Green hydrolysis conversion of Wool wastes into organic nitrogen Fertilisers

Life+ 12 ENV/IT/000439 GreenWoolF:
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Budget: 1 995 265 euro

01/07/2013 ï 30/06/2016

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SHEEP POPULATION IN EUROPE

Green hydrolysis conversion of Wool wastes into organic nitrogen Fertilisers

➢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

FELTS, CARPETS, BIO-BUILDING

EU COMMISSION REGULATION N º 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.

LIFE+GREENWOOLF PROJECT

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COARSE WOOL VALORIZATION

Greasy wool without washing

Recover on a large scale waste wool to obtain nitrogen organic fertilizers with an ecological and sustainable process

AIM

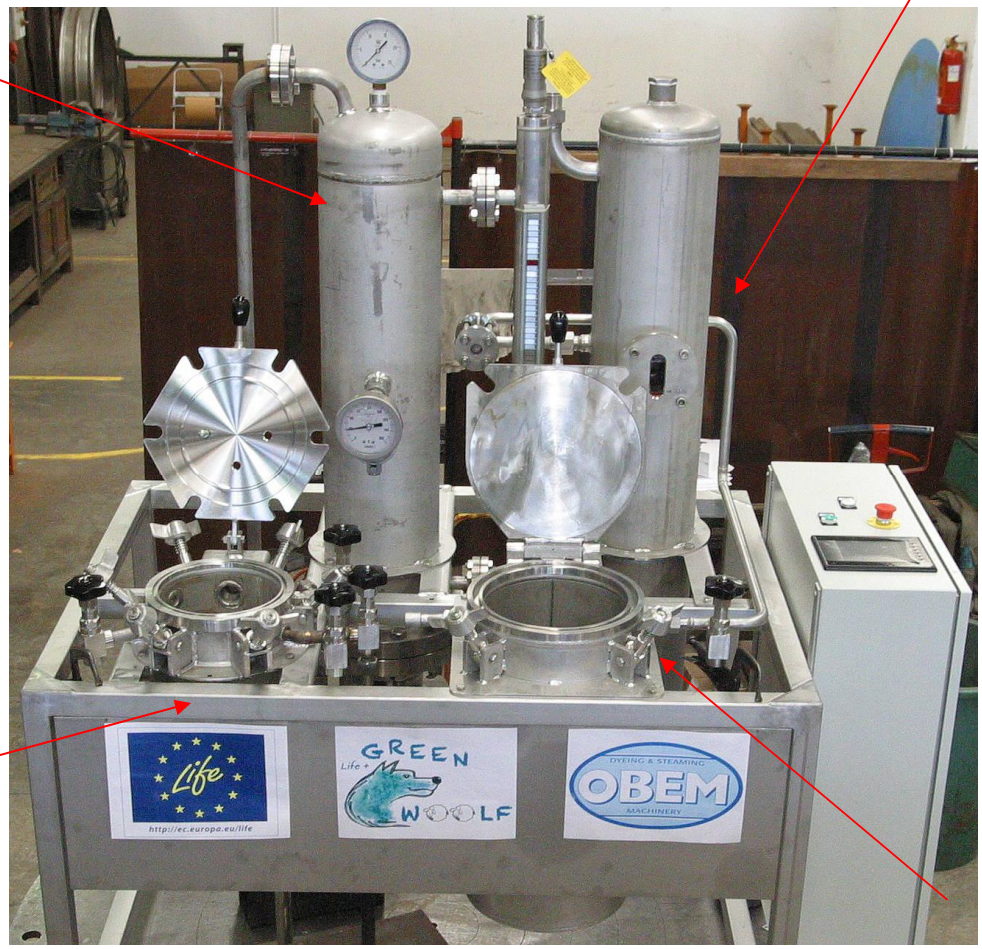
Recycling unserviceable wool into amendment-fertilisers is a way of:

-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

H_2S scrubbing unit



- hydrolysis reactor

drain collection vessel

GREENWOOLF PROCESS WITH DEMONSTRATION UNIT (saturated steam)

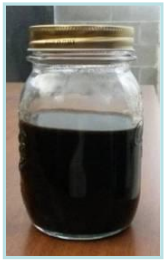
Hydrolysis unit

↑ temperature
(~ 180° C)
↑ pressure
(~ 9 bar)

~ 1,5 h

~ 1 h

fertiliser / bio-stimulant



Liquid (foliar)

solid

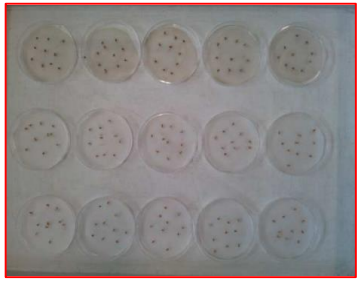
pellets

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

Properties of the ñGreenWoolFò Bio-amendment-fertiliser

(Dep. of Agricultural Science, University of Turin)

