Innovation brief

RESEARCH PROGRAM ON Livestock

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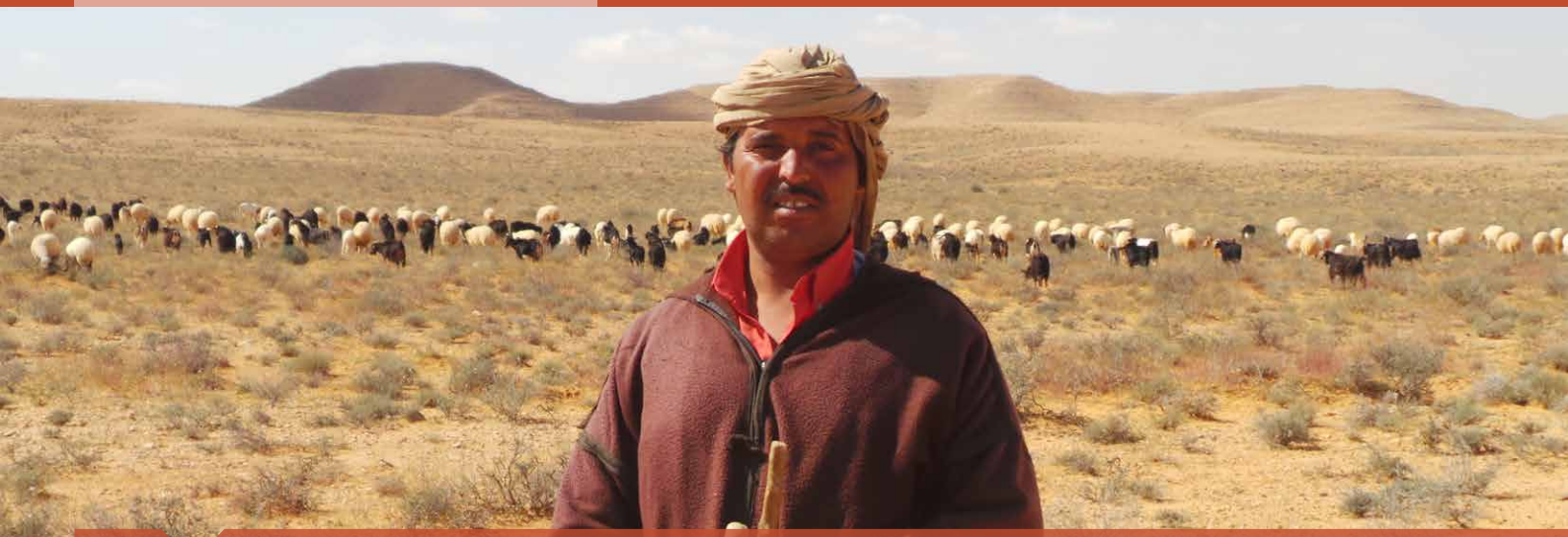

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Better land-use decisions on the horizon with new Sustainable Rangeland Management toolkit

KEY MESSAGES

- Rangelands cover an estimated 54% of the world's land surface (Rangelands Atlas, 2021) and support livelihoods, livestock production, climate-change mitigation and biodiversity preservation, among other things.
- However, between a quarter and a third of the world's rangelands are considered degraded, through land conversion, overexploitation and climate change.
- Rangeland management is complex and delicate. To manage rangelands more sustainably – and in doing so provide tangible benefits for communities, economies, and ecosystems – decision makers, such as government and development actors, need better access to reliable, up-to-date information and tools.
- Researchers at the International Centre for Agricultural Research in the Dry Areas (ICARDA), in partnership with the International Union for Conservation of Nature (IUCN), have developed a new Sustainable Rangeland Management (SRM) toolkit for sustainable rangeland restoration, which integrates indigenous knowledge and state-of-the-art science.
- The kit details a range of techniques, methods and strategies for SRM, as well as guidance for users about how to determine which practices to choose in their specific context; case study examples; and a practical guide to Rangeland Inventorying, Monitoring and Assessment (RIMA) – a set of protocols designed to help guide SRM.
- The toolkit was first tested in Tunisia to address degradation in the country's arid and semi-arid rangelands, where it has been adopted and continues to be used by national and subnational governments, with positive results.

