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RESEARCH BRIEF

A flexible approach to the restoration of degraded rangelands

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Most development projects tend to focus exclusively on rangeland rehabilitation without also considering rangeland management and the interests of pastoralists. As a result, they often fail to attract local support, risking their long-term sustainability. While resting and excluding livestock from degraded areas remains a cost-effective restoration technique, it can also be prolonged for too long and exacerbate feed gaps. An alternative approach, developed by ICARDA and its national partners in Tunisia, permits controlled rapid grazing during periods of sufficient rainfall and good biomass production. This flexible restoration strategy delivers for both fragile rangeland ecosystems and local communities, and it holds significant promise for rehabilitation efforts throughout the dry areas.

The strategic importance of Tunisia's rangelands

Tunisia's rangelands occupy approximately 5.5 million hectares (ha), 87 percent of which are in arid and desert areas. They provide the main feed source of traditional livestock rearing systems and offer a range of essential products and services that support human livelihoods, such as firewood and nutritious food (Lund 2007).[1] Estimates suggest that the products and services rangelands generate are equivalent to 1,062 million Tunisian Dinars (TND) every year (US$ 340 000)—triple the amount generated by the country's forests and representing 1.5 percent of national GDP (Croitoru and Daly, 2015).[2]

Despite their strategic importance, however, these fragile environments are becoming increasingly degraded. From 2005 to 2012, some 600,000 ha of productive rangeland were lost at a rate of approximately 34,000 ha per year. The corresponding losses are estimated at 74 million TND – or 18 percent of the economic value of rangeland products and services (Croitoru and Daly, 2015; Sarniguet, Bruzon and Makhlouf, 1995).[3] Degradation is driven by a combination of pressures, including population growth, overgrazing, and the worsening impacts of climate change—Tunisia and the North Africa region are expected to become drought hotspots over the coming decades.

The limitations of resting

Degradation has prompted several conservation efforts. One important initiative was the National Strategy for Rangeland Management, which was established in 1990. Overseen by the Ministry of Agriculture, Fisheries and Water Resources, the Strategy prioritizes 'resting'—a process that involves the banning of animal grazing over a specified area to allow biomass to recover, widely perceived as an effective strategy to reduce or eliminate the negative impacts of overgrazing. Animal grazing is banned for three

1 Lund, H.G., 2007. "Accounting for the world's rangelands. *Rangelands*." 29(1): 3-10.
2 Croitoru, L. and H. Daly. 2015. Toward sustainable management of forest and rangeland ecosystems in Tunisia: Analysis of benefits and costs of the degradation of forests and rangelands. DGF/Ministry of Agriculture and the World Bank. Economic indicators. http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD.
3 Sarniguet, J., V. Bruzon and A. Makhlouf. 1995. Le développement des zones de parcours. Contribution à la stratégie nationale des parcours. An nexe III: Tunisie, pp 1-161. Une stratégie pour le développement des parcours en zones arides et semi-arides. Document de la banque Mondiale, Rapport N°14927 MNA.

years in areas of severe degradation, with pastoralists receiving a subsidy to cover economic losses on condition they do not enter designated areas.

In some regions, the strategy has achieved some degree of success. In Tataouine, for instance, some 41,850 ha—approximately 25 percent of the region's private rangeland areas—have been naturally restored, benefiting an estimated 1,078 people. However, the approach has also provoked criticism among some pastoralist communities who complain that subsidies are insufficient and cannot compensate for the reduced access to feed, which negatively impacts livestock productivity, lowers incomes, and forces many to rely on costly feed alternatives. There are fears their continued unhappiness could ultimately undermine the support and trust of local communities, thereby limiting the long-term sustainability of land restoration schemes.

Adopting a flexible approach to rangeland restoration

In response to rising livestock numbers on Tunisia's rangelands and a need to consolidate and build on previous sustainable natural resource management (NRM) initiatives, ICARDA worked with the Office for Livestock and Pasture (OEP), an agency within Tunisia's Ministry of Agriculture, Fisheries and Water Resources, to create a more flexible approach to the restoration of privately-owned rangeland, striking a balance between the needs of pastoral communities and those of fragile rangeland ecosystems. A July 2018 workshop, held with a wide range of stakeholders, devised a flexible approach that allows pastoralists to rapidly graze rested areas under certain conditions, when precipitation levels are high and biomass production is good. By closely monitoring conditions and identifying precisely where, when, and how much grazing can take place, ICARDA and OEP have been able to lay the foundations of a sustainable NRM strategy that also attracts the support of pastoralists.

