Improving the date production chain in the Moroccan oases through small mechanization inputs to support the governmental development strategies

Francesco Garbati Pegna (1), Pietro Bartolini (1), Lhoussaine El Rhaffari (2), Soumia Fahim (2), Claudio Zucca (3), Enrico Bonaiuti (3), Quang Bao Le (3)

1University of Florence, Dept. of Agricultural, Food and Forestry Systems (GESAAF), Italy
2Université Moulay Ismail, Fac. of Science and Techniques of Errachidia, Morocco
3International Center for Agricultural Research in the Dry Areas (ICARDA), Jordan

Point of contact: francesco.garbati@unifi.it; pietro.bartolini@unifi.it

Traditional palm-based oasis ecosystem:

- Oasis agrobiodiversity
- Livestock
- Water management
- Palm grove
- Commerce
- Ksourien habitat
- Traditional knowledge

Degraded oasis ecosystem:

- Palm grove crisis: Capital losses, Decreasing date production, Diseases
- Agricultural crisis: Soil losses, Salinization, Plot subdivision, Fam. agriculture abandoned
- Biodiversity losses
- Water crisis: Structural hydraulic stress, Inadequate hydraulic system, Overpumping
- Demographic growth
- Rural exodus
- Conflict between urban development and traditional management
- Traditional and familiar knowledge losses
- Youth involvement in agriculture decreased

Main oasis degradation factors:
- Land and water scarcity
- Salinity
- Silting and desertification
- Negative impact of pests and diseases
- Loss of traditional knowledge

Moroccan date production main problems:

<table>
<thead>
<tr>
<th>Farmers</th>
<th>Cooperatives/associations</th>
<th>Economic Interest Groups (GIE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of interest by young generation</td>
<td>Poor marketing</td>
<td>Equipment inadequate or insufficient</td>
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<tr>
<td>Lack of money</td>
<td>Health certification (ONSSA) difficult to be obtained</td>
<td>Infrastructure not fitting international certification criteria</td>
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<td>No palm renovation</td>
<td>HACCP principles rarely followed</td>
<td>Lack of adequate formation</td>
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<td>Formal agreement with brokers and buyers</td>
<td>Poor logistic for transport and marketing</td>
<td>Difficult relations with cooperative and producers</td>
</tr>
</tbody>
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Proposed mechanization scheme:

- Small size tractor with trailer and multiple tools
- Small size transporter
- Small size excavator
- Motocultivator with multiple tools
- Motorhoe
- Small size self-propelled off-road aerial platform
- Metal ladder (adapted to date palm)
- Power scissors (pneumatic or electric)
- Chain saw (pneumatic, electric)
- Knapsack motorized sprayer
- Motorized static mulcher

In Moroccan oases, date palm agricultural operations are mainly manual and seldom implemented, contributing to palm grove degradation.

The introduction of small mechanization may reduce drudgery, encourage/attract youths, increase labor productivity and safety.