INTRODUCTION

Rangelands are the world's largest land cover type, covering more than half of the Earth's land surface. They produce a wide variety of goods and services, including livestock forage, water, wildlife habitat, wood products, mineral resources, recreation space and natural beauty. They support more than 200 million households and 50% of the world's livestock; they are also home to a third of the world's terrestrial biodiversity and provide a habitat for 28% of all endangered species. Rangelands also store around one-third of all land-based carbon.

Overgrazing in rangeland environments can contribute to degradation and changes in botanical composition, which can lead ultimately to desertification – with major implications for climate change, and for the millions of pastoralists worldwide who depend on livestock breeding for their livelihoods. Under-grazing can also impact negatively on rangeland ecosystems. Because conditions can change a lot from year to year, it's often difficult for land managers to make the right decisions to help their rangelands thrive.

In that context, the International Centre for Agricultural Research in the Dry Areas (ICARDA), in partnership with the International Union for Conservation of Nature (IUCN), has developed a new **sustainable rangeland management (SRM) toolkit** for sustainable rangeland restoration. This toolkit, which integrates indigenous knowledge and state-of-the-art science, is transforming rangeland restoration processes and influencing governance of these important landscapes.

ICARDA
Science for resilient livelihoods in dry areas

This work was developed by the livestock and environment flagship of the CGIAR Research Program on Livestock, which is supported by contributors to the CGIAR Trust Fund. https://www.cgiar.org/funders/

THE CHALLENGE

Between a quarter and a third of the world's rangelands are considered degraded, with some regions more heavily affected than others. Drivers of rangeland degradation include a growing human population, increased investment that drives over-exploitation, unsustainable management practices, gaps in policy that undermine traditional management practices, the widespread misunderstanding of rangeland ecology and the adaptations that rangeland communities have made to local conditions. These adaptations include complex communal land management systems and herd mobility that have evolved over centuries.

Rangelands are likewise affected by conversion of land to uses such as crop farming and are increasingly susceptible to the impacts of anthropogenic climate change.

To restore degraded rangelands – and help healthy ones continue to thrive – better rangeland management will be a critical piece of the puzzle.

A gabion retaining wall prevents erosion in this rangeland landscape in Zaghouan, Tunisia. Photo ICARDA/Mounir Louhaichi

WHAT IS SUSTAINABLE RANGELAND MANAGEMENT?

SRM is the management of rangelands to meet current human needs while ensuring their long-term productivity. To maintain and improve rangelands' productivity, it is important to understand how they respond to ongoing environmental changes and anthropogenic pressure. This knowledge can guide conservation and restoration efforts in dryland rangelands, as biotic factors can be actively managed locally to increase ecosystem resilience to global changes.

SRM requires the application of knowledge about rangeland ecology, such as using grazing management and other interventions to stimulate the growth of desired plant species and inhibit the growth of less-desirable ones. For instance, it is vital to understand the close relationship between grasses and grazers: many grasses are highly adapted to the habits of grazing ungulates and thrive under the influence of grazing. These same grasses are outcompeted by less well-adapted plants in the absence of grazing. Without grazing livestock, the existing ecological community will shift away from grasses toward increased woody vegetation.

Successful SRM differs in every location in which it is applied, and will draw on a suite of strategies and practices that are adapted to fit the local environment, people and cultures.

TOOLS TO HELP MAKE IT HAPPEN

Despite technical advances, the scale of rangeland rehabilitation intervention is still small and lacks a holistic approach. Most projects focus on a single SRM practice, ignoring the myriad possible interventions that would guarantee achieving the desired restoration objective(s).

This toolkit brings together state-of-the-art knowledge about SRM practices known to contribute to sustainable rangeland management. Its contents are not 'set in stone' – existing tools can be updated based on feedback from users, and new tools will likely be added as innovations arise in the future.

