Life+ 12 ENV/IT000439 GreenWoolF: Green hydrolysis conversion of Wool wastes into organic nitrogen Fertilisers

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EU-27 has the second world sheep population, numbered about 100 million heads in December 2011, the majority of which were based in the UK (25%), Spain (20%), Romania (10%), Greece (10%), Italy (9%), France (9 %) and Ireland (4%) (Source EU-Eurostat 2012). The EU flock is made of crossbred sheep not graded for fine wool production; the primary role is meat, whilst the milk market is relatively small, being confined to Mediterranean regions. Sheep population is declining (4% in 2011), with the highest rate being registered in Italy. Nevertheless, slaughter is forecast rising, thus increasing dependency of imported sheep meat from the Southern Hemisphere, which amounts to 20% about.

Sheep husbandry plays an important role in the subsistence mixed farming systems and is vital in poorer and rural parts of the EU. The annual wool clip amounts to more than 200 000 t (18-20 are produced in Italy) and its management is a specific problem for the EU livestock sector. Indeed, wool from sheep farming and butchery industry is very coarse and contains a lot of kems (dead fibres), making it practically unserviceable for the textile industry. The use for filling mattresses has been outclassed by synthetic materials, so that there is no market for crossbred wool, excluding handicraft niches.

Unserviceable wool is mostly disposed in landfills or illegally thrown over, with serious ambient threats since it can affect the pastures and bring illness if leave out on soil, where it does not readily degrade. Thus, shearing, storage, transportation and disposal of waste wool in accordance with current EU Regulation, heavily weigh on the profit of sheep farming.

Figure 1. Grazing sheep (left), waste wool (center) and organic nitrogen fertilizer from green hydrolysis conversion of waste wool (right)

The Life+ 12 ENV/IT000439 GreenWoolF, supported by the LIFE 2012 EU financial instrument, aims at demonstrating that waste wools can be recycled into organic nitrogen fertiliser for grassland management and other cultivation. Controlled hydrolysis with superheated water converts wool keratin (the wool protein) into simpler compounds, tailoring the release speed of nutrients to plants. Wool contains elements such as carbon, nitrogen and other nutrients, which play an essential role in plant nutrition. Wool, when added to the soil, increases the yield of grass grown, absorbs and retains
moisture very effectively, reduces run off of contaminants such as pesticides, and can aid in water conservation. The environmental soundness of recycling waste wool into amendment-fertilisers relies on the following items:

- the closed-loop cycle grass-wool-grass is an efficient form of recycling, because the wool-grass step is solar powered and reduces the use of synthetic fertilisers;
- recycling unserviceable wool into amendment-fertilisers is a way of exploiting natural renewable resources, reducing organic wastes disposed in landfills (thus promoting waste prevention);
- amendment-fertilisation of grassland contributes to the reduction of soil degradation, including erosion and decline in organic matter;
- grazing sheep increases soil carbon sequestration on grasslands and fertilisation, if not over-used, can enhance the carbon sequestration rate;
- increasing management yield and extension of the pasture lands may contribute to employment and profit of sheep farming, increase EU sheep population, and reduce dependency of imported meat which is forecast to rise in the next years.