Controlled rapid grazing further supports restoration objectives, enhancing the long-term recovery and resilience of Tunisia's rangeland areas. Livestock hoofs break up the hard-crusted soils common to arid rangelands, allowing rainfall to penetrate the soil and seeds to germinate; and in the case of perennial grasses, grazing removes oxidized plant material that would otherwise remain on the top of plants and prevent photosynthesis, causing the plant to die after several years. These benefits were verified during trials undertaken by OEP and ICARDA in three different rangeland plant communities during the spring of 2019. Vegetation sampling before and after controlled grazing also revealed that small ruminants selected only annual species, with no damage to perennial species, supporting long-term restoration efforts.

Expected benefits

- Over 2.5 million ha of arid and semi-arid rangelands could benefit from this approach, **supporting restoration over an extensive area**;
- Enhanced trust could be built between administration officials and beneficiaries (pastoralists), **enhancing long-term sustainability**;
- The cost of feed could be lowered, **increasing the overall income** of pastoralists;
- Seeds can be dispersed by animals, helping to **expand new plant growth** over wider areas;
- Ecosystems will **function more effectively** – as a result of hoof action breaking-up hard-crusted soils, allowing rainfall to penetrate and seeds to germinate.

Drawing on its own research and an extensive review of existing literature, ICARDA developed a series of key indicators, shared and agreed upon with stakeholders, to guide planning and identify the conditions under which controlled rapid grazing could be permitted. As Figure 1 demonstrates, in a bad or average year when precipitation and biomass production are not sufficient, no grazing is allowed in rested areas. However, in a favorable year, when plant cover exceeds 40 percent, at least 30 percent of plant species are palatable, and minimum rainfall levels reach at least 60 mm in Ramada and 80 mm in Medenine and Tataouine (areas that account for more than 75 percent of Tunisia's rangelands), controlled rapid grazing can be permitted on land in the second or third year of its restoration.

Calculating rangeland production also helps to estimate the optimal length of the permitted grazing period and the 'carrying capacity'—the number of animals allowed to graze in a given area. Rangeland production is estimated for each major vegetation type and plant community. In designated resting areas, as a general rule, 50 percent of

