



## REPORT

# On-Job-Training in Rangeland Restoration

November 2024

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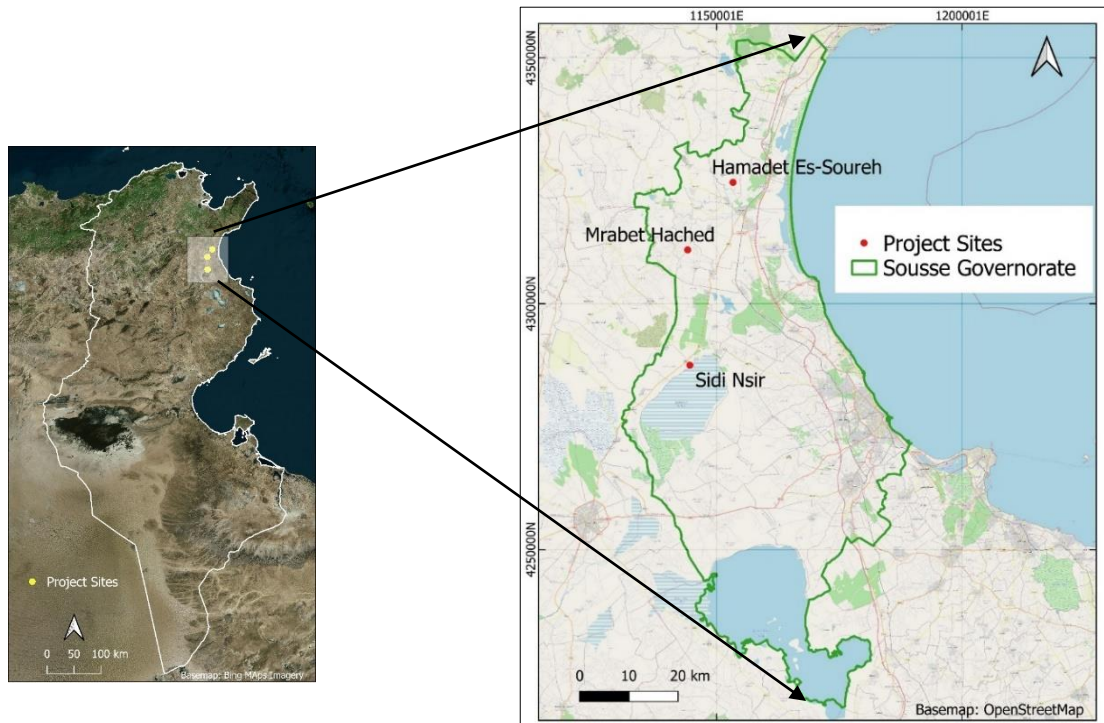


## Introduction

Rangelands are among the most crucial natural resources in Tunisia. They cover about 5.3 million hectares. They are classified under various land tenure statuses: about 2.5 million ha are communal, 1.3 million ha are private, one million ha are managed under the Forest legislation, and 452 thousand ha are alfa rangelands. Most of the communal and alfa rangelands are located in the semi-arid to arid areas of the Center and South. They represent the most important forage resources for the inhabitants and where grazing of these regions, whose grazing is the predominant activity and main source of livelihood. This certifies their importance in economic, social, and environmental sustainability since they contribute to establishing the country's environmental and biological balance and mitigating the effects of climate change. They also play a fundamental role in protecting the soil from erosion, combating desertification, and preserving wildlife. The production capacity of natural rangelands in the forests and the lands under the forest legislation is estimated at 1,500 million feed units in rainy years and 450 million fodder units in dry years, meeting thus the herds' requirements within a range ranging between 15 and 25%.

It is a common belief that the productivity of these rangelands has declined due to the increase in drought events and overgrazing. Understanding how vegetation recovers after dryness events will help devise management practices that avoid overgrazing.

An on-the-job training related to the assessment of rangeland condition and restoration of three degraded range sites with different range conditions located in Sidi Nsir (Kondar), Mrabet Hached (Enfidha), and Hmade Es-Soureh (Bouficha) in Sousse province Central Tunisia (Figure 1) using the most suitable technical packages was held on November 26, 2024.



**Figure 1.** Geographical location of the restoration targeted range sites in Sousse Governorate, Central Tunisia (maps prepared by B. Essifi)



## Objective

This on-the-job training aims to enhance and build the capacity of the Engineers and technical staff of the General Directorate of Forests (DGF) involved in rangeland restoration.