It was co-written by several leading scientists in rangeland management, led by Mounir Louhaichi (Team Leader of Rangeland Ecology and Forages at ICARDA) and Jonatan Davies (Global Drylands Coordinator at IUCN). It outlines an array of SRM tools and techniques, including background, benefits, principles and steps required to carry them out, including:

- Participatory Rangeland Management
- *Hima* (a traditional communal rangeland management system that has been used in the Arabian Peninsula for over 1,500 years)
- Water harvesting techniques
- Soil surface scarification
- Direct seeding
- Shrub/tree plantation
- Grazing management
- Fire management

The toolkit also covers site characterisation criteria, which helps users to decide what kinds of SRM practices to apply in their particular context. It shares case study examples of site characterisation and ensuing adaptive management and

restoration strategies in several sites, including the arid and semi-arid rangelands of Chenini-Tataouine in southern Tunisia; the Karnabchul semi-desert in southwestern Uzbekistan; and the steppic Badia rangelands in Jordan. In 2022, the creators will add other case studies from sub-Saharan Africa and/or Latin America.

However, to successfully apply these methods, tools and approaches requires they be used together with improved rangeland assessment, monitoring and better data on rangeland ecosystem services. It also requires attention to policy gaps and failures, including legislation on communal tenure rights. Sustainable rangeland management ultimately requires a major increase in investment, which requires a deeper understanding of investment opportunities and the values of ecosystem goods and services.

In Jordan, intermittent contours and shrub plantation help reduce erosion, with the added benefit of providing a source of feeding for livestock.

Photo ICARDA/Mounir Louhaichi

SRM FOR CLIMATE-CHANGE ADAPTATION

As climate change impacts temperatures and rainfall patterns across the globe, SRM practices may be required in a larger number of the world's rangelands, including formerly healthy ones. To this end, some of the techniques outlined in the kit may prove particularly useful. For instance:

• **Soil surface scarification** is a technique to break up crusted or capped soils, which are common in arid and semi-arid rangelands and often result in very low seed germination and/or seedling performance. Lightly breaking up the surface soil creates narrow furrows that trap moisture and improve seedbed conditions. In the event the soil seed bank is depleted, this practice can be complemented by seeding, which is cost-effective technique for rehabilitating degraded rangelands.

Scarification has historically been achieved naturally by grazing wildlife which, when chased by predators, would stampede and break up the soil surface. It can also be achieved through practices that can mimic predator-induced behaviour such as the use of a mobile watering facility or additional feeding and/or mineral supplementation, or mechanically with the use of a field cultivator or ripper.

Soil surface scarification–shown here in the Badia of Jordan, also known as the Jordanian Steppe in the desert/semi-desert regions of the country–is one of the many low-cost, practical solutions featured in the SRM toolkit.

Photo ICARDA/Mounir Louhaichi

Direct seeding in pits in the rangelands of Syria where precipitation is less than 200 mm. This role is mostly carried out by women.

Photo ICARDA/Mounir Louhaichi

• **Direct seeding** is a technique that involves sowing seeds directly into their final growing location rather than transplanting seedlings nurtured elsewhere. It is an age-old and lower-cost practice that is regaining popularity in places where the terrain and cost of transplanting seedlings prevent natural regeneration or planting.

Under intensifying climate change and increasing soil degradation rates, direct seeding without disturbing the soil (no-tillage) is becoming more appealing. The practice helps the soil retain moisture and maintain more organisms that break down organic matter into vital nutrients, increasing the potential for nutrient recycling and in doing so leading to healthier soil.

• **Water harvesting** helps to maintain and build soil fertility and productivity in areas where rainfall is scarce or unreliable, as well as to support human populations, livestock, and native flora and fauna through dry periods; capture atmospheric carbon through increasing biomass production; and contribute to the replenishment of groundwater tables.

