

Restoration and Participative Management of Silvopastoral Systems

The Case of Chahda Community, in Northern Tunisia

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Summary

The Chahda silvopastoral restoration site in northern Tunisia demonstrates how participatory land restoration can reverse degradation while improving rural livelihoods. In 2018, ICARDA, FAO, and the General Directorate of Forests (DGF) launched a restoration initiative on 70 hectares of degraded rangeland affected by overgrazing, soil erosion, water scarcity, and declining vegetation cover.

The project combined soil and water conservation measures, reseeded with the drought-tolerant forage legume *Sulla* (*Hedysarum coronarium*), invasive species control, native vegetation restoration, regenerative grazing, and farmer training. Local communities were actively involved through a participatory management approach supported by a local Agricultural Development Group (GDA).

The intervention increased biomass production by 440%, vegetation covers by 330%, doubled species diversity, and tripled the grazing period. Livestock productivity, household incomes, and food security improved, while stronger community governance enhanced the long-term sustainability of restoration efforts. The Chahda experience provides a scalable model for climate-resilient silvopastoral restoration in Tunisia's drylands.

The process followed six key steps:

1. Diagnosing site-specific needs and challenges;
2. Identifying major constraints and obstacles;
3. Mapping and engaging relevant stakeholders;
4. Adopting a participatory and multidisciplinary approach;
5. Implementing proven technologies and climate-smart practices aimed at the sustainable development of the silvopastoral production system, with a particular focus on climate change adaptation; and

Background

Silvopastoral systems are typically characterized by highly variable biophysical conditions, including poor soil quality, low and erratic rainfall, recurrent droughts, high stocking rates, and vulnerable rural populations that frequently face food insecurity. In northern Tunisia, these systems are increasingly threatened by overgrazing, soil erosion, climate variability, and declining vegetation cover.

The Chahda silvopastoral site, located in a semi-arid region of Tunisia receiving approximately 350–400 mm of annual rainfall, serves as a flagship example of silvopastoral restoration. The site covers approximately 70 hectares of state-owned land managed by the Direction Générale des Forêts (DGF). Prior to restoration efforts, the area experienced severe environmental degradation and socio-economic challenges that threatened both ecosystem health and local livelihoods.

Vegetation cover had been significantly reduced as a result of forest clearing and the overexploitation of rangelands. The site supports more than 70 rural households whose livelihoods depend primarily on small-ruminant grazing and olive production. However, declining vegetation cover, uneven and sloping topography that accelerates soil erosion and land degradation, and increasing water scarcity reduced the productivity of both rangelands and agricultural lands.

These environmental pressures weakened local economic resilience and heightened the vulnerability of farming households. Climate variability, recurrent droughts, and extreme weather events further jeopardized the sustainability of agricultural production systems and household incomes, underscoring the urgent need for integrated watershed restoration and sustainable land management interventions.

To enhance productivity, resilience, and livelihoods within the agro-silvopastoral community, the International Center for Agricultural Research in the Dry Areas (ICARDA), the Food and Agriculture Organization of the United Nations (FAO), and the Direction Générale des Forêts (DGF) initiated a participatory restoration process in the Chahda pilot site in 2018.

Continuation steps...

6. Strengthening the capacities of all stakeholders involved.

The overall objective of the initiative is to strengthen the resilience of silvopastoral communities to climate change through the implementation of proven climate-smart practices in the semi-arid regions of Tunisia.

The specific objective is to provide technical knowledge and support to Chadha farmers on Sulla (*Hedysarum coronarium*) management practices and to promote the large-scale dissemination and adoption of the successful outputs and lessons learned from the silvopastoral system initiative.



