

Template for technical final report 2018

Country of implementation: Jordan

Activity Title: Project Title: Restoration of Badia ecosystem services for enhanced community livelihood

Research program / BUS: 200205

Activity Leader: Dr Mounir Louhaichi

Cooperating Scientists: Dr. Peter Moyo and Dr. Sawsan Hassan

Objective: Investigate various restoration techniques on the growth of shrubs, as well as initiate rational goat browsing (2 years since establishment) of the improved site

Methodology: Shrub growth (height, width, stem thickness and stomatal conductance) was monitored under three different water harvesting techniques (V-shape, semi-circle and Vallarani contours). A section of the restoration site was grazed for a period of six weeks, where a field day is planned for the spring to raise local community awareness about sustainable grazing management strategies. Furthermore, direct seeding of *Salsola vermiculata* coupled with soil surface scarification was assessed as an alternative cost-effective option for improving rangeland condition.

Project progress in relation to deliverables: Assessment of Badia restoration methods has continued successfully (different water harvesting treatments on different shrub species).

Main achievements:

- **Monitoring of shrubs planted in three different water harvesting structures**

Planting shrubs in Vallarani contours resulted in higher shrub growth characteristics (height, stem thickness and stomatal conductance) than the semi-circle and v-shaped water harvesting structures (Figure 1).

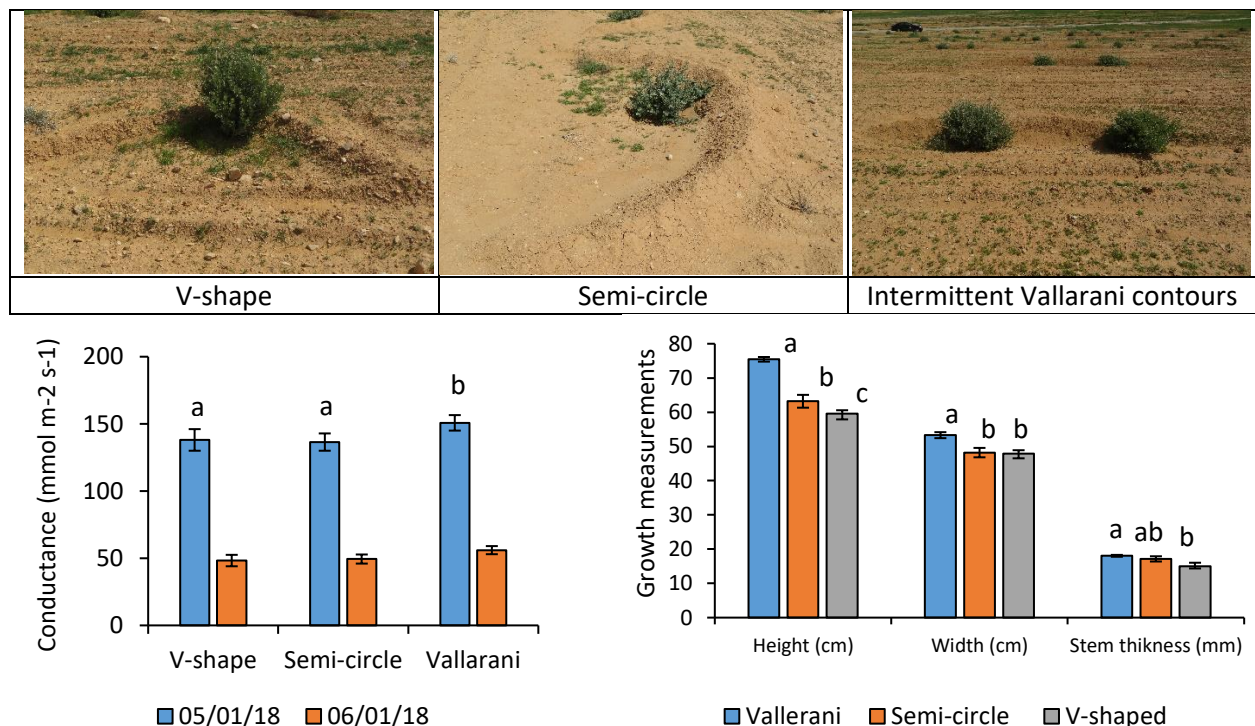


Figure 1. Stomatal conductance and shrub height, width and stem thickness of shrubs grown in different water harvesting structures in Majidya (Jordan).

- **Establishment of a grazing management activity**

One of the objectives of grazing the partially rehabilitated rangeland were to reduce the feed gap and feed costs for a local farmer (Fig. 2). A total of 100 goats, consisting of does in their early pregnancy and bucks, were selected based on similar age, weight and age. Free browsing- goats were herded into the block of planted shrubs and allowed to graze for a period of at least six hours a day and then removed from the site. The grazing lasted six weeks and livestock were expected to defoliate at least 50% of the total biomass on each shrub.

