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SUSTAINABLE LAND MANAGEMENT IN RANGELAND AND GRASSLANDS

Working paper





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Abbreviations and acronyms

FAO	Food and Agriculture Organization of the United Nations
GDP	gross domestic product
GEF	Global Environment Facility
IUCN	International Union for Conservation of Nature
LDN	land degradation neutrality
NDC	nationally determined contributions
NPP	net primary productivity
PRAGA	participatory rangeland and grassland assessment
SDG	Sustainable Development Goals
SLM	sustainable land management
SRM	sustainable rangeland management
UNCCD	United Nations Convention on Combating Desertification
WWF	World Wildlife Foundation

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Preamble

Project context

The project "Participatory assessment of land degradation and sustainable land management in grassland and pastoral areas" was funded by FAO-GEF and implemented in five pilot countries: Burkina Faso, Kenya, Kyrgyzstan, Niger and Uruguay. The objective of the project was to strengthen the capacity of local and national stakeholders in pastoral areas comprising grasslands and rangelands to assess land degradation and make informed decisions to promote SLM in a way that preserves the diverse ecosystem goods and services provided by rangelands and grasslands.

There are considerable gaps in the definition of healthy rangelands and indeed of what constitutes SLM. The participatory rangeland and grassland assessment (PRAGA) experience aimed to contribute to this knowledge by exploring sustainable land management (SLM) practices that underpin sustainable production and participatory rangeland management involving local communities, keeping in mind that some of these practices have been used for millennia to sustainably manage rangelands by pastoralists. This was achieved by taking into account the management objectives of pastoralists in an approach that combined traditional/local knowledge with scientific knowledge.

Purpose and audience of the report

This report documents the good practices of rangeland management as a way to: (i) inform decisions on rangeland management; and (ii) raise awareness about the importance of locally identified management practices. It highlights the fact that these rangeland management practices do not necessarily align with practices as defined by scientists/ecologists. The target audience of this working paper includes decision-makers, land managers, other land users, and scientists.


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Introduction

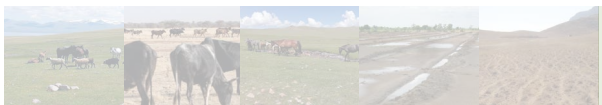
The importance of rangelands and grasslands (biophysical and socioeconomic)

A commonly cited definition of rangelands is "land on which the indigenous vegetation (climax or sub-climax) is predominantly grasses, grass-like plants, forbs or shrubs that are grazed or have the potential to be grazed, and which is used as a natural ecosystem for the production of grazing livestock and wildlife," (Allen *et al*., 2011).

Rangelands are an important part of our natural heritage and societies around the world have developed different concepts for and understandings rangelands that predate attempts to define them. This has, understandably, created challenges in terms of measuring both rangelands and grasslands, and agreeing on how to manage them, how to value them, and how to judge whether or not they are in a good health. The Rangeland Atlas (ILRI *et al*., 2021) uses seven of 14 biomes or rangeland types made up of terrestrial ecoregions as defined by the World Wildlife Fund (WWF).[1] According to the atlas, rangelands occupy 54 percent of the terrestrial surface area and include deserts and xeric shrublands (35 percent), tropical and subtropical grasslands, savannas and shrublands (26 percent), tundra (15 percent) and temperate grasslands (13 percent) among others.

According to the atlas, rangelands include all the world's drylands, which are estimated to have a population of over 2 billion people. 84 percent of these rangelands are used for livestock production, and support an estimated 200–500 million pastoralists worldwide (McGahey *et al*., 2014).

[1] www.worldwildlife.org/publications/terrestrial-ecoregions-of-the-world



Livestock and its products are among the primary values of rangelands and grasslands. Rangelands provide fodder for livestock and wildlife and contribute to the food supply directly through meat and milk, and indirectly through income from meat, milk, fibre and other products, as well as manure, drought power and other services. Animal protein from the rangelands makes an important contribution to nutrition and food security in many countries, particularly those that are the most nutrient-deficient. Rangelands also offer employment opportunities throughout the livestock product value chains within and outside of their geographical area. Livestock production in rangelands contributes to national economies in many countries, for example 11 percent of GDP in Chad and 11.9 percent of Mongolia's GDP (Wane *et al*., 2020).

Although livestock keepers in the rangelands go by many names, such as herders, shepherds, drovers or nomads, we use the inclusive term "pastoralist"[2] throughout this report. Pastoralists herd different species according to their location and context and many pastoral societies typically keep a variety of species: for example, several pastoral societies in Kenya maintain flocks of sheep and goats and herds of camel and cattle to take advantage of different resources and markets and to manage different risks. The diversity of livestock species has been shown to improve food security, nutritional status and income generating opportunities in Burkina Faso, particularly during periods of drought stress (Fraval *et al*., 2020).

Besides their value in livestock production, rangelands perform important environmental and ecological functions. They host rich biodiversity that includes flora, fauna, microbes and diverse ecosystems with high environmental, economic, cultural, scientific and amenity value. Despite their aridity, many rangelands are part of major catchments and drainage systems and play a major role in hydrological cycles. When managed sustainably, rangeland vegetation can reduce surface flows, improving water infiltration, boosting soil moisture, and recharging ground water resources. This contributes to reducing the risks of natural hazards such as floods and drought (IUCN, 2015).

Rangelands hold significant stores of carbon: the total stock of accumulated soil organic carbon in drylands (which dominate rangelands) accounts for approximately 30 percent of the total global SOC stocks – as much as all the organic carbon

[2] The term pastoralist also encompasses agropastoralists, silvopastoralists and other subsets that may be defined separately under some circumstances.

stocked in terrestrial vegetation. This carbon has above-average permanence due to the dry conditions (Laban, Metternicht and Davies, 2018) while 1.8 billion people will be living in water-scarce areas. While food production is increasing globally, the land on which agriculture depends is degrading at an alarming rate, jeopardizing future progress. Soil biodiversity and soil organic carbon are vital to the way ecosystems function and they largely determine the role of land in producing food, storing water, and mitigating climate change. They are the key to unlocking the multiple economic and environmental benefits – the multifunctionality – of land. Globally, soil biodiversity has been estimated to contribute between USD 1.5 and 13 trillion annually to the value of ecosystems services. Yet despite its global importance, soil biodiversity is often neglected in public policy and is being lost at a considerable rate through unsustainable land management practices, soil erosion and other land degradation processes. Between one-quarter and one-third of all land worldwide is estimated to be degraded, resulting in lower agricultural production, disrupted water cycles, and release of sequestered greenhouse gases. Dryland soils make an important contribution – roughly one-third – to global stocks of soil biodiversity and soil organic carbon, and they can contribute significantly to global food production and to climate change mitigation. They account for 42 percent of the world's land, providing 44 percent of all cultivated land and 50 percent of the world's livestock. Drylands are particularly valuable for carbon storage due to their high degree of permanence – the duration that carbon is stored in the soil – compared to humid areas. The proportion of degraded land in the drylands is similar to the global proportion, but the solutions may be different to those suitable for more humid lands. The comparatively high level of poverty and under-development in drylands means that drivers of degradation are different and the nature of policies and investments to address desertification should differ accordingly. Restoring or preserving soil biodiversity and soil organic carbon requires increased inputs of organic matter or a reduction of carbon losses, or both. It is particularly important to maintain soil organic carbon (SOC). Grasslands that cover approximately 25 percent of the Earth's land surface store an estimated 34 percent of global terrestrial carbon, with 89 percent of this carbon stored in the soil (Eze, Palmer and Chapman, 2018). As such, rangelands and grasslands play an important role in climate regulation, which suggests that their restoration should be given much greater consideration in climate-change mitigation strategies.

Rangeland biodiversity underpins tourism economies in many rangelands, in some cases supporting local livelihoods while financing local social amenities, and generating revenue for national governments and entrepreneurs. Indeed, many of the world's revered parks and reserves, as well as a host of emblematic and threatened species, like the critically endangered desert antelope (*Addax nasomaculatus*) and the Dama gazelle (*Nanger dama*) in the Sahel region of West Africa, are found in rangelands.

