The MediOpuntia project: Promoting cactus plantation on large scale in marginal lands of Mediterranean countries

Ana Luísa Fernando (ala@fct.unl.pt)

MEtRICs/DCTB
Faculdade de Ciências e Tecnologia
Universidade Nova de Lisboa
Consortium

FCT-UNL (coordinator)

CREA-IT (partner)

SRTA-City (partner)

Univ. Cadi Ayyad (partner)
Consortium

Universidade Nova de Lisboa, Faculdade de Ciências e Tecnologia (public)
City of Scientific Research and Technological Applications (public)
Consiglio per la ricerca in agricoltura e l’analisi dell’economia agraria (public)
Université Cadi Ayyad (public)

Funding
The MediOpuntia project aims to promote planting cactus on large scale in marginal lands of Mediterranean countries with minimum pressure on available water resources.
Objectives/Motivation

✓ The target is to develop an integrated management package of inventive low-cost on-farm practices for producing cactus

✓ as well as adding value to the final product

✓ by introducing innovative manufacturing techniques to produce functional food from cactus seeds, stems and fruits
Objectives/Motivation

✓ The project

✓ will give demonstration of the use of Opuntia as food in a micro-scale processing chain

✓ to provide job and small business opportunities at all social levels

✓ elevating the role of women and youth in the social nets of the rural communities
Objectives/Motivation

✓ Socio-economic analysis
✓ Environmental impact assessment analysis
✓ Promotional activities
  ✓ To ensure the sustainability of cultivation and the micro-food chains
  ✓ To guarantee the gender-equity of the proposed actions
  ✓ And to give future perspective after project conclusion
Opuntia spp.

Family: Cactaceae
Subfamily: Opuntiodeae
Genus: Opuntia $\rightarrow$ 300 species

Arid, semiarid and tropical climates
Low water resources

Native from México
Opuntia spp.

✓ Promising crop

✓ xerophytic plant
✓ adapted to arid lands and severely degraded soils
✓ unsuitable for traditional crops

Vegetative part: Cladodes
Rich in Pectine

Fruits

Flowers
Opuntia spp.

Fruit

“Cactus pear a treasure under the thorns”

Peel

Pulp – rich in betalains

Seeds
**WP2**

- Experimental setup and on-farm management (WP2)
- Leader: SRTA/CITY, Participants: UCA
  - Determination of actual and potential status of cactus plantation
  - Selection of Cactus (*Opuntia* spp.) genotype, field preparation and initial measurements
  - On-farm management and monitoring
2) Irrigation Treatments

T1: 12 L/plant/week regardless soil water content in effective root zone

T2: received water only when SWC dropped under 85% of soil available water (AW)

T3: received water each time SWC dropped below 70% of AW
RESULTS

Crop water productivity

\[ WP = \frac{Y_a}{TWU} \]

Where \( Y_a \) is the actual harvestable yield in tons ha\(^{-1} \), and TWU is the total seasonal water use by the crop in m\(^3\) ha\(^{-1} \).

The obtained results revealed that T2 and T3 increased water productivity compared to T1.
WP3

✓ Innovative water management retention systems (WP3)
✓ Leader: CREA-IT, Participants: SRTA-CITY, UCA
  ✓ Development of the prototype for the application of SWRT (Subsurface water retention technology) and identification of the best low-cost irrigation system
  ✓ Application of the systems, training and monitoring
Subsurface water retention technology is a technology that increases water holding capacity in permeable sandy soil by placing a plastic sheet under soil surface in the shape of U letter.

This novel and long-term improvement of marginal soils increases soil water holding capacity in the root zones and will impact production agriculture.

Development of the prototype for the application of SWRT and identification of the best low-cost irrigation system.
PRODUCTION OF LOW COST DIFFERENT INNOVATION FUNCTIONAL FOOD (WP4)

Leader: FCT/UNL, Participants: All other partners

- Food processing based on low cost techniques will be applied to produce functional food using cactus stem and fruits
- Smoothies and cactus soda juice will be produced and stems and fruits will be dried by low cost technologies for snacks or dessert toppings. Different packaging will be tested to increase the shelf life.
Pectin extraction

CHEMICAL COMPOSITION

- Peel
  - Total fiber: 0.4%
  - Ash: 1.1%

- Pulp
  - Total fiber: 0.6%
  - Lipids and reducing sugars: 2.5%
  - Ash: 1.9%
  - Water: 92.2%

MATERIALS AND METHODS

- Total protein
- Color parameters: L, a, b, Hue Angle

EXTRACTION

- Cutting
- Homogenized with water 1:1 (v/v) (85°C/20 min)
- Filtration and Washing 65% ethanol aqueous solution (4°C/20h)
- Washing with ethanol 96% and Filtration under vacuum
- Drying in vacuum oven (20°C)

EXTRACTION

- Yield of extraction (%)
- Pulp: 0.72%
- Peel: 15.29%

✓ To use as coating
✓ Bioplastic
Drying processes

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Moisture Content (% w/w)</th>
<th>Time (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50°C</td>
<td>90</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Moisture Content (% w/w)</th>
<th>Time (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60°C</td>
<td>90</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>50</td>
</tr>
</tbody>
</table>
WP5

✓ SOCIO-ECONOMIC ANALYSIS, ENVIRONMENTAL IMPACT ASSESSMENT STUDIES AND GENDER REPRESENTATION (WP5)

✓ Leader: UCA, Participants: All other partners

✓ questionnaires to record:

✓ i) The already existing socio-economic conditions of the target regions and groups

✓ ii) All technical and economic data of Opuntia production systems for a three-year period (including establishment period).

✓ Environmental Impact Assessment (local impacts)

✓ Gender representation
Expected Results / Outcome

✓ Identify a way to exploit unproductive arid lands with a drought-tolerant plant and using smart water management systems

✓ Provide food supply opportunities to rural communities

✓ Increase job opportunities, especially for women and youths in the agricultural sector and in the context of the micro-food processing
Expected Results / Outcome

✓ Establish an integrated relationship between women and their local society

✓ Increase farmer and small agri-business welfare and income in the Egyptian and Moroccan marginal lands

✓ Enhance system production efficiencies, post-harvest value added, and new market opportunities

✓ Foster knowledge sharing and networks, connecting European with African Countries in order to scaling up knowledge sharing and enhancing two-way learning