Duckweed for nutrient recovery and/or biomass production

About Lemna.

- Duckweed (Lemnaceae) is a small floating macrophyte
- 4 genus (Lemna, Landoitia, Spirodela and Wolffia) and 40 known species
- Duckweed naturally grows in river banks or lakes but it is also been used for wastewater phytoremediation through lagoons or raceway systems
- Capacity to duplicate weight in 16 h-2 days
- High productivity per surface (see table).
- High absorption capacity N and P: 2 and 0.5 ton-ha⁻¹-year⁻¹
- Biomass composition rich in proteins 22.5-29.3 %, carbohydrates 10-32.5 % and lipids 8.7-11.2 %. Suitable for many biobased products

Potential applications of duckweed biomass

<table>
<thead>
<tr>
<th>Species</th>
<th>Production MT DM/ha/year</th>
<th>Protein % DM</th>
<th>Protein yield MT/ha/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duckweed</td>
<td>12-16</td>
<td>16-45</td>
<td>1.9-7.2</td>
</tr>
<tr>
<td>Water hyacinth</td>
<td>24-32</td>
<td>12-35</td>
<td>2.9-8</td>
</tr>
<tr>
<td>Homwort</td>
<td>10</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>Cattail</td>
<td>32</td>
<td>10-14</td>
<td>3.2-4.5</td>
</tr>
<tr>
<td>Algae</td>
<td>8</td>
<td>50</td>
<td>4</td>
</tr>
</tbody>
</table>

alia’s technical resources and know-how

- Laboratory (1 L) and pilot scale duckweed (50-200L) cultivation systems
- Know-how on duckweed cultivation including initiation, cultivation and harvesting
- Process control by light, pH, COD, morphology and other parameters

Experience

Duckweed technology for improving nutrient management and resource efficiency in pig production systems

Objectives and scope:
Life LEMNA aims to reduce manure nutrient pollution of water bodies in farming areas, improve resource efficiency and close the mineral cycle.
A 250 m² duckweed-based cultivation system will be designed and built to daily treat about 3,000L of digestate and produce >35 kg of duckweed biomass. A biogas plant located in a pig farm will be the project site for demo trials.
The duckweed biomass will be used as a feedstock for producing a biofertiliser and feed which will be evaluated.

Foreseen results
- Pioneer prototype in the EU for duckweed cultivation on digestate.
- A collection of 25 duckweed strains will be developed.
- 95-100% nutrient (N and P) recovery efficiency rates treating anaerobically digested pig manure
- Validation of new duckweed biobased products: feed biofertiliser
- Carbon footprint reduction of animal production.
- e-LEMNATool for system replication in other EU farms.

Beneficiaries
ALINA, CNB-CSIC, Ecobiogas

Duration
3 years, 2016-2019