



## **Sustainable Silvopastoral Restoration to Promote Ecosystem Services in Tunisia**



Quarterly Progress Report  
01 July – 30 September 2018

31 October 2018

## Project General Information

<b>Quarter:</b> 3	<b>Year:</b> 2018	<b>Project Name:</b> Sustainable Silvopastoral Restoration to Promote Ecosystem Services in Tunisia
<b>Project start date:</b> December 2017	<b>Partner:</b> Direction General des Forets (DGF), Tunisian Ministry of Agriculture	
<b>Project end date:</b> March 2019	<b>Provincial Partners:</b> Commissariat Regional de Development Agricole (CRDA) Zaghouan (Forestry department & Conservation des Eaux and du Sol (CES), Office of Livestock and Pastures (OEP) <b>Community Based Organization:</b> Ouled Sbaihia Women Association	
<b>Implementing Agency:</b> ICARDA	<p><b>Overall Goal:</b> Building resilience of silvopastoral production through the promotion environmental improvement, reduced climate impact and increased resilience to environmental impacts, climate change and natural disasters. The project also focuses on strengthening capacity of communities.</p> <p><b>Purpose:</b> To develop a pilot site in semi-arid Tunisia (Zaghouan Governorate) that will be scaled up in 2018 – 2019 based on ICARDA experience in the NENA region in illustrating sustainable management of silvopastoral production system in an integrated pasture-forestry-livestock production system</p> <p><b>Specific objectives include:</b></p> <ul style="list-style-type: none"> <li>- Increase the forage and livestock production in agro-silvo-pastoral production systems.</li> <li>- Alleviate grazing land degradation</li> <li>- Reduce water erosion</li> <li>- Conservation of natural resource base (flora, fauna, soil and water)</li> <li>- Develop the linkages between seasonal fodder/forage production and livestock husbandry.</li> <li>- Increase community resilience, income and capacity of the local population</li> <li>- Improve livelihood of agro-silvopastoral communities</li> </ul>	

## A. Project Progress

Objectives	Expected Outputs	Implementation Progress Activities undertaken during quarter 3	Comments
<b>Restoration of degraded silvopastoral production systems of Sbaihia site, Zaghuan - Tunisia</b>	<ul style="list-style-type: none"> <li>- Reseeding and planting of fodder shrubs in the targeted degraded rangelands with full participation of local communities implemented.</li> </ul>	<ul style="list-style-type: none"> <li>- Survival rate (%) of shrub/trees plantation was assessed.</li> <li>- Maintenance of established shrub/tree plantations (irrigation and protection) and water harvesting structures</li> <li>- A meeting took place on the 22/09/2019 with the community and concerned parties (34 participants) to agree on the 2018/19 workplan (<b>see Appendix A</b>)</li> <li>- Following the workplan, the Forestry Department (DGF) ordered all inputs necessary for the season 2018/2019 (mainly seeds).</li> <li>- Furthermore, a new layout of the selected site was agreed illustrating the land use during the 2018/19 (<b>see Appendix B</b>)</li> </ul>	<ul style="list-style-type: none"> <li>- Survival rate per species: <ul style="list-style-type: none"> <li>▪ Cactus pear 100%</li> <li>▪ Old man saltbush 99%</li> <li>▪ Medic tree 58%</li> <li>▪ Carob tree 48%</li> </ul> </li> </ul> <p>The local community was keen on capacity building and seeding the four species in their private land.</p> <p>3.7 tons of sulla were purchased (only 0.5 ton was paid by the project, the rest was paid for by the DGF) 2 tons will be used in the pilot site and 1.7 tons will be distributed to local community members.</p>
<b>Improving livelihood and reducing vulnerability to climate change</b>	<ul style="list-style-type: none"> <li>- Targeted silvopastoral site(s) better managed and contributes to improving the livelihoods of local communities</li> <li>- Reduced vulnerability of livestock production to climate change</li> </ul>	<ul style="list-style-type: none"> <li>- A baseline survey (socio-economic) was developed and uploaded to tablets. The survey will be conducted during the last quarter of 2018.</li> <li>- Awareness of local community about rangeland governance, grazing management and diversification was enhanced</li> </ul>	<p>During the spring season grazing was authorized for the local community surrounding pilot site.</p> <p>Productivity of improved site was almost doubled (2.3 t DM/ha) compared to control site (1.2 t DM/ha).</p>
<b>Capacity development of all stakeholders</b>	<ul style="list-style-type: none"> <li>- Increased level of awareness and understanding will lead to better involvement,</li> </ul>	<ul style="list-style-type: none"> <li>- A workshop on water and soil conservation was organized in Hammamet on 05/07/2018 (33 participants)</li> </ul>	<p>Since the beginning of the project, ten capacity development events were executed benefiting a total of 300</p>

