Research Paper

Rangeland management practices in Somaliland: lessons learned from the Aroori Grazing Reserve

By Ahmed Ibrahim Awale

On the Ground

- Pastoralism, which is the chief mainstay for most of the population in the Somali region of the Horn of Africa, has witnessed sweeping changes. These changes are characterized by weakening resilience due to a combination of climate-induced challenges and anthropogenic factors, including overgrazing, deforestation, land-use changes, loss of soil fertility, and proliferation of invasive species.
- This article provides a brief overview of rangeland management in Somalia starting from the colonial days until the collapse of the central government in 1991. The period that followed until 2016, which covers the years of self-declared independence of Somaliland up to the re-establishment of Aroori Grazing Reserve (AGR), was characterized by low investment in natural resources including agriculture, forestry, and rangelands and compounded by weak institutions due to the paucity of resources.
- I outline the key takeaways from the 2016 restoration of AGR in Somaliland, including the area's value to pastoralists as a fodder reserve for livestock during hard times brought on by prolonged droughts. I also highlight emerging trends in community-led grazing management in the form of "village grazing lots" through joint land-use planning.
- Grazing reserves serve as refuges and as tools to maintain indigenous grass biodiversity.

Keywords: community-managed grazing reserves, livestock, pastoralists, rangeland management, resilience of pastoral livelihoods.

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Introduction

Somaliland has an arid to semiarid climate, which makes it susceptible to climate change, environmental degradation, drought, and flooding.[1,2] The country has seen over the decades an increase in recurring droughts, flash floods, massive land degradation, and invasive species colonization.[3]

The livestock sector is the largest contributor to Somali livelihoods, with 65% of the population engaged in the sector. Livestock and their products account for 80% of exports in a typical year.[4] Other than livestock, frankincense and myrrh are among the most valuable nontimber forest products for export.[5] Estimated at 18.6 million, Somaliland's livestock population consists mainly of camels, sheep, goats, and cattle.[6] As an important asset to the country's economy, livestock often accounts for more than 80% of foreign exchange earnings.

In recent decades, the livestock sector has been hit by a combination of climate-induced challenges and anthropogenic factors, including overgrazing, deforestation, land-use changes, loss of soil fertility, and proliferation of invasive species. The loss of grazing and water resources available for livestock has caused the impoverishment and deprivation of the herders, which ultimately led to many of them losing their pastoral livelihoods and ending up in internally displaced peoples' camps.[7]

Although pastoralism, despite its significance for food security and the economy, is often ignored and receives limited targeted support, there are examples of best practices in offering support that are important to study and draw lessons from. Accordingly, the main objective of my study is to assess the impact of the AGR in terms of its socioeconomic advantages to pastoral herders and livestock exporters, as well as its overall ecological benefits. I intend to use the findings of this study to support decision-makers in managing areas set aside for pastoralist use and protecting communities from the adverse effects of climate change-induced droughts, including grazing deficits.

I initially provide the historical context by offering a succinct review of shifts and patterns shaping rangeland management in Somaliland. I discuss the AGR with related analyses

of its core potentialities and challenges surrounding the long-term sustainable management of grazing reserves. Lastly, I draw on insights from the case and reflect on emerging trends in community-led grazing management. I conclude by presenting key considerations crucial for supporting rangeland health and, more widely, for enhancing climate change resilience in Somaliland.

Methods

My research employed a variety of data gathering techniques, including semistructured in-person and small-group interviews with a total of 42 interviewees. The interviewees were composed of 30 pastoralists, 30% of whom were women, and 12 government officials, including those working at the Aroori Livestock Center of Excellence (ALCE), camel dairy farm operators, livestock exporters, and officers from development organizations involved in rangeland management. The purpose of including women in the research was to capture their perspective toward rangeland restoration because they are economically involved in livestock production activities such as herding, taking care of animals, milking, and processing milk products. Women also play an important role in the milk value chain because the marketing of milk is predominantly done by women.[8] In part, this is because women are increasingly taking on new roles and responsibilities, including household provider.[9] The women I interviewed mainly came from pastoral households that were headed by women. Their families maintain a mixed stock consisting of sheep, goats, and a few camels.

I conducted fieldwork in May 2023; however, my research also draws on published and unpublished material on rangelands in the greater Somali region and, more widely, pastoral areas in sub-Saharan Africa. Expert interviews were conducted with staff from the newly established ALCE as well as officials from the Ministry of Livestock. My qualitative data included focus group discussions and key informant interviews. The participants for the focus group discussions were community members and included pastoralists and agropastoralists settled around AGR. The participants in the key informant interviews were experts in different disciplines, such as range, biodiversity, veterinary science, and agriculture. Because the AGR has helped livestock exporters, my interview data includes their viewpoints and concerns. The reconnaissance visit included a transect walk within AGR to explore and determine the dynamics of vegetation cover and diversity. Field observations were critical in gathering data in the AGR. Historical accounts reconstructed through interviews and conversations with older adults revealed changes in species composition and richness, including dramatic declines due to overgrazing because of their palatability and their potential for regeneration after the establishment of the reserve. My assessment used geographic information systems and satellite-derived maps to track changes through time.

