Biodiversity conservation and sustainable livelihoods in rangelands: Trends, challenges and opportunities

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Abstract

Rangelands cover about 54% of the earth's surface and are essential for agricultural and livestock production, environmental protection and the in-situ conservation of genetic resources. Despite providing services that support life on earth, rangelands have been neglected to a large extent when compared to other types of ecosystems. This paper provides an overview of the importance of rangelands in conserving biodiversity and supporting the livelihoods of millions of people globally. Rangelands have lost ecological integrity due to unsustainable anthropogenic land-use changes and impacts. It is estimated that over 80% of Key Biodiversity Areas (KBAs) are either not adequately protected or not protected at all. The rangeland ecosystems constitute over 43% of KBAs covered by terrestrial protected areas globally. The biodiversity-agriculture nexus show that Agriculture is the leading driver of global land-use changes and biodiversity loss, accounting for up to 80 per cent of biodiversity loss, up to one-third of greenhouse gas emissions, and use up to 70 per cent of freshwater (UN 2021). Policy agents and investors should prioritise the sustainable utilisation of rangeland ecosystem goods and services to ensure that the issues of degradation, biodiversity loss and climate change are addressed globally. Investment in landscape restoration interventions to improve ecosystem services such as pollination, better water quality or soil fertility must become issues of high priority in rangelands.

Introduction

Rangelands cover a large portion of the earth's surface and are important for agricultural and livestock production, environmental protection, and the in-situ conservation of genetic resources. Rangelands also contain some of the earth's most precious habitats that conserve biodiversity and deliver important ecosystem services. In addition, in both developed and developing countries, millions of people depend on rangelands for their livelihood.

Rangelands have been mainly neglected despite providing services that support life on earth compared to other types of ecosystems (*Johnsen et al., 2019*). For example, just 10 per cent of national climate action plans (as part of the Paris Climate Agreement) include references to rangelands, compared to 70 per cent of those plans, including references to forests (International Livestock Research Institute- (ILRI) *et al.,* 2021).

Over the years, many rangelands have been converted to land uses that continue to lead to habitat loss, declining biodiversity, ecosystem fragmentation, and desertification/land degradation in some areas. Once home to some of the world's most remarkable assemblages of wildlife, the remaining intact indigenous rangelands now support only remnant populations.

This paper provides an overview of the importance of rangelands in conserving biodiversity and supporting the livelihoods of millions of people globally. It describes the state of rangelands and the deteriorating

trends and highlights various remedial actions being undertaken, their impacts and what further measures could be taken.

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Changes in rangelands

According to a recent Rangelands Atlas published in May 2021, rangelands cover 54% of the global terrestrial surface. They are made up of several rangeland types, including deserts, grasslands, forests, shrublands, woodlands, and tundra. Grasslands make up 23% of the global terrestrial surface and 44% of rangelands (ILRI 2021).

The ILRI *et al* 2021 Report shows that rangelands have undergone a critical transition from mostly wild to mostly anthropogenic between 1700 and 2000, passing the 50% mark early in the 20th century. Within this period, for example, pastoral villages grew from 1,566 km^2 to 365,064 km^2 (23,300% increase); populated croplands grew from 287,308 km^2 to 4,010,017 km^2 (1406% increase); populated rangelands grew from 1,101,217 km^2 to 11,209,691 km^2 (1017% increase); irrigated villages increased from 10,054 km^2 to 695,705 km^2 (6929% increase); remote croplands increased from 8,311 to 1,991,376 km^2 (23961% increase) and residential rainfed croplands increased from 873,040 to 4,274,271 km^2 (490% increase).

These changes have resulted in intense resource use conflicts and biodiversity loss, in most cases fueled by poor governance, ineffective legislation, poor land-use planning, conflicting land-use policies, burgeoning human population growth, unplanned developments, poverty, overlapping land-use rights, value conflicts, economic inequality, among other causes. For example, a recent biodiversity assessment shows that the global populations of mammals, birds, fish, amphibians and reptiles declined by 68% between 1970 and 2016 (Almond *et al.*, 2020), while another report estimates that one million animal and plant species are threatened with extinction, and predicts that 550 mammal species will be lost this century, including within rangelands if we continue along our current path (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) 2019).

Threats to global biodiversity in the Key Biodiversity Areas (KBAs), defined as sites that contribute significantly to biodiversity's global persistence, have continued to escalate. Over 80% of KBAs are either not adequately protected or not protected at all. In areas where indigenous and local communities manage biodiversity, threats from tenurial insecurity, extractive industries and inappropriate developments, inappropriate land use, industrial agriculture, internal inequalities and injustices, demographic and cultural changes, and external market incursion to biodiversity loss. Without tenure security and active participation in decisions that affect them, such communities cannot effectively protect their lands and resources (Gonzalo *et al.* (, 2005).

Protected areas

One of the most effective global strategies to achieve the long-term conservation of nature and the associated ecosystem services and cultural values has been establishing protected areas. By October 2021, there were 266,561 protected areas in 245 countries covering more than 22.5 million km2 (16.64% of land) and 28.1 million km2 (7.74% of coastal and marine areas) (https://www.protectedplanet.net/en). Within rangelands, protected areas constitute over 43% of the area covered by terrestrial protected areas globally.