	<p>effective participation, and better decision making and commitment to the sustainable management of silvopastoral production system.</p>	<ul style="list-style-type: none"> <li>- A workshop on strategic orientations and role of development agencies to improve rangelands in Tunisia was held at DGF HQs on 08/07/2018 (88 participants)</li> <li>- An abstract about sulla reseeding was accepted at an international conference on sustainable agriculture and environment <b>(see Appendix C)</b></li> <li>- It was agreed with DGF partners to play an active role during the upcoming celebration of the national day for trees. ICARDA will lead a session on sustainable development of silvopastoral production systems (5-7 November 2018)</li> <li>- A factsheet was published on <i>Hedysarum coronarium</i> L.: a biennial herbaceous legume used for forage in the Mediterranean basin <b>(see Appendix D)</b>.</li> </ul>	<p>participants including local farmers, extension staff, local authority and students.</p>
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## B. Core Challenges

Challenges:	Actions taken (or proposed) in response:
<ul style="list-style-type: none"><li>- Uncertainty about additional funding to complete establishment of the pilot site (Sbaihia, Zaghouan)</li><li>- A restoration project of 18 months is too short to establish a solid example (pilot site) especially when a severe drought occurs in this period</li><li>- The LoA was signed late in the season in 2017 so reseeding took place in January 2018 which was quite late as we missed first rain in the fall.</li><li>- The season (2017/18) was very dry since only 60% of the long term average precipitation was received</li></ul>	<ul style="list-style-type: none"><li>- Requested additional resources from FAO (Water Scarcity Initiative) for 2019 with a justification for requesting an extension</li><li>- It does not make sense to end the project in March 2019 just before spring season when vegetation reaches its peak as the impact of the project has to be assessed over the full sprig season</li><li>- For the 2018/2019 season reseeding was initiated in early October and the season seems to be more favorable than last year</li><li>- Given poor germination (late reseeding coupled with severe drought), there was a need to reseed sulla.</li></ul>