	N (%)	C (%)	C/N (%)	P (ppm)	K (%)	Microelements	pH
Raw wool	8	32,5	4,27	491	2,33	(Cu, Zn Mn)	10
GreenWoolF fertiliser	Up to 6.5	Up to 22	---	330	0,5-0,8		7-8



Germination tests of Lepidium sativum

Ig % (1g/l) = 177.02 %

Ig % (10g/l) = 90.05 %

- **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 ñgreen hydrolysisò plant

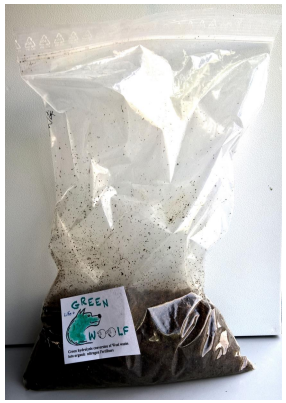
The GreenWoolF demonstration plant

The fertiliser

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)



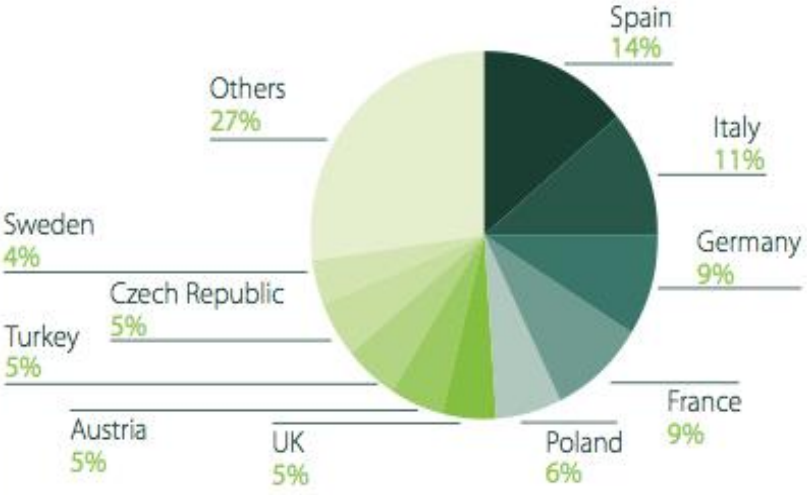


Figure 5.1: Distribution of organic agricultural in Europe, 2012 (11.2 million hectares)

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

HYDROLYSIS PLANT	50000	€
Maintenance	1000	€
STEAM GENERATOR	10000	€
Maintenance	200	€
STORAG AND HANDLING MACHINERY	35000	€
Maintenance	700	€

Reactor size	*100 kg*
Number of cycles/day	*6*
Number of operators	*2*
Pay back period	*2 years*

Fertilizer form	During payback period ú/kg	Following payback period ú/kg
Liquid	0.46	0.33
Solid	0.52	0.33

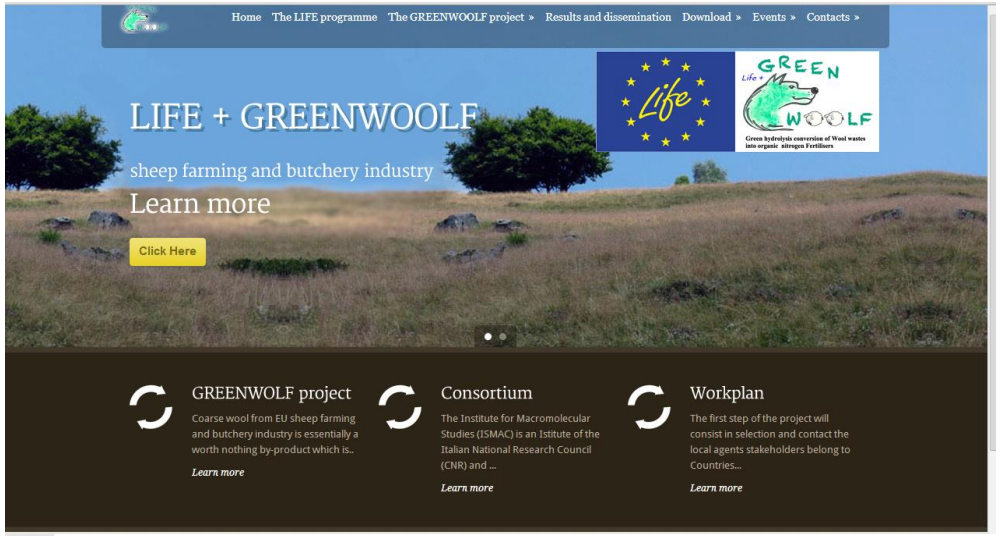
CONCLUSIONS

➢ **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 opportinity because:**

reduces disposal costs
increases profit of sheep farming
increases industry and market employment
promotes start-up



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