Life+ 12 ENV/IT/000439 GreenWoolF: Green hydrolysis conversion of Wool wastes into organic nitrogen Fertilisers

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Workshop LIFE WDS- 4 February 2016, Barcelona, Spain
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Green hydrolysis conversion of Wool wastes into organic nitrogen Fertilisers

Budget: 1,995,265 euro
01/07/2013 – 30/06/2016
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100 million sheep, mainly for meat and milk production (December 2011):

- United Kingdom (25%)
- Spain (20%)
- Romania (10%)
- Greece (10%)
- Italy (9%)
- France (9%)
- Ireland (4%)

200,000 tons/year (18-20,000 tons/year in Italy)
EUROPEAN WOOL

Good quality wool (25%)

Low quality wool (75%)

Textile applications

Alternative applications

EUROPEAN WOOL

EU COMMISSION REGULATION N° 142/2011

- Wools are a special waste subjected to restrictions provided for Class 3 Materials
- Collection, storage, transportation and disposal of unprocessed wool are subjected to EU regulations.

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Recover on a large scale waste wool to obtain nitrogen organic fertilizers with an ecological and sustainable process.
Recycling unserviceable wool into amendment-fertilisers is a way of:

- exploiting natural renewable resources
- reducing organic wastes disposed in landfills
- promoting waste prevention
- increasing employment and profit of sheep farming
- increasing EU sheep population
- reducing dependency of imported meat
Laboratory Scale Unit for Superheated Water Hydrolysis

- Superheated water preparator
- Hydrolysis reactor
- Drain collection vessel
- H₂S scrubbing unit

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GREENWOOLF PROCESS WITH DEMONSTRATION UNIT (saturated steam)

Hydrolysis unit

↑ temperature
(~ 180° C)

↑ pressure
(~ 9 bar)

fertiliser / bio-stimulant

~ 1,5 h

Liquid (foliar)

~ 1 h

pellets

This plant is simple to operate, it is small enough to be moved to other places for demonstrative purposes.

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- Protein hydrolysates (amino-acids and low molecular weight peptides) are permitted in biological agriculture;

- N release (and other nutrients to plants) can be tailored;

- Protein hydrolysates display bio-stimulant properties (soil microbic activity) and are suitable for foliar-feeding;

- Protein hydrolysates display chelating properties for micro-elements (Fe, Cu, Zn) and may reduce the use of chemical fertilisers and complexing agents such as EDTA.
What is marketable?

The "green hydrolysis" plant

The fertiliser

The GreenWoolF demonstration plant

The GreenWoolF fertiliser
What is the market for the fertiliser?

In 2012, 11.2 million hectares were farmed organically in Europe
In Italy 25% of the organically farmed land is fertilised with Protein Hydrolysates from other sources (animal byproducts)

Figure 5.1: Distribution of organic agricultural in Europe, 2012 (11.2 million hectares)
Source: OrganicDataNetwork survey 2013 based on national data sources and FIBL-AMI-IAMB survey 2013, based on Eurostat and national data sources
Break even point for a 100 kg unit

Hypothesis: 150 000 kg/y wool

Corresponding to 300000 kg/year liquid or 390000 kg/year solid fertiliser

<table>
<thead>
<tr>
<th>HYDROLYSIS PLANT</th>
<th>50000 €</th>
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<tbody>
<tr>
<td>Maintenance</td>
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<table>
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<tr>
<th>STEAM GENERATOR</th>
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<tr>
<td>Maintenance</td>
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<th>STORAG AND HANDLING MACHINERY</th>
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<tr>
<td>Maintenance</td>
<td>700 €</td>
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**Reactor size** 100 kg

**Number of cycles/day** 6

**Number of operators** 2

**Pay back period** 2 years

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<tr>
<th>Fertilizer form</th>
<th>During payback period €/kg</th>
<th>Following payback period €/kg</th>
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<tbody>
<tr>
<td>Liquid</td>
<td>0.46</td>
<td>0.33</td>
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<tr>
<td>Solid</td>
<td>0.52</td>
<td>0.33</td>
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CONCLUSIONS

- Hydrolysis with saturated steam (Demonstrative Unit)

  The protein hydrolysates contain enough nitrogen to have fertilizing properties which make them suitable for different crops (flower, horticulture vines).

- The conversion of wool wastes into organic nitrogen fertilisers may be a business opportunity because:
  
  reduces disposal costs
  increases profit of sheep farming
  increases industry and market employment
  promotes start-up
Thank you!