

IRELAND

Greenhouse gas & ammonia emissions

Location

Kerry

Programming period

2014 – 2020

Priority

P5 - Resource efficiency &
Climate

Measure

M16 - Cooperation

Funding (EUR)*

Total budget 940 498
EAFRD 526 679
National/Regional 413 819

Project duration

2019 – 2021

Project promoter

Biorefinery Glas

Contact

James.gaffey@staff.ittralee.ie

Website

<https://biorefineryglas.eu/>

Biorefinery Glas is a demonstration of small-scale biorefinery in Ireland, supporting development of new business models and farmer diversification into the circular bioeconomy.

Summary

Biorefinery Glas is one the first projects in Europe which looks at the integration of farmers in a value-added bioeconomy value chain. Using a small-scale biorefinery, this EIP-AGRI operational group has demonstrated the production of four new products from grass with farmers in South-west Ireland. It offers a viable solution to meeting key sustainability challenges including protein availability, renewable energy and reduction of GHG emissions in the agricultural sector. As the biorefinery is small-scale and automated, the project is a step towards changing the role of farmers in the bioeconomy, from suppliers of cheap biomass, to producers of value-added products.



Results

Through the Biorefinery Glas approach it is expected to achieve an improvement of approx. 40% in nitrogen use-efficiency, compared with the current situation.

It is also expected to see a significant reduction in nitrogen and phosphorus (N and P) emissions in cattle excrement, along with additional reductions in emissions associated with imported animal feed.

The new process will improve the resource efficiency of Irish grasslands by producing four products from one feedstock and create diversification opportunities for farmers.

Lessons & Recommendations

- ❑ The project is based on the collaboration between dairy farmers and pig farmers with the cooperatives acting as an intermediary. In future the dairy farmers could collaborate with pig farmers in a stand-alone system to create new products for the local market (farm-to-farm bioeconomy).
- ❑ The project includes peer learning aspects including the digital storytelling initiative which allows the participating farmers to tell their experience of the biorefinery to other farmers.

* The Project promoter/beneficiary is an EIP-AGRI Operational Group (<https://ec.europa.eu/eip/agriculture/en>)

Context

The agriculture sector forms a key part of the social fabric and economy in Ireland. Accounting for over 60% of land and 5.7% of gross value add (2015), agriculture employs around 170 000 people nationally, mainly in rural areas. While it is an integral part of Irish society, agriculture currently faces unprecedented challenges including climate change and increasing protein (feed) demands.

Ireland is almost unique in OECD countries with over a third of national greenhouse gas emissions arising from the agriculture sector (including 64.5% methane (CH₄), and 35% nitrous oxide(N₂O)). This presents a key challenge as Ireland strives to meet the 2020 and 2030 emissions reduction targets and to decarbonise the economy by 2050. The challenge presented by emissions in agriculture was underlined in 2017, when a national Citizens Assembly on Climate Change voted to recommend the imposition of taxes on emissions arising from agriculture and highlighting the need to find sustainable measures for emissions reduction in agriculture.

Another concern for Irish farmers is the growing over-reliance nationally on imported feed. The EU Protein Plan recognises the need to address long-standing protein deficits in the EU. Ireland is particularly exposed, importing around three million tonnes of animal feed annually, double that of its European neighbours. This issue of over reliance was highlighted by several recent feed shortages driving up feed prices for farmers to new levels. Additionally, Ireland's feed imports include about 1.7 million tonnes of genetically modified (GMO) products, including soya products with a large carbon footprint associated with deforestation in South America. These aspects have raised questions around the sustainability of Irish agri-food products.

These key issues of climate change and resource availability compounded by the uncertainty of Brexit, has focused the minds of agricultural stakeholders on the need to sustainably diversify their product base and mitigate against these challenges.

Objectives

The project sought to demonstrate a small-scale biorefinery which would allow farmers to produce new products from grass and diversify their income. The products would help farmers by improving the protein efficiency of grass through the production of a fodder for cows, which contains part of the protein they need, and an additional grass protein co-product, which could be fed

to non-ruminants. In addition, the nature of the products would allow a reduction in emissions directly in cattle (through feeding the biorefined fibre instead of silage), while creating 40% more protein from grassland and indirectly, by replacing emissions associated with imported soybean.

Activities

Preparation: The project began in February 2019 by selecting farmers to participate in Biorefinery Glas. Upon selection, a meeting was scheduled (March) with participating farmers to outline the project and discuss logistical and operational aspects of the biorefinery. Dates for demonstrations and a schedule of farms was agreed with a follow-up meeting in May to review plans.

