

Community rangeland management approaches for land and ecosystem restoration: A brief review of ICARDA and ILRI research

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Key messages

- The global community's land and ecosystem restoration commitments cannot be met without significant action taken in support of restoration in rangeland ecosystems.
- In rangeland ecosystems, grazing is a key factor in ecosystem dynamics. The use of grazing by livestock to achieve restoration objectives can create synergies in which restoration activities improve rangeland condition, which then translates into more productive livestock.
- More intensive and targeted interventions for restoration work best when built on a foundation of grazing management systems that are designed and implemented by communities of livestock keepers.
- ILRI and ICARDA research has also explored what is needed to create an enabling environment for rangeland restoration, including monitoring systems, supportive policies and land tenure frameworks, and appropriate incentives.

The challenges for restoration in rangelands

The global community, recognizing that the Sustainable Development Goals (SDGs) will not be achieved if the current worldwide pattern of environmental degradation continues, has launched several initiatives that target action in support of land and ecosystem restoration. For instance, the United Nations Decade on Ecosystem Restoration, which runs from 2021 to 2030, calls on the member states to 'mainstream ecosystem restoration into policies and plans' (1). The United Nations Convention to Combat Desertification and Target 15.3 of the SDGs also rely on restoration in order to achieve land degradation neutrality. The Bonn Challenge is an initiative aligned with these aims of the SDGs, the Decade on Ecosystem Restoration, and the environmental conventions, that entails a pledge to bring 350 million hectares of degraded lands into restoration by 2030 (2).



Given that approximately fifty per cent of the world's ecosystems are rangelands, these commitments and targets will not be achieved without significant action taken in support of restoration in rangeland ecosystems. Invasive species, climate change, large-scale conversion of natural rangeland ecosystems to cropland and overgrazing all pose serious threats to rangeland ecosystems (3). Unfortunately, some methods used for restoration in rangelands such as building erosion control structures, mechanically clearing bush encroachment from savannahs and grasslands, and wholesale exclusion of livestock face serious challenges. Many such technology-driven approaches to restoration can be either expensive or difficult to implement and maintain over time, or both, while also failing to address the root causes of degradation.

The policy opportunity

How, then, should investment and policy for land and ecosystem restoration be targeted, and what approaches for sustainable restoration are best suited for rangelands?

While there are many technologies and specific technical practices that can be effective under the right conditions, a promising avenue is to embed these technologies and practices within participatory approaches to rangeland management carried out by communities of livestock keepers. This briefing note takes stock of some of the research by the International Center for Research in the Dry Areas (ICARDA) and the International Livestock Research Institute (ILRI) that is relevant to considering how participatory and community-based rangeland management approaches can be applied and adapted to diverse contexts to achieve restoration objectives.

Methods and approaches for restoration in rangelands

Research by ICARDA and ILRI, much of it recently supported by the CGIAR Research Programs (CRPs) on Livestock and on Policies, Institutions and Markets (PIM) has investigated various rangeland restoration approaches and practices, many of them based on methods that pastoralists—mobile livestock keepers—have used for centuries. Where these rangelands are a common pool resource shared by communities of livestock keepers, one strategy of governmental and non-governmental organizations engaged in restoration is to support inclusive, collective management by those communities, drawing both on their traditional knowledge and on scientific research. In this vein, ICARDA and ILRI, building on their research findings, have helped to develop the Sustainable Rangeland Management (4, 5) and Participatory Rangeland Management (6, 7) approaches.

At the core of any such restoration approach is grazing management, which is based on using the frequency, duration, intensity, location and timing of grazing by livestock to restore and maintain healthy rangeland ecosystems. While excessive livestock numbers can result in degradation, it is often the timing and duration of grazing that have the

greatest impact on rangelands. A fundamental objective of grazing management, therefore, is to use the timing and location of livestock grazing as a tool, eliminating excessive grazing and ensuring that all pastures are rested at certain times. Importantly, this does not necessarily require the kind of strict rotational grazing systems often used in commercial ranching, as relatively simple grazing management approaches can inexpensively produce positive restoration results (8).

