

Biorefinery Glas and the potential of the bioeconomy to transform grassland agriculture in Ireland

James Gaffey



The European Agricultural
Fund for Rural Development:
Europe investing in rural areas



Ireland's European Structural and
Investment Funds Programmes
2014-2020

Co-funded by the Irish Government
and the European Union



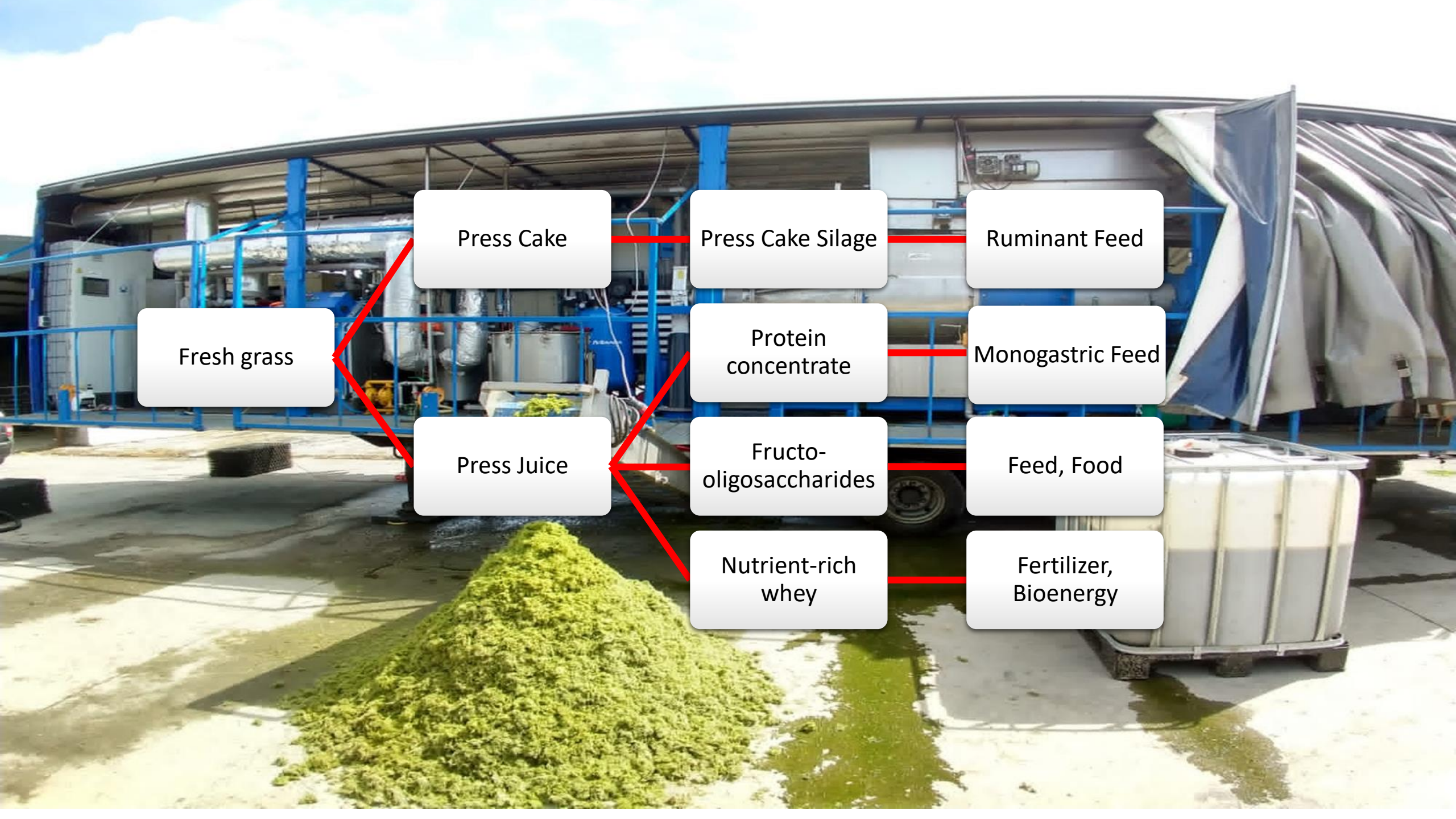
MTU
Ollscoil Teicneolaíochta na Mumhan
Munster Technological University