Rangeland management: historical background in Somaliland

Somaliland is a de facto state, considered internationally as a part of Somalia. It seceded and declared independence from Somalia in 1991.[10] Somaliland is an arid or semiarid country.[1] Vegetation ranges from desert grassland to open woodland habitat dominated by deciduous scrubland and patches of montane forest in some of the highest ecological zones. Rainfall is low and has a variable distribution, which occurs in two rainy seasons (April to June and October to November).

The pastoral production system is well adapted to its environment and for centuries has provided a reliable source of food.[11] Although the climate in this region of the Horn of Africa is hot, ranging from arid to semiarid, Somali herders have evolved a system of nomadic rotation dictated by the harsh environment.[12] The seasonal movement of herders with their stock in search of better pasture and water availability has been a crucial strategy for pastoral livelihoods. The functioning of this system relied on the mobility and movement of herds and people across different vegetation zones to compensate for the sparse and unpredictable resources characterizing the arid environment.[13] Such a pulsatory system of managed movements made it possible for herders to maintain a productive system of pastoralism for more than 2 millennia.[14]

In terms of diversity and species richness, the state of Somaliland today is a contrast to the past. At the turn of the 20th century, Drake-Brochmann described the mountain range south of Berbera as "park-like," with abundant trees and grass teeming with wildlife.[15] This is the main mountain range (Golis) in central Somaliland that runs parallel with the Gulf of Aden and reaches 1,373 to 2,134 m (4,500 to 7,000 feet) above sea level.[16] A decade prior, Major Swayne described the extent of vegetation between the Shebelle River in eastern Ethiopia and Adadlay at the southern foothills of the Golis Mountain Range. In one sentence, he succinctly recounts the country passed over "as one continuous sea of dense bush, dotted over with red ant-hills, of the spires being twenty-five feet high."[17]

Extreme violence and sociopolitical stability plagued this area between 1899 and 1921, having a detrimental impact on both the environment and the populace.[18] Rangelands experienced overgrazing as the seasonal migrations of herders and stocks were interrupted by the effects of instability.

The British Administration in Somaliland Protectorate, which served until independence on 26 June 1960, first introduced range management early in the 1950s through a system of forest and grazing reserves (including famine reserves) by using a deferred grazing system.[19] For example, Heemstra[20] reported that on Tuyo Seasonal Reserve, which was established in the 1950s, grazing was not allowed during the rainy season (i.e., twice per year for about 3 months) but was allowed during the dry season.

In his comprehensive report, the "General Survey of Somaliland Protectorate 1944–1950," John A. Hunt proposed the distribution of grazing stock to relieve grazing burden

from areas near permanent watering points.[21] The reorganization of the pastoral grazing movements in 1951 included a major intervention in water development whereby the administration built 30 *ballehs* (i.e., surface reservoirs) to capture runoff water. These were built about 16 km (10 miles) apart, along the waterless area 483 km (300 miles) long, north of the Ethiopian border.[22] Range improvement activities took place, including the provision of an adequate water supply in consideration of the land capability and runoff water spreading and being diverted by using cross-slope bunds directed to where they could be more productive.

With the establishment of the National Range Agency (NRA) in 1972, during Siad Barre's rule, the authorities carried out a range of activities aimed at mitigating the ongoing range degradation. According to Musse,[23] these included, establishing seasonal range reserves, each 400 km^2 (154 square miles), protected by local guards from pastoral associations and opened for grazing during the dry seasons. As of 1987, there were 110 reserves all over Somalia. The NRA also established famine reserves, each 600 km^2 (232 sq. miles), which served as fodder banks for livestock feeding during times of stress caused by prolonged drought and were changed every 4 to 5 years to reduce the influence of bush invasion.

Musse[23] documents how the NRA formed range and livestock associations that used rotational grazing schemes. The seasonal range reserves owned by the range and livestock associations were each split into 8 or 12 blocks. The aim was to give 1.5 years (i.e., three consecutive growing seasons) of rest to about 25% (i.e., two to three blocks) of the association's land at a time. After 1.5 years, the rested blocks were available for grazing, and another set of blocks was closed to grazing. Musse[23] argues that the intention was for the vegetation to become sufficiently vigorous after four consecutive rest periods (16 years) to allow for a shorter rest period. Community participation was an essential element in the design, implementation, and maintenance of these grazing schemes. The association committees, which also included representatives from pastoralists, were involved in site selection, promotion of community acceptance of the concept, and providing guards.

