Grass biomethane could be biofuel solution for Ireland

New research indicates that biomethane made from grass could be an energy efficient and sustainable transport biofuel in Ireland and other temperate Northern climates. Its net energy is potentially higher than rapeseed biodiesel and wheat ethanol systems.

The EU renewables directive has set a mandatory target of at least 10 per cent renewable energy for transport in each Member State by 2020. Any biofuels must meet agreed sustainability criteria, to be allowable to count towards the directive’s targets, to count towards Member States’ own renewable energy obligations or to be eligible for financial support. However, energy crops indigenous to Europe tend to have low yields.

The study examined the potential of biomethane made from grass in Ireland, where grassland makes up 90 per cent of the country’s agricultural land. More specifically it considers grass from relatively small enclosures that are not in arable rotation and are dominated by perennial grasses and scrub. The process uses anaerobic digestion, which breaks down the grass with microorganisms in the absence of oxygen. The research modified data from a grass-to-biomethane facility in Austria to model the potential energy used and produced by an Irish grass biomethane system from the ‘cradle to grave’, i.e. from the production of the grass in the field to the resulting biomethane in the vehicle.

The gross biomethane production is the energy available at the pumps after a certain amount has been used to fuel the anaerobic digester. This totalled 389,125 m³ of gas per year, the equivalent of 103.7 Gigajoules (GJ) per hectare per year. This means that a 137.5 hectare farm could power 365 cars. The net energy is significantly less at 69 GJ per hectare per year. This figure takes into account the energy used both directly in the production of biomethane and indirectly, such as in fertilisers or herbicides. The research also considered three scenarios to change the energy balance.

- If the digestate (solid material left after anaerobic digestion) is used as a fertiliser, less chemical fertiliser is needed and the net energy is increased by almost 10 GJ per hectare per year to 78 GJ per hectare per year.
- Clover added to the turf can reduce the need for nitrogen fertiliser. However, clover requires different management techniques and would require further analysis.
- If wood chips are used to produce energy instead of the biomethane itself, this would increase the volume of available biomethane to 452,389 m³ per year, which could fuel 425 cars. The carbon credit associated with biomethane would make this a more economically viable option.

The researchers compared the figures to other biofuel systems and found that grass biomethane could potentially have a similar gross energy to palm oil biodiesel. It appears to provide more energy than traditional first generation European biofuel systems and its gross energy is 50 per cent greater than the improved wheat ethanol system similar gross energy to palm oil biodiesel.

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Contact: jerry.murphy@ucc.ie

Theme(s): Climate change and energy

LIFE news: Securing the conservation of grassland habitats with bioenergy production

Following the success of its first LIFE project, 'Trockenrasen Saar', the University of Kassel’s newly-funded LIFE+ PROGRASS project will demonstrate the feasibility of producing bioenergy from grasslands in the German state of Hesse and in other European model regions. The project will cover an area of more than 400 hectares and will show alternatives to bioenergy production from food crop plots. The project expects to achieve an increase of conversion efficiency of up to 30 per cent compared with conventional biogas technology. The beneficiary estimates that grassland cuttings from NATURA habitats could provide 4-6 million tonnes/yr of biomass.