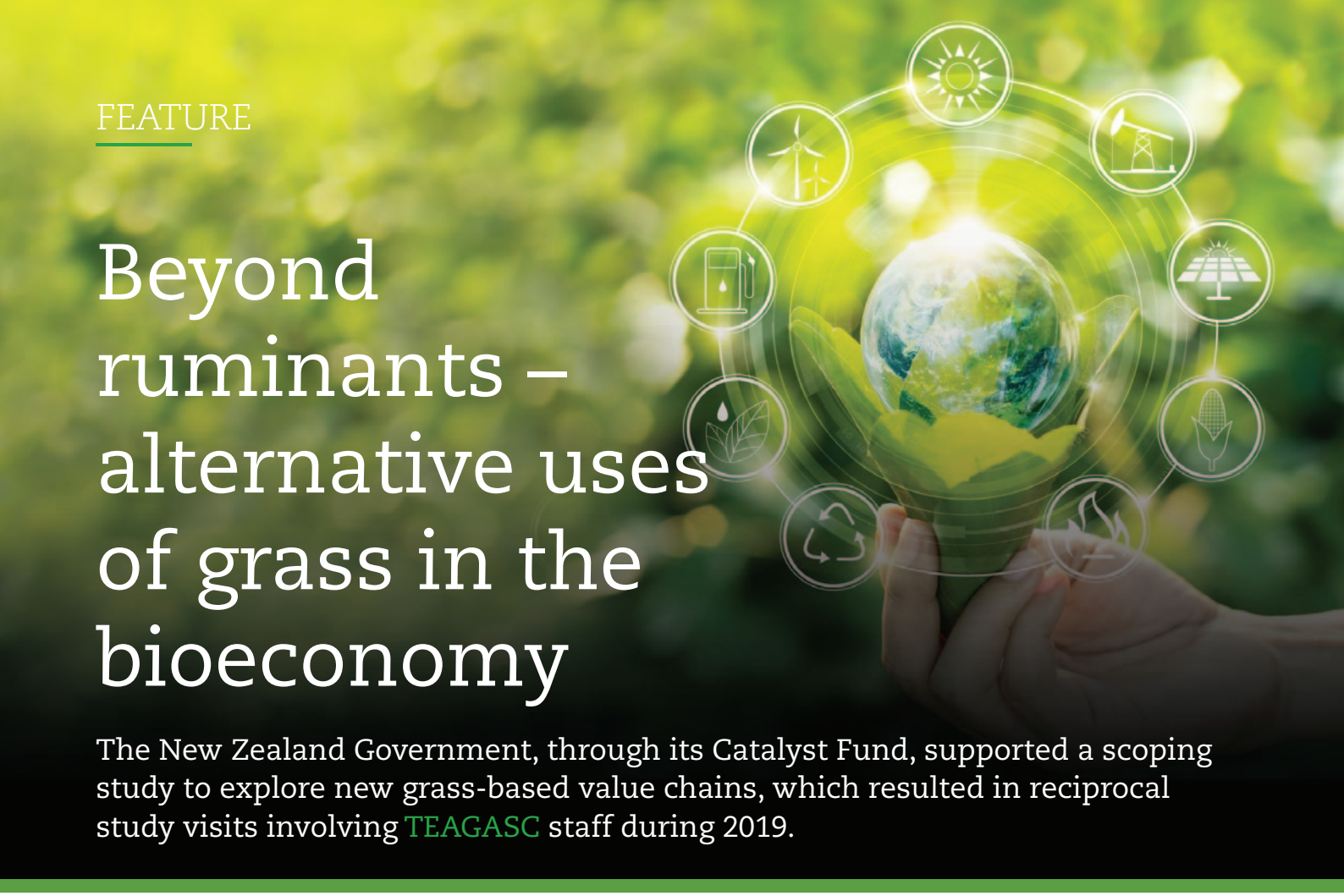
FEATURE

Beyond ruminants – alternative uses of grass in the bioeconomy



The New Zealand Government, through its Catalyst Fund, supported a scoping study to explore new grass-based value chains, which resulted in reciprocal study visits involving TEAGASC staff during 2019.

The Irish and New Zealand Governments both have ambitious goals for growth in agricultural output, as well as commitments and targets relating to carbon emissions and other environmental challenges. Another common denominator is that grass grows well in both countries. This suggests both an opportunity and an obligation to develop new ideas for grass-based production systems as a means to increase output and exports, while reducing environmental impacts. A delegation from Ireland recently visited New Zealand as part of a scoping study to explore adding value to grass. At the heart of the project is the concept of a green biorefinery, which can provide alternative or complementary uses for grass. A biorefinery is a facility, or a series of processes, that converts biomass into a spectrum of value-added products. The key challenge is to get the highest possible value from the biomass in a sustainable manner.