During the civil war period (1988–1991) and the political instability that followed, all national legislation on rangeland conservation, protection, and enforcement ceased. The gains achieved over the previous years in range improvement were reversed. The hostilities also affected the seasonal mobility of pastoralists with their stock, causing heavy concentration in areas where they tried to be out of harm's way.[24] As range productivity declined, rangeland resource competition began. Spontaneous range enclosures proliferated, some overlapping with and/or encroaching on, former government reserves. This also resulted from the weakening of the traditional community-based pasture governance systems, known as *Xeer*, which were compounded by weak environmental governance.[25] The cumulative effect of these changes brought about irreversible changes to range ecosystems and to pastoral livelihoods.

AGR

Site conditions

AGR derives its name from the Aroori treeless plain (*Banka Aroori*). It is situated approximately 10 km (6.2 miles) to the southwest of Burao on the northern border of the Aroori plain. The area lies at 9° 26′ 20N and 45° 26′ 44E, with an elevation of 1099 m (3605 feet) above sea level (Fig. 1). The soil, like that of the wider Aroori plain, is an immature sandy

Figure 1. Somaliland indicating the location of Aroori Grazing Reserve (AGR) in the vicinity of Burao city and the wider Aroori plain. Courtesy of: https://www.openstreetmap.org/#map=8/9.143/45.176, with modification by Abdikani Mohamed.

loam of varying depths where there is an underlying layer of secondary Karkar limestone formation.[26] The annual precipitation varies from about 150 to 300 mm (6–12 inches), falling mainly during two rainy seasons (i.e., April through May and October through November).

Background

The current AGR was previously a livestock holding ground split off in 1972 from the wider Aroori plain (Fig. 1) established to facilitate and support livestock exports through the Berbera port on the Gulf of Aden. The facility ceased to function due to the civil war that broke out in 1988 and, ultimately, ended the regime of Siad Barre in 1991 (MA Abdiweli, Project Manager, ALCE, 20 May 2023, personal communication). During the period from 1988 to 2016, there was no management in place. More than 2 decades of overgrazing, absence of grazing management, exacerbated by the effects of droughts had led to plant retrogression, resulting in the disappearance of several palatable perennial grasses that were an important source of fodder stability for grazers (MA Abdiweli, Project Manager, ALCE, 20 May 2023, personal communication). These included *Cenchrus ciliaris*, *Chrysopogon aucheri*, *Sporobolos variegatus*, *Eragostis* spp., and *Cynadon dactylon*. Overgrazing altered pasture plant condition and according to the elders interviewed during the field study, some of the species that replaced the palatable perennial grasses, mostly woody shrubs, included *Indigofera* spp., *Vernonia cinerascens*, *Helichrysum glumaceum*, and *Crotolaria horrida*. Tree species that increased included *Vachellia tortilis*, *Vachellia nilotica*, and, more recently, *Prosopis juliflora*.

The rehabilitation of AGR as a livestock holding ground was started in 2016 with financial support from the Somaliland Development Fund, but in a second phase of development in 2023, it was upgraded to an ALCE. (MA Abdiweli, Project Manager, ALCE, 20 May 2023, personal communication). The main purposes of ALCE are to provide applied research, training, and extension services for animal production, fodder production, and animal health for Somaliland's animal producers, knowledge and information dissemination, and as a grazing reserve to keep pasture for livestock during lean years when fodder is scarce. According to the project review sheet dated May 2023, 60%, equivalent to 12,000 ha (29,653 acres) of the ALCE is allocated for natural regeneration of pasture to serve as a grazing reserve.[27]

Observable postenclosure impacts

Vegetation recovery—Following the ban on all-season free grazing starting in 2019 as a conservation measure, the AGR, as reported by the interviewees during the fieldwork, demonstrated an impressive vegetation recovery under natural conditions in terms of species richness and composition (Fig. 2). Many grasses, shrubs, and forbs, some of which have been repressed or presumed extinct because of their high palatability, have reappeared on the site (Table 1). These grass species were almost nonexistent outside the fenced area. Before the introduction of rest intervals, overgrazing allowed the proliferation of nonpalatable species, namely, *Solanum* spp., *Aerva javanica*, and *Abutilon fruticosum*. This is because of the extended periods of rest provided by fencing the site, whereby defoliated grasses and shrubs recovered, regenerated, and productivity and resilience increased. The long-term sustainability of ecosystems and wildlife populations, as well as biodiversity and ecosystem goods and services, depend on maintaining or increasing vegetation heterogeneity.[28] The greater the plant diversity on AGR, the greater the chance of sustainable feed source because less grazing pressure is placed on the species of higher preference by grazers. Annual plants typically have long seed viability in the soils, but constant seed recruitment from the soil seed bank without replenishment will reduce the amount of seed storage in the soil. This is because livestock continuously graze annuals too early, preventing them from flowering and setting seeds (MM Mirreh, "The Current Situation of Major Rangelands of Somaliland," unpublished report, 2012).

