 2016). The ecosystem is inhabited by large ungulates, such as the endemic greater kudu; large carnivores such as leopard, which is endangered; primates, such as patas monkey (*Erythrocebus patas*); extremophiles; and cyanobacteria/blue-green algae, the most dominant being *Spirulina plantesis* (BCG & KWS, 2019). It was because of this rich biodiversity, in addition to the beautiful scenery and hydrological features, that Lake Bogoria was gazetted as a national reserve for protecting wildlife in 1970 and designated a United Nations Educational Scientific and Cultural Organization (UNESCO) World Heritage Site in 2010 (LBNR, 2020). Additionally, Lake Bogoria was in 2001 designated as a wetland of international importance under the Ramsar Convention. The endemic pastoral Endorois community inhabits the study area.

Data collection and Analysis

Written permission to undertake data collection was sought from Egerton University and the National Commission for Science, Technology and Innovation. The consent of respondents was also sought before they were involved in the study. Primary data collection was undertaken from December 2022 to February 2023. The Endorois community, community wildlife conservancies' officials, Lake Bogoria National Reserve personnel, Kenya Wildlife Service officers, Kenya Forestry Research Institute personnel, Kenya Agricultural and Livestock Research Organization personnel, and Ministry of Agriculture, Livestock and Fisheries officials constituted the target population for the study.

Household surveys were conducted to obtain data from the local Endorois community, stratified sampling techniques being employed to select a sample. The use of this technique was essential to ensure proportional representation of the four divisions according to their population sizes, thereby enhancing the overall representativeness of the sample. Thus, the population was first be divided into two broad strata: Marigat and Mogotio Sub-Counties. It was then divided into four smaller strata: Marigat and Mochongoi Divisions (in Marigat Sub-County) and Mogotio and Kisanana Divisions (in Mogotio Sub-County). Simple random sampling was used to choose household heads from each division, to constitute the sample. The number of subjects from each division were computed proportionately, based on the Kenya National Bureau of Statistics (KNBS) 2019 population statistics of the sublocations covered within the four divisions.

The sample size was calculated using the formula by Nassiuma (2000):

$$n = NC^2/ (C^2 + (N-1)\, e^2)$$

Where n is the sample size; N is the population size; C is the coefficient of variation and e is the margin of error. Nassiuma (2000) recommends this formula for survey studies, stating that ranges of $21\% \leq C \leq 30\%$ and $2\% \leq e \leq 5\%$ are acceptable. For this study N = 15,010, C = 25 % and e = 2.5%. Hence, the sample size was computed as follows:

$$n = 15{,}010 \times 0.25^2/ (0.25^2 + 15{,}009 \times 0.025^2) \approx 100$$

The 100 household heads were proportionately selected as follows: 24 from Marigat, 19 from Mochongoi, 28 from Mogotio and 29 from Kisanana Divisions.

Further, key informant interviews and focus group discussions were held with personnel from Chuine Wildlife Conservancy, Kiborgoch Community Wildlife and Wetland Conservancy, Irong' Community Conservancy, Lake Bogoria National Reserve, Kenya Wildlife Service, Kenya Forestry Research Institute, Kenya Agricultural and Livestock Research Organization, and Ministry of Agriculture, Livestock and Fisheries (Livestock Department). Photographs were also taken to complement the other data collection methods.

Descriptive statistics were used to describe the primary data obtained via the semi-structured questionnaires administered to household heads. Particularly, frequency and distribution summaries – relative frequencies (percentages) and bar chart – were used. Two inferential statistics were also employed. Spearman's Rank Correlation was used to determine the strength of the relationship between establishment of community wildlife conservancies and pasture availability, based on the community's perspective. Additionally, Pearson's Chi-square test was used to assess the significance of the relationship between the establishment of community wildlife conservancies and pasture availability, with the level of significance being tested at alpha = 0.05.