## Beneficiaries

The beneficiaries of this training course were the staff of the DGF headquarters and the local forest services in Enfidha and Kondar in Sousse. Participants may have limited or no prior experience or training in rangeland conditions assessment and management skills. The course follows a general approach and is designed for participants with diverse educational backgrounds. A total of 16 participants attended both training sessions, including 4 from the DGF head quarter, 6 from the Forest Service of Enfidha, and 6 from the Forest Service of Kondar.

## Training Methodology:

Two main themes were considered in this on-the-job training:

- Rangeland condition survey: the visual method was used to estimate the vegetation cover attributes, (cover, species composition, plant diversity, and the presence and abundance of the keystone species) as well as the soil surface states (crust, stone, sand, litter, animal feces, ...);
- Restoration of degraded rangeland ecosystems using different techniques such as resting, controlled grazing, and establishing appropriate water harvesting systems combined with planting/sowing native species of better resilience towards climate change and well-adapted to the local environmental conditions.

## Challenges facing degraded rangeland restoration

The rangelands' improvement and management in Central Tunisia are facing several problems related to several issues: land tenure, social, economic, ecological (environmental), and technical management. They are managed in different ways and are, in most cases, used collectively.

Habitat change and biodiversity loss are converting natural ecosystems to farmland, exploitation through selective grazing, fuel wood removal, charcoal production, and livestock overgrazing are the main causes of rangeland degradation. Disturbances caused by these activities and then amplified by climate change. Climate change influences ecosystem dynamics, structure, and composition by intensifying the negative impacts of drought on rangeland vegetation, leading to low levels of emergence of annual species, changes in phenology and reproduction timing, reduced biodiversity, low plant cover, and a decline in the productive capacity of pastoral systems. Climatic changes may also contribute to water resource shortages, widespread land degradation, and increased desertification. These threats have the potential to negatively impact rangeland biodiversity, the life cycle of plants, and crop/livestock productivity. Overall, climate change poses a significant risk to the resilience of rangeland ecosystems.

On the other hand, rangeland rehabilitation and management are facing several challenges and constraints, the main are :



- Short-term protection (rest) is acceptable by pastoral communities and can only be efficient if the vegetation cover maintains its resilience and the key range species are rarefied and do not disappear. Long-term protection of rangelands which is different from natural reserves, has many negative effects and very often leads to blockage of the vegetation cover dynamics resulting from either the aging of existing plants or the absence of new emergenging seedlings due to the extension of crusts.
- Failure of most rehabilitation projects due to the unavailability of seed production systems and nurseries of native species. Most tentatives used non-native grass reseeding or introduced unsuitable ecologically demanding exotic shrubs that were found to consume excessive water and may exhibit toxic compounds, with negative effects on the survival and abundance of native plant species.
- Weak or even absence of communication and consultation among the various institutions serving and supporting rangelands management, with pastoral communities when projects are first formulated. Consequently, most past efforts restoring/rehabilitating rangelands have been predominantly technical, lacking consideration for social aspects such as tribal rules and land tenure.

### Restoration of degraded rangeland ecosystems

During this ongoing on-the-job training, ICARDA scientists discussed with the DGF trainees the concepts and main techniques of restoration and rehabilitation that can be adopted to enhance pastoral productivity in the 3 selected rangeland sites.

Several techniques that enhance the ecosystem resilience of rangeland and face of disturbance and stress factors and improve its productivity, depending on the level of degradation reached, have been presented and described. Figure 2 summarizes the main potential options (1 and 2) that can be recommended to develop and improve the rangeland vegetation cover productivity instead of option 3, based on introducing exotic shrubs, which is very often used by DGF.





Figure 2. The three potential ways for improving degraded rangelands in relation to the degree of resilience.

- **Site 1: Sidi Nsir in Kondar**

The site is located close to the salty depression or Sebkhha of Kondar collecting the runoff water. Part of the site is planted by *Acacia saligna* from 2 to 5 years. It was shown to the trainees that despite the excellent growth of plants and their ability to provide short-term surface stability and protection from the immediate problems of surface erosion, it may lead to highly oversimplified and artificial plant community systems inconsistent with the form and function of the natural ecosystem, or with the objectives of ecosystem management. It was also demonstrated that the creation of such an artificial system has not only prevented these areas to return to a natural ecosystem state but also retarded or delayed ecosystem re-establishment following disturbance. Furthermore, the exotic *A. saligna* is well known for its low palatability, high levels of condensed tannins, and short lifespan, which has limited its use by the community livestock. This may be attributed to the unfortunate land management decisions and poor information.