There are a wide array of manual and mechanical water harvesting techniques: determining which ones have the best performance, and choosing which ones to promote and scale up, requires consideration of biophysical, technical and socioeconomic factors. Raising awareness, promotion and training will facilitate the adoption, adaptation and spread of water harvesting practices among landowners; however, effective community participatory initiatives are still needed to promote the adoption of these techniques.

Jessour is a water harvesting technique in Tunisia that consists of a dam, terrace, and catchment area Photo ICARDA/Mounir Louhaichi

CASE STUDY: Using the toolkit to align grazing strategies with changing conditions in Tunisia

Over a third of Tunisia's land surface is made up of natural rangelands, which support herds of both wild and domestic animals through their native grasses, forbs (herbaceous flowering plants) and shrubs.

But the majority (87%) of these rangelands are in arid and desert areas, and erratic fluctuations in rainfall supply mean there's not always enough vegetation to sustain the animals – mostly sheep, goats, and camels – that are raised there.

In 1990, the Ministry of Agriculture in Tunisia launched a rangeland improvement strategy implemented by its development agencies, primarily through the Office of Livestock and Pastures (OEP), which has attempted to address rangeland degradation.

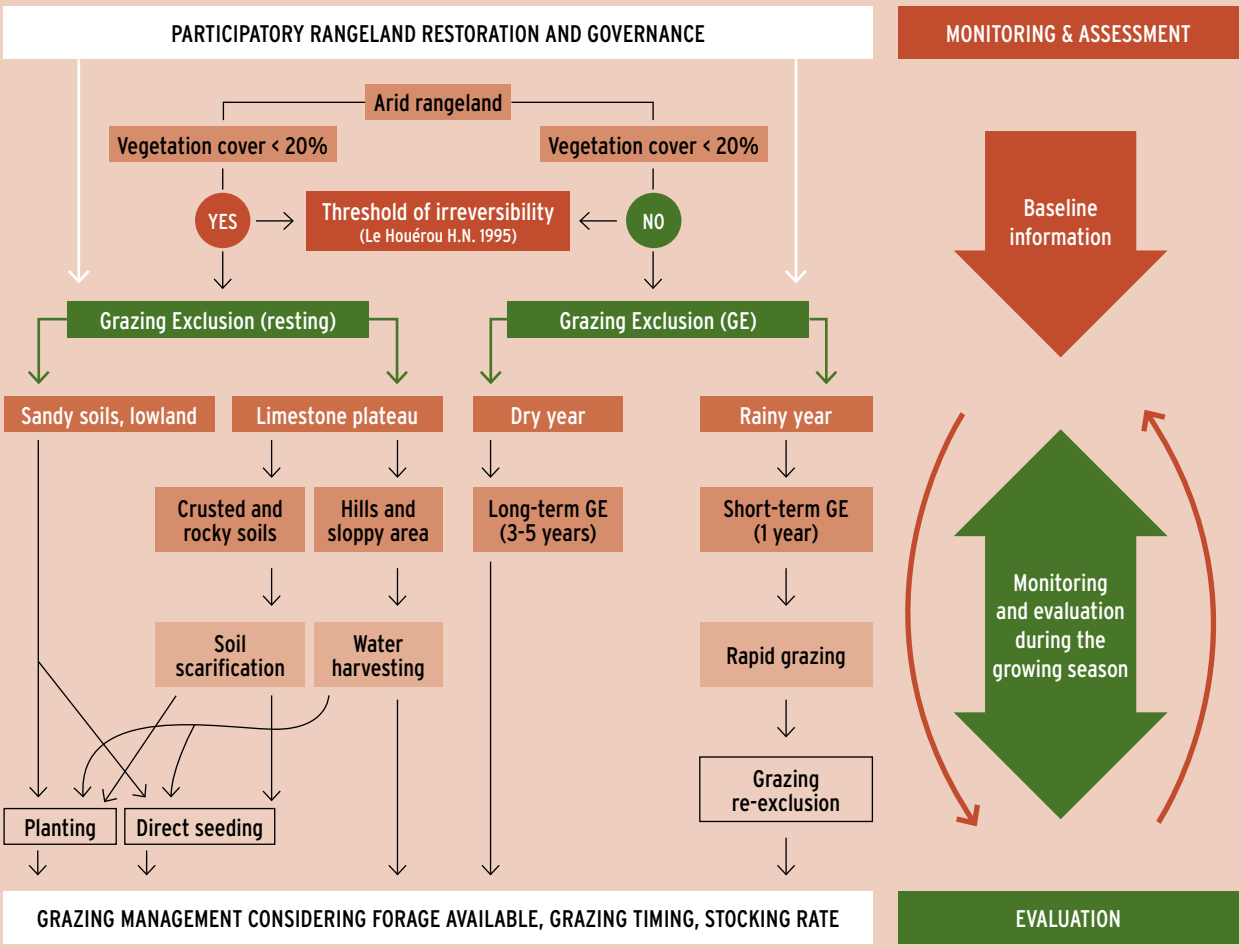
Among the cost-effective interventions is the technique of *Gdel*, which consists of 'resting' pieces of land for a fixed period – normally 3 years – during which the land cannot be grazed by animals. Each year, more than 3,000 hectares of private rangelands are rested in the country's arid southern governorates, and as part of the strategy, the pastoralists whose animals would normally graze in these areas are supported through the provision of feed supplements.

