Business models for small-scale mechanization of animal feed to improve farmers’ incomes, soil conservation and climate change adaptation/mitigation

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SWC@Scale (PROSOL)
Practices to Mitigate and Adapt to Climate Change in Tunisia

• Conceptual Framework

Positive impacts on water quality, soil quality, and air quality

Increases productivity and potential to achieve food security

Effects of best policies/practices for air, soil, and water conservation that contribute to climate change mitigation and adaptation

Time (Years) and Impacts of Climate Change

Review of the scientific literature shows that the size of the world population is projected to increase with time and that climate change is likely to continue to impact soil and water resources and productivity over time.

Effects of no policies/practices for air, soil, and water conservation and/or poor policies/practices for air, soil, and water conservation that do not contribute to climate change mitigation and adaptation

Negative impacts on water quality, soil quality, and air quality

Decreases productivity and potential to achieve food security

SWC@Scale (PROSOL)

Practices to Mitigate and Adapt to Climate Change in Tunisia

• **Hypothesis**

  ▪ There is a causal relationship between climate change, water and soil resources, population growth, and food security.

  ▪ Climate change is impacting soil and water resources and is threatening agricultural production.

  ▪ Good soil and water practices can contribute to climate change mitigation and adaptation.

  ▪ Poor soil and water practices will contribute to negative impact on agricultural productivity.
Which Climate Smart Practices for the project

- Conservation agriculture, and no-tillage seeding.
- Appropriate forage species and forge mixture adapted to contexts in both cereal and olive-based farming systems.
- Integration of legumes and cereal-legume mixtures in the cereal mono-cropping rotation.
- Integrated improved crop management systems to enhance WUE, soil fertility and reduction of erosion, especially under rainfed agriculture.
Mitigation and Adaptation actions from SWC@Scale (PROSOL) practices

Mitigation Strategies for Agriculture Production

- Increasing soil C sequestration to improve soil functions.
- Increasing the efficient use of N for mixed cropping systems.
- Capturing nutrients and energy from crop residue, and cover crop management.

Adaptation Facts for Climate Change

- Erosion prevention and protection.
- More diverse cropping systems to adapt to variable climates and new pest and disease pressures.
- Managing soil and crops to increase water use efficiencies.
- Developing new crop-forage varieties that are drought-tolerant and more resistant to heat-stress.
Mitigation and Adaptation actions from SWC@Scale (PROSOL) practices

- SWC@Scale (PROSOL) practices are beneficial to mitigate and adapt to climate change in arid areas.
- Farmer management adaptations and use of conservation practices to adapt to a changing climate have the potential to greatly reduce soil erosion rates.
- Conservation practices will be key and must be used as strategies for adaptation to climate change impacts on the soil resource.
- Helping farmers adopting these practices can also significantly improve their capacities to climate change adaptation and mitigation.
Why Small Machinery in a Soil Conservation Project?

The solutions generally suggested for soil rehabilitation are facing rigid trade-offs (between long and short-term benefits).

 Farmers

Small farmers are generally interested in short-term profit

 Natural Resources (soil)

Need for long term integrated approach to improve soil health
Introduction

Why Small Machinery in a Soil Conservation Project?

Small machines in mixed crop-livestock systems help to “boost” adoption and to accept certain soil conservation innovations/practices such as:

- Rotations with fodder can be kept in the form of pellets thanks to a small pelleting machine.
- Crops like cactus, which can be chopped with a feed grinder and mixed to produce a low-cost mix for animal feed.
- Better availability of seeds of fodder crops which improve the quality of the soil, thanks to mobile seed cleaning & treatment machines.

Objective

How to use machines to complement other soil relevant innovations and practices!!
Motorized chopper / Feed grinder

• Support local manufacturers of motorized and mobile feed grinders (220V/380V/ tractors - PTO)

**Capacity:** 1-10t/day

**Cost:** TND 3.300

• Chopping and grinding of barley, straw, hay, etc.

☯ Better digestion and absorption of nutrients.

• Grinding of organic matter (stems and leaves of olive trees).

☯ Production of compost.

• Business opportunity for SMSAs and young agripreneurs (rental of grinder or related service).

• Better adoption of innovative feed (mixture with cactus and other alternatives).
Small machines for seed treatment and sowing

• Support a local manufacturer in the development of a mobile seed cleaning & treatment machines.

Clean and treat the seeds of barley, wheat, vetch, puffball, fava bean, etc. with the different sieves.

• Capacity: 1t/h
• Cost: TND 18,000

Distribution of 25 manual seeders (220 V, mobile).

≤ Improve the quantity (increase in biomass production by 20%) and the quality of seeds.