For the rest of the site, we all agreed that the rangeland degradation reached the threshold of irreversibility and we presented some indicators such as the abundance of the unpalatable species *Salvia aegyptiaca* and the halophyte *Tamarix gallica* and we concluded that there is probably a lack of seeds in the soil and the reconstitution of the ecosystem by a simple restoration is no longer possible. The rehabilitation by planting native range species such as *Atriplex halimus* in contour lines to harvest the runoff water becomes the only alternative to improve the productivity of the rangeland ecosystem near the salty depression.

- **Site 2: Mrabet Hached**

This site is located in Enfidha and colonized by *Artemisia herba-alba* and *Anabasis oropetiorum* plant community on sand-loamy soil. In addition to the mentioned species, the site is characterized by the presence of *Salvia aegyptiaca*, *Plantago albicans*, *Thymus capitata*, *Ziziphus lotus*, *Lycium shawii*, and a relic of *Globularia alypum*, *Periploca angustifolia* and *Rhus tripartita* settlement rarefied under heavy grazing pressure. The percentage of vegetation cover is very low and does not exceed 10-15%. Many soil and water conservation structures locally called “tabias” were established on the site apparently for many years but without any plantation.



Overgrazed rare individual of *Periploca angustifolia* at Mrabet Hached site



To restore the site and given the presence of a gentle slope, we all agree that any planting operation should be combined with small water harvesting structures such as semi-circle, crescents, and simple contour lines. The species recommended should be native and with multipurpose use (source of feed for the community livestock grazing, medicinal, honey, ... etc) such as *Ceratonia siliqua*, *Periploca angustifolia*, and *Rhus tripartita* as main tree and shrub and *Hedysarum coronarium* and *H. carnosum* as herbaceous.

- **Site 3: Hamadat Es Sourah**

This site belongs to Bouficha and is characterized by an excellent rangeland condition. The vegetation cover exceeds 80% with an important species richness. The main plant species recorded in the site are: *Thymlaea hirsuta*, *Artemisia campestris*, *Lycium shawii*, *Cenchrus ciliaris*, *Stpa parviflora*, *Hyparrhenia hirta*, *Olea europaea*, *Stipagrostis sp.*, *Fagonia glutinosa*, *Plantago albicans*, *Helianthemum sp.*, *Cynodon dactylon*, *Salvia aegyptiaca*, *Calycotome villosa*, *Globularia alypum*, *Plantago albicans*, *Diploaxis simplex*, ...etc.



The Hamadat Es Sourah site is characterized by an important vegetation cover with high plant diversity and density.

It has been agreed by all the attendees that this site is in very good condition and does not need any human intervention (such as planting, water harvesting, ...). Grazing by an adequate animal carrying capacity from the surrounding community herds will be the most appropriate tool to sustainably manage the site. To this effect, it was recommended to conduct a measurement campaign in springtime to determine the vegetation cover attributes including production and carrying capacity.







Step 1: Assessing the rangeland condition.



Step 2. Discussion of the technology package suitable for restoring the vegetation cover.



Step 3. Implementing the appropriate technology package to restore the vegetation cover.





## Conclusion

The on-the-job training took place in 3 different range sites located in Sousse Governorate, Central Tunisia. These sites have different conditions. Trainees learned how to use some simple indicators on the vegetation (total plant cover, plant diversity, presence of keystone species, plant vigor, palatable plants,...) and soil surface (presence of crust, stones, sand, litter, animal feces, ...) to assess their conditions and identify the appropriate technique(s) for their restoration and sustainable management.

This training focused on ecosystem restoration and rehabilitation using native plants instead of the high ecological demand exotic species. While visiting an *Acacia saligna* plantation, the negative effect on soil and understorey vegetation has been shown. A technology package including the reintroduction of well-adapted native species combined with appropriate water harvesting systems and sustainable grazing management is the best option to restore the rangeland ecosystems and improve their productivity and resilience, particularly in the context of climate change.





How to cite:

Ouled Belgacem, A., Hassan, S., Essifi, B., Louhaichi, M. 2024. On-Job-Training in Rangeland Restoration. Tunis, Tunisia: International Center for Agricultural Research in the Dry Areas (ICARDA).

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