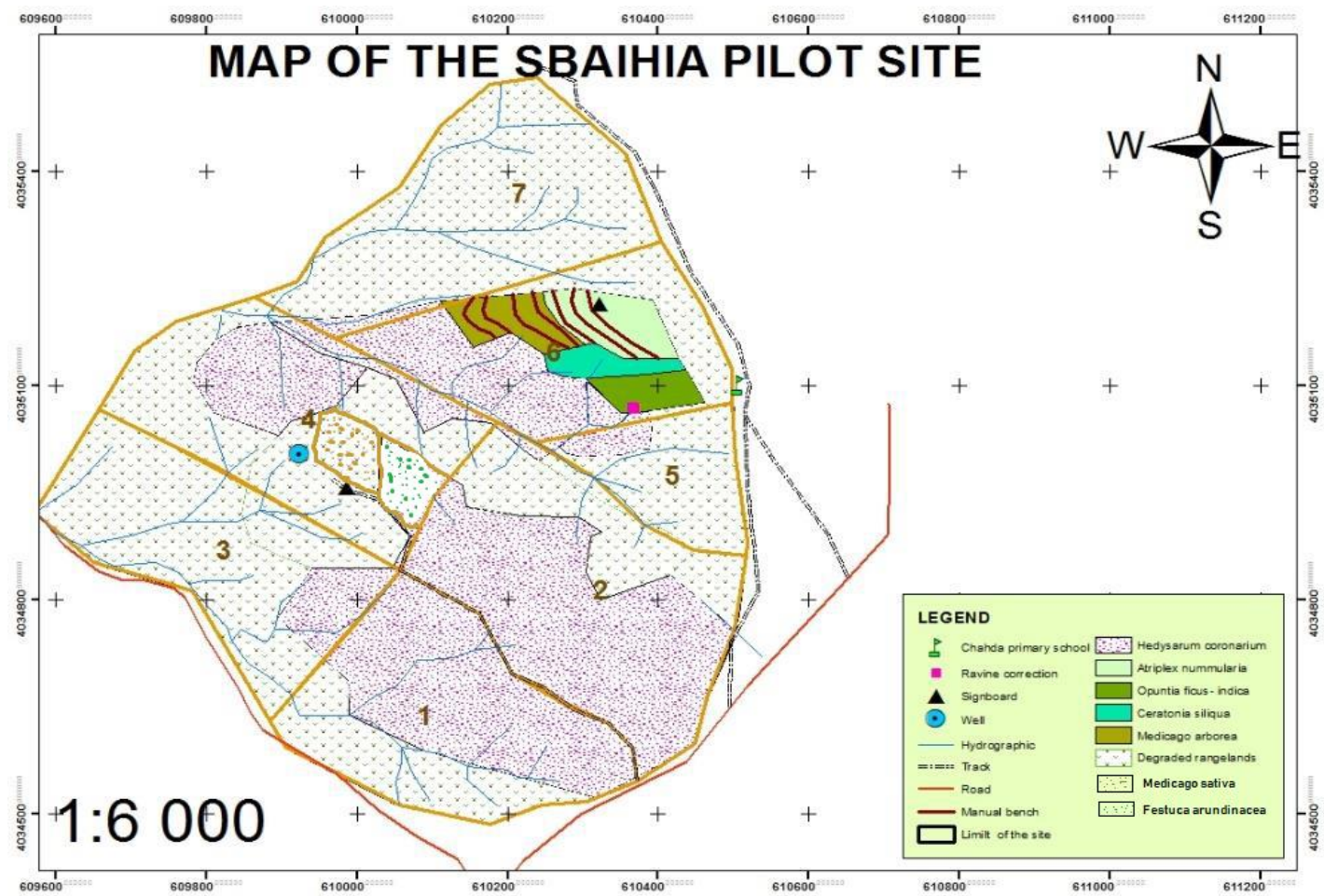
## C. Core Lessons Learned

Lessons learned this period:
<p>Rational grazing is difficult to implement during a drought year, especially when dealing with a complex land tenure regime (state/communal). Thus, in the 2017/2018 season the local community members failed to adopt rational grazing strategies and did not consider sustainably managing natural resources. Rather, their focus was on making ends meet (survival) while competing for the limited/scarce resources. In 2018, free grazing was allowed as a way of creating a participatory and inclusive management towards the restored rangelands (gaining trust). In the future, however, grazing will be restricted, and the local community members will have to pay a small fee to gain access for grazing their livestock (similar to what the “Direction Générale des Forêts does”.</p>