Table 1
Plant species* that reappeared after a 1.5-year rest period† in Aroori Grazing Reserve (AGR) Somlialand

Scientific name	Family name	Vernacular name
Aristida adscensions	Gramineae	*Maajeen*
Eragrostis cilianensis	Gramineae	*Xarfo*
Aristida kelleri	Gramineae	*Baal-xoorre*
Dinerbra retroflexa	Gramineae	*Jabi-oke*
Convolvulus hystrix	Convolvulaceae	*Geel-dabar*
Chrysopogon aucheri	Gramineae	*Dixi*
Sporobolus variegatus	Gramineae	*Sifaar*
Cynodon dactylon	Gramineae	*Doomaar*
Sporobolus helvolus	Gramineae	*Sifaar*
Dactyloctenium scindicum	Gramineae	*Saddexo*

* Nine of the 10 species are grass species, and the remaining one is a shrub.
† A 1.5-year rest period is equivalent to three consecutive growing (rainy) seasons.

Overgrazing in AGR had a significant impact on soil infiltration and water runoff, but the reappearance of perennial vegetation has slowed runoff. Vegetation cover increases soil moisture and leads to plant community persistence.[29-31] Older adult community members from the region explained during interviews that AGR's biomass peaked in spring 2023 for the first time in more than 30 years. The overall recovery of AGR is visually demonstrated in satellite imagery (Figs. 3 and 4) using the Normalized Difference Vegetation Index, which is an indicator of vegetation greenness.[32-36]

Community perception and attitudinal changes—Countrywide, the proliferation of private grazing enclosures in the public common land by livestock owners and urban dwellers, whereby the later convert land into a form of commercial real estate bought and sold, caused the shrinkage of the communal grazing lands, thus pushing "pure" pastoralists

Figure 2. Former bare grounds in Aroori Grazing Reserve (AGR) slowly being crowded by perennial grasses and shrubs following the closure of the area aimed at improving vegetation cover, composition, diversity, and richness. Photo courtesy of A. A. Awale, April 14, 2023.

onto marginal lands (MM Mirreh, Land Grab in Somaliland: A Recipe for National Disaster, unpublished, 2012).

The highly productive areas are the first to be appropriated into private grazing enclosures. This trend of privatizing grazing commons is driven by socioeconomic and ecological incentives. Henceforth, the "pure" pastoralists, who were made "landless" because of their constant movement from one place to another, often resist the establishment of grazing enclosures in the open range. Therefore, in preparation for the rehabilitation of the old livestock holding ground, which is in essence the current AGR, there were months of extensive community awareness and dialogue with the pastoralist leaders on the benefits of the project. In fact, a twin project of the same nature, which was planned to be implemented in Qool-caday Plain, approximately 60 km (37.5 miles) to the south of Hargeisa (Fig. 1), the Capital of Somaliland, was halted due to community resistance to the planned intervention.[39] The failure of Qool-caday project was partially caused by livestock exporters and quarantine investors/operators who resisted because of lack of interest in complying with standard livestock export practices, which they believed would increase the cost of doing trade.[40] However, the project would have relocated pastoral households within the Qool-caday communal grazing plain to allow fencing the area, which is a major concern of pastoralists in the Qool-caday area. They worry they will end up as landless and without alterative grazing land, as almost all areas surrounding Qool-caday plain are appropriated by private enclosure operators (R. Ali, elderly livestock herder, 8 June 2023, personal communication).

Nowadays, land issues remain contentious and not only in the urban setting but also in the rural areas.[41] The competition for land resources among pastoralists, agropastoralists, and sedentary populations often leads to community friction. Resolving conflicts over rangeland use often requires government interventions, bolstered by the traditional system of governance whereby community leaders play a crucial role.[42]