Results and Discussion

Community Wildlife Conservancies

Seventy-three percent of the agropastoralists interviewed resided in proximity to one of the three community conservancies within the Lake Bogoria landscape: 23% lived near Kiborgoch Community Wildlife and Wetland Conservancy (established in 2015); 19% near Chuine Wildlife Conservancy (established in 2010); and 21% Irong' Community Conservancy (established in 2009). Kiborgoch Community Wildlife and Wetland Conservancy spans Sandai, Loboi and Kapkuikui locations in Marigat Division and covers about 3,500 hectares (BCCA, 2021a). Chuine Wildlife Conservancy, covering 1,805 hectares of land, is located on the North-eastern side of Sandai location (BCCA, 2021b). It encompasses Tuitik and Samuran villages in Mbechot sub-location, and Cheploch, Mutaran and Mogokwo in Sandai sub-location (Akivaga, 2024). Irong' Community Conservancy, whose size is approximately 130 hectares, covers Loboi, Kapkuikui, Kamar, Koibos and Soi locations (BCCA, 2021a; BCCA, 2021b).

These conservancies served as livestock grazing zones, for 50% the local Endorois community members interviewed, and bee keeping zones for 34% of the respondents. Other benefits that accrued to the community include the conservancies being a tourist site and source of employment, firewood and papyrus reeds. In reference to the latter, Chelaba Women Group harvested papyrus reeds from Kiborgoch Community Wildlife and Wetland Conservancy and weaved mats and other handicrafts. Additionally, given that the Conservancy is largely aquatic, it serves as an important water source for watering livestock, irrigating farms and domestic uses (BCCA, 2021a).

On the other hand, the community experienced a myriad of challenges by residing in proximity to the conservancies. These included competition for pastures and water between the wild animals and livestock; disease and vectors transmission from wild animals to livestock; and crop destruction and livestock

predation by wild animals. The major animals that destroyed crops included hyena, baboons and elephants. Livestock predators mentioned included cheetahs, leopards and caracals.

Within Kiborgoch Community Wildlife and Wetland Conservancy, pasture development was practiced; communal land had been set aside to grow pastures. The grass types grown were Bermuda grass (*Cynodon dactylon)* and star grass (*Cynodon nlemfuensis)*. During the study period, *Cynodon dactylon* grass (known as *Amrikwa* in the local Endorois dialect) had been planted within Kiborgoch Conservancy, for livestock use during the dry season (Plate 1). Similarly, in the nearby Lake Baringo catchment area, the local agropastoral Tugen and Njemps communities reseeded the fields using the indigenous drought-tolerant species, including the perennial African foxtail bunchgrass (*Cenchrus ciliaris*), Maasai love grass (*Eragrostis superba*), narrowleaf turpentine grass (*Cymbopogon pospochilii*), rat-tail grass (*Sehima nervosum*) and mopane grass (*Enteropogon macrostachyus*), in order to adapt to climate variability and ameliorate the effects of land degradation (Githu *et al.*, 2022). In East Africa, reseeding using the native *Eragrostis superba* and *Cenchrus ciliaris* species, preferred due to their forage value, has been successful in combatting desertification (Mganga *et al*., 2015).

Plate 1: Pasture development within Kiborgoch Community wildlife and wetland conservancy

Plate 1:

Thirty-nine percent of agropastoralists noted that the vegetation cover within the community wildlife conservancies had decreased over time. The reduction in vegetation was attributed to influx of a high number of livestock beyond the conservancies' carrying capacity. The National Environment Management Authority (NEMA, 2021) concurs that many drylands in Kenya are overstocked. Thirty-nine percent of agropastoralists indicated that vegetation cover had increased. Twenty-two percent of the respondents had not observed any change in vegetation within the conservancies. During the study, it was observed that wild animals and livestock grazed together (Plate 2).