**Appendix A:** Plan of Work of the pilot site for 2018/19

Activity	Implementation date	Methodologies	Expected Results	Responsible party (team)	Budget (Tunisian Dinars)
Sulla reseeding	First week of October	Acquisition of 3.7 T sulla Acquisition 80 kg of tall fescue seeds, Soil preparation (scarification)	Reseeding of 40 ha (2 tons within the pilot site) Distribution of 1.7 tons to farmers)	- Mr. Jamel (DGF) - Slim (Consultant) - Mr. Lassaad (CRDA Zaghouan) - CBO SBAYHYIA	7,000 DT as follow : ▪ 2,750 DT sulla ▪ 2,080 DT for tall fescue ▪ 2,200 TD for soil preparation and seeding
Plantation of 700 plants of tree medic & 500 plants of Oldman salt bush	Third week of November	Soil preparation and plantation	At farm level: planting 350 medic trees & 250 Oldman salt bush Pilot site: replacement of missing shrubs and consolidation of water harvesting structure	- Mr Jamel (DGF) - Mr Slim (Consultant) - Mr Hasnaoui (CRDA) - Mr Bechir (CES) - CBO SBAYHYIA	1,000 DT
Plantation of carob tree and cactus pear	March - April	Soil preparation and plantation	Establishment of a pilot site for carob tree and cactus pear which will serve as a demonstration and training venue	- Mr Jamel (DGF) - Mr Slim (Consultant) - Mr Hasnaoui (CRDA) - Mr Bechir (CES) - CBO SBAYHYIA	2,000 DT
Soil and water conservation	First week of March	Construction of threshold over 150 m <sup>3</sup>	Gully correction and protection against water erosion	- Mr Jamel (DGF) - Mr Slim (Consultant) - Mr Bechir (CES) - CBO SBAYHYIA	15,000 DT
Capacity Development: - Meeting with community - Training sessions and national tree festival	First week of October November - December	Themes will be defined based on the need of the local community	Increased awareness of target trainees (farmers to extension agents)	- DGF - ICARDA - CRDA	15,000 DT
<b>Total budget</b>					<b>40,000 DT</b>

Appendix B: Layout of the land use for 2018/19 at Sbaihia site



## Appendix C: Accepted abstract

### **Title: Pastoral improvement using *Hedysarum coronarium* L. under semi-arid environment conditions of Tunisia**

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### **Abstract**

This study was carried out to investigate the effect of scarification and/or reseeding on the vegetation cover and dry matter production of rangelands in Sbaihia, Governorate of Zaghuan, Tunisia during 2017-2018. A total of 75 ha degraded rangeland was selected. The experimental design consisted of a randomized block design with six replicates where the following treatments were randomly assigned: i) sulla (*Hedysarum coronarium* L.) reseeding following soil scarification, ii) soil scarification only and iii) control (no scarification neither sulla reseeding). Dry matter yield (DMY), rain use efficiency (RUE), and the pastoral value (PV) were quantified during the study. For all measured parameters, the highest values were obtained from the improved rangelands with sulla. The DMY, RUE and PV values were 2.3 t DM/ha, 0.83 kg MS/ha/m<sup>3</sup> and 57.3% respectively. These results indicate that combined scarification and reseeding using local well adapted forage species (sulla) has a great potential to improve the value of the natural rangelands even under harsh semi-arid conditions (<225 mm annual rainfall).

**Key words:** rehabilitation, scarification, reseeding, sulla, pastoral value





RESEARCH  
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Science for resilient livelihoods in dry areas

## PASTORAL AND AGRO-PASTORAL SYSTEMS

**CGIAR RESEARCH PROGRAM ON LIVESTOCK**

Aims to increase the productivity of livestock agri-food systems in sustainable ways across the developing world.

### Managing rangelands: promoting sustainable legume species

*Hedysarum coronarium* L.: a biennial herbaceous legume used for forage in the Mediterranean basin.

Arid and semi-arid rangelands face increasing climate variability and grazing pressure as the world's demand for food increases. ICARDA is promoting drought-tolerant species as a crucial means of assisting rangeland rehabilitation efforts, helping to conserve rapidly depleting water resources and maintain grazing at sustainable levels. The result: a win-win situation for rural communities and the environment.

Sulla (*Hedysarum coronarium* L.) is deep rooted and drought resistant. This species native to the Mediterranean is effective in biological fixation of sloping land, and improving organo-mineral soil fertility and yields and protein value of cereals. It is a biennial or short-lived perennial with semi-erect to erect growth, height of 0.3–2 m, strongly rooted, with root depth exceeding 2 m and numerous secondary roots.