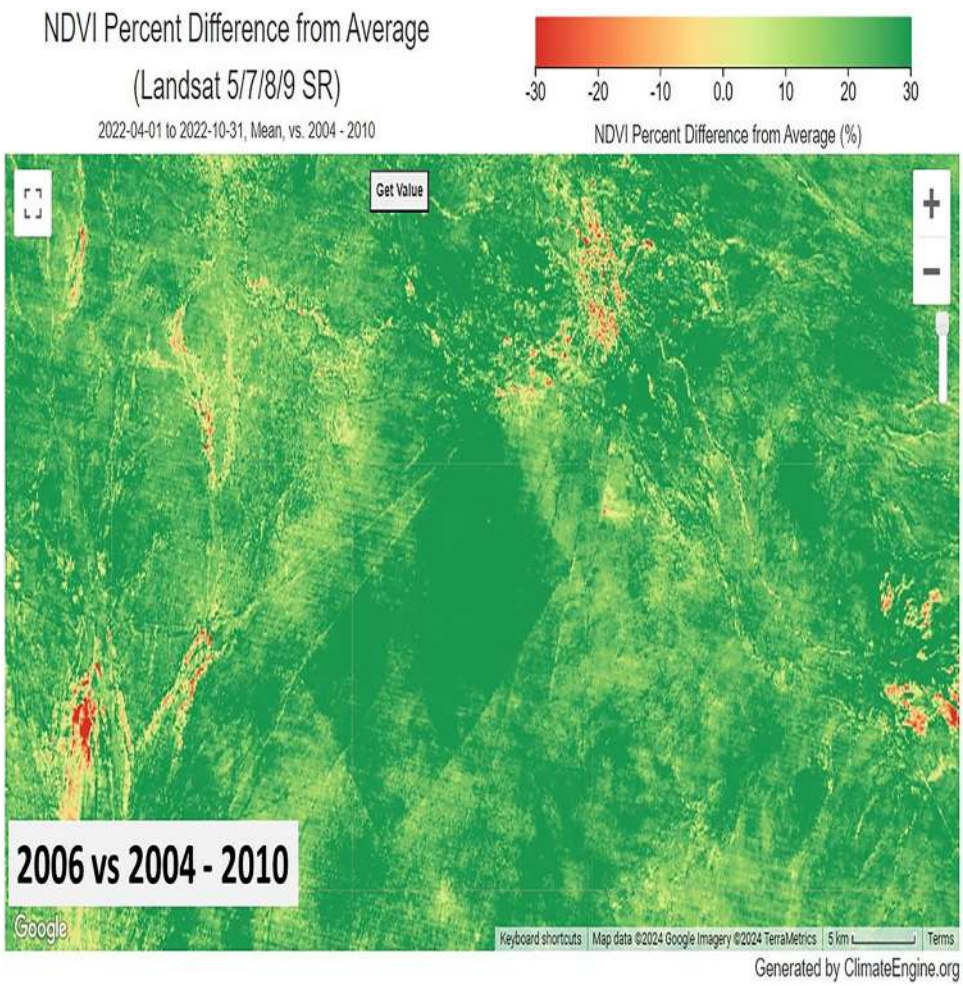

Figure 3. Aroori Grazing Reserve (AGR; solid green rectangle) during the rainy season (Gu'). Image produced using the Climate Engine online platform (https://climateengine.com/research-app/) in October 2023. Data source is a composite of satellite data from the Landsat program (https://landsat.gsfc.nasa.gov/).

However, the success of AGR in terms of vegetation recovery and the accompanying short-term economic benefits gained by pastoralists gave impetus to the conservation agenda relating to rangeland rehabilitation through enclosures. Therefore, AGR rehabilitation had a positive influence and a demonstrative effect on the communities' attitude and understanding toward the importance of such centralized control of grazing management, which serves as a crucial feed reserve during fodder shortages. More widely, research has established the key importance of communal grazing enclosures in most parts of Africa as a coping strategy in response to declining rangeland productivity.[43] In alignment with this perspective, ALCE, which also encompasses a demonstrational component, has been hosting visitors from diverse backgrounds and institutions, including academia specialized in range and agricultural science from local universities, pastoral groups and associations, fodder producers, livestock traders, and ministries of environment and agriculture. These efforts are contributing to important knowledge generation.

Most of the respondents (94%) perceived that the establishment of enclosures like the AGR had positive ecological, social, and economic impacts and supported the expansion and distribution of such reserves in different areas of the country to reduce grazing pressure on existing ones. However, the remaining 6% showed resistance related to overstocking and the accompanying livestock diseases. Many of them reported loss of herds during times of peak livestock concentration in AGR in 2022. However, the elders from the AGR and Togdheer region in general, who became aware of the benefits of AGR, expressed their interest in the establishment of grazing reserves close to their respective geographic locations. Many communities from various parts of Togdheer region and farther afield are adopting the idea of establishing community-led grazing reserves at a smaller scale. There is a wide consensus among the respondents that such interventions allow more sustainable utilization of the flow of ecosystem services generated by the conserved sites.

Key challenges facing AGR

I identified the following key findings as the main critical challenges facing the management of AGR.

