

<b>Belgium, Rumbeke-Beitem</b>	<b>Willem Boeve</b>
<i>Institution</i>	Inagro (Research Center on Agriculture and Landscape)
<i>Position</i>	Department of Energy and Biomass; Project engineer, Project coordinator
<i>Field of work</i>	Harvesting and valorization of grass Technique for mowing and collection of grass used in anaerobic digestion Grass from nature conservation areas and roadsides (minor roads)
<b>Experience</b>	
<i>About the feedstock</i>	Within the COMBINE project, the treatment of grass from nature conservation area (4 ha) and from roadside mowing (1 ha, minor road) was investigated for two years. Total yield of the grass from 5 ha was 50 t. The grass was used as a substrate for anaerobic digestion.
<i>Processing chain</i>	<p><i>Mowing of the grass: Disc mower</i></p> <p>The flail mower was not used because it also takes soil with the grass which is unfavourable for the digestion.</p> <p><i>Collection: Forage harvester</i></p> <p>Forage harvester offers the advantage of shredding the grass simultaneously with the collection, which is favourable for the use in the digester. Moreover, no metal objects are collected with the grass, because the harvester stops once it encounters a metal object.</p> <p><i>Transport: Wagon</i></p> <p>The size of the wagon was limited to avoid soil compaction on the conservation area. During the first year of the experiment, the grass was transported in a wagon with capacity of 10 t directly to a small anaerobic digestion plant (5 km distant; 30 kW). In the second year, the grass was first brought to an intermediate storage and picked up after ca. 24 hours by larger truck (with capacity of 25 – 30 tons). With the truck the grass was transported to more distant plant with larger capacity (20 km; 2 MW).</p> <p><i>Digestion:</i></p> <p>In the first year, grass was ensilaged for ca. 3 months and processed in small bits in 30 kW digestion plant. In the second year, it was immediately digested in a 2 MW plant and therefore there was no need for storage. No complications occurred when processing the grass.</p> <p>Besides the pilot case studies, the PROGRASS® procedure was developed within the project, where the grass is washed and separated in two fractions – fibrous and liquid. The liquid fraction can be easily digested in the plant and the fibrous fraction is processed in briquettes. Briquettes are dried to 85% DM content by waste heat on the biogas plant. They can be easily combusted and stored.</p>

## *Economics*

### *Costs of the processing chain:*

Mowing: 10 €/t

Forage harvester: 30 – 35 €/t (slow)

Transport with the small wagon: 15 €/t; with the larger truck: 10 €/t

Processing at the digestion plant: there were no costs since it was their own plant;

Usual price in Flanders for uptake of such biomass at a digestion plant: 20 €/t

Usual price for accepting the grass at a composting plant: 30 – 40 €/t

## *Wider context and problematic issues*

In Flanders, there are big amounts of residual grass to be managed, since there is the obligation of removing the grass from roadsides and nature conservation areas after the maintenance work.

The amounts are estimated for 200 – 350 000 t/year. The grass from maintenance work is considered as waste, and its treatment brings considerable costs. Other motivations of the project, besides utilizing the amounts of waste grass was to substitute the most usual feedstock for digestion plants – maize.

The grass is mostly composted, although there is minimal economic revenue for selling the compost. The prices for accepting the grass at the composting plants are high, which means extensive economic burden for the municipalities and other management authorities. However, composting is still the prioritized solution of residual grass treatment. Although the costs for disposing the biomass in a biogas plant are much lower, the requirements on the feedstock quality are higher. Using the grass in a biogas plant would mostly require new machinery and quality control, which seems too complicated to the administrative bodies. Moreover, this treatment is also discouraged by the government, who supports composting and promotes it as a better way of residual biomass usage, since it valorises the nutrients. The only motivation for the administrative bodies to change their behaviour is economic. The environmental point of view or the fact, that this biomass could be used as sustainable source of energy has little resonance.

When organizing a series of workshops with government bodies, grassland managers and digester managers in several regions in Flanders, the aim was to communicate the benefits of grass digestion. The workshop showed that these actors prefer the easiest way of the biomass treatment, which does not require additional investments or care. Municipalities have mostly one mower, which can be used for all areas and are not interested in purchasing a special equipment. In only two cases, the meetings triggered change. In the one case for example, it was thanks to high interest of the digester and because the municipality purchased smaller machinery which was not so costly. Nevertheless, the system setting is not ideal and complication still occur when optimising it.

*Related formalities* Grass from nature protection areas and roadsides is categorized as waste in Flanders and regarding its treatment, recovery of organic material by composting is preferred before the energy use. The use of grass for compost production is supported by the legal frameworks, while they are not foreseen to change.

Combustion of grass briquettes from the PROGRASS® procedure is illegal in Flanders, as from legal point of view it is waste combustion. Nevertheless, the briquettes are produced and combusted in Germany proving to be good and easily storable fuel.

#### *Messages*

There are large amounts of grass from landscape conservation and maintenance work in Flanders to be treated. However, the legal setting and the attitude of the decision makers remains unfavourable for its use for bioenergy production. Grass could potentially substitute maize - the usual feedstock for biogas plants and could provide easily storable biomass fuel for combustion.

#### *Contact information*

willem.boeve@inagro.be

#### *Interlink*

Project *COMBINE* and *GR3 – Grass to green gas*

#### *Photo Gallery (Author © Inagro)*



*1. Flail mower, used conventionally for mowing*



*2. Mowing with disk mower*



*3. Forage harvester, picking up and blowing grass into the wagon*



*4. Ensiling the grass*