GRASS BIOREFINERY
Background

Fresh Grass Biorefinery Operating Principles

Biorefinery Glas focuses on the demonstration of a small-scale grass biorefinery with farmers in South West Ireland with the aim of diversifying farmer produce, while resolving significant challenges in traditional agriculture

Biorefinery Glas is a European Innovation Partnership (EIP) Operational Group funded by Department of Agriculture, Food and the Marine under the Rural Development Programme 2014-2020. Led by the Institute of Technology, Tralee, Biorefinery Glas has a total of 5 partners including technology developer GRASSA, Barryroe Co-operative, the Carbery Group and University College Dublin.
The project aims to improve the sustainability, value and resource efficiency of Ireland's livestock sector by supporting farmer diversification into the bioeconomy. During the project the partners have demonstrated the GRASSA small-scale biorefinery with farmers in the West Cork Region.

BIOREFINERY GLAS

QUICK FACTS

> 4 product streams evaluated

> Presscake fibre is produced for cattle feed

> Green protein concentrate is produced for monogastric feed

> A high-value prebiotic, fructo-oligosaccharides is extracted

> The residual grass whey can remain on the farm as fertiliser

> Grass whey process residues can also be used for the production of biogas through anaerobic digestion

Products

From a single feedstock, grass, the biorefinery converts freshly harvested grass into a range of products, including; an optimised cattle feed fibre (press-cake), a non-GMO green protein concentrate feed for monogastrics, a high-value sugar stream of fructo-oligosaccharides and a grass whey for bio-fertiliser or bioenergy applications. By balancing the need to feed cows the proteins in grass that they use at a higher efficiency, and separating the remaining protein and feeding this to monogastrics, the project targets a 40% increase in usable protein per hectare. The project also expects to achieve a 25% reduction in nitrogen emissions in cattle excrement, with additional emissions savings through displacement of soybean feed imports with a grass-based monogastric feed for chickens or pigs. Biorefinery Glas will also evaluate the possibility of reducing cattle rumen methane emissions through utilization of presscake fibre feed. The residual, deproteinized grass stream (the whey) still contains long chain sugars (fruco-oligosaccharides) which will also be extracted and evaluated as a high-value prebiotic ingredient in animal nutrition. Using a zero-waste biorefinery approach, the residual stream is being evaluated as a bio-fertiliser and as a substrate for anaerobic digestion, with initial analyses indicating that the waste streams is a suitable feedstock for biomethane production. The biorefinery model could allow farmers to continue to feed their cattle, with reduced emissions, while at the same time producing three co-products which can increase their overall farm efficiency.

Biorefinery approach

In the biorefinery, fresh grass is loaded into the machine where it is washed to remove dirt, stones and sand. The material is then crushed using an extruder which separates up to 50% of the protein into a liquid juice fraction and the remaining 50% into a high solid fibre fraction. The fibre can ensiled and fed directly to cows. Coagulation by heating can be used to concentrate the protein in the juice fraction which can be separated as a green protein concentrate suitable for chickens and pigs. The residual fraction, the grass whey, still contains high value sugars, fructo-oligosaccharides, which can be extracted by membrane separation and can serve as a prebiotic in animal nutrition, improving animal gut health. The residual material containers some sugars and minerals which can be concentrated using reverse osmosis to separate the water, or can be used to produce biogas through anaerobic digestion.

Farmer-led Bioeconomy

The small-scale biorefinery model is much lower in CAPEX than larger EU biorefinery systems, where CAPEX remains prohibitive to technology uptake. In the small-scale scenario, individual farmers, groups of farmers or contractors would have capacity to come together to take up such a technology themselves. The GRASSA biorefinery is fully automated and managed via a touch screen panel which captures all the process information, so the farmers can monitor their process and produce their own products, which can be managed by baling or storing or upgraded as necessary. This approach offers the farmers more empowerment in the value chain. As the model is mobile, it also allows the farmers to transport the technology from farm to farm to increase improve flexibility and collaboration.

3 million tonnes

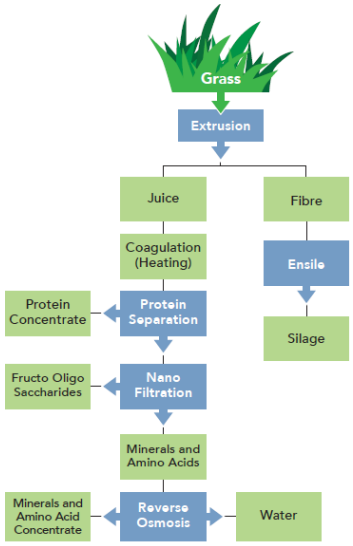
The average annual imports of protein feed in Ireland

Future-proofing Irish Agriculture

> Over 1/3 of Ireland's greenhouse gas emissions come from the agriculture sector

> Methane accounts for 64.5% of total agriculture emissions

>Over 98% of ammonia emissions arise in the agriculture sector



Partners

Funded by Dept. of Agriculture, Food and the Marine under the 2014-2020 Rural Development Programme