One of the simplest approaches involves assisting community members to agree on seasonal grazing plans in which the community's territory is divided into rainy season and dry season grazing areas. A study of community rangeland management and governance in Kenya investigated five communities that had each been supported by external organizations to develop and implement a seasonal grazing plan. Using a combination of remote sensing analysis and participatory assessment by local pastoralists, the study found that, on the whole, the efforts effectively maintained and improved rangeland condition, helping the communities to avoid the degradation experienced by neighbouring communities that lacked such systems, and in some cases significantly improving rangeland condition (9). A similar comparative study of community-based approaches to rangeland management in Ethiopia, Kenya and Tunisia found that positive environmental outcomes were evident in all the cases (10).

A similar approach that pastoral communities use to ensure pasture resting and to restore and maintain rangeland condition is to identify particular pastures to be set aside for an agreed period so that vegetation can recover. It is important to note that in many rangeland ecosystems, it is possible to overdo resting, thereby imposing opportunity costs on livestock owners with little or no further benefit for the rangeland ecosystem realistically expected. In Tunisia, for example, the revival of a traditional resting practice called Gdel (also known as Hima in some other countries in North Africa and the Near East) was found to reduce bare ground and increase plant cover and livestock carrying capacity after only two years' rest in years of adequate rainfall (11). In some situations, resting a previously grazed rangeland for as little as one year 'is adequate for it to recover its vigor and productivity' (12: p. 30). This is good news for land restoration efforts—it implies that positive results can be achieved without the need for massive investment or long-term sacrifice by livestock keepers.

Action research carried out in Ethiopia and Kenya by ILRI and local community partners took this further, demonstrating that resting sections of pasture for as little as two months during the rainy season can significantly improve plant cover and initiate restoration over large areas at very low cost (13). This latter method, termed rotational resting as opposed to rotational grazing, should be relatively easy to implement by pastoralist community organizations as it only requires exclusion of herds from the particular target pasture area for a limited period rather than attempting to intensively manage herd movements across their entire territory.

When livestock are used to achieve restoration objectives, trade-offs between livestock production and environmental protection begin to fade, replaced by synergies in which restoration activities improve rangeland condition, which then translates into more productive livestock. Moreover, it is not inevitable that livestock will be a source of degradation. In rangeland ecosystems, grazing—whether by wildlife or by livestock—is a key factor in ecosystem dynamics, and strategically applied grazing can positively contribute to restoration. For example, high-intensity short duration grazing can remove excessive oxidized plant litter and break up hard, crusted soils thereby improving infiltration of rainfall (14). By improving rangeland condition and increasing the availability of quality forage, these improvements translate into improved livestock health and ability to cope with drought (9, 15). This in turn builds the resilience of pastoral rangeland systems, helps communities to adapt to climate change, and enhances livestock-based livelihoods, thereby creating a ‘positive feedback loop’ that incentivizes further investment in restoration.

Grazing management, as well as producing benefits in and of itself, provides a foundation for strategic and selective application of other kinds of restoration practices. For example, research by ICARDA and ILRI has demonstrated practices such as rainwater harvesting for water capture and erosion control, tree and shrub transplantation, and direct seeding with native species that can effectively restore degraded rangelands and prevent further degradation and has investigated the conditions and methods needed for successful implementation of these practices (16–20). Several of these practices can produce impressive results in a very short period, while providing economic, social and environmental co-benefits.

Enabling environments for rangeland restoration at scale

One challenge for scaling out these approaches and practices has been the lack of data on ecosystem outcomes. Measuring and monitoring outcomes of land restoration can be time-consuming and expensive given the extent of rangeland areas, their variability, and the difficulty of detecting weak effects over large areas. As a result, rangeland management interventions often lack any kind of systematic monitoring system. Efforts, therefore, have gone into developing rangeland monitoring and assessment methods based on remote sensing (17, 21–23).