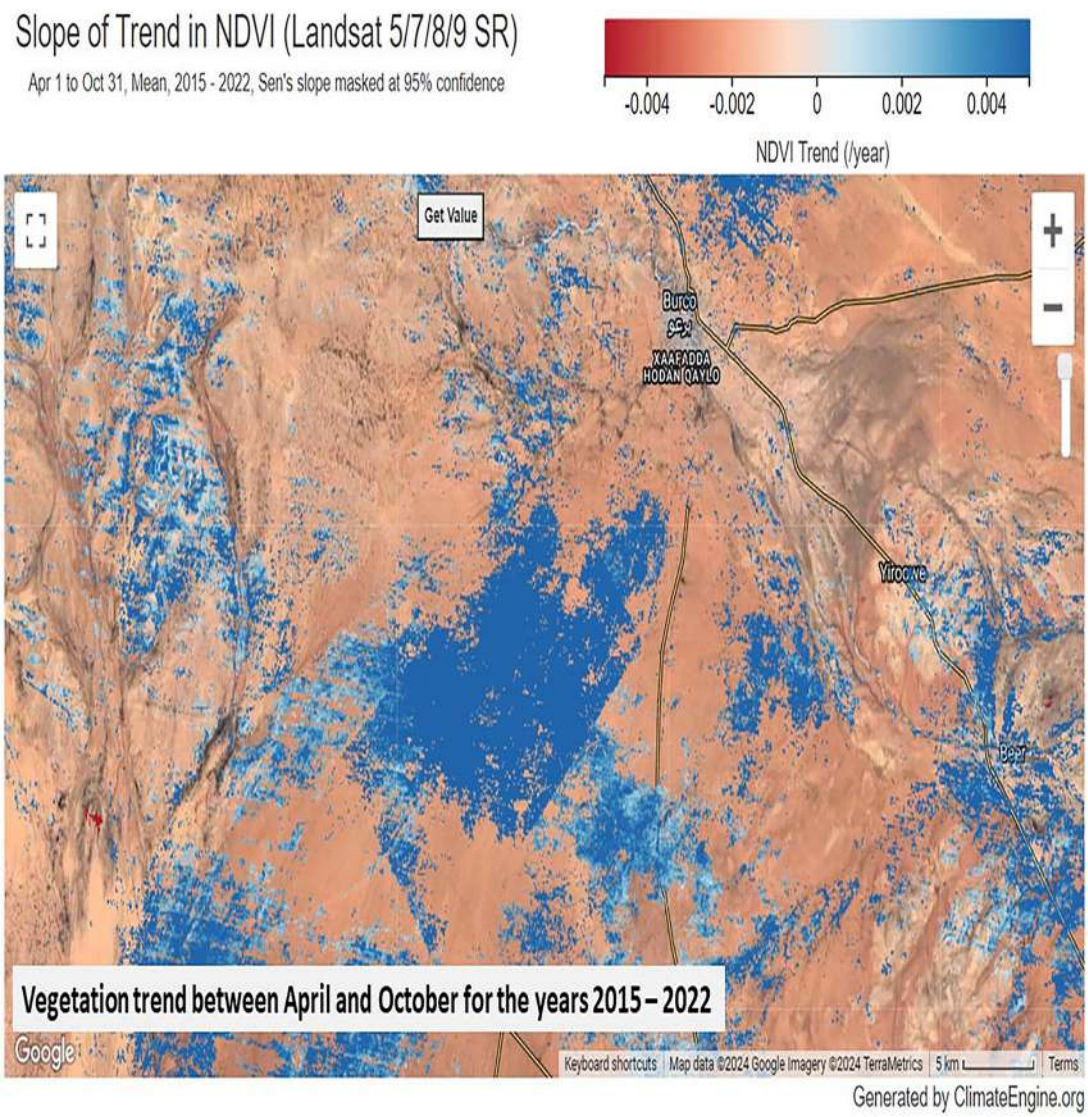

Figure 4. Aroori Grazing Reserve (AGR) trend of vegetation greenness in April through October 2015 and 2022. Units are given in Normalized Difference Vegetation Index values per pixel per year. Image shows statistically significant increase in vegetation production (blue in center of image is AGR). Image produced using the Climate Engine online platform (https://climateengine.com/research-app/) in October 2023. Data source is a composite of satellite data from the Landsat program. It is important to note that the trend shown is the temporal slope of each pixel that makes up the map during the aforementioned period, which is standard method in remote sensing studies to calculate trends on continuous surfaces such as those derived from satellite imagery.[36-38] Thus, the displayed pixelwise trend indicates a fractional change in greenness during the prescribed period and season.

Grazing pressure—AGR is open for grazing during the peak dry season when feed is scarce elsewhere. However, no measures are currently in place to prevent overstocking and overgrazing. Exceeding the carrying capacity of AGR can reverse the ecological gains realized through rest periods. This underlines the importance of a balance among the number of grazing animals, the area of the land, and the length of grazing time. One important factor in keeping livestock is the importance of not exceeding carrying capacity of a pasture.[44] Carrying capacity is the maximum stocking rate without incurring damage to vegetation and related resources.[45] The high density of livestock entering AGR, when it is opened for grazing, could impair the regrowth of palatable species. Overgrazing can lead to increased soil compaction and decreased infiltration of water into the ground, resulting in reduction soil productivity.[46] Low soil organic matter content aggravates this compaction even further.[47] In 2022, below-normal rains and the subsequent drought led to the influx of hundreds of pastoral households with their livestock (i.e., >800,000 heads comprising sheep, goats, camels, and cattle) into AGR, causing the reversal of prior gains in site vegetation recovery (MA Abdiweli, Manager of ALCE, 20 May 2023, personal communication).