Plate 2: Zebras and livestock (goats, sheep and cattle) grazing within Kiborgoch Community Wildlife and Wetland Conservancy

In addition to the zebras, several other wild animals are found within Lake Bogoria National Reserve and its immediate environs – which encompasses Kiborgoch Community Wildlife and Wetland Conservancy. According to Lake Bogoria National Reserve Management Plan for 2019-2029 (LBNR, 2020), these wild animals include twenty-three other mammals (besides the zebras), some of which are threatened or very rare. The greater kudu (*Tragelaphus strepsiceros*) is threatened; Cape buffalo (*Syncerus caffer*) is rarely seen; leopard (*Panthera pardus*), serval cat (*Leptailurus serval*) and the African wildcat (*Felis lybica*) are very rare; klipspringer (*Oreotragus oreotragus*), blue duiker (*Cephalophus caeruleus*), yellow-backed duiker (*Cephalophus silvicultor*), common waterbuck (*Kobus ellipsiprymnus*), spotted hyena (*Crocuta crocuta*), striped hyena (*Hyaena hyaena*), bat-eared fox (*Otocyon megalotis*), patas monkey (*Erythrocebus patas*), cheetah (*Acinonyx jubatus*) and aardvark (*Orycteropus afer*) are rare; while vervet monkey (*Cercopithecus pygerythrus*), common jackal (*Canis aureus*), warthog (*Phacochoerus aethiopicus*), bush pig (*Potamochoerus porcus*), Anubis baboon (*Papio anubis*), Grant's gazelle (*Gazella granti*), impala (*Aepyceros melampus rendilis*), dikdik (*Rhynchotragus kirki*) and the zebra (*Equus quagga*) are common (LBNR, 2020). The heavy grazers, such as zebras, warthogs and buffalos (Potgieter & Kerley, 2022; Treydte *et al*., 2006; Landman *et al*., 2018), likely degrade vegetation within the Lake Bogoria landscape.

Pasture Resources

Forage for livestock in the Lake Bogoria landscape included grass, shrubs and tree leaves. During the rainy season, grass was cited by 42% of the respondents as the major fodder for livestock. Within Lake Bogoria ecosystem are more than two hundred grass species that are alkaline tolerant (BCCA, 2021a). Shrubs and tree leaves were the major source of forage according to 32% and 26% of the respondents, respectively. Tree leaves, known as "charawek" when dry by the Endorois community, was cited by 66% of the agropastoralists interviewed as the main forage especially for goats during the dry season. Shrubs was indicated by 22% of the respondents as the major livestock fodder during this season. Most of the grasses within the region are ephemerals, only available for livestock to graze on for approximately two months, after which they dry up (Kareri, 2018). This explains why few (9%) of the agropastoralists interviewed

relied on grass during the dry season. According to 47% of the respondents Lake Bogoria National Reserve served as grazing zone for their livestock during the dry season. In Sinende location was located a hay barn. However, only 3% of the respondents relied on hay for their livestock feed during the dry season. Despite the existence of hay barns, there was little hay during the study period due to the frequent and prolonged droughts in the area.

According to Lake Bogoria National Reserve Education Office key informant, some of the trees and shrubs within the area that are browsed on by the livestock within the landscape include the various species of Acacia and others that are adapted to the arid and semi-arid conditions (Table 1). Some of these species are also found within Lake Baringo catchment in Baringo North constituency. The species within Lake Baringo catchment include *Acacia tortilis*, *Acacia reficiens*, *Balanites aegyptiaca*, *Boscia coriacea* (leathery boscia), *Cordia sinensis* (grey-leaved saucer berry), *Maerua angolensis*, *Prosopis juliflora*, *Opuntia ficus-indica* and *Salvadora persica* (Kaimba *et al.*, 2011; Petek, 2018).

Table 1: Trees and shrubs that constitute fodder for livestock in Lake Bogoria landscape