Besides conserving biodiversity, effectively managed protected areas can be crucial players in poverty reduction, employment and wealth creation. Moreover, through the provision of ecosystem services, they

also support many sectors of the economy such as energy, water, agriculture, security, forestry and horticulture.

Many studies show that most protected areas are not effectively managed and are not achieving their conservation and sustainable development goals (e.g., Leverington *et al.*, (2010); Knights *et al.* (2014); Lindsey *et al.,* (2017); Davis *et al. (*2001); Mascia & Pailler (2011); Mascia e*t al.,* (2014); Gibson(1999); UNODC (2016);, Makochekanwa, (2013), Hartley *et al. (*2007), Lindsay *et al.* (2018).
Since the 2003 Durban Accord (IUCN 2005), protected areas have been increasingly viewed as social enterprises that should be managed with the needs of local communities in mind, often in partnership with local communities. In addition, community-conserved areas have been created and/or recognized. The drivers of change behind the modern model of protected areas include a heightened awareness of human rights, including through international mechanisms such as the 2007 United Nations Declaration on the Rights of Indigenous Peoples (UN 2007) and a more significant move toward democratization. Communities and private landowners have set aside conservancies to create space for wildlife while providing wildlife-focused development options that enable landowners to adapt to the changing socioeconomic realities. In areas where animal husbandry and agriculture fail to deliver reliable returns due to shifting weather patterns, conservancies are part of an alternative land-use model that can reduce rural poverty and generate alternative revenue streams. For example, in Kenya, Namibia and Zimbabwe, conservancies have provided strong, tangible benefits beyond purely conservation goals - including peace, security, and social cohesion (King *et al.* 2016).

Communities are also exploring the potential for promoting biodiversity-based enterprises such as carbon trade, biodiversity off-sets, payment for ecosystem services, bioprospecting, agroforestry, aquaculture and nature-based products such as honey and drugs. Where properly designed and managed, such enterprises can help diversify resource-dependent livelihoods and keep people from pursuing unsustainable resource exploitation approaches. Bishop *et al.* (2008) provides examples of biodiverse-based enterprises, including opportunities and challenges likely to be encountered.

The biodiversity-agriculture nexus.

Agriculture is the leading driver of global land-use changes and biodiversity loss (IPBES 2019). Recent reports have found that food systems are contributing up to 80 per cent of biodiversity loss, up to one-third of greenhouse gas emissions, and use up to 70 per cent of freshwater (UN 2021). Since 1970, the collective biomass of wild mammals has declined by 82 per cent, and a small number of farmed animal species (mainly cows and pigs) now dominate global biomass, together accounting for 60 per cent of all mammal species by mass, compared to 4 per cent for wild mammals. Animal farming now occupies 78 per cent of agricultural land globally (Bar-On *et al.* 2018). Currently, cropping and animal husbandry occupy about 50 per cent of the world's habitable land (Ritchie and Roser, 2019). The loss of healthy soil moderately or severely impacts about 52% of all land used for food production. A study on 8,688 species on the UN Red List found that 72% of species are imperilled by overexploitation while 62% are imperilled by agricultural activity (Maxwell *et al.,* 2016).
Through the exportation of agricultural products, global consumption increased by 2800% between 1970 and 2017 (Liu 2020). However, the 2021 UN Food Systems Summit Processes have shown that the current production systems are unsustainable and must be rethought for better health, environment, and poverty.
In addition to food production, food preparation is another factor that must be addressed to lessen the loss of biodiversity and ecosystem services in rangelands. Of all the wood produced every year in sub-Saharan Africa, 90 per cent is used as fuel, posing a major sustainability challenge (FAO 2021). Environmental damage from fuelwood harvesting is significant where too many people depend on too few and diminishing

forests and woodlands. Innovations to replace wood fuel with a more sustainable source must become an important agenda in national and local efforts to conserve biodiversity.
The IUCN is developing a new engagement in agriculture, guided by the vision of a future where biodiversity is restored and conserved on farms and in agricultural landscapes as nature-based solutions to global challenges and human and societal needs, contributing to the transition towards sustainable and resilient societies (IUCN 2021).

Discussions and conclusions

Given the importance of rangelands and the threats they face, their conservation must be made part of policy discussions around everything from confronting climate change to reducing poverty, managing threats to biodiversity, and developing sustainable food systems. Transforming our food and agricultural systems hold power to realise our shared aspiration for a better world.

Investment in landscape restoration interventions to improve ecosystem services such as pollination, better water quality or soil fertility must become issues of high priority in rangelands. However, such efforts will not be realised at a meaningful scale without the buy-in of millions of indigenous and local communities, farmers, agribusinesses and governments. Acting collectively, we must encourage, facilitate, and deliver rangeland conservation and restoration policies and investments that harness and capture indigenous knowledge to deliver meaningful local development and sustainability. Uplifting the living standards of indigenous peoples must be an essential step in addressing the biodiversity problem.

Systemic challenges such as overconsumption, high population growth, agricultural and economic systems that do not value biodiversity; low levels of investment in conservation; weak policies, inequalities, conflicting land-use policies and low public awareness of the importance of biodiversity must be addressed. Equitable governance of nature, capacity building, economic empowerment of indigenous and local communities, equitable sharing of the costs and benefits of nature, and rights-based approaches to conservation must be embraced if there will be any hopes of reducing human impacts on biodiversity in rangelands. In addition, politics will remain a key success factor in achieving conservation outcomes grounded on the principles of equity and inclusivity.

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