**Benefits:**

- Ideal for short pasture rotations in both mixed farming and livestock production systems
- Improves soil fertility and erosion control
- Excellent forage with high protein content
- Highly palatable, nutritious, and productive forage
- Multipurpose species with melliferous properties



**Scientific name:**  
*Hedysarum coronarium* L.

**Common names:**  
Sulla, Italian sainfoin, Spanish sainfoin, French honeysuckle, cock's-head

**Locations:**  
Tunisia, Algeria, Morocco, Malta, southern Italy & Spain

Flowering begins in early spring, and the melliferous inflorescences are in racemes with up to 35 florets, ranging from dark red to purple pink. It prefers well drained, medium to fine-textured soils. Performs well in slightly acid to alkaline soils (pH 5.5–8.5), sandy loams, and loams to clays. Sulla is a highly palatable, nutritious, and productive forage for ruminants. It is cultivated throughout the Mediterranean basin, where it is extensively grown as a forage crop for grazing, hay, or silage. The species plays a key role in cereal-based systems of semi-arid regions, particularly in organic and low-input agriculture, and is commonly used to enhance the productivity and sustainability of farming systems (e.g. as a nitrogen supply and to maintain soil organic matter). One of the main values of sulla is its water requirement coupled to its ability to provide large amounts of palatable forage in steppe areas.



Biological fixation of sloping land using sulla, Zaghuan, Tunisia



Sulla mellifluous inflorescences



Sheep grazing sulla, Mateur, Tunisia

There has been growing interest in sulla due to its excellent adaptability to marginal and drought-prone environments, versatility as a good quality and high-protein forage crop, and its moderate levels of condensed tannins beneficial to ruminant production. Sulla is also a melliferous plant (supporting 15 hives/ha).

### Establishment and management

A well-cultivated, uniform, and weed-free seed bed is required for good establishment. Plowing to depths of 20–25 cm is indicated or passage of a chisel plow to 30–35 cm. Usually sow from the end of September and avoid seeding in December. Sow 25–40 kg/ha of seed in pods and 10–20 kg/ha of husked seeds. The use of manure in cultivation of sulla is beneficial for its establishment and development, but not advisable for economic reasons and because sulla is a pioneer plant that tolerates poor soil. Seeding is generally superficial at 1–2 cm deep. With its high dry matter yields and ease of cutting, sulla is suitable for green forage, grazing, or hay/silage. Sulla should be cut at early flowering as the stems can become woody after flowering and quality will be much lower despite higher yields. Sulla makes good silage. Including large amounts of sulla in silage (e.g. 75% and above) increases the level of lactic acid, resulting in lower pH and higher quality silage. Sulla has a high water-soluble carbohydrate content, which enhances silage quality. However, fresh sulla has a dry matter (DM) content of about 25% that can hinder the ensiling process, and wilting may be necessary. Good fermentation is achieved when sulla is ensiled at a DM content of at least 35% at the early bud stage, and fermentation is also acceptable when ensiled at 25% DM at the early flowering stage.

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For hay, sulla should be cut before peak flowering, preferably around 10% flowering. Like other legumes, it tends to shed leaves during hay making but leaf retention is better than for alfalfa. Sulla retains most leaf if conditioned and raked carefully. In the establishment year, sulla should be lightly grazed to ensure good root development and plant numbers for the second year. Sulla does not tolerate heavy grazing as the relatively high soft crowns and succulent stems are preferentially grazed and easily damaged. In its first year, sulla gives about 20–30 t of green fodder/ha and 30–50 t in the second year. Sulla must be rotationally grazed. It should be grazed when it reaches about 40–50 cm in height and should not be grazed lower than 15 cm because regrowth is faster from the leaf axils than from crowns. Sulla is best managed by cutting for forage/silage or strip grazing. When grazing, it is advisable to move large numbers of stock onto small areas for rapid grazing and promptly remove stock when the desired grazing height is achieved.

### Effective Management

- Prefers slightly acid to alkaline soils
- Superficial seeding of 1–2 cm deep
- Good fermentation when ensiled at DM content of at least 35%
- Should be grazed when height is 40–50 cm
- For hay production, sulla should be cut before peak flowering (around 10%)
- For silage production, sulla should have at least 35% dry matter

#### ICARDA's Rangeland Ecology and Management Unit

ICARDA's Rangeland Ecology and Management Unit aims to address the unsustainable use of resources induced by adverse effects of climate change and an increasing demand for food and feed in the dry areas. ICARDA programs promote the enhanced quality and productivity of crop, forage, livestock, and the improved management of water resources through close cooperation with farmers and national researchers.

