Food and Agriculture Organization of the United Nations

TECA - Technologies and Practices for Small Agricultural Producers

Date: 11/26/2023 - Path: https://teca.apps.fao.org/en/technologies/10158/

Title: Cultivating cactus

Id number:	10158
Source:	International Center for Agricultural Research in the Dry Areas (ICRADA)
Language:	English
Date of Publication:	September 2023
Date of Revision:	September 2023
Keywords:	Dryland management, Drylands, Resilience
Categories:	Crop Production
Country:	Tunisia
Region:	Northern Africa and Western Asia
Related SDGs:	

Summary

This technology relies on the natural benefits and multi-purpose applications of the spineless cactus pear (*Opuntia ficus-indica*) to transform underutilized lands in central Tunisia, resulting in positive environmental and socioeconomic outcomes.

Description

The central regions of Tunisia are semi-arid, receiving less than 250 millimeters of annual rainfall. Consequently, most of these lands have been classified as marginal due to ongoing land degradation. Historically, these marginal lands have primarily served as low-productive grazing areas for livestock. In order to rejuvenate these regions and bring benefits to the local population, the International Centre of Agricultural Research in Dry Areas (ICARDA) and its local partners have explored the potential of cultivating cactus as a crop, specifically the Opuntia ficus-indica variety.

Although spineless cactus was first introduced to Tunisia in the 16th and 17th centuries, it was only in the 1920s and 1930s that its cultivation for fodder production began to evolve. Opuntia is sometimes fear for its invasive tendencies; however, the promoted Opuntia ficus-indica variety being is non-invasive hence well-suited. This particular crop is exceptionally well-suited to the Tunisian environment, thriving in high temperatures and flourishing in semi-arid regions with limited rainfall. Furthermore, the plant has remarkable resilience, capable of enduring extended dry seasons thanks to its high-water content and water-use efficiency, attributes stemming from its unique morphology (waxy cuticle and absence of actual leaves) and its Crassulacean Acid Metabolism (CAM). In CAM plants, stomata in the leaves remain closed during the day to reduce evapotranspiration but open at night to capture and fix carbon dioxide (CO_2). Overall, cacti offer multiple products that contribute to local livelihoods, including consistent fodder production for livestock and fruit for human consumption. Additionally, cactus cultivation demands minimal inputs such as fertilizers, making it well-suited for marginal lands. The primary current threat to cactus cultivation is the cochineal, an insect pest.

Figure 1. Farmers of cactus plantation being interviewed in Tunisia

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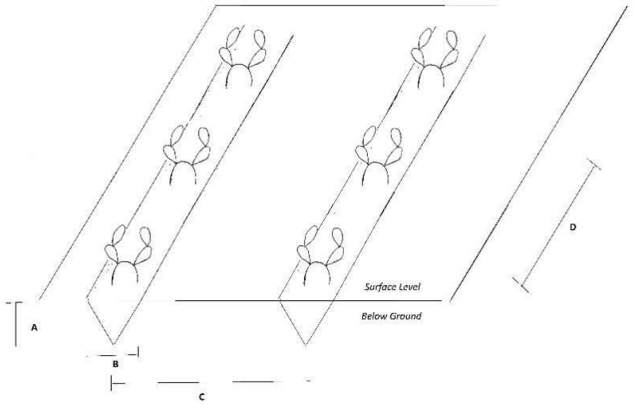
1. Technicality

Establishing a cactus plantation involves ploughing the surface to loosen the often-crusted soil, followed by the construction of furrows in which cactus pads are planted. Concurrently, the furrows are partially filled with manure. The furrows are typically 30 cm deep and wide. Plants within the row are spaced 50 cm apart, with a 5 m gap between rows. Weeding is a necessary maintenance task and is mechanically performed using a plough from March to May. Fruit harvesting is carried out manually by fruit-pickers in August to September. Cacti can also be harvested for their pads, which can be used for livestock feed or out-planting. These pads are excellent fodder, boasting high nutritional value and water content. On average, farmers employing these agronomic practices can generate an income of approximately 800 USD per hectare.

Technical dimensions (see figure):

- A = Depth Furrow = 30 cm
- B = Width Furrow = 30 cm
- C = Spacing between rows = 5 m
- D = Spacing between plants = 0.5 m,

Figure 2. Technical drawing of a cactus plantation.



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2. Benefits and Weaknesses

2.1 Benefits

Cultivating cacti has the following benefits:

- Cacti are highly productive with minimal inputs (e.g., fertilizer or irrigation).
- It does not require much water, which is typically limiting in these areas.
- It improves (climate) resilience of the farmers because cacti is a very resilient crop, withstanding temperature fluctuations and long dry spells.
- Cacti could provide vegetation to otherwise bare soils, reducing or even overcoming soil erosion and land degradation.

2.2 Weaknesses

The cultivation of cacti has some drawbacks, such as:

- Substantial (labour) cost for harvesting.
- Increased risks of (new) pests.
- Knowledge gap for farmers.

Figure 3. Cactus pear at a cactus plantation in Jordan.

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Figure 4. Cactus fruits come in different colours and tastes.

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Figure 5. Farmer inspecting his cactus plantation.

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Figure 6. Cactus field day.

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Figure 7. Sheep feeding on chopped cactus.

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3. Validation of the practice

This practice is validated in Tunisia (and also Jordan). In Tunisia, it is estimated that cultivation of cacti is performed at over 100 farms, covering an area larger than 10 km^2.

It is currently validated in the following areas in Tunisia:

- Kairouan
- Zaghouan
- Siliana
- Kef
- Sidi Bouzid
- Kasserine
- Gafs.

4. Minimum requirements for the successful implementation of the practice

The following natural parameters must be met for successful implementation:

- Rainfall between 300 and 600 (or compensated with irrigation).
- Semi-arid to arid agro-climatic zone.
- Soils deeper than 30 cm and well drained (coarse/light/sandy soils).
- Minimal risk to frost.

5. Related/associated technologies

- Post-harvest handling and utilization of cactus fruits: ID 8734.

6. Further reading

- WOCAT Factsheet Cactus Cultivation (Tunisia) by Joren Verbist, Mounir Louhaichi and Slim Slim, available from https://qcat.wocat.net/en/summary/5994/?as=html

- WOCAT Factsheet Cactus Fruit Plantation in Arid Dry Lands (Jordan) by Joren Verbist, Mounir Louhaichi and Sawsan Hassan, available from https://qcat.wocat.net/en/summary/5882/?as=html
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