Invasive species—The most common invasive species found within AGR is *P. juliflora*. It is already well-established in many parts of the country, particularly along seasonal water-

courses, settlements, and urban areas. It is a primary threat to the integrity and function of ecosystems.[48] It is also regarded as one of the worst invasive species in the world, seriously harming the arid and semiarid lowlands in the Horn of Africa.[49] AGR managers are aware of the threat of *P. juliflora* and have taken measures, such as eradication from AGR, to limit its negative impacts.

Bush encroachment—My field trip to AGR and the wider Aroori plain in May 2023 revealed the progression and recruitment of woody plants including invasive species that risk disturbing the balance of this environment. Bush encroachment is often considered a symptom of land degradation.[50] The most conspicuous species are *V. tortilis* and *P. juliflora*. An initial control measure adopted by the Ministry of Livestock is to process the pods of these two species by mixing and grinding with crop residue as an alternative feed supplement for livestock.

Disease transmission risks—The high density of livestock during the open periods of AGR raises the risk and incidence of disease and parasite exposure. Respondents I interviewed reported a high prevalence of livestock diseases, which emanated from the high concentration of animals in the enclosure. One pastoralist lost seven of nine camels because of a disease outbreak. This occurred despite on-site animal health surveillance from the Ministry of Livestock in AGR. Another herder reported losing 26 sheep (one-third of his herd) because of respiratory infections. The influx of pastoralists with their livestock during the 2022 drought period from different localities of the Togdheer Region and beyond overwhelmed the AGR.

A grazing reserve surrounded by a "sea" of private enclosures—Private enclosures have been defined as reserve areas enclosed for an individuals' own livestock and, in most cases. appropriated without community consensus and in the absence of any specific law governing the size and location.[51] Over the past few decades, there has been an upsurge in Somaliland in the privatization of communal lands and the spread of private enclosures into the open communal range. The proliferation of enclosures is a major issue for the nomads in Somaliland, and when grazing grounds are restricted, livestock may not have access to sufficient food and/or water.[52] Many of the communal grazing reserves remaining from previous land-use allocations are under the pressure of being fenced off for private development.[25,53]

In the same manner, the areas surrounding AGR and Burao are experiencing an intensification in the establishment of private enclosures to the point that AGR looks like an "island" within a "sea" of private enclosures. AGR is near Burao (Fig. 1) the second-most populated city in Somaliland.[54] Because of the growing demand for fresh camel milk countrywide, an increasing number of camel dairy farm operators are taking advantage of such opportunities and establishing their farms near major cities, including Burao.[55] Gobaad Camel Dairy Cooperative, based in Burao, has 53 members of whom 40 (75%) own their camel farms (with some of them owning more than one) all within a radius ≤25 km (15.5 miles) from the city (A. Bashir, Chairman of Gobaad Camel Dairy Cooperative, 9 July 2024, personal communication).

Additionally, land speculation is driving the privatization of communal lands. The Somali diaspora community is a major player in this new form of "land rush." Unfortunately, many of these investments remain "idle" properties even after the small stockowners and mobile pastoralists are pushed further into marginal lands. These developments in land-use change not only restrict the movement of pastoralists but also limit their access to communal grazing in AGR whenever government authorities open it for grazing.

Community-led grazing enclosures

The success of AGR has become a catalyst for creating more community-managed grazing reserves, which has attracted interest in sustainable land management by nearby rural communities. Communities play a vital role in sustainable land management. However, this cannot be achieved without influencing communities' attitudes toward the importance of communal grazing enclosures during feed shortages when rangeland productivity decreases. Allocating communal land as village grazing lots for the village livestock herds can serve the dual purpose of providing milk for villagers and integrating sustainable rangeland management. These village grazing lots can also serve as seed banks and allow generation of plants that have declined in the open rangelands. However, there is the risk that arbitrary land allocations to villagers, in the absence of land-use restrictions demarcating the size of land set aside as village grazing lots, may proliferate and cause the shrinkage of the communal rangeland available for mobile pastoralists.