Grassa
GREEN REFINED SOLUTIONS



Barryroe
CO-OPERATIVE LIMITED



Presscake as a replacement for silage in Ruminants



Dry Protein concentrate as a replacement for soyabean meal in pigs



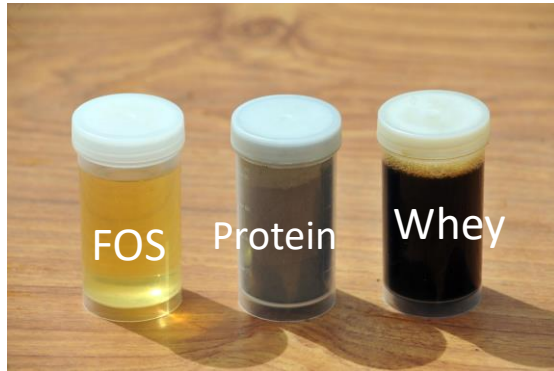
Date of Weighing	Daily Feed Intake (kg/d)		Feed Conversion Ratio		Average Daily Gain (kg/day)	
	Treatment	Control	Treatment	Control	Treatment	Control
Period 1	1.022	0.991	1.77	1.67	0.577	0.592
Period 2	1.247	1.182	1.83	1.83	0.683	0.646
Period 3	1.386	1.301	1.90	1.86	0.729	0.699
Period 4	1.512	1.400	2.04	2.05	0.742	0.682



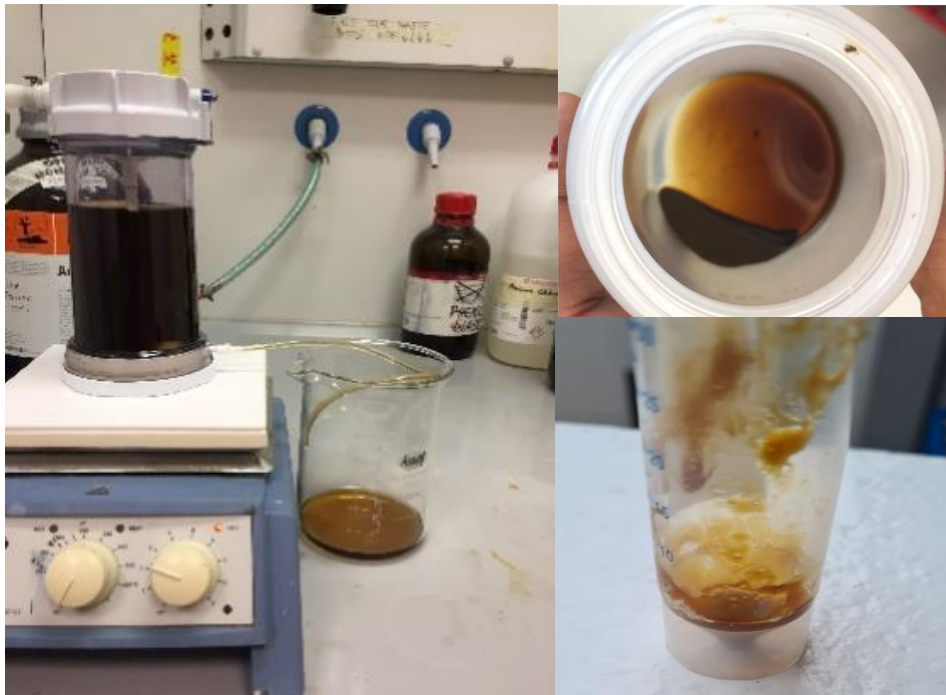
Results of weaner trial comparing treatment (grass-protein based) v/s control diet

Animal Feed Protein Sources	Crude Protein	Lