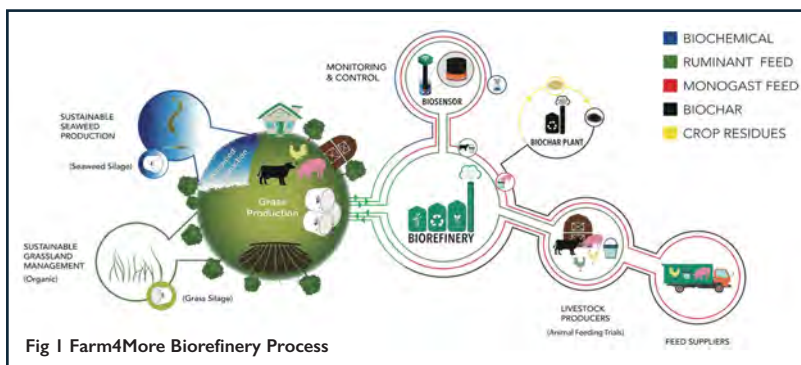


GREEN BIOREFINING OF GRASS-SILAGE

life farm4more

Climate Action | Green Feed | Biorefinery

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In Ireland and Austria a groundbreaking sustainable initiative called Green Biorefinery is being developed to disrupt conventional grassland farming practices and associated climate change impacts. LIFE farm4more which is being led by University College Dublin (UCD) and is co-financed by The Department of the Environment Climate & Communication (DECC) is the 1st Irish led LIFE climate action project and is valued at €5.5 m. LIFE farm4more has set a number of animal protein production climate change mitigation targets which it aims to achieve primarily, by implementing a Green Biorefinery technology that processes organic and sustainably produced grass clover silages into high value organic and sustainably produced amino acid concentrate animal feed products, which can be fed to pigs and chickens.

The transnational project began in July 2019 (Figure 2) and includes Irish partners; UCD, Biorefinery Research Implementation & Development Ltd. (BRID); Bantry Marine Research Station (BMRS) and Austrian partners; TBW Research (TBWR), Agricultural Research and Education Centre Raumberg-Gumpenstein (AREC), Biochar-Nergy, and BioNorum GmbH.



Life Farm4More team

THE GREEN BIOREFINERY CONCEPT

The 1st step within LIFE farm4more's Green biorefinery pilot plant (www.farm4more.ie/biorefinery/) which has been built by partners BRID, BioNorum and TBWR in an organic Region in Japons, Austria (Figure 3a, 3b), is fractionating inputted grass-clover silage feedstocks (Figure 4.a) into a; press cake (Figure 4.b) which can be fed to cattle immediately or preserved for future use by applying a re-ensiling process; and a press juice (figure 4.c) which is further refined by a novel downstream process into a high value organic protein and amino acid concentrate, as feeds for pigs and chickens.



Figure 3a. The Green Biorefinery plant in Japons Austria



Figure 3b. The Green Biorefinery plant, evaporators, in Japons Austria



Figure 4 a. Organic or sustainably produced grass-clover silage as a green biorefinery input feedstock b. green biorefinery press cake and c. green biorefinery protein juice processed into high value organic protein products and amino concentrate feeds for pigs and chickens.

THE INNOVATION

One mechanism by which LIFE Farm4More aims to mitigate the environmental impact of cattle production in Ireland is by reducing nitrogen and phosphorous excretions by enhancing cattle nitrogen (NUE) and phosphorous (PUE) use efficiencies. Short-term feeding trials have been conducted in both Ireland and Austria whereby up to half of high performing conventional and organic dairy cattle's grass clover silage fodder intake has been replaced with green biorefinery grass silage press cakes. The feeding trials conducted in Austria were fully organic, however, to ensure that the results of the Irish dairy cattle Feeding trials would be relevant to both Irish organic and conventional cattle production systems, Teagasc Solohead research farm's Zero-Nitrogen System Grass Clover silage was chosen as the input fodder, as it applies chemical P and K but no chemical N. This silage was shipped to the green biorefinery in Austria where it was processed into a press cake and shipped back for the Irish dairy cattle feeding trial that was conducted in UCD's Lyons Agricultural farm (Figure 5-6-7).

The purpose of the Irish feeding trial was to assess if the removal of highly soluble nitrogen and phosphorous which remains in grass silage juices produced from grass silages processed by the Green Biorefinery (GBR) would result in less phosphorous and nitrogen being excreted from cattle when fed the resulting press cakes in comparison to the control. Of course, any reduction in the excretion of phosphorous and nitrogen needed to be carefully considered in relation to milk yields, milk quality and animal health. The Irish press cake feeding trial assessed this reduction by measuring how much nitrogen and phosphorous entered the animal through its feed and how much was excreted to milk, manure and urine. They observed that there were no significant changes in milk yield but total nitrogen and phosphorous excreted per day per cow was reduced. These trials are a positive 1st step towards showcasing how organic and sustainably produced grass-clover silage diets can be supplemented with green biorefinery press cakes but further full Irish press cake studies are required.

In December LIFE farm4more organised an exciting workshop in UCD, Dublin which brought together key European Green Biorefinery stakeholders with Key Irish Stakeholders (Governmental Departments, Policy makers, Farming representatives, AD sector representatives, NGOs, funding and financial bodies) to demonstrate the green biorefinery's potential and work towards establishing an Irish Green Biorefinery Sector (Figure 8). One significant outcome from this workshop was the recognition of the importance of



Figure 5. Zero chemical nitrogen - grass silage bales loaded for transit at Solohead Research Farm, Ireland, and unloaded at Japons, Austria



Figure 6. Grass silage weighed and churned in the mixer wagon while water was added to achieve lower dry matter



Figure 7. Watered silage loaded into a feeder to be pressed by a mechanical screw press

engaging policy makers, farmers, farming representatives and the AD sector and providing them with tailored evidence of the potential benefits of GBR with the objective of advocating for supportive policy changes to establish and drive an Irish Green Biorefinery Sector.

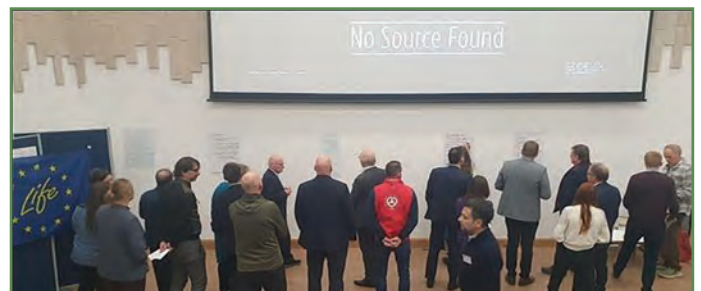


Figure 8. Working towards establishing an Irish GBR Sector workshop

The engagement of Irish farmers is crucial for unlocking the complete potential of GBR in Ireland. Through this collaboration, we can streamline the process, as evidenced by initiatives like the Austrian organic- and Irish Zero nitrogen-produced-grass-clover silage press cake dairy cattle feeding trials. These trials exemplify both innovation and sustainability, laying the foundation for the development of a grass-based GBR systems in Ireland. For more information, feel free to visit our website www.farm4more.ie and get in touch with us. We look forward to hearing from you!

This project is co-funded by the LIFE Programme, the European Union's instrument for protecting the environment and the climate, and the Department of Environment Climate & Communication of the Irish Government.