Botanical Name	***Common English Name***	***Endorois Name***
Acacia brevispica	*Wait-a-bit thorn*	*Kornista*
Acacia mellifera	*Black thorn*	*Ngorore*
Acacia drepanolobium	*Whistling thorn*	*Ngowe*
Acacia gerrardii	*Red thorn*	*Sebeldi*
Acacia nilotica	*Egyptian thorn*	*Chebiywo*
Acacia nubica	*Nile thorn*	*Sebeiwe*
Acacia reficiens	*False umbrella thorn*	*Barsule*
Acacia senegal	*Gum arabic*	*Chemange*
Acacia seyal	*White thorn*	*Lengwe/chuine*
Acacia tortitis	*Umbrella thorn*	*Sesia*
Acalypha indica	*Indian nettle*	*Walbeyon*
Achyranthes aspera	*Chaff flower*	*Chesirim*
Albizia amara	*Oil cake tree*	*Kotutwe*
Albizia anthelmintica	*Worm-bark false thorn*	*Barmukute*
Acalypha fruticosa	*Birch leaved acalypha*	*Lokuru*
Arundinaria alpina	*Mountain bamboo*	*Tegante*
Asparagus africanus	*African asparagus*	*Tobororwe*
Balanites aegyptiaca	*Desert date*	*Ng'oswe*
Berchemia discolor	*Wild almond/Brown ivory*	*Muchukwe*
Boscia angustifolia	*Rough-leaved shepherds tree*	*Likto*
Boscia salicifolia	*Willow-leaved shepherds tree*	*Kurionde*
Cadaba edulis	*Indian cadaba*	*Eldumeiyon*
Cadaba farinosa	*Herd's boy fruit/ African cadaba*	*Imbirikwo*
Calotropis procera	*Apple of sodom*	*Lopusakie*
Capparis fascicularis	*Zigzag caper-bush*	*Korobuywe*
Carissa edulis	*Climbing num-num*	*Leketetwet*

Cissus rotundifolia	*Venezuelan treebine*	*Rorowe*
Combretum molle	*Velvet bushwillow*	*Chepchopoiwo*
Combretum aculeatum	*Spiny bushwillow*	*Kamsalawa*
Combretum hereroense	*Russet bushwillow*	*Miskitwe*
Commiphora africana	*African myrrh*	*Tolnginy*
Commiphora edulis	*Rough-leaved corkwood*	*Masian*
Cordia ovalis	*Snot berry*	*Tembererwe*
Croton dichogamus	*Orange-leaved croton*	*Kelelwe*
Dichrostachys cinerea	*Kalahari Christmas tree*	*Tinet*
Diospyros scabra	*Hard-leaved monkey plum*	*Tuwetye*
Dodonaea angustifolia	*Sand olive*	*Tibilikwo*
Ficus sycomorus	*Sycamore fig*	*Lokoiywet*
Ficus thonningii	*Strangler fig*	*Simotwe*
Gardenia ternifolia	*Yellow gardenia*	*Kipbulwe*
Grewia bicolor	*False brandy bush*	*Sitewe*
Grewia tenax	*White cross-berry*	*Toronwe*
Grewia villosa	*Mallow raisin*	*Mokuywe*
Haplocoelum foliolosum	*Northern galla-plum*	*Kokonte*
Hibiscus indica	*Hibiscus*	*Imenwe*
Indigofera arrecta	*Java indigo*	*Tilyon*
Indigofera tinctoria	*True indigo*	*Aruopngwony*
Kigelia africana	*Sausage tree*	*Rotinwo*
Lannea fulva	*African wild mango*	*Lelit*
Lannea triphylla	*Three-leaved marula*	*Tabuiye*
Lantana camara	*Tick berry*	*Cheramba*
Ludwigia adscendens	*Water primrose*	*Chepchomusion*
Lycium europaeum	*European tea tree*	*Kipyambatai*
Maerua angolensis	*Bead-bean tree*	*Cheposiewe*
Maerua decumbens	*Blue bush-cherry*	*Monongwe*
Maerua subcordata	*Bastard wild mango*	*Chebuluswo*
Maerua triphylla	*Small bead-bean*	*Roson*
Meyna tetraphylla	*Four-leaf meyna*	*tilingwo*
Olea europaea	*Olive tree*	*Yemtit*
Opuntia ficus-indica	*Prickly pear cactus*	*Matundiante*
Pappea capensis	*Jacket plum*	*Kibiriokwo*
Pistacia aethiopica	*Commercial pistachio nut*	*Tulde*
Premna resinosa	*Resin premna*	*Kekech /birtapta*
Prosopis juliflora	*Mathenge*	*Pestus*
Rhus natalensis	*Northern dune currant*	*Siryandet*
Salvadora persica	*Toothbrush tree*	*Sokotoiwo*
Sclerocarya birrea	*Cider tree*	*Tololokwa*