Schedule: Biorefinery demonstrations began on 1 July 2019 at Vanessa Kiely O' Connors farm in Cork, the first of five demonstration farms in the project. The biorefinery was based at one of the farms from Monday-Friday, processing grass into products and transferring to the next farm during the weekend to begin the processing cycle again.

Demonstration activities: The purpose of the demonstration was firstly; to produce enough of each product stream to carry out a validation analysis; and secondly to give farmers good exposure to the process and products. Each day grass was harvested (in the morning and midday) by the farmer and transferred to the biorefinery where it was processed in the machine to make three products: a press-cake fibre for cattle feed; a protein co-product for monogastrics; and a liquid grass whey which is rich in nutrients and sugars. The press-cake fibre was baled daily, while the protein and whey streams were separated and stored in containers for analysis.



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Analysis and upgrading of products: The press-cake is undergoing a comparative dairy feeding trial with silage as a control (began December 2019-ongoing). Despite lower overall protein, a comparable feed conversion efficiency has been observed to date. Analysis of N and P emissions in cattle excrement and rumen methane analysis will also be undertaken.

The protein co-product is undergoing pig feeding trials (began January 2020-ongoing) by a cooperative pig feeding mill. The pig feed trial will test the protein co-product as a replacement for soybean in compound feed for pigs. The cooperative mill leading the feed trials are an existing part of the cooperative structure which represents the dairy farmers producing the products. This helps to demonstrate that a cooperative approach can help farmers to find a route to market for their new product. The grass whey was analysed as a fertiliser in September 2019 and for its biogas potential in a zero-waste approach (first analysis completed in January 2020). The analysis has been positive with good yields and over 60% of gas composition is methane. The produced digestate has good phosphorus and potassium (P and K) values for use as fertiliser. In addition, the whey is being analysed for extraction of fructo-oligosaccharides, a potential prebiotic with residual matter also being evaluated for its biogas potential. In this way a cascade approach is used extracting products of value first – fibre, protein, fructo-oligosaccharides, while leaving the final product for use in biogas production.

Dissemination: The project has been presented at numerous national and international conferences and workshops and has been featured widely in national news channels including television. The farmers participating have made a series of digital stories highlighting their experiences of the demonstrations, which have been viewed widely and support peer learning among farmers. A demonstration day was organised in July 2019 where farmers were invited to an open ‘farm walk’ to see the biorefinery in operation and learn about the project from the operational group. The event attracted over 300 stakeholders, primarily farmers. The project was integrated as a model of best practice as part of the Irish government “AgClimatise” Draft National Climate & Air Roadmap for the Agriculture Sector, and has been highlighted as a best practice for farmer integration in the Bioeconomy by a recent Bio-based Industries Joint Undertaking (BBI JU) study on Participation of the Agri-sector in the BBI JU.

Main results

- Through the Biorefinery Glas approach it is expected to achieve an improvement of approx. 40% in nitrogen use-efficiency compared with the current situation.

- It is also expected to see a significant reduction in N & P emissions in cattle excrement, along with additional reductions in emissions associated with imported animal feed. The operational group is also assessing the ability of the press-cake fibre to inhibit rumen methane production.
- The new process will improve the resource efficiency of Irish grasslands by producing four products from one feedstock and create diversification opportunities for farmers. The business case of this approach versus a traditional approach will be assessed following product benchmarking.
- The operational group is demonstrating a mechanism for farmers to produce their own products, using a small-scale automated mobile system and improves the familiarity of this system and its products among farmers. This can help farmers to add value to their feedstocks by themselves. The mobile small-scale approach can act as a vehicle for collaboration among farmers, allowing the opportunity to scale up gradually using a mobile system.

Key lessons

The project is based on the collaboration between dairy farmers and pig farmers with the cooperatives acting as an intermediary. In future the dairy farmers could collaborate with pig farmers in a stand-alone system to produce new products for the local market (farm-to-farm bioeconomy). Alternatively, by replicating the small-scale model within a distributed regional system, the protein coming from numerous processes could be compounded into a final product at a regional feed mill.

The project includes peer learning aspects including the digital storytelling initiative which allows the participating farmers to tell their experience of the biorefinery to other farmers.



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Additional sources of information

www.youtube.com/watch?v=Z1UFHU-rt9s

<https://twitter.com/BiorefineryGlas>

www.facebook.com/biorefineryglas/

www.linkedin.com/company/biorefineryglas/

<https://biorefineryglas.eu/digital-storytelling/>