Biobased products from grass

Lene Lange from the Technical University of Denmark (DTU), who participated in both tours, argues that grass can be used to produce many bio-based products, including upgraded protein for pig and poultry feed, bioactive peptides (Dotsenko and Lange, 2017) and natural fibres as an alternative to cotton. Grass is also a good feedstock for energy production in an anaerobic digester (Lucci *et al.*, 2019). A green biorefinery has already been operated at pilot scale in Ireland as part of the 'Biorefinery Glas' project, an EIP-Agri Operational Group (OG) funded by the Department of Agriculture, Food and the Marine (DAFM). The New Zealanders met James Gaffey from IT Tralee, who co-ordinates the OG, at Teagasc Oak Park, and James joined the group through video conference on the reciprocal visit. This EIP project includes Barryroe Co-operative, the Carbery Group, GRASSA B.V. and UCD, and demonstrates, in a hands-on way, how the circular bioeconomy approach can work, starting from farm level.

History of dried grass in Ireland

The use of grass as a protein source for monogastrics is not new in Ireland. There was an animal feed protein industry based on dried grass prior to the arrival of soya beans as a preferred protein source, and **Table 1** shows the extent of the industry. High oil costs, combined with the availability of soya beans, led to the demise of the grass-drying industry. Research on the mechanical extraction of the protein fraction from the grass feedstock was undertaken by An Foras Taluntais at Ashtown in the early 1980s, and this idea is receiving renewed attention.

Recent research

The EU 'GrassMargins' project demonstrated that green biomass from grass can be produced very efficiently from grasslands on wet and heavy soils and tillage fields with a range of grass species (Meehan *et al.*, 2017). In Ireland, another EIP project, 'Biomass to Biochar for Farm Bioeconomy', produces high-value biochar from biomass from grasslands with many rushes (*Juncus spp.*) to pilot the conversion of unutilised agricultural biomass to a stable form of recalcitrant biocarbon to improve soils and provide ecosystem services.

Adding value to grass

The New Zealand interest in the green biorefinery concept is to reduce the environmental impact of livestock production as much as to add value. They have done some research that finds feeding cows the 'cake', which is the solid that remains after grass has been screw-pressed to separate the liquid and solid fraction, results in lower levels of nitrogen leaching. This is because the cows take in lower levels of protein (containing nitrogen) than would be the case with fresh or ensiled grass (Lucci *et al.*, 2019). The Danish have a strong focus on high-value opportunities. DTU has already developed a

Grass harvesting in the 1970s in Lucan, Co. Dublin. Shackleton Grass Driers processed 3,000 t of dried grass per annum, In 1972, 47,000 t of dried grass was produced in Ireland.

process that extracts protein from the liquid fraction, which is then dried into a protein powder, and has developed products for human consumption that contain up to 10% grass-based protein.

The New Zealanders have done a considerable amount of work in adding value to wood-based waste streams. Such thinking could help to stimulate and progress ideas for grass-based systems. SCION – a New Zealand Crown Research Institute, which converts wood and fibre into a range of renewable and sustainable products and energy using research, science and technology – has considerable expertise that could be transferred into grass-based chains, e.g., in relation to bio-based fibres and bio-chemicals. AgResearch New Zealand has expertise in relation to life cycle analysis, which would enable a comparison to be made between different value chains in terms of different sustainability credentials.

The opportunities presented by grass, beyond a feed for ruminants, are immense. Research by Teagasc shows that the existing land base can produce 1.7 million t of dry matter (DM), surplus to requirements for meat and milk production (McEniry *et al.*, 2013). The challenge now is to identify a small number of potential value chains for further research and preliminary feasibility analysis.

References

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Table 1: Land utilisation and production of dried grass in Ireland in 1972.

Provincial Grass Driers Association and independent producers (1972) Company name	Acres	Annual t dried grass
John Nicholson Balrath, Kells, Co. Meath	750	5,000
Sir Richard Musgrave Dublin Airport	1,000	6,000
Gallaghers South Slob, Wexford	1,000	6,000
Shane Jameson Cappoquin, Co.Waterford	1,000	6,000
Shackleton Grass Driers Lucan, Co. Dublin	500	3,000
Alex Tong Edenderry, Co. Offaly	700	3,000
Louis McAuley Balrath, Kenstown, Co. Meath	1,000	6,000
Gowna Grass Driers Ballinasloe, Co. Galway	1,000	6,000
Geesala Grass Driers Killala Co. Mayo	1,000	6,000

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