Sesbania sesban	*Egyptian rattle pod*	*Arwap ngwony*
Sterculia stenocarpa	*Bush butter*	*Mukoywe*
Syzygium guineense	*Water pear*	*Lomoiwo*
Tamarindus indica	*Tamarind*	*Orwo /orwet*
Tarchonanthus camphoratus	*Wild cotton*	*Lelegwet*
Terminalia brownii	*Red pod terminalia*	*Koloswo*
Vangueria madagascariensis	*Spanish tamarind*	*Komolwo*
Vernonia cinerascens	*Grey-leaved Vernoia*	*Tuiyarus*
Warburgia ugandensis	*Greenheart tree*	*Soke*
Zanthoxylum chalybeum	*Knob wood*	*Kokchante*
Ziziphus mucronata	*Buffalo thorn*	*Noiwet*

"Ng'oswe" (*Balanites aegyptiaca)* tree was used as fodder: pastoralists chopped branches and leaves for livestock. The remaining tree parts were burnt for charcoal. Cacti succulent was also used as fodder: the thorns were burnt and the succulents chopped for livestock. "Rorowe" (*Cissus rotundifolia)* was also an important climber fed on by cattle, especially during drought, as it is drought tolerant.

Most of the agropastoralists (92%) stated that availability of pastures had decreased within Lake Bogoria landscape in Baringo over the four decades (Figure 2). In corroboration, Kipkulei *et al*. (2025) recorded a decrease of 406.54 km² in grassland in Baringo County from the year 2000-2024. Contrary to the community's perception in Lake Bogoria landscape, Kipkulei *et al*. (2025) found out that the shrubland had increased by 418.44 km² from the year 2000-2024 within Baringo County. Additionally, another study of land use land cover changes in Tiaty East within Lake Baringo basin over the period 1985-2015 showed an increase in dense shrubs and trees, from 14.93% - 32.73% of study area (Greiner et al., 2021). Within northern Baringo rangelands, an increase in availability of edible plants for browsers was also recorded (Vehrs, 2018).

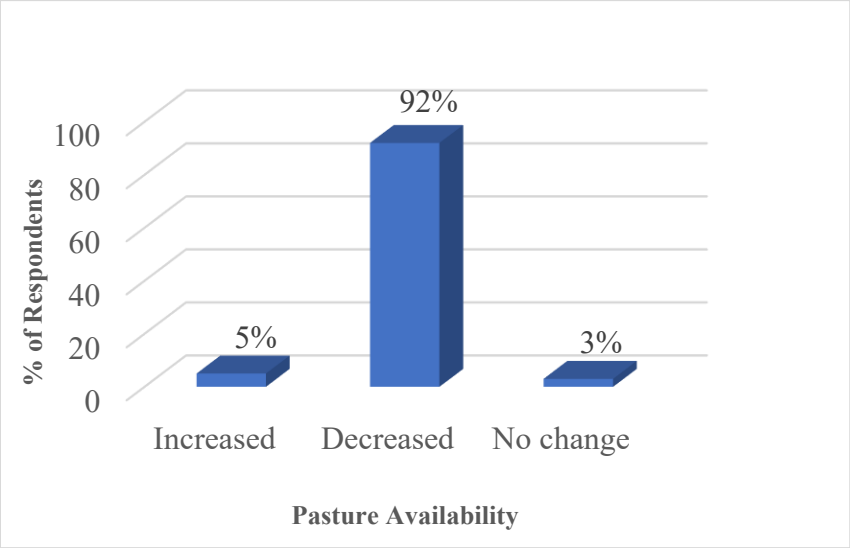

Figure 2: Changes in pasture availability in Lake Bogoria landscape in Baringo

Despite their observation of reduction in pasture availability, only 18% of the agropastoralists stated having traditionally conserved pastures for use by their livestock during the dry season. In many arid and semi-arid areas in Kenya and Tanzania, pastoralists often conserve pastures within a certain section of their land, fencing off these pasture reserve enclosures using thorny bushes such as those of Acacia species (Ngenzi *et al*., 2024). According to Livestock Department, there used to be grazing land (a traditionally conserved communal land) in Sandai location that would be irrigated naturally by the spillover of River Waseges water. However, when the river changed course, grass dried up and *Prosopis juliflora* dominated the area. Eighty-two percent of the respondents did not have pastures conserved for dry seasons.