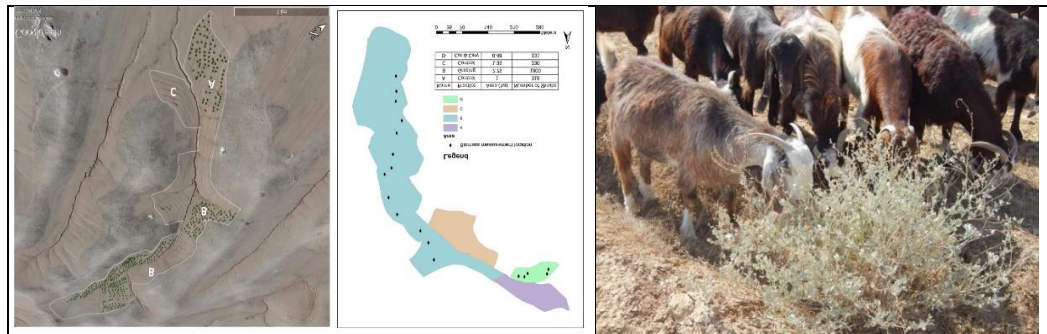


Figure 2. The aerial photograph of the planted area (left), location of the grazing parcels including: control (A), browsing (B) and the cutting and carry (C) treatments (middle) and goats browsing 2 years-old *Atriplex halimus* in Majidya, Jordan.

- **Assessment of direct seeding of *Salsola vermiculata***

During the last winter, *Salsola vermiculata* was seeded at a rate of 8 kg/ha. of Direct seeding resulted in significant germination and establishment of seedlings, with 15,000 seedlings ha⁻¹ in 2018 and an additional 9800 seedlings ha⁻¹ by 2019 (Fig. 3).

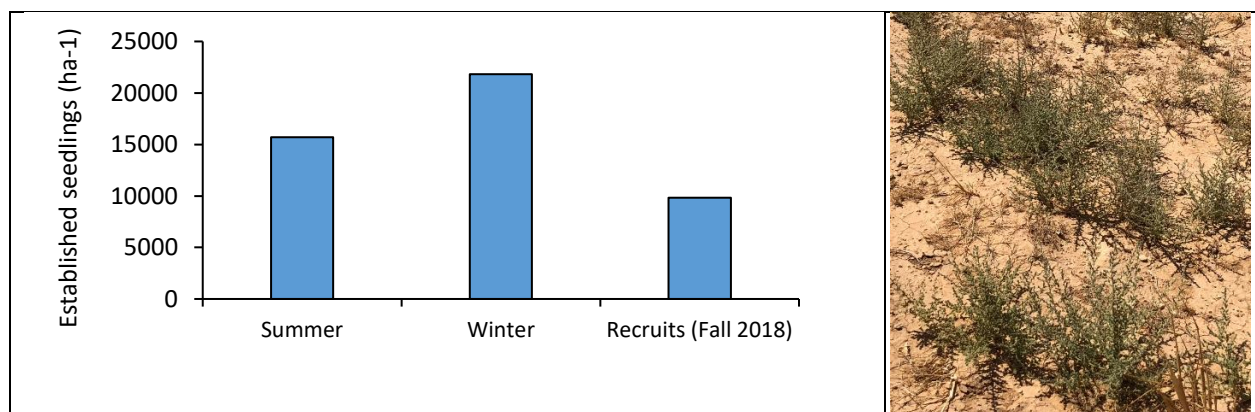


Figure 3. Seedlings emergence of *Salsola vermiculata* after direct seeding in early summer and winter seasons of 2018.

Publications:

Published Abstract

H. Moyo, S. Hassan and M. Louhaichi. 2018. Assessing the impact of livestock grazing on vegetation dynamics of the Jordanian Badia. Enhancing ecosystem services through ecological restoration for nature and people in MENA Region, Dead Sea, Jordan. April 22-26, 2018.

<http://hdl.handle.net/20.500.11766/9038>

Factsheet

Managing rangelands: promoting native shrub species: *Bassia prostrata* (L.): A resilient drought and salt tolerant shrub use for rangeland improvement and for provision of quality fodder for livestock. ICARDA's publication (<http://hdl.handle.net/20.500.11766/9046>)

Research for Development (R4D)

Shrub/tree planting: contributing to ecological sustainability while aiming towards livelihood improvement (<http://hdl.handle.net/20.500.11766/8527>)

Capacity building: 'On the job training' of two male members of the local community (Al Majidya village, Jordan) on grazing management over six weeks (04 November -15 December 2018) and demonstrations on the estimation of shrub biomass measurements after browsing in the Badia.

Visits made to Majidya site

- Visit by Assistant Director General of Research (ICARDA, Dr. Jacques Wery) and the NARC Director General (Dr. Nizar Haddad) on 23 July 2018.
- Dr. S. Ayyappan (ICARDA BoT member) visit to the restoration site on 26 October 2018.
- Field visit to the Majidya site on the 28 October 2018 for a grazing management brainstorming and planning meeting (in total 12 participants including ICARDA and NARC staff members and two local community members).
- Visit of visiting scholar, Dr Robert Washington-Allen (University of Nevada, Reno) on 26 November 2018, to map improved site using LiDAR.



Partnerships with NARS: National Agricultural Research Center (NARC), Jordan.

Summary:

In arid ecosystems, it is necessary to come up with strategies which significantly improve rangeland production to better the lives of smallholder farmers. The use of intermittent contours for water harvesting to boost shrub growth has resulted in higher plant growth characteristics. Establishing and promoting sustainable rangeland management practices such as water harvesting techniques, shrub transplantation, direct seeding and controlled grazing are important towards improving biodiversity and production levels of rangelands in the Badia. Therefore, strategies that promote sustainable management of biodiversity are needed to meet the increasing demand for agricultural products which are putting pressure on limited grazing and rangeland resources.