Millions of people in the rangelands rely on natural resources like charcoal, timber, and medicinal products. Rangelands contain many high-value medicinal plants and have reserves of genetic resources, including indigenous livestock breeds that have been selected by natural and human pressures to be highly adapted to the ecological, sociocultural and management requirements (Scherf *et al*., 2008). These local breeds are adapted to the highly variable conditions, are able to walk long distances, resist diseases and reasonably withstand drought. As a result, rangelands are critical for genetic pools and phenotypic diversity (FAO, 2020a).

Rangeland ecology and the implications for sustainable rangeland management

Rangeland ecology differs significantly from the ecology of other biomes, notably forests. The ecology of these regions is determined by several factors, including aridity, temperature, seasonality, incidence of fire, and co-dependency on grazing species. Sustainable management of rangelands must be informed by a solid understanding of these factors and many of the most effective management regimes attempt to replicate some of these natural phenomena.

Ecological science is strongly influenced by the Clementsian model of plant succession, in which an ecological community progresses towards a climax equilibrium state, or is held back from that state through human intervention (such as ploughing or grazing) and thus maintained at a lower (and implicitly inferior) state of equilibrium (Clements, 1916). However, natural rangelands and grasslands do not conform to this theory and an alternative theory developed in the 1980s in which rangelands are viewed in a state of non-equilibrium. In this model, rangeland vegetation and ecological communities respond in complex ways to different pressures, including natural phenomena of grazing, drought and fire. The responses are not always linear or reversible and rangelands can exist in distinct ecological states, transitioning between states according to different pressures, sometimes referred to as the state-and-transition model (Westoby, Walker and Noy-Meir, 1989).

More recent research suggests that both equilibrium and non-equilibrium ecologies can be found in the rangelands (Vetter, 2005).

Plants in the drylands have co-evolved with grazing species over millions of years and have become dependent on the action of grazers to maintain plant health (Frank, McNaughton and Tracy, 1998; McNaughton, 1983). Grazing stabilizes grassland ecosystems and the absence of grazing destabilizes the system (Perevolotsky and Seligman, 1998). It has been shown that the patchy growth that results from high uncertainty in dryland climate patterns in rangelands supports much greater grazing pressure than would be estimated from stocking rate studies (Hiernaux and Turner, 1996).

Fire is a common occurrence in rangelands due to their dryness and the high seasonal temperatures. Rangelands are typically fire-adapted and fire-dependent and fire can enhance rangeland health and productivity. Periodic fire is a typical disturbance on shrub-grass rangelands and maintains a balance between grasses, forbs, woody shrubs and trees. Fires typically open up dense canopies of woody vegetation and allow grass-forb communities to thrive. Fires can lead to ecological renewal with an overall increase in species diversity and a flush of new growth of fire-adapted species, resulting in a net increase in biomass. Livestock herders frequently use fire as a tool to remove low-grade vegetation and replace it with more digestible vegetation and more desirable pasture species (Keely, 2012; Rundel *et al*., 2018; Scott *et al*., 2014).

Rangeland management needs to be hinged on these ecological dynamics (Onyango *et al*., 2021). Attempts to develop rangeland management have often over-relied on the concept of rangelands at equilibrium, manifested through application of a static carrying capacity concept, and overlooking the heterogeneous nature and variability of rangelands. Sustainable rangeland management, as discussed in the following section, depends fundamentally on movement herds to track the availability of resources while giving resource areas appropriate periods of rest and recovery – long enough to allow regrowth and reproduction but not so long as to alter the balance in favour of less grazing-adapted species. Rangeland management also makes controlled use of fire to replicate natural events, removing old growth and enabling regrowth of fire-adapted species. The breeds used by pastoralists can be highly adapted to the heterogeneity of rangeland landscapes and to the exigencies of mobility and drought. These breeds are often integral to maintaining ecological balance in the rangelands and can contribute to biodiversity conservation and SLM.

Land degradation in rangelands

Land degradation is defined as the 'reduction or loss of the biological and economic productivity and complexity of terrestrial ecosystems, including soils, vegetation, other biota, and the ecological biogeochemical, and hydrological processes that operate therein' (United Nations, 1994). Desertification refers to land degradation in drylands and is defined as 'land degradation in arid, semi-arid and sub-humid areas resulting from various factors, including climate variations and human activities' (ibid.).

Land degradation affects millions of citizens in both developed and less developed countries, through reduced food yields, contribution to climate change and natural hazards like droughts and floods, and loss of biodiversity and ecosystem services like water provision (Adeel, 2006). Deforestation and land degradation were estimated to cost up to EUR 1.5–3.4 trillion or 3.3–7.5 percent of global GDP in 2008 (TEEB, 2008). However, land degradation processes in rangelands are poorly understood and knowledge gaps have contributed to poorly informed interventions that in many cases have contributed to further degradation (Davies *et al*., 2010).

Global measures of land degradation remain uncertain but are steadily converging. A global analysis of the period 1981–2003 using remotely sensed data showed that 24 percent of the land area has been degrading (Bai *et al*., 2008). However, this analysis showed only changes in vegetation during the monitored period and makes no assessments of what the authors call "the legacy of thousands of years of mismanagement in some long-settled areas". Cropland and forest land were overrepresented in that assessment: 12 percent of all land is cropland, but this accounted for 19 percent of all degrading land, whereas forests occupy 28 percent of land but represented 43 percent of total degrading area.

Regional assessments do not always confirm the global assessment but can highlight anomalies in assessment methodologies. For example, remote sensing data for the Sahel indicate a steady process of greening or increasing net primary productivity (NPP). This may be attributed to increased rainfall in the region over the last two decades, which may disguise the effects of degradation processes, and highlights the shortcomings of remotely sensed data for quantifying land degradation (UNEP, 2012). Furthermore, despite higher rainfall and an apparent greening of the Sahel, water does not infiltrate as efficiently as in the past, and the incidence of flooding has increased.

Climate change is a contributing factor to land degradation, for example through increased temperatures and more variable precipitation, leading to prolonged droughts and flooding. The acceleration of land degradation by climate change has been recorded in Kenya and Ethiopia, where forage recovery was shown to be reduced after periods of prolonged and frequent droughts (Kirui and Mirzabaev, 2014; Matere *et al*., 2020). Increased temperatures and aridity can increase the incidence of drought, susceptibility to fires, and the risk of soil erosion.

Land degradation is caused by a wide range of pressures and numerous underlying drivers. Changes in technologies, economies, population growth, institutional changes and other factors drive up the pressure on land, for example through changes to land management practices, development of infrastructure, and resource extraction (Davies *et al*., 2015). Anthropogenic drivers can be linked to breakdown in natural resource management structures including weakened tenure rights, urbanization and population growth. Population growth and population density can increase the demand for land resources, leading to overexploitation to meet the immediate needs for food, fibre and fuel.

Inappropriate development and land use planning systems have consistently failed to consider the interconnectedness between social and ecological factors in the rangeland system, limiting planning to small areas, individual resources, or government administrative units, contributing to degradation. Ineffective planning has also promoted land conversion and contributed to fragmentation of rangeland landscapes, restricting pastoral mobility, which is one of the fundamental practices through which rangelands can be sustainably managed (Flintan, 2011).

Land degradation has been shown to undermine ecosystem services in Senegal. Provision of food, fodder, fibre, fuel and freshwater is most greatly affected, followed by support services, such as nutrient and water cycling, soil and vegetation cover, and cultural services (Ndiaye and Dieng, 2015). The latest report of the Economic Commission for Africa on drought and desertification in Africa indicates that at least 485 million people, or about 40 percent of Africa's population, are impacted by land degradation, which is costing the world as much as USD 10.6 trillion annually, equivalent to 17 percent of global GDP (UNEP, 2015).

From a hydrological point of view, the soil's rainfall use efficiency appears to have declined, contributing to an edaphic (i.e. soil) drought. The apparent paradox of increased vegetation cover and increased runoff is explained by both rainfall intensification and a reduction in soil water-holding capacity, which is likely linked to extension in cropping areas, as well as vegetation degradation and soil erosion (Dardel *et al*., 2014). The loss in water-holding capacity in degraded soils is related to the decline in soil organic carbon. A US-based study found that when grasslands are converted to agricultural land, soil carbon stocks tend to decline by an average of 60 percent (Guo and Gifford, 2002).

A common narrative around livestock production focuses on greenhouse gas emissions, although research in the Sahel has shown that pastoral landscapes can have a neutral carbon balance, in which emissions from animals are offset by carbon sequestration in soils and plants. These findings depend on conducting a complete ecosystem assessment to integrate the use of the pastoral landscape as a whole, according to the seasons and the areas grazed by herds (Assouma *et al*., 2019). The true potential for carbon sequestration and storage of pastoral systems depends on understanding not only the herding cycles across the landscape, but also the natural baseline against which pastoral systems should be compared, taking into account, for example, wild ruminants and termites which are responsible for the background greenhouse gas levels (Manzano and White, 2019).

As productivity falls and livelihoods are weakened, people migrate out of rural areas. Rural-urban migration has been attributed to land degradation in Senegal and Kenya (Gray, 2011; IFAD, 2016). When the productivity of lands decreases, farmers are more likely to sell their property, particularly in peri-urban villages where city-based entrepreneurs involved in land speculation are constantly ready to buy.

Dwindling resources can also be indirect conduits for intra- and inter-community conflicts as they further exacerbate historical disputes. Weakened local laws especially when traditional laws are not legally backstopped by statutory laws, communities struggle to regulate resource access and use by outsiders and neighbours.

Rapid urbanization linked with infrastructure development is both directly and indirectly impacting sustainable rangeland management. Infrastructure including housing and roads, is sealing soils and reducing the permeability of water and can block mobility routes for livestock and wildlife. As urbanization opens up hitherto rural

areas, towns bring in new wave of settlers, the majority of whom are not sensitive to local cultures and the norms that are applicable in natural resource management resulting in their further weakening.

More recently, links are also being made between degradation and the spread of pests and diseases due to land use changes and habitat destructions including in extensive livestock production systems such as in rangelands (FAO, 2013). It is therefore in the interests of everyone that landscapes including rangelands remain healthy in order to meet the needs of local communities and the ecosystem services demands of the global community.

The concern over land degradation has given rise to the concept and adoption of land degradation neutrality (LDN) as a means to maintain or improve the productive capacity of land. Under the mandate adopted by the UNCCD (United Nations Convention on Combating Desertification), Sustainable Development Goal (SDG) target 15.3 states: “By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world”. Target 15.3 has therefore become a strong vehicle for driving UNCCD implementation, while at the same time contributing to other SDGs, including those relating to climate change mitigation and adaptation, biodiversity conservation, ecosystem restoration, food and water security, disaster risk reduction, and poverty.

Determining degradation and sustainable management in rangelands

The Rangelands Atlas shows that 84 percent of rangelands are used for livestock production, suggesting that many rangelands are semi-natural ecosystems: ecosystems which have been altered by human actions, but which retain significant native elements.[3] This creates a significant challenge in objectively measuring land degradation, since the desired state of the land is likely to depend on the production objectives of the users. While some measures of land degradation are likely to be objectively correct – such as erosion of topsoil or pollution and contamination – other common indicators can be misleading, such as vegetation composition or total biomass. A shrub-dominated rangeland may be considered degraded by a cattle keeper, while an adjacent grass-dominated area may be considered degraded by a camel herder. Heavy standing biomass may be considered a sign of good management by a wildlife manager but a sign of wasteful management by a livestock keeper.

Assessment of land degradation in rangelands may therefore require a combination of quantitative and qualitative methodologies. Quantitative data is information about quantities, and therefore numbers, whereas qualitative data is descriptive, and regards phenomena that can be observed but not measured. This does not mean that one approach is objective and the other is subjective: the concepts of quantitative and qualitative are not necessarily opposed to that of objectivity or subjectivity. Table 1 summarizes the relevant differences between quantitative and qualitative data.

Table 1. Differences between quantitative and qualitative data

	QUANTITATIVE	QUALITATIVE
Conceptual	Concerned with discovering facts about social phenomena	Concerned with understanding human behaviour from the informant's perspective
	Assumes a fixed and measurable reality	Assumes a dynamic and negotiated reality
Methodological	Data is analysed through numerical comparisons and statistical inferences	Data is analysed by themes from descriptions by informants
	Data is reported through statistical analyses	Data is reported in the language of the informant

Source: Adapted from Minichiello (1990).

[3] www.cabi.org/isc/glossary/94288

The principal difference between quantitative and qualitative data lies in the conceptualization and methodology of collection, analysis and reporting. Thus, while quantitative data aims to establish general laws of behaviour and phenomena across different settings/contexts, qualitative data aims to understand the social reality of individuals, groups and cultures as nearly as possible as its participants feel it or live it (McLeod, 2019). Thus, rather than looking at quantitative and qualitative data as opposing to each other, they should be seen as complementing each other. The results from quantitative methodology can be improved using qualitative methodology and vice-versa. For example, qualitative analysis can play the important role of suggesting possible relationships, causes, effects and dynamic processes that could be further investigated using quantitative methods.

The PRAGA methodology combines quantitative and qualitative indicators to overcome the challenge of objectively determining rangeland health according to the management objectives of the users. It depends on thorough stakeholder analysis to ensure all stakeholders are fully engaged, and aims to enable stakeholders with opposing views of what constitutes rangeland health to reach agreement. This can be challenging when use and management rights of the rangelands are contested or unclear.

A typical indicator used by local rangeland users is the presence of certain high-value species versus the presence of low-value or unpalatable species. This evidently depends on the type of livestock reared. Data of this nature can be used to interpret remote sensing data, which might indicate a change in total biomass production but cannot define whether that change is desirable. For instance, measures of net primary productivity give an indication of total biomass, but in highly heterogeneous rangelands the greenness of a landscape does not equate to palatability of species and suitability for livestock production. As a result, integrating qualitative indicators in assessment of rangeland health can facilitate subjective judgements that inform decision-making on the land.

The maxim, “you cannot manage what you cannot measure” is relevant in this context. Without a robust methodology for measuring land degradation, it is almost impossible to objectively verify SLM practices. In addition to the challenges outlined above, rangeland management takes place on a vast scale – in some cases over many thousands of square kilometres and sometimes spanning international boundaries. Monitoring the outcome of rangeland management at that scale is sometimes

impossible. Rangelands are subject to variability that occurs within years, between years, and over decadal timescales, making short-term measurements of rangeland health highly misleading. All of these features create challenges to objectively determining whether a given set of management practices are leading to maintenance of rangeland health.

The PRAGA methodology helps to address this challenge. Objectively verifiable indicators of unambiguous land degradation can serve as a basis for restoration decision-making. For example, if physical soil erosion is observed in the rangelands, then it can be interpreted as objective evidence that management practices need to change. However, PRAGA also underscores the unreliability of remote sensing data, beyond giving the most superficial indication that something is changing: the data does not usually help to determine whether an increase or decrease in productivity implies degradation of improvement. Significant increases in NPP in many rangelands indicate bush encroachment, which implies a loss of palatable vegetation and reduced productivity for cattle keepers. Changes in species composition, along with other indicators, can be used to inform long-term monitoring at a scale that can be more revelatory of the effectiveness of rangeland management practices.

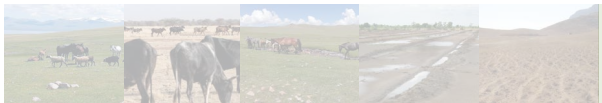
What is sustainable land management in rangelands and grasslands?

Sustainable land management

LDN is essentially the outcome of balancing three processes: degradation, restoration and SLM (IUCN, 2015). SLM has been defined as "the use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions" (UN Earth Summit, 1992).[4] FAO uses a similar definition: "measures and practices adapted to biophysical and socioeconomic conditions aimed at the protection, conservation and sustainable use of resources (soil, water and biodiversity) and the restoration of degraded natural resources and their ecosystem functions."[5]

[4] https://knowledge.unccd.int/topics/sustainable-land-management-slm

[5] www.fao.org/land-water/land/sustainable-land-management/slm-practices/en/



The TerrAfrica consortium defined SLM as "the adoption of land use systems that, through appropriate management practices, enable land users to maximize the economic and social benefits from the land while maintaining or enhancing the ecological support functions of the land resources" (FAO *et al*., 2016). According to this resource, SLM can be clustered under four categories:

1. agronomic measures such as improving soil cover;
2. vegetative measures such as plantations and reseeding;
3. structural measures such as terraces; and
4. management measures such as changes around land use types.

The definition of SLM emphasizes the environmental, social and economic benefits derived from SLM, in addition to the benefits it provides in terms of increased land productivity. This is an important aspect and the examples of good practices around the world provide evidence that SLM can achieve the Rio Conventions as well as the SDGs. Indeed, SLM contributes to biodiversity conservation, enhancing the carbon sequestration potential of soils, thus climate change mitigation; all of which contribute to reducing population vulnerability, poverty, inequalities, and improving human health.

SLM practices in rangelands typically revolve around institutional strengthening, focused on enabling the effective movement of livestock herds at scale and ensuring land use planning at the scale of rangeland landscapes. These solutions, which are discussed in greater detail in later sections of this report, could be captured under the 4th category of SLM, but in practice receive insufficient attention. Institutional and governance changes are sometimes seen as a foundation for developing an SLM solution, rather than recognized as an SLM solution in their own right.

Common SLM practices in croplands address soil degradation from unsustainable farming practices and include the use of organic fertilizer to improve soil structure, water infiltration and retention, and nutrient storage, serving to improve productivity (Sanz *et al*., 2017). SLM practices in the forestry sector can include the practice of agroforestry, in which trees are integrated into crop and livestock systems to improve the productive capacity of the landscape. In rangelands, the predominant land use activity is livestock keeping through extensive grazing, and SLM should be viewed principally on what a healthy rangeland would imply for productive and sustainable livestock production.

In rangelands, particularly those that are communally managed, a critical factor in SLM is the effectiveness of group decision-making, acceptance and enforcement. Conventional SLM approaches classify land users' decisions on taking up SLM into two clear groups; adopters versus non-adopters, based on update of a specific technology or a practice in a defined area. In rangelands, such analysis would need to encompass many diverse approaches employed by large numbers of land users over a vast scale. For instance, herd mobility should be evaluated based on the extent to which herders allow vegetation to regenerate as they move, but also the extent to which they respect rules and norms of host communities.

A collection of practices, institutions, relationships and organizational arrangements by pastoralists have resulted in a "modus operandi" for rangelands that can help to define SLM. However, these are not isolated practices as usually posited in conventional SLM definitions, but a host of different approaches and technologies, interacting across spatial and temporal scales, and embedded in cultural norms. In many rangelands it is less useful to describe specific SLM "practices" and more relevant to examine sustainability within the entire governance system. Understanding how this system works and how decisions are made and enforced is the first step in improving our understanding of SLM, identifying shortcomings in land management approaches, and proposing solutions.

Principles of sustainable rangeland management

As already outlined earlier in this report, successful rangeland management hinges on adapting herd management to the ecological demands of the system. As the case studies cited illustrate, this depends to a large extent on enabling effective herd movements, often over long distances, to access seasonal resources and to create periods of rest and recovery. These practices mimic nature and the natural behaviour of herds of wild ungulates, which have co-evolved with grasslands.

A common misunderstanding that has led to inappropriate management practices, or constraints on traditional practices, surrounds grazing dependency and the risk of undergrazing. While overgrazing is widely understood and commonly diagnosed, undergrazing (and over-resting) of land, for example by excluding livestock, can be a major contributor to rangeland degradation . Although it may appear counter-intuitive, understanding the beneficial relationship between grazing species and grasses is vital

for their effective management. These dynamics apply irrespective of the grazing system, whether nomadic or transhumant pastoral systems, commercial ranching or mixed agrosilvopastoral systems.

In traditional grazing systems, herd mobility relieves areas of livestock concentration and allows animals to use grazing resources that are unevenly distributed. Multiple species are usually grazed – by grazers like sheep and cattle as well as browsers like goats and camels – allowing more efficient use of variable resources. Moving livestock creates periods of rest and recovery for grasses and provides multiple benefits that promote grass regrowth, reproduction and diversity. At the same time, frequent droughts in many countries ensure that livestock populations are kept in check and do not over-shoot the available resources (Behnke Jr. *et al*., 1993; Ellis and Swift, 1988; Oba, Stenseth and Lusigi, 2000). Later work suggested that climate change, varying water tables, or combinations of herbivores, fire, and climate changes were responsible for the decline of woodlands. These results showed that elephant control programmes were, in some cases, a needless slaughter of a scarce species (Western 1973, Sinclair and Norton-Griffiths 1979, Pellew 1983, Dublin 1987). Evidently, as developments are made to reduce livestock mortalities, rangeland management practices may need to be modified.

Moderately intense but periodic grazing has been found to promote higher grassland productivity than the absence of grazing (Noy-Meir, 1973). Plants in the drylands have co-evolved with grazing species over millions of years and have become dependent on the action of grazers to maintain plant health (Frank, McNaughton and Tracy, 1998; McNaughton, 1983).

Grazing management depends on careful timing of its impact: both in terms of duration and periodicity. Plants become overgrazed as a result of multiple, severe defoliations without sufficient physiological recovery between defoliations. The stocking rate only affects the proportion of plants likely to be heavily used, and while conservative stocking can be an important step towards sustainable management, it must be applied in conjunction with other management practices, like reduced grazing periods, high stock density impact and periodic deferment to mitigate the effects of selective grazing (Teague *et al*., 2009).

In simple terms, 'overgrazing' occurs when plants are exposed to grazing for extended periods of time (with animals staying too long), or without sufficient recovery periods (with animals coming back too soon). Overgrazing is not a question of too

much grazing too much, but rather doing so for too long, and it commonly occurs at three different times:

1. when plants are exposed to the animals for too many days and animals graze while plants are in a recovery phase;
2. when animals return to graze too soon while the plants are still using stored energy to reform leaf; and
3. immediately following dormancy when plants are growing new leaf from stored energy.

These impacts of overgrazing can occur independently of livestock densities. The key inference is therefore that damage to plants from overgrazing is a function of time exposure rather than animal numbers.

A number of principles can be proposed to guide sustainable rangeland management (Hatfield, 2021):

- After grazing, plants regrow rapidly in tropical zones. Growth is rapid for the first few days and weeks but declines as the grasses mature.
- Mature vegetation can stifle growth, for example by blocking sunlight, while removing older plant material through grazing can stimulate grass growth.
- Reduction of animal numbers on its own will not eliminate overgrazing, whereas a reduction of time exposure of plants to grazing may do so, regardless of livestock densities.
- Healthy plants vary in recovery time depending on species and rainfall levels so the duration of grazing and recovery times must be adjusted to favour preferred species and discourage less favourable species.
- Overgrazing can only damage plants in the growing (wet) season since once bitten no plant regrowth can occur in the non-growing (dry) season due to lack of moisture.

Since rangelands and grasslands are dependent on certain beneficial impacts of animals, management of such animals can be a tool for regeneration. Beneficial impacts can include manuring, seed dispersal and trampling. These impacts alter soil conditions and have been shown to improve soil water content, temperature, aeration, mineral content including carbon and soil organic matter, root tissue structure, bacterial and microbial communities, and decomposition rates, many of which the nutrients and physical and chemical properties of soil (Davies *et al*., 2015). The role of livestock managers in the rangelands is thus to capture these benefits, which depends on the careful timing of herd movements.

Following the ecological lessons outlined above, we suggest several categories of good practice for sustainable rangeland management:

1. Herd management (movement) practices that capture the benefits of grazing (e.g. transhumance, resting pastures, protecting seasonal resource zones).
2. Institutional arrangements that allow herds to be moved effectively at scale (e.g. land rights, rangeland user groups, public institutions).
3. Vegetation management (e.g. reintroduction of missing species, bush control).
4. Physical interventions (e.g. soil restoration, appropriate water points).

Lessons on sustainable land management in rangelands from PRAGA assessments

PRAGA assessments were carried out on a landscape scale in Kenya, the Niger, Burkina Faso, Uruguay and Kyrgyzstan in order to determine rangeland landscape health and the need for restoration. Assessments were not primarily conducted to evaluate SLM practices, but by identifying areas of rangeland health within these landscapes it was possible to identifying underlying factors and practices that contribute to maintenance of land health. Examples from each of the target countries are provided in the following sections.

Grazing management in Burkina Faso

Several factors – such as culture, season, livestock species and land occupation – determine how natural vegetation is used to provide feed for livestock in Burkina Faso. Water and good quality grass are plentiful during the rainy season in Sahelian landscapes in northern Burkina Faso. During that period livestock are taken out to graze daily, often during the night to maximize feed intake and nutritional security.

After crop harvest seasons, plant residues on the cultivated lands are available for livestock grazing. However, throughout these months in which surface water resources are reduced, the water for livestock's the daily use of livestock must be harvested manually from small hand-dug wells in dry riverbeds. As these are labour-intensive, the result is only a small number of cattle can be kept in the village and these are usually weaker cattle or lactating cows, and goats (mainly because they are browsers). The larger part of the herd (cattle and sheep) is moved to other more humid landscapes where water and fodder remain available for longer periods of time.

The departure for transhumance occurs as early as December and as late as May. Herders cross numerous community territories and sometimes protected areas such as the Arly National Park to reach distant grazing areas in southern Burkina

Faso, northern Benin, Togo or Ghana. The return trip starts around June as the rainy season commences and herbaceous plants begin to grow around the villages (home/source points) again.

This transhumance system has been practised by the Fulani over multiple decades and offers several advantages, including giving vegetation a chance to rest and recuperate from continuous grazing by potentially large numbers of cattle. Transhumance therefore plays a key role in reducing the degradation of pastoral lands. Additionally, it allows livestock to feed on diverse plant species and minerals with more nutritional benefits as livestock access different soils that also have different mineral compositions.

The sustainability of transhumance is however facing increasing number of challenges. Livestock numbers have increased across almost all landscapes, while cultivated areas have rapidly expanded due to demography, land degradation and the clearing of forests for commercial crops such as cotton, which require large areas of fertile land. These have been linked to increasing risk and frequency of clashes between herders, crop farmers and forest dwellers.

In response to this situation, pastoralists now organize themselves into associations such as the Communication Network for Pastoralism or apex organizations such as the "*rugga*". A *rugga* is made up of leaders of mobile pastoralists capable of facilitating integration between pastoralists communities and non-pastoral communities. Each *rugga* aims to contribute to peace and securing pastoral activities while ensuring the visibility of the positive values of pastoralism.[6] These associations identify delegates who are sent annually to negotiate access to favourable landscapes in the territories that transhumant pastoralists wish to visit. The subjects for negotiation include the number of cattle heads allowed, the duration of stay, and the exact location of available pastoral resources.

Regional and national governments have made attempts to better organize transhumance through application of national and regional policies and regulations, establishing official migration routes, and the issuance of international transhumance certificate and health certificates. The certificates are usually issued by the respective government ministries in charge of animal resources and are a requirement for border crossing. While these institutions offer a way to regulate, coordinate and legitimize transhumance, they also face challenges, including resistance by some sedentary

[6] http://www.hubrural.org/L-Union-nationale-des-Rugga-du-Burkina-explique-les-roles-et-organisations-des.html

communities. Additionally, some illegal taxes have been levied by law enforcement, which pastoralists perceive as unofficial taxes.

In an attempt to reduce the frequency of conflicts, the Burkinabe government has established "pastoral zones" that are solely dedicated to livestock rearing. However, to be fully effective and sustainable, these pastoral zones will require additional efforts, notably in the establishment of local management committees, drafting and implementation of participatory management plans, and clarification and subsequent enforcement of access rules and the code of conduct for users. The management plan will need to include an ecological monitoring and management programme (such as fire management plans to facilitate the regrowth of plant species), water resource monitoring and management (including informed positioning of artificial watering points) and artificial salt points. The creation of any new pastoral zones will also need to be fully participatory and based on a verifiable request from the beneficiary communities.

Grassland rehabilitation practices in Niger

Surveys carried out during the execution of the project among central state actors, the decentralized technical services of the state, and herding communities have identified 14 different SLM techniques in Niger. These techniques and practices were assessed using ten criteria including productivity, soil conservation, basin protection, biodiversity conservation, plant production and regeneration, adaptation to climate change, mitigation, conflict risk reduction, and increased income and support for vulnerable groups. Of the 14 applied techniques and practices for sustainable grassland management, silvopastoral half-moon (Figure 1) and grassland seeding were ranked as the best practices. Both practices are aimed at grassland rehabilitation.

Grassland seeding promotes the establishment of competitive species with high forage value while combating invasive, non-palatable species. It is implemented on poor grassland soils that have sometimes been entirely colonized by low-value forage species that are of little use to animals. *Hybicus sabdariffa* has been promoted to control the invasive *Sida cordifolia*, which animals usually do not graze. The technique consists of scarifying the soil followed by spreading of 25 to 40 g/m^2 of seeds of *Hybicus sabdariffa*. At these levels, *Hybicus sabdariffa* provides good vegetation coverage up to 98 percent and can completely stop the development of *Sida cordifolia*.

The scarification of the land facilitates the superficial burying of the seeds and prevents them from being destroyed or carried away by wind. It is also recommended to protect the seeded area for about one rainy season to allow the *Hybicus sabdariffa*

to establish itself and to increase the stock of the seeds for the next rainy season. In the process, the *Hybicus sabdariffa* overtakes *Sida cordifolia* on the target grassland.

The silvopastoral half-moon is a combination of the grassland treatment, including soil preparation in layers with half-moons, the planting of multipurpose woody shrubs and seeding with herbaceous species. It aims at slowing down erosion, increasing the soil's water reserves and improving the physicochemical properties of soil. The silvopastoral half-moon is designed in such a way as to alternate strips to be vegetated with bare strips that play the role of an impluvium (rainwater catchment), each 7 to 8 m wide. The impluvium allows the transfer of water from the bare strips to the vegetated strips. In the strips to be vegetated, the half-moons are spaced at 1 m lengthwise and 2 m widthwise and are arranged perpendicular to the land slope to collect runoff, fine soil particles, and diaspores. For each strip to be vegetated, each half-moon has a dimension of 4 m in diameter, generally 0.25 m in depth but varying between 0.15 and 0.30 m and a bead height of 0.30 to 0.40 m. On average, 313 half-moons can be established per hectare (Soumana *et al*., 2011).

Figure 1. Half-moon for grassland rehabilitation

These practices were deemed best practices by stakeholders based on pilot interventions for the rehabilitation of rangelands and pastures. They all aim to increase the productivity of rangelands biomass and the diversity of species of good pastoral quality. Additionally, for this to happen, the stakeholders also identified and highlighted the need for best management and governance practices.

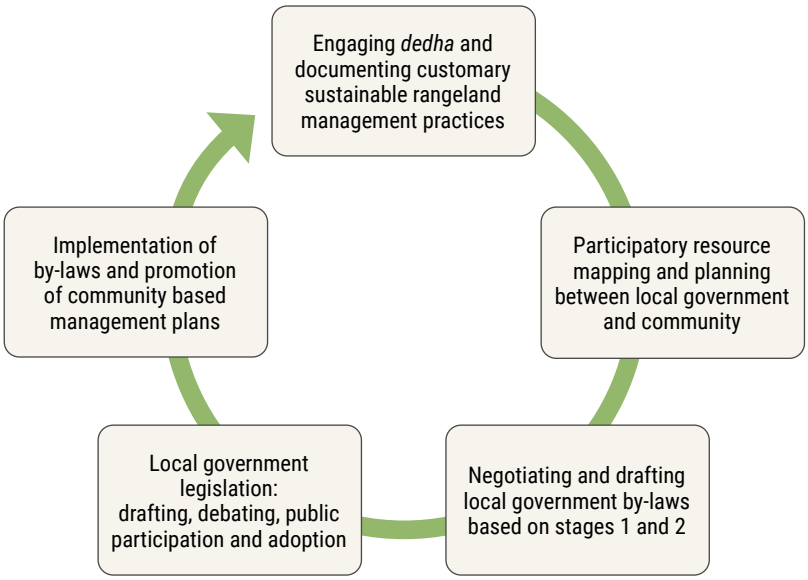
Bylaws for customary natural resource management in Kenya

Garba Tula is a region of Kenya's Isiolo County that is home to approximately 40 000 pastoralists, predominantly from the Borana tribe. Among the Boran, the *dedha* is a customary institution for the management of natural resources. Local *dedha* councils identify grazing areas to be set aside for drought reserves and other purposes. No one can graze their animals in these areas except during drought periods. The *dedha* decides when these rules apply and ensures that herders respect its decisions. Among the Boran, the *dedha* plays an essential role in planning for rangeland resources during times of drought, including managing relationships between local communities and in-migrating herders from neighbouring communities over a shared resource base . Young men are trained to patrol pastures and water areas to make sure people adhere to the rules.