Actions Taken

Restoration Interventions

The restoration strategy focused on improving forage production while rehabilitating degraded ecosystems through:

- Applying soil and water conservation measures (mostly gabions) to control water erosion and different water harvesting systems (Figure 1).
- Reseeding degraded rangelands with the native forage legume Sulla (*Hedysarum coronarium*). Sulla was selected because of its drought tolerance, nitrogen-fixing capacity, and high nutritional value for livestock. Its introduction significantly improved pasture productivity and ecosystem functioning.
- Implementing measures to control the widespread invasive species *Acacia saligna* while restoring native vegetation through the planting of locally adapted species, including *Ceratonia siliqua*, *Medicago arborea*, *Periploca angustifolia*, and *Rhus tripartita*.
- Implementing regenerative grazing of community livestock.
- Establishing demonstration plots and farmer training activities.

Outcomes

Ecological and Socioeconomic Outcomes

The Chahda silvopastoral system was selected as a lighthouse site for its successful participatory restoration approach, which actively engaged local men and women in decision-making on species selection, site management, and ecosystem service enhancement. The participatory approach has transformed the role of farmers from passive recipients to essential contributors to the restoration and management of the silvopastoral system.

The experience demonstrated the importance of integrating soil and water conservation measures, such as gabions and water-harvesting structures, with shrub and tree establishment and sustainable silvopastoral management to maximize restoration benefits. Monitoring results showed substantial improvements after restoration:

Indicator	Improvement
Biomass production	+440%
Vegetation cover	+330%
Species diversity	Doubled
Grazing period	Tripled

Participatory Management Approach

A key feature of the Chahda initiative is the active involvement of local stakeholders. The restoration process followed a participatory, bottom-up approach that included:

- Local livestock keepers and farmers.
- The General Administration of Forests (DGF)
- Regional Agricultural Development Commissariat (CRDA).
- The Livestock and Pasture Office (OEP)
- High School of Agriculture of Mateur
- Researchers from ICARDA.

An important achievement was the establishment and strengthening of a community-based organization, called the Agricultural Development Group (GDA), which enhanced community participation in decision-making, grazing regulation, seed distribution, and restoration activities. Capacity-building workshops and governance training helped local actors assume greater responsibility for managing natural resources.

These ecological benefits are translated into economic gains for livestock producers:

- Lambs and goat kids gained 5–10% more live weight.
- Dairy cows produced 15–25% more milk.
- Dependence on purchased feed decreased significantly.
- The successful establishment of sulla subsequently encouraged farmers to diversify their livelihoods through beekeeping activities
- Household income and food security improved.

The social benefits included:

- Strengthened trust between local communities and government institutions.
- Increased engagement of young people in livestock farming, reducing migration risks.
- Enhanced participation and role of women in animal husbandry.
- Reduced conflicts among community members over grazing management.

The success of the restored communal rangelands encouraged farmers to adopt Sulla cultivation on their own private lands, demonstrating strong local ownership and scaling potential.

The site also offers strong opportunities for scaling and outreach. Its proximity to Tunis, together with the presence of a primary school adjacent to the site, provides an ideal setting for awareness raising and environmental education on sustainable land restoration. Furthermore, the site is managed by the General Directorate of Forests (DGF), which oversees approximately 5.7 million hectares of silvopastoral lands in Tunisia.

As part of the Ministry of Agriculture and a key partner of ICARDA, DGF provides institutional support that facilitates the promotion, replication, and long-term sustainability of restoration practices demonstrated at the Sbailia site.

Lessons Learned

The Chadha silvopastoral restoration initiative demonstrates that participatory management can effectively reverse land degradation while improving rural livelihoods in northern Tunisia.

Through collaboration among communities, government agencies, and research institutions, the project has created a replicable model for sustainable management of Mediterranean forest-rangeland systems. The integration of ecological restoration, livestock production, and community governance offers a promising pathway toward resilient and productive landscapes in Tunisia's drylands. The Chadha experience highlights several important lessons.

The Chadha experience highlights several important lessons:

- Ecological restoration is more sustainable when local communities participate actively in planning and management.
- Native forage species can simultaneously improve livestock productivity and ecosystem health.
- Strong local institutions are essential for regulating grazing and maintaining restoration gains.
- Combining scientific knowledge with local experience enhances adoption and long-term success.
- Participatory governance increases community commitment and resilience to climate change.