However, the implementation of the resting technique has had its shortfalls. In 2018, rainfall levels in the region were unusually high and vegetation growth boomed. Unfortunately, the grazing/resting strategy at the time was not flexible enough to accommodate the boom and many farmers were unable to make the most of the abundant growth, resulting in widespread frustration.

Based on this experience, ICARDA researchers developed criteria to help land managers decide whether the grazing activity would impede rangeland restoration efforts. The proposed approach has high expectations of adoption thanks to the appreciation from local communities of the flexibility to adjust grazing strategies based on climatic conditions that differ from year to year. For instance, instead of relying on arbitrary, visual estimation to grazable biomass, now the carrying capacity is based on four criteria that offer key indicators of rangeland health: 1) biomass availability, 2) percentage of desirable (edible for livestock) species, 3) vegetation cover and 4) rainfall distribution and amount.

ICARDA is now in discussions with OEP to change the structure of its grazing contracts with pastoralists, so that rather than strict, rigid rules about exclusion periods, there will be an amendment added whereby if specific criteria are met, pastoralists can graze the land.

Step-by-step illustration on when to apply the SRM toolkit: the case of southern Tunisia.



NEXT STEPS

ICARDA and IUCN's partners will now trial the first version of the toolkit as part of a capacity development process. The research team will then use the feedback they receive from this to develop a second version, which will also include an expanded range of SRM practices – particularly within the water-harvesting section, whereby each technique will be developed as a separate module. They also hope to apply the toolkit across various rangeland ecosystems, and to include some of these as case studies in the revised version.

The SRM toolkit will also be translated into a range of local languages to help local users and populations understand the context behind the tools being applied in their areas. It is one of the 'pillar innovations' that will come under the OneCGIAR initiative 'Livestock, Climate and Systems Resilience' for sustainable restoration of degraded rangelands. The kit will eventually be linked to the World Overview of Conservation Approaches and Technologies (WOCAT), to help boost adoption of SRM practices and show impact.

CONCLUSION

What the SRM toolkit offers is a new way of thinking when implementing rangeland restoration projects, which begins with conducting a thorough diagnostic to understand the roots of degradation – whether these are natural and/or human induced disturbances. Special attention is given to the social and institutional dimensions, to guarantee good governance of resources. Then a set of tools, which integrate indigenous knowledge and practices based on scientific evidence, are applied. The process is guided by cost-effective monitoring and assessment protocols to make sure that the desired restoration objectives are met. If every developing project follows these steps, the success of rangeland restoration at large scales will be high, and its sustainability secured.

Acknowledgements

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Key resources

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A herder takes her sheep to graze on lush pasture. Photo ICARDA/Mounir Louhaichi