The Kinna community in Garba Tula established a *dedha* to strengthen their customary governance of rangeland resources and to restore and protect their rangelands. These actions were guided by the desire to address severe and frequent droughts, rangeland degradation, and increased competition for rangeland resources. A range of interventions were enforced, such as grazing management and dry season water sources governance, and the institutionalization and formalization of customary institutions concerning rangeland landscapes. This approach has allowed for greater recognition of customary institutions, customary rangeland management, participatory and negotiated resource use and access, and social values of communities across a rangeland landscape. The approach focuses on strengthening customary *dedha* institutions by:

- increasing their power over rangeland governance at local scales;
- recognizing and using indigenous knowledge systems;
- institutionalizing customary institutions of rangeland governance to improve their decision-making processes; and
- improving their capacity to identify, monitor and prevent rangeland degradation at local scales.

Figure 2. By-law process in Isiolo county, Kenya



Source: PRAGA project, 2022.

These steps help to address competition and conflicts over shared resources. They have also contributed to reversing rangeland degradation and addressing overgrazing and the subsequent shrinkage and disappearance of palatable grass cover around dry season water resources. The approach works by enabling the use of traditional ecological knowledge of the *dedha* institution (also linked to customary management) as part of sustainable rangeland management and institutionalizing this knowledge and the powers of the *dedha* in local government by-laws.

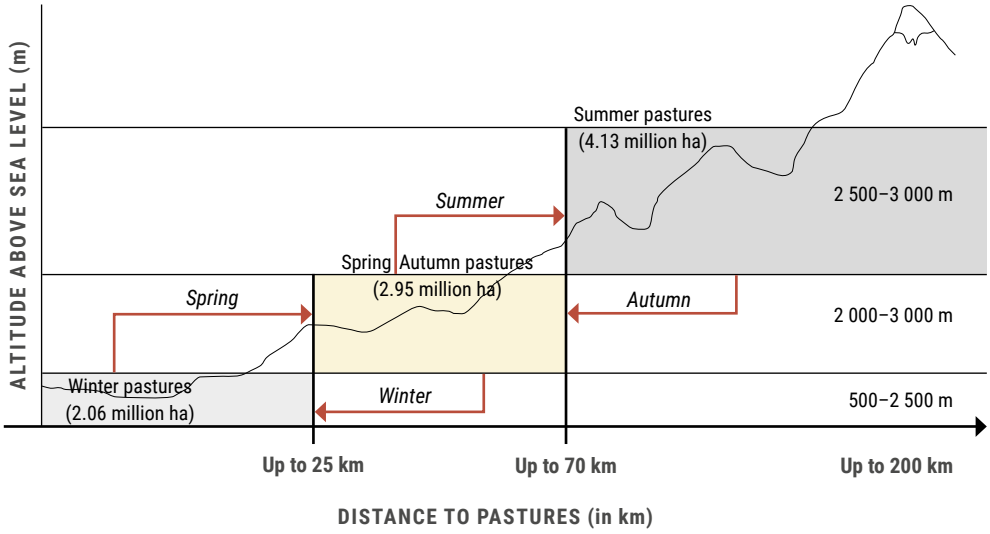
Managing altitude grazing for sustainable rangeland management in Kyrgyzstan

Kyrgyzstan in Central Asia is characterized by mountainous terrains and a continental climate with cold dry winters and warm wet summers. Due to the low precipitation and extreme weather conditions, Kyrgyz herders migrate with their livestock according to seasonal changes in natural vegetation from summer to winter. The pasture areas are divided by altitude and seasons into upper, middle and lower zones, or summer, spring-autumn and winter pastures.

Summer pastures are usually located in middle-elevation and high mountain valleys and gorges with high productivity. They are used in summer periods from one to four months and usually located at significant distances from the villages. These pastures can be hard to access due to the lack of roads and bridges over mountain rivers but are crucial for the annual use and regeneration of the entire landscape.

Spring-autumn pastures are usually located at shorter distances from the villages, in the foothills below 2 500 m above sea level. Livestock use these pastures in early spring (at the beginning of the growing season), and in the autumn when the harvest is gathered from the fields. The winter pastures are located close to the settlements, in areas of light or negligible snowfall and where the livestock can be easily housed. As they are located near settlements and are easily accessible, winter pastures are usually susceptible to degradation due to overuse and in some cases neglect by shepherds. In assessing the health of these pastures, ground truthing is important as they also straddle arable lands which may be mistaken for "healthy pastures" by satellite imagery due to their greenness but are instead croplands.

Figure 3. Horizontal and vertical pasture distribution and seasonal usage system



Source: CAMP Alatoo.

Figure 4. Winter pastures in Acha-Kaiyndy, Kyrgyzstan, July 2021

Figure 5. Summer pastures in Kazan-Kuigan, Kyrgyzstan, July 2021

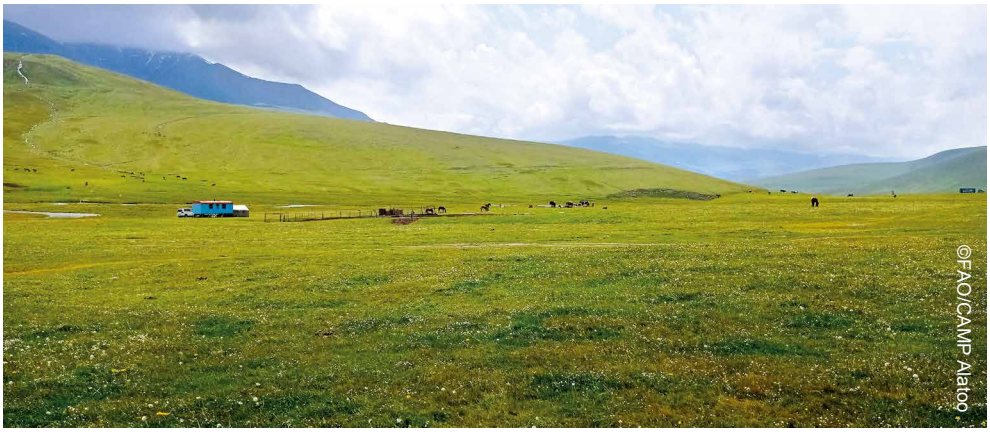


Figure 6. Autumn-Spring pastures in Jergetal, Kyrgyzstan, July 2021

In Naryn Oblast (province), Camp Alatoo, the main PRAGA project partner in Kyrgyzstan, has been working with pasture committees to improve pasture management by ensuring that shepherds follow the annual rotational plan. A pasture monitoring system has been developed with pasture users' associations which combines traditional knowledge and modern monitoring approaches to interpret the impact of livestock on pastures, with the results used to guide the planning of livestock grazing. Other activities include the rehabilitation of dilapidated infrastructures, such as water points, to encourage and to facilitate ease of access, and the use of the remotely located summer pastures. In addition to improving pasture conditions, while working with local communities and facilitating consultative dialogue platforms has helped reduce conflicts related to the use of and access to pastures and water resources.

Mixed herds in management of grasslands in Uruguay

Load adjustment is a common grasslands management strategy in Uruguay's natural grasslands (Schossler *et al*., 2021). It aims for optimal and sustainable use of grassland systems, while ensuring the achievement of desired animal development (ibid). Load adjustments factor in various species using the landscape/farm and the complementary benefits accruing from their interactions. Central to this are cattle-sheep interactions. As sheep and cattle have different feeding habits, this mixed grazing benefits the structure of grasses by maintaining tall and short species in the right proportions, thus supplying quality forage to both herbivores. Excessive use by cattle, for example, can result in domination by shrub-like homogeneous low-grass tapestry (dominated by summer species) while excessive sheep overload on the other hand results in tough grasses that dominate and choke the development of other grass species (ibid). A sheep-to-cattle ratio; the total number of sheep over the total number of cattle is applied to get the right balance.[7] The optimal ration has been placed at 3:1 sheep to cattle. However, this can also be influenced by other factors, such as the profitability of each species, management needs and pasture types.

[7] This is expressed in both livestock heads and units at a given time.