An example of a communal grazing lot at Nasiye village in the Togdheer region was possible through collaboration among the Halo Trust, a mine clearance organization, Candlelight nongovernmental organization, and the Nasiye community. This collaboration assisted the community with fencing 9 ha (22.2 acres) of land after the mine clearance operation, which involved extensive soil disturbance and vegetation loss. The rehabilitation work was reinforced with water spreading and soil bunds to check runoff and enhance water infiltration. The vegetation recovery provided a forage reserve for the village livestock herd in Nasiye (Fig. 5).

Furthermore, Welt Hunger Hilfe, a German nongovernmental organization, has supported 23 community-protected areas in villages across different ecological zones, with further plans for expansion and replication in different parts of Somaliland. These protected areas differ from the grazing reserves in Aroori and Nasiye in that they are not fenced, even though they had temporary post rain closures put in place. These protected areas may have varying levels of success based on the level of protection accorded, but they could reduce deforestation because nearby woodlands have been used for fencing.

Figure 5. A community-managed enclosure in Nasiye village in the Togdheer Region of Somalialand, formerly a degraded area showing good vegetation recovery following a year period of closure. Note the rainwater captured by the vegetation, causing water to soak into the ground. Photo courtesy of A. I. Awale, April 12, 2023.

Conclusions and policy implications

I reviewed the previous work on Somali rangelands, with emphasis on Somaliland. I also attempted to present the impact of the years of instability in Somaliland (1988–1991) on rangelands, followed by a period characterized by weakened range management institutions and low investment in the livestock sector. AGR benefits the livestock trade in Somaliland because Burao, which is several kilometers from AGR, is the second-largest urban center in Somaliland and the biggest livestock market in the Horn of Africa. AGR has a vital role in improving animal health, including weight gain, particularly for livestock destined for the export market that are shipped through the Berbera port, which helps maximize the income for pastoralists and exporters.

As pastures are degraded the communal grazing areas shrink because of the increase in private enclosures, dry-land farming, and, more recently, the rise of camel ranches for selling milk. The intense grazing pressure applied to the remaining lands reduces pasture production and allows noxious and invasive species to spread, which worsens the rangelands' capacity for grazing. Ultimately, this negatively affects the strategies of pastoralists to cope with change, including climate change. Therefore, I emphasize the importance of reviving and revitalizing the rangeland resources, which are not only crucial for maintaining biodiversity but will also enable pastoralists to thrive in the multifaceted ecological, climatic, and social-economic challenges prevailing in the region. I also emphasize the importance of learning from past conservation strategies and actions in the light of the contemporary challenges in improving rangeland management. Recreating more grazing reserves with better governance (i.e., grazing plans, community participation, and ownership) is vital for improving the current grazing conditions.

Finally, the following points I extracted from the foregoing discussion encapsulate the implications for government policy:

- Creation of more government-managed grazing reserves modeled after AGR across the country in diverse vegetation zones would be a key step for enhancing pastoral and community resilience. This is, especially important in areas where reserves were already in place prior to the collapse of the central government of Somalia. Past interactions and knowledge of the benefits of grazing reserves may facilitate acceptance within the community. The lessons learned from AGR may give impetus and boost the government's plans for the establishment of more reserves in line with the 2023–2027 National Development Plan.[6]
- AGR requires a grazing plan to maintain carrying capacity. However, this might seem challenging until more reserves of a similar kind are established, with the goal of easing the grazing burden at a specific location.
- There is a need for community-led rangeland management, like the example of Nasiye village. This example should be replicated in villages and settlements across the country and, in the long run, may ameliorate the effects of the tragedy of the commons. However, a prerequisite for the success of such initiatives is to empower communities to manage their rangelands sustainably to clearly identify, articulate, and respond to their needs and ensure their full participation in the process to create ownership as a basis for sustainable community-based grazing reserve management. Enhancing the communities' rangeland governance is an important component in putting communities in charge of land management, and as far as the village grazing lots are concerned, they have to deal with day-to-day challenges in terms of resource sharing, site protection and rehabilitation, and accommodation of mobile pastoralists. The customary land governance practices whereby decisions at the community level are made regarding the access and use of land could be integrated into national land governance and planning. The involvement of relevant national institutions, including the ministries of livestock, environment, regional administrations, and the Ministry of Interior, will be pivotal.
- To address land-use challenges characterized by the reduction of communal rangelands that have marginalized pastoralists, there is a need for critical analysis and review of the regulatory frameworks pertaining to land use in the light of current climatic, environmental, and socioeconomic trends.
- Soil and water conservation, water spreading, cross-slope structures, and range reseeding are needed where range degradation has occurred. The effectiveness of these efforts will be visible when used in tandem with sustainable management of rangelands, which includes rest periods.

Declaration of competing interest

The author certifies that he has no financial interest in the subject matter discussed in this manuscript.

CRediT authorship contribution statement

Ahmed Ibrahim Awale: Conceptualization.

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Author is from: University of Hargeisa, Hargeisa, Somaliland