≤ Reduce workloads.
Mobile seed cleaning & treatment machine impact

<table>
<thead>
<tr>
<th>Cooperative (SMSA)</th>
<th>Number of potential users (farmers)</th>
<th>Seeds cleaned and / or treated (tons)</th>
<th>Total net benefit (TND)</th>
<th>Number of users (farmers)</th>
<th>Seeds cleaned and / or treated (tons)</th>
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<th>Total net benefit (TND)</th>
<th>Number of users</th>
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<td>315</td>
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<td>575</td>
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<td>El Felah</td>
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<td>47.3</td>
<td>-13</td>
<td>20</td>
<td>60.8</td>
<td>1.520</td>
<td>33</td>
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<td>2.532</td>
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<td>Ettaouen</td>
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<td>145.7</td>
<td>1.467</td>
<td>95</td>
<td>480</td>
<td>11.520</td>
<td>220</td>
<td>745.3</td>
<td>559</td>
<td>330</td>
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<td>Melyen</td>
<td>150</td>
<td>22.5</td>
<td>225</td>
<td>11</td>
<td>111.7</td>
<td>3.594</td>
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<td>45</td>
<td>1.350</td>
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<td><strong>Total</strong></td>
<td><strong>1.020</strong></td>
<td><strong>239.7</strong></td>
<td><strong>1.994</strong></td>
<td><strong>138</strong></td>
<td><strong>690.9</strong></td>
<td><strong>17.209</strong></td>
<td><strong>299</strong></td>
<td><strong>907.8</strong></td>
<td><strong>5.095</strong></td>
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</table>
Imported pelleting machines

- Introduction of Imported pelleting machine to farmers coopératives, associations, and agripreneurs for feed preservation and business development – livestock feed.
  - Model 1: 150 kg/h; 220V; 2.700 TND
  - Model 2: 500 kg/h; 380V; 9.000 TND

**Ingredients:** barley, wheat bran, olive pomace, alfalfa, faba beans, declassified dates.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Formula 1 (%)</th>
<th>Formula 2 (%)</th>
<th>Formula 3 (%)</th>
<th>Formula 4 (%)</th>
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<tr>
<td>Olive cake</td>
<td>34</td>
<td>45</td>
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<td>Wheat bran</td>
<td>32</td>
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<td>30</td>
<td>30</td>
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<tr>
<td>Grinded barley</td>
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<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Faba beans</td>
<td>30</td>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Soy cake</td>
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<td>-</td>
<td>-</td>
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<tr>
<td>Luzerne</td>
<td>-</td>
<td>-</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Grinded Date kernels</td>
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<td>-</td>
<td>40</td>
<td>-</td>
</tr>
<tr>
<td>Downgraded Dates</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>40</td>
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<td>CMV (minerals)</td>
<td>4</td>
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<td>6</td>
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</table>

Very feasible and profitable activity:

Cost of final feed produced: 350 – 900 TND/t compared to 1,200 TND/t of concentrate.

- Private entrepreuner started the local production of an efficient pelleting machines following the increase in the demand for such machines.

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Calculation of profitability (pellets)

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Practical case 1</th>
<th>Practical Case 2</th>
<th>Practical case 3</th>
<th>Practical case 4</th>
<th>Practical case 5</th>
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</thead>
<tbody>
<tr>
<td>You Feed2 (Big machine)</td>
<td></td>
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<tr>
<td>SMSA Ankoud El Khaier 2 (Big machine)</td>
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<tr>
<td>Private breeder (Small machine)</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>SMSA Ettaouan 2 (Big machine)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>OEP/SMSA EL Marai-Kebil (Big machine)</td>
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</tr>
<tr>
<td>Cost of Production (TND/Ton)</td>
<td>714.00</td>
<td>965.80</td>
<td>341.50</td>
<td>552.34</td>
<td>513.23</td>
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<td>Production per year (T)</td>
<td>1200</td>
<td>1200</td>
<td>360</td>
<td>1200</td>
<td>1200</td>
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<tr>
<td>Average net income (TND/an)</td>
<td>5877.73</td>
<td>13422.12</td>
<td>5380.92</td>
<td>8136.9</td>
<td>2902.16</td>
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<td>Profitability Index (PI)</td>
<td>4.57</td>
<td>10.43</td>
<td>10.34</td>
<td>15.34</td>
<td>2.25</td>
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<tr>
<td>Payback period of invested capital (years)</td>
<td>1.18</td>
<td>0.52</td>
<td>0.40</td>
<td>0.85</td>
<td>2.31</td>
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<tr>
<td>Net present value (NPV/TND)</td>
<td>32144.14</td>
<td>84954.8</td>
<td>23304.5</td>
<td>48147.37</td>
<td>11315.13</td>
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<tr>
<td>Cost benefit ratio (CBR)</td>
<td>3.57</td>
<td>9.43</td>
<td>9.34</td>
<td>14.34</td>
<td>1.25</td>
</tr>
</tbody>
</table>
Small machinery in the SWC@Scale (PROSOL)

1. El Khol, Kairouan
2. Sers, Kef

Rhahla, Siliana

Mobile seed cleaning & treatment machine
Pelleting machine

Pelleting machine and Mobile seed cleaning & treatment machine
Thank you for your attention