Impact of Conservancies' Establishment on Pasture Resources

The Spearman's Rank correlation indicated a very weak positive non-significant relationship between the perceived changes in vegetation cover in community wildlife conservancies and perceived pasture availability ($\rho = 0.122$, $p = 0.226 > 0.05$). This implies that the establishment of the community wildlife conservancies did not have a significant monotonic relationship with pasture availability, based on the perception of the local Endorois community. Pearson Chi-square test confirmed that the association between the establishment of community wildlife conservancies and pasture availability was not statistically significant ($\chi^2 = 3.763$, $df = 4$, $p = 0.439$). The two variables were statistically independent. This suggests that perceived pasture availability did not differ significantly in areas with conservancies and those without conservancies within the study area. These findings imply that, based on the community's perspective, the establishment of community wildlife conservancies did not have a discernable impact on pasture availability in the Lake Bogoria landscape. According to the focus group discussion participants, invasive tree species and overcrowding within the community wildlife conservancies negated the expected benefits of these conservancies with regard to pastures.

The focus group discussion participants elaborated that in 1981 there was more grass on hills and in lowlands, fewer *Acacia mellifera* trees and no *Prosopis juliflora*. But, being invasive, *Acacia mellifera* had increased in numbers and *Prosopis juliflora* had colonized pastures since its introduction. Thus, the *Acacia mellifera* had dominated the hills while *Prosopis juliflora* had dominated lowlands, resulting in reduction of grass. The participants noted that 1997 marked the last year when the hills were distinctively covered by grass. During the study period, there was hardly any grass. Actually, Chuine Conservancy was particularly established to address the loss of native flora depended on by wildlife and livestock (Akivaga, 2024). Nonetheless, according to one focus group discussion participant:

Chuine hills, within Chuine Wildlife Conservancy was predominated by Acacia mellifera, whose white flowers serve as pollination sites for bees (Plate 3). The hills served as traditionally reserved dryland grazing area for livestock in the 1980s.

Okoth (2024) adds that *Vachellia reficiens* (*Acacia reficiens*) covers approximately 40% of Chuine Wildlife Conservancy, while *Opuntia spp.* (prickly pears) cover about 15% of the conservancy, both being invasive species. Vehrs (2018) confirms that the northern Baringo rangelands, within the wider Lake Baringo-Bogoria basin, was dominated by perennial grasses before the year 1950 but has recently been dominated by Acacia bushes. Since the 1950s, there has been a rapid increase in *Senegalia mellifera* (*Acacia mellifera*), *Acacia nubica* and *Vachellia reficiens* within these northern rangelands (Vehrs, 2018). Consequently, high-

quality grasses, such as *Eragrostis cilianensis*, *Setaria homonyma* and *Brachiaria deflexa*, have declined in the northern Baringo rangelands (ibid.).

Plate 3: Chuine hills, within Chuine Wildlife Conservancy, predominated by Acacia mellifera

