Integrated Waste Management for the Olive Oil Pressing Industries in Lebanon

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Project Rationale

- Lebanon relies heavily on olive and olive oil production for local consumption as well for export
  - Olive territory constitutes 20% of agricultural land;
  - Agriculture contributes to 5.8% of GDP in Lebanon;
  - Olive production ranges between 1.8-8 t/ha;
  - 70-78% of olives are used for olive oil production;
  - 57% of farmers are olive growers;
• Olive Oil Production is a highly polluting industry
  • OMW is considered among the "strongest" industrial effluents (e.g. BOD 100 g/L)
  • Large Quantity of Organic Solid Waste (Pomace) is produced;
  • Degradation of natural resources due to improper management of Olive Oil Wastes;
  • Pollution spells are restricted to given geographical areas and concentrated within a given period of time (olive season);
Project Framework

• The project was within the context of the Euro-Med Partnership;
• It was implemented under the Short and Medium Term Priority Environmental Action Program (SMAP II);
• Funded by EU, Managed by the Ministries of Environment in Lebanon, Syria and Jordan;
• The project duration was 3 years (2005-2008).
Project Objective

The overall objective of the project was to introduce the elements of an integrated olive oil waste management system.
Project Phases

1. Database Development;
2. Introducing cleaner production options, prevention measures and control & treatment options to the olive oil production sector (including demonstration actions);
3. Setting /Updating relevant environmental quality standards;
4. Undertaking financial and economic analysis;
5. Implementing institutional strengthening and capacity building programmes
1. Database Development
Geographical Distribution of Olive Mills (492 Mills)
Olive Oil Extraction Methods Lebanon

(492 Mills)
43 % (Hot Spots)
57 % (Non Hot Spots)
Vegetable Water Disposal Methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Water bodies</td>
<td>7%</td>
</tr>
<tr>
<td>Septic tanks</td>
<td>6%</td>
</tr>
<tr>
<td>Drying and using for sites</td>
<td>21%</td>
</tr>
<tr>
<td>Special network for</td>
<td>0%</td>
</tr>
<tr>
<td>Land</td>
<td>30%</td>
</tr>
<tr>
<td>Sewage</td>
<td>27%</td>
</tr>
<tr>
<td>Treatment plant</td>
<td>1%</td>
</tr>
</tbody>
</table>
Pomace Disposal Methods

- 2ary extraction of oil: 32.36%
- Blocks for heating: 17.45%
- Heating: 33.46%
- Composting: 3.27%
- Soil conditioner: 3.27%
- Drying: 0.36%
- Coal: 9.82%
National Pollution Loads

Some 180,340 tonnes of olives have been processed by the olive mills (2004 season) which produced approximately:

- 280,000 m$^3$ of OMW
- 7,868 tonnes of BOD$_5$, 
- 25,267 tonnes of COD, 
- 3,710 tonnes of Oil & Grease, 
- 8 tonnes of phenols, 
- 17,547 tonnes Total Suspended Solids, 
- 73 tonnes of Phosphorous, and 
- 83,109 tonnes of Pomace
Cost of Environmental Degradation from the Olive Oil Production Sector
Cost of Environmental Degradation from the Olive Oil Production Sector

- Added Value of olive oil sector: 15.77 Million USD/Season
- Cost of Env. Degradation: 13.27 million USD/Season
- 2.5 Million USD i.e. cost of env. deg. Consists of 84% of the sector’s added value

- Damages to fish population
- Damages to domestic water quality
- Damages to env. amenities
2. Introducing CP options prevention, control and Treatment Measures
Some Cleaner Production Alternatives

1. Converting all traditional mills to 2-phase mills
2. Converting all 3-phase mills to 2-phase mills
3. Converting 3-phase decanters to 2& half phase decanters
4. Replacing natural decantation tanks with centrifuge machines
Converting All Traditional Mills to 2-phase mills

Benefits:
1.75% reduction in water consumption
2.14% increase in olive oil quantity produced
3.80% decrease in OMW produced