Factors influencing adoption of SLM in rangelands

Restoration and SLM initiatives in rangelands are scarce compared to the number and spatial scale of actions in crop farming landscapes and forest landscapes. Global analysis of land degradation indicates that land degradation in rangelands is significant, which suggests that more strenuous efforts are needed to generate restoration and SLM action. In some affected countries, rangeland investments are a low priority and greater awareness must be raised of the value of rangelands and the benefits of restoration. Some international organizations have been inhibited from acting in rangelands due to the publicization of past mistakes and uncertainty over how to do achieve their goals. The good practices and principles outlined in this report are intended to help overcome such barriers. However, several other barriers must be addressed if rangeland restoration and SLM are to be scaled up to the level required.

Investment in rangelands has gained acceptance at the global level through SDGs and under the various work programmes of the three Rio Conventions. Although these high-level commitments have not translated into sufficient action in the rangelands, they provide legitimacy for action and create an entry point for initiating the investments needed. The UNCCD highlights the importance of land in relation to the ecosystem services it provides and its fundamental importance for human well-being, including food security and livelihoods (Sanz *et al*., 2017). When land resources are over-exploited and degraded, quality of life is negatively affected and can result in food insecurity, job losses, displacement, or conflict. Addressing land degradation – achieving LDN – therefore supports multiple SDGs while contributing to the objectives of the three Rio Conventions.

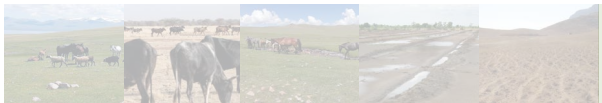
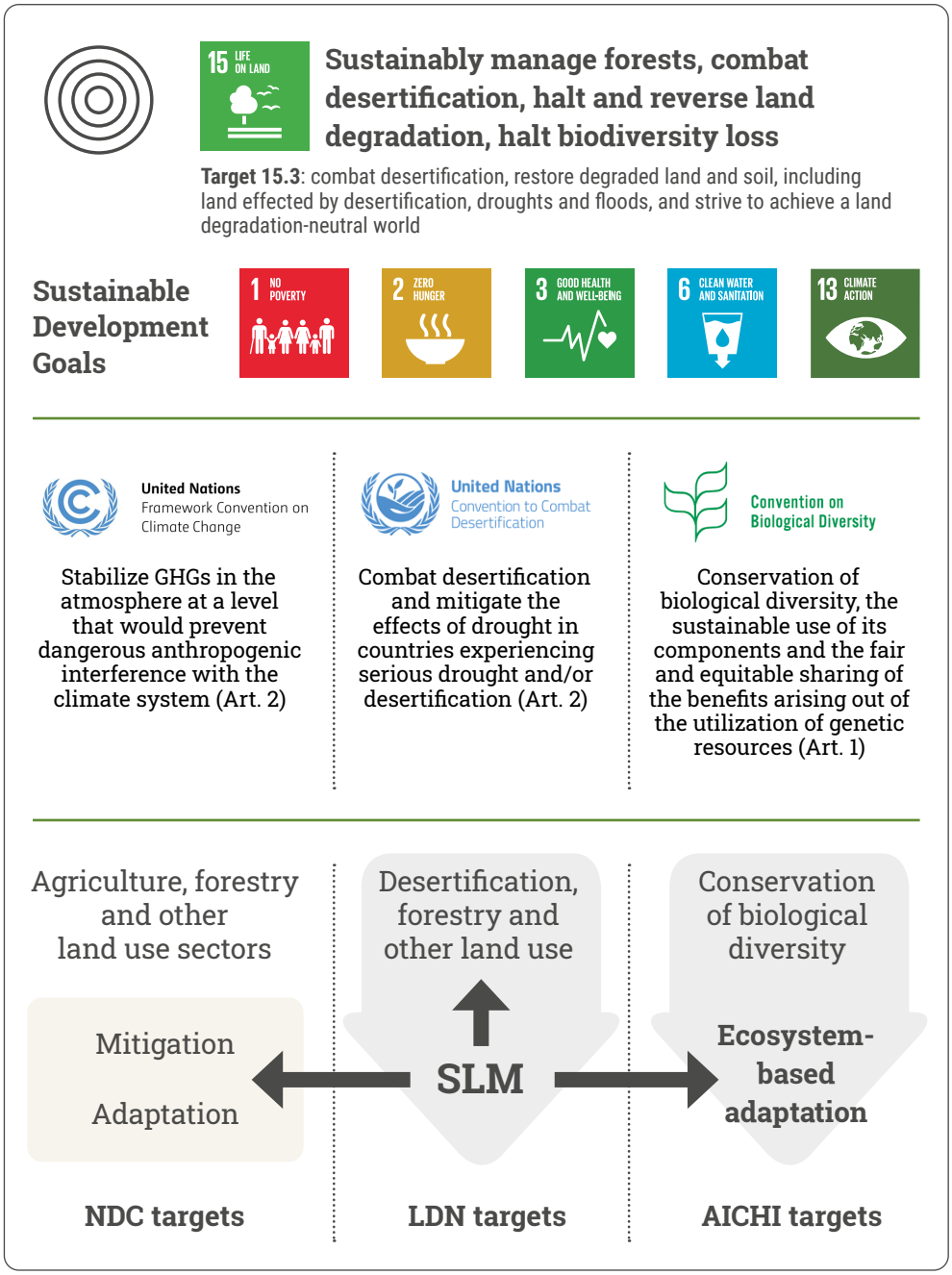


Figure 7. Sustainable land management supporting the Rio Conventions and the Sustainable Development Goals



Source: PRAGA project.

Barriers to sustainable rangelands and grasslands management

Services and infrastructure provisions

Sustainable rangeland management largely depends on organized herd movements, often on a large scale. Movements have historically been determined by natural features but are increasingly influenced by availability of services and infrastructure, as observed in Kyrgyzstan where summer pastures are increasingly unused due to lack of amenities and public services. Installing suitable infrastructure in rangelands, such as roads and veterinary services, can be costly. These macro-conditions can either facilitate or impede the mobility of herds and families and governments and development partners have a crucial role to play through investments in rangelands that support SLM.

Risk factors

Pastoralists face a myriad risks that affect their use of and access to productive resources in rangelands. This includes insecurity, for example in Kenya where contested grazing zones that are critical for the dry season cannot be accessed by Borana and Somali pastoralists due to feuds between the two communities. In Niger and Burkina Faso, ongoing insurgencies in parts of the countries not only push people away from their landscapes, curbing mobility, but lead to overconcentration in some areas that can result in overuse and degradation. Livestock and human diseases present other risks and movement away from infested areas – for example along riparian zones and wetlands – is driven by the urge to avoid disease in many pastoral communities.

Weak and ineffective governance

Weak governance manifests at two inter-linked levels. At community level, it may result from the weakening of local decision-making structures, leading to disregard for community rules and norms designed to guide the use of natural resources. At an administrative level, it can stem from decisions that undermine traditional use of and access to resources thus eroding the legitimacy of traditional institutions and weakening them. Statutory laws may also exist to govern the use and management of natural resources, but their implementation may be too weak to adequately protect SLM activities.

Knowledge and capacity gaps

Gaps are often identified in the capacity of public actors to implement restoration solutions. While this is a barrier in many countries, it highlights an attitudinal problem over the rights and responsibilities for rangeland restoration. Effective approaches have been demonstrated through which pastoralists can revive their institutions and apply their knowledge to enable the natural regeneration of rangelands. The capacity gap concerns the inability of external agents to facilitate institutional strengthening.

Capacity gaps among external agencies often result from weak underlying knowledge of rangeland ecology and low regard for pastoralist knowledge, practices and institutions. The result is a focus on externally driven solutions rather than enabling pastoral land users to find and implement their own solutions. Public institutions in pastoral areas are often weak and under-staffed and their mandate over rangelands is frequently uncertain. At the same time, policy makers at national level are not always well versed in the complexities of rangelands and grasslands and are ill-equipped to develop appropriate policies (Onyango *et al*., 2021).

Policies

Many countries lack clear policies for sustainable rangeland development. Where policies do exist (as mentioned earlier in Burkina Faso) their implementation is often weak, and public acceptance may sometimes be low. Policies tend to be designed at national levels with little consultation with sub-national authorities or rangeland communities. They can be contradictory between sectors, for example when forest restoration policies lead to development of monoculture forest plantations in grasslands. In many countries, responsibility for rangelands falls to a variety of sectors, such as forests, water, wildlife, and agriculture), creating policy incoherence and institutional competition.