Moreover, approximately 10% of Chuine Wildlife Conservancy had been colonized by the invasive *Prosopis juliflora,* threatening the native vegetation and altering the area's ecological balance (Okoth, 2024). Similary, the focus group discussion participants noted that the shrub had led to extinction of some indigenous tree species, especially within Kiborgoch Conservancy. The Kenya Forestry Research Institute key informant expounded that *Prosopis juliflora* invasion, especially in Marigat division, had massively impacted pasture availability negatively; it had subjugated the pastures and browse species. Where there was dense *Prosopis juliflora* most of these species had been eliminated. A lot of pastureland had been lost to the shrub. *Prosopis juliflora* suppresses the growth of biodiversity, such as grasses, under its canopy by delaying germination of seeds and inhibiting growth of various plant parts and reducing stem diameter and the height of the plant (Hundessa & Fufa, 2016). Livestock Department Marigat office highlighted that in the past, beneath Acacia trees were shrubs that used to be browsed on by goats, but *Prosopis juliflora* had replaced the shrubs. By being the undergrowth, *Prosopis juliflora* threatened Acacia; the Acacia slowly dried up. Whereas bush encroachment is a key concern in Chuine and Kiborgoch conservancies, encroachment of communal grazing lands due to the changing land tenure systems is a key challenge within Irong' Conservancy (Mukalo, 2024).

According to the conservancies' management, there was competition for pastures among the livestock and between livestock and wildlife, which was compounded by erratic rainfall. During dry seasons, almost all livestock were grazed within the conservancies, exceeding the carrying capacity of the conservancies. Generally, the large cattle herds within Baringo County strain vegetation (Chemelil, 2018). The Ilchamus had also brought in their livestock to the conservancies. Due to cattle rustling, which resulted in insecurity in Arabal location, Mukutani division, people immigrated to Marigat Division, as from around 1985. During the period 2000-2009, Ilchamus conflicts with the Pokot, Samburu and Turkana communities intensified as grazing pressure heightened on the pasture lands (Anderson & Bollig, 2016). Most of the Ilchamus

immigrants from Arabal settled on Chuine hills, where they practiced charcoal production. This, in addition to influx of livestock, increased competition, reducing pasture availability in Marigat Division. This led to animals crowding along the Lake as well. The crowding intensified the competition between livestock belonging to Endorois and those of immigrants from Arabal, greatly reducing the pastures within and around Lake Bogoria National Reserve.

Subsequently, some wildlife had been driven away from the conservancies by the flocking livestock, in search of pastures. This resulted in human-wildlife conflict as the wild animals fed on farmers crops and preyed on livestock on private farms. According to Kenya Wildlife Service office within Lake Bogoria National Reserve, Kenya Wildlife Service compensated farmers for crop destruction by elephants, especially in Kabuswo and Sinende locations, where the elephant corridors traversed. However, in the case of the bat-eared fox (*Otocyon megalotis*) and serval cat (*Leptailurus serval*), there was no compensation. Only certain animals are outlined to warrant compensation, to an affected person, in the Kenya Wildlife Service Wildlife Compensation Scheme, developed in the national assembly. Those outlined include elephant (*Loxodonta Africana*), hippopotamus (*Hippopotamus amphibius*), zebras (*Equus quagga*), cheetah (*Acinonyx jubatus*) and leopard (*Panthera pardus*). The Kenya Wildlife Service office also proposed that farmers could also use traditional methods to reduce human-wildlife conflict, such as, erecting scarecrows, beating drums and making loud noises. Kenya Wildlife Service, besides compensation, does scaring of wild animals, elimination of and setting traps for the predators among other methods.

Conclusion and Recommendation

Majority of the local community members did not observe positive impact of the community wildlife conservancies on pasture availability, attributing this to overgrazing by the overcrowded livestock beyond the conservancies' carrying capacity and pasture colonization by invasion tree species (Kiborgoch conservancy was invaded by *Prosopis juliflora*, and Chuine conservancy by *Senegalia mellifera*). According to them, the community-based conservancy governance model was not effective in Lake Bogoria landscape. Thus, future researchers should employ comparative quadrat sampling and Normalized Difference Vegetation Index analysis to empirically assess the impact of the community-based wildlife conservancies on pasture resources. By combining ground-level vegetation measurements with remotely-sensed data, researchers can quantitatively compare greenness, plant diversity, species composition, and biomass productivity within and outside conservancies' boundaries. Such an integrated approach would provide objective evidence on whether the conservancies enhance or negatively impact forage availability, accounting for the spread of invasive tree species and overgrazing intensity, thereby strengthening the scientific basis for rangeland management interventions in arid and semi-arid lands.

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