Some of the studies referred to above have also explicitly examined the social and ecological contexts for implementation, identifying under what conditions particular approaches or methods are likely to be more difficult to implement or less likely to produce significant outcomes. ILRI’s application of an ‘options by context’ methodology is a case in point, having identified how elements of the political and physical geography of a rangeland landscape limit the effectiveness of certain kinds of community-based approaches (10). Similarly, ICARDA research has explored within what range of rainfall levels different technical restoration practices are most likely to be effective (12, 24). This kind of knowledge and flexibility can contribute to wise scaling out, making it easier to choose the right method to be applied at the right place and time. The growing knowledge base on monitoring, context and implementation is increasingly being documented in toolkits, manuals, and other kinds of training materials (4, 7, 8, 14, 19, 25–28).



An enabling policy environment is also essential. For instance, some of this research has unpacked ways in which land tenure systems and governance at the community and landscape scales enable, or erode, the capacity of communities to effectively implement rangeland restoration and management methods (10, 29–34). It has also shed light on how strategic investments can be used to help create incentives that serve as a first step on a sequential path toward sustainable restoration (35).

The way forward

Research such as that referred to above has demonstrated that approaches for rangeland management anchored in grazing management systems implemented by communities of livestock keepers can achieve significant restoration results at relatively low cost. However, community rangeland management is not a blueprint—the right combination of technical practices based on local conditions, embedded in overall approaches adapted to the particular climatic, social, political, economic and ecological context are needed. For this reason ICARDA and ILRI have integrated restoration science with local knowledge and practice, in this way generating evidence as to what does and does not work, for whom, where, when, and under what conditions.

Although these community rangeland management approaches involve the implementation of technical practices, it is clear that implementation of the practices depends on social and institutional capacity, and that this will often require some kind of investment: for example, capacity development for community rangeland management organizations and strengthening the accountability of these organizations to their communities. Attention also must be directed to ensuring that the right incentives and a favourable policy environment are in place, including elements such as equitable land tenure systems and frameworks that enable appropriate mobility of livestock herds.

While the research described above, supported by the Livestock and PIM CRPs, has shown that rangeland management can make an important contribution to land and ecosystem restoration, climate change adaptation, and achievement of the SDGs, the targets of the Bonn Challenge, and other international commitments; further research into certain questions would nevertheless be helpful.

Four key areas for further research stand out. The first need is for continued testing of restoration practices in different contexts in order to deepen understanding of which approaches and practices are applicable in which contexts. Second, there is a need for further development of methods and systems for ongoing monitoring of ecosystem condition and degradation, combining field

and remote sensing data. Currently, baseline ecological data for community rangeland management initiatives are too scarce, ongoing monitoring is too rare, and use of remote sensing methods insufficiently developed. Third, economic analysis of community rangeland management approaches such as through cost-benefit analysis would be helpful for policymakers and other decision makers. Lastly, a deeper understanding is needed on the matter of how local-level governance by communities interfaces with livestock mobility and other dynamics at the large landscape scale. Research in these areas would add to the already substantial body of knowledge on approaches such as Sustainable Rangeland Management and Participatory Rangeland Management, further illuminating their potential for land and ecosystem restoration.

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CGIAR is a global partnership that unites organizations engaged in research for a food-secure future. The CGIAR Research Program on Livestock provides research-based solutions to help smallholder farmers, pastoralists and agro-pastoralists transition to sustainable, resilient livelihoods and to productive enterprises that will help feed future generations. It aims to increase the productivity and profitability of livestock agri-food systems in sustainable ways, making meat, milk and eggs more available and affordable across the developing world. The Program brings together five core partners: the International Livestock Research Institute (ILRI) with a mandate on livestock; the International Center for Tropical Agriculture (CIAT), which works on forages; the International Center for Research in the Dry Areas (ICARDA), which works on small ruminants and dryland systems; the Swedish University of Agricultural Sciences (SLU) with expertise particularly in animal health and genetics and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) which connects research into development and innovation and scaling processes.



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