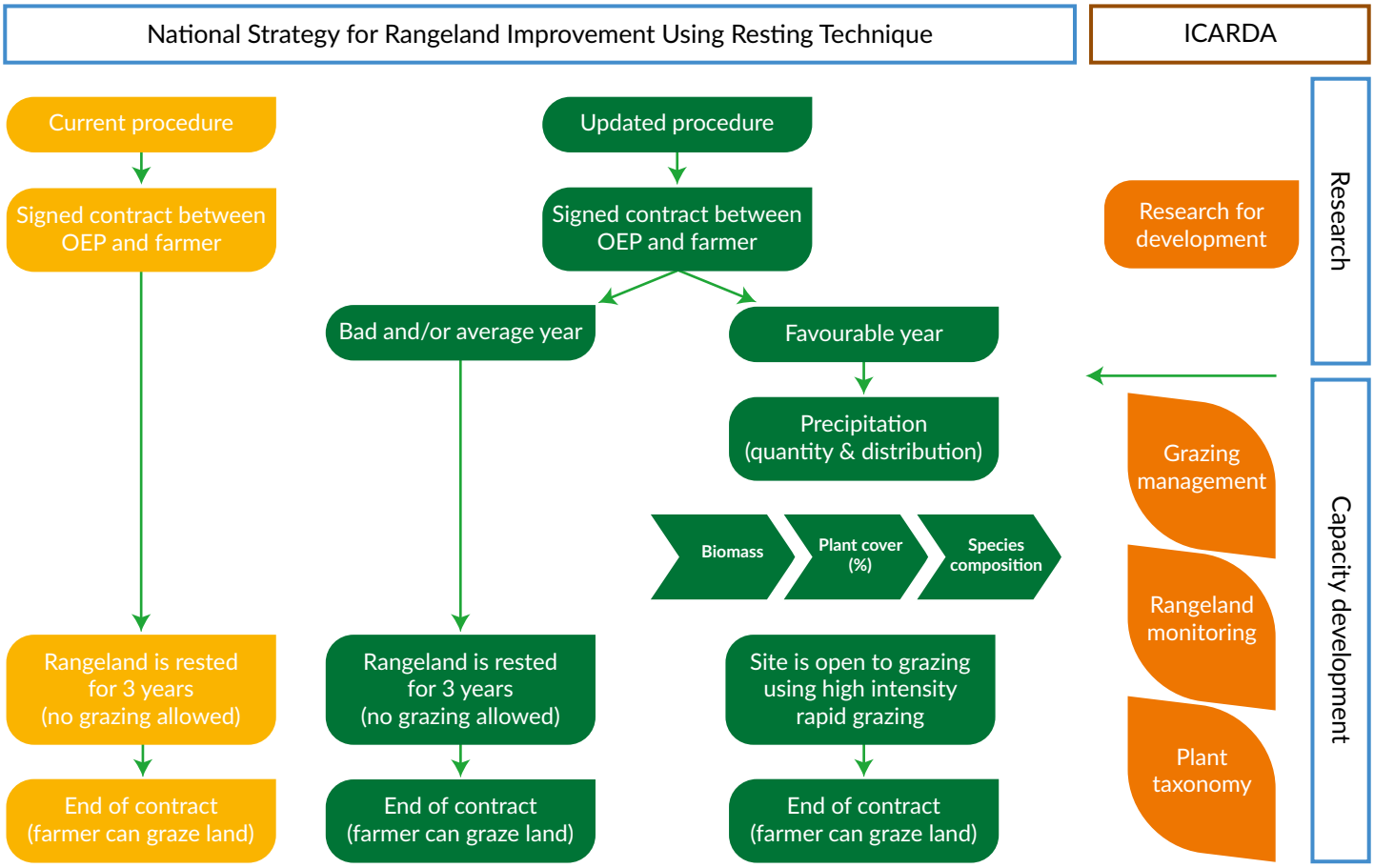

Figure 1. Implementing a flexible restoration strategy: current procedure versus updated procedure.

the vegetation is made available for grazing, and 50 percent is left untouched, allowing it to contribute towards sustainable regeneration.

Rangeland production is estimated using the following formula:

$$P = 1.5 \sum (Pli \times CSi) \times TPC/100$$

With P = total rangeland production in Forage Units (FU) /ha/year; CSi= Cover of species i in %; Pli= Palatability index of the species i; and TPC= total plant cover in %.

Implementing the new approach

In terms of implementation, OEP regional offices are responsible for deciding when controlled rapid grazing should be permitted, following field visits and measurements of biomass. Every office is expected to form a rangeland team composed of technical staff from OEP and staff from various relevant departments within Tunisia's Ministry of Agriculture, Fisheries and Water Resources. The rangeland teams are continuously provided with capacity development opportunities, equipping them with the knowledge

Implementing a sustainable rangeland management strategy

- Using the rangeland production formula **calculate the 'carrying capacity' and optimal duration of grazing** within a rested area to prevent over-grazing;
- Convene all stakeholders, including pastoralists, and **build consensus and agreement** on the conditions under which grazing can take place;
- **Form a working group** responsible for monitoring conditions and, based on a review of existing data, determining when a parcel of land can be grazed;
- Provide **capacity strengthening opportunities** so that local authorities can monitor conditions, calculate the optimal carrying capacity, and disseminate information to pastoral communities;
- Allow **controlled rapid grazing** for a designated period when conditions are optimal on land that is in its second or third year of restoration.

and skills to conduct the required measurements, decide on the optimal carrying capacity and duration of grazing, and disseminate appropriate information to inform planning. At the July 2018 workshop, which discussed rest techniques and good governance, participants also raised the possibility of extending the rest duration from 3 to 5 years, a procedure that is now being evaluated by an initiative in southern Tunisia, funded by the International Fund for Agricultural Development (IFAD).

ICARDA has provided scientific support, helping to monitor degradation and rates of recovery, and capacity-strengthening opportunities for pastoralists, OEP staff, and the staff of other partner organizations, such as the Regional Commissariat for Agricultural Development (CRDA). Some of the core scientific themes ICARDA is targeting include rangeland assessments and monitoring conditions using conventional and modern technologies; grazing management; and implementing participatory approaches to rangeland governance. Additional support has been provided through the production of manuals and guidelines.

The approach outlined in this policy briefing can guide restoration efforts in other countries throughout the dry areas where the combined effects of overgrazing and climate change are threatening the viability of rangeland areas and the essential products and services they provide. The key questions that decision-makers will need to consider include: Are the development agencies in charge of implementing national restoration strategies well equipped in terms of skills and resources? Are targeted pastoral communities likely to embrace the suggested approach – and how can planners gain their support? Finally, is there a need for increased funding and research initiatives to help implement more sustainable rangeland restoration strategies?

Further reading

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