Creating an enabling environment for sustainable rangeland management

Governance

Sound rangeland management cannot exist without secure land and resource tenure rights and holistic strategies to guide the development of land and natural resources. There is increasing governmental interest in the case studies of countries that strengthen the policy and regulatory environment for supporting sustainable rangeland management through improvements on land tenure among other measures. Governance should also entail strengthening customary institutions or pasture user groups by expanding and strengthening institutional channels of consultation and by fostering collaboration between customary institutions on one hand and local government institutions on the other. A key entry point for all stakeholders is to address the institutional (and not just technical) aspects of sustainable rangeland management as the core determinant of arrangements around rangeland management and access.

In Kenya's Garissa County, the renewed interest in community-based participatory natural resource governance that involves pastoralists' customary institutions has led to governance improvements through the elaboration of by-laws. Local decision-

making structures have been established, for example at catchment levels, to enable the sustainable management of rangeland resources. Stronger natural resource governance has strengthened the resilience of communities to drought and related water scarcities.

Community participation

Participation of local communities is a central element of good governance and should be included in the planning, use and monitoring of rangelands resources. Initiatives to promote sustainable rangeland management demand the active participation of pastoralists. Due to the vastness of the rangelands, local community members such as herders usually cover distances that for example administrative units cannot match. This is a resource that can be tapped into for monitoring purposes but also in terms of passing crucial information to security operatives in the country.

Promoting and strengthening stakeholder platforms

Stakeholder platforms can be established on different scales to promote joint planning, common understanding, dialogue, and conflict reduction. Such platforms will help improve understanding of the institutional arrangements around land use and rights of access between and across different groups. Stakeholder platforms should accommodate the needs and views of different groups who may have completing interests over resources and often require strong capacity for mediation and negotiation.

Incentives and investments

The majority of effective SLM solutions at scale work because they are low-cost and can be implemented by pastoralist communities. However, supporting investments are often needed to enable pastoralists to implement their management strategies, and this can sometimes incur high costs. Effective planning is needed to guide public investments in services and infrastructure to align with pastoral herding strategies. For example, correctly citing water resources and other infrastructure to ensure that it facilitates herd movements. There is increasing interest in identifying private investors in rangelands, which raises questions about the type of investment that will enable pastoralism (rather than appropriate pastoral resources) and ensuring investments are compatible with pastoral management strategies. Community organizations, such as producer associations and cooperatives, can play an important role as intermediaries between producers and other value chain actors, and should be strengthened and mandated to ensure that the changing demands of the marketplace do not undermine rangeland management strategies.

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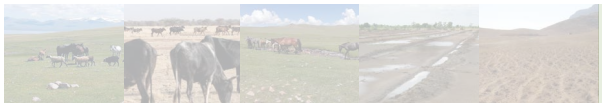
Recommendations for promoting sustainable rangeland management

Several conclusions and recommendations for scaling up sustainable rangeland management can be drawn from the lessons in this report. They reflect the understanding that sustainable rangeland management requires actions on a vast scale that are cost effective and can be implemented by pastoralists. Although other SLM practices, which have been documented elsewhere, can be used in rangelands – implemented by external agents and subsidized by public funding – it is assumed that these practices are less likely to succeed if underlying governance arrangements have not been clarified and strengthened. On the other hand, when governance has been strengthened, it enables herd management practices that can stimulate natural regeneration. New technologies and practices can be introduced that complement these management-based SLM solutions, but such actions should not be undertaken without first strengthening the underlying governance.



1. Strengthen institutions for rangeland governance and secure land tenure and rights

Institutions may need to be developed or strengthened at local (community), sub-national (public authorities) and national levels to create a foundation for sustainable rangeland management (SRM). SRM requires effective governance systems that uphold tenure rights, devolve decision-making power, allow coordinated and strategic action, lead to equitable sharing of resource, and are inclusive and respect different cultures. Good governance should be accountable, fair, abide by the rule of law, and ensure justice and conflict resolution (Campese *et al*., 2016; Davies *et al*., 2016).

At community level, rangeland governance can be strengthened be reinforcing and developing local organizations, such as traditional pasture management groups or other community-based organizations. Effective governance of rangelands should ensure participation in decision-making process by all stakeholders, including pastoralists who are the main users of the rangelands, and other marginalized groups, including women and youth. Securing land tenure rights are a prerequisite for adopting and implementing SRM, as land managers may not adopt SRM if their rights over the resource are not recognized in policies.

Public institutions, including sub-national authorities and national ministries, require clear mandates for sustainable rangeland management, including targets for restoration that are aligned with national voluntary LDN targets. Mechanisms are needed to ensure coordination over resource exploitation and development planning between ministries and sectors – such as agriculture, water, and infrastructure – and those mechanisms need to be responsive and accountable to rangeland communities. Public institutions must be capable of strengthening local governance and rights and ensuring justice and security for rangeland communities.

Capacity building for SRM should be developed around a clear vision of institutional strengthening. Capacities can be strengthened to enable rangeland communities to secure and uphold resource rights, establish effective and accountable planning, and ensure that public services and investments are aligned with rangeland management approaches, including adjustment to the geographic scale and seasonal needs of pastoralism.

2. Develop effective tools for sustainable rangeland management

Sustainable rangeland management must be grounded in the herding practices of rangeland communities, and new technologies and approaches should be harnessed to support those practices. This does not preclude adaptation to herding strategies, but those strategies must be guided by detailed understanding of rangeland ecology and the management objectives of herders. Sustainable rangeland management has often been held back by lack of agreement over the vision of rangeland development between public agencies and pastoral communities and development strategies are more likely to succeed if they are built around a common vision. It is essential to ensure effective participation in developing this vision, since different communities, men and women, youth and elders may all have different aspirations for the future.

Effective sustainable rangeland management requires, as a minimum, tools for the assessment and monitoring of rangeland health, tools for participatory planning that include large-scale herd management plans, and approaches for securing tenure over resources.

Adopting and promoting best practices for SRM and rangeland monitoring requires that actors have a solid understanding of the rangeland ecology, their status and values, and the threats and pressures that affect rangelands. Restoring degraded rangelands also requires that these factors be monitored on a regular basis to assess rangeland health using the available assessment methods that include pastoralists. It also requires that scientists work together with pastoralists, the main users of rangelands, to generate the data and provide information of the status of rangelands, their contribution to providing ecosystem services, and the ways in which they influence SRM. Mobility is an important aspect of maintaining healthy rangelands; and grazing management depends on how mobility is managed. Understanding grazing management in terms of timing and intensity of grazing is crucial for rangeland restoration.

3. Identify opportunities for investment that are aligned with pastoral rangeland management strategies

Scaling up SRM requires a combination of public and private investments, and such private investments must be supportive of pastoral management strategies. Sustainable financing and the willingness of partners to invest in rangelands depend on multiple factors including understanding the values of the resources and the potential to develop sustainable and economically viable value chains, the perception of the risks associated with investment in rangeland management, and the possibility to create markets.

There is growing demand from development banks and development agencies to mobilize private investment for restoration. However, restoration initiatives in rangelands need to overcome decades of underinvestment and expectations must be tempered accordingly. Nevertheless, as public investments are mobilized, for example through infrastructure projects and market development, opportunities can be explored for orientating public finance to incentivize private investment. This can include investments in local entrepreneurship within the rangeland, as well as innovations in finance, related for example to drought risk insurance.

Investment plans should be guided by a strong understanding of the value of rangelands, including secondary products and ecosystem services, for which markets may be under-developed. Balancing investment in livestock with investment in natural products like medicinal plants, or investments in non-consumptive values like tourism can help pastoralists strike a balance of production objectives that are compatible with sustainable rangeland management.

Innovative thinking is also needed to connect returns on investment with the kind of investments that are a priority in the rangelands. In particular, sustainable rangeland management depends on effective community organizations and leads to improvements in livestock production. The pathway between investment in a rangeland user group and returns through meat, milk and fibre markets is often unclear and requires new partnerships between value chain actors, community groups and public institutions. Guidelines on responsible agricultural investment (Committee on World Food Security, 2014) can be adapted to the needs of rangelands to ensure investors enhance food security and nutrition and support the progressive realization of the right to adequate food in the context of national food security.

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