Challenges:
1. High investment cost (100 million USD)
2. High cost for drying the we pomace (4-7 million USD) in 10 years
3. 170% increase in energy consumption

Non Practical Suggestion
Comparison of different OMW control and treatment options

- Irrigation Option
- Lime Pretreatment Option
- Evaporation Ponds Option
- Central Thermal evaporator Option
- Central Anaerobic Option

Treatment Scenario

(Million USD)

<table>
<thead>
<tr>
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<th>Low</th>
<th>High</th>
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</thead>
<tbody>
<tr>
<td>Irrigation Option</td>
<td>$0.00</td>
<td>$10.00</td>
</tr>
<tr>
<td>Lime Pretreatment Option</td>
<td>$0.00</td>
<td>$10.00</td>
</tr>
<tr>
<td>Evaporation Ponds Option</td>
<td>$0.00</td>
<td>$20.00</td>
</tr>
<tr>
<td>Central Thermal evaporator Option</td>
<td>$0.00</td>
<td>$30.00</td>
</tr>
<tr>
<td>Central Anaerobic Option</td>
<td>$0.00</td>
<td>$40.00</td>
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Pilot Project
Objectives of Establishing a Pilot Project

- Demonstrate how to produce olive oil using cleaner production options and integrated environmental management practices.
- Using the pilot project for research and capacity building of concerned stakeholders.
- To practically demonstrate the implementation of the theoretical concept of integrated waste management in the olive oil production sector.
Pilot Mills

10 pilot mills were selected as follows:
## Pilot Mills Interventions

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Integrated Waste Management for the Olive Oil Pressing Industries in Lebanon, Syria & Jordan
# Pilot Mills Interventions

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3. Setting Relevant Environmental Quality Standards
Environmental Quality Standards

- Guidance note for the olive oil production sector
- Environmental Guidelines for establishing and operating olive mills
- Environmental Guidelines for irrigation with OMW
- Eco-labeling Scheme
- Monitoring strategy for the olive oil production sector
4. Undertake Financial and Economic Analysis
Cost of Compliance with Environmental Guidelines at the Mill Level

![Bar Chart: Cost of Compliance](chart.png)

- Water Mgt: Minimum 37, Maximum 62
- OMW Mgt: Minimum 8, Maximum 59
- SW Mgt: Minimum 4, Maximum 133
- Air Emissions Mgt: Minimum 4, Maximum 133
- Noise Mgt: Minimum 3, Maximum 7
- General requirements: Minimum 2, Maximum 3
- Total: Minimum 60, Maximum 275

Legend:
- Blue: Minimum (1,000 USD)
- Red: Maximum (1,000 USD)
Cost of Compliance with Environmental Guidelines at the National Level

- Water Mgt: Minimum 16.95, Maximum 65.74
- OMW Mgt: Minimum 0.76, Maximum 2.38
- SW Mgt: Minimum 0.42, Maximum 3.38
- Air Emissions: Minimum 0.26, Maximum 2.01
- Noise Mgt: Minimum 0.26, Maximum 3.01
- General: Minimum 0.42, Maximum 3.38
- Total: Minimum 16.85, Maximum 92.02

Legend:
- Blue: Minimum (M. USD)
- Red: Maximum (M. USD)
5. Institutional strengthening and Capacity Building
Training Workshops

- Olive mill owners
- Public sector
- MoE staff
Awareness Activities

- Awareness audio CD
- TV and radio episodes
- Lectures in universities
- Participation in national exhibits and festivals
- Production of awareness materials
- Documentary about the olive oil production sector
- Newsletter
- Newspaper articles
Different aspects of sustainability:
- Technical
- Environmental
- Social
- Product quality
- Economic & financial

Different stakeholder groups:
- Mill owners
- NGOs
- Public sector
- Complementary industries
- Small grants organizations

Different habitat scales:
- Industrial scale
- Neighborhood scale
- Regional scale

Integration Among

Different prevention, treatment and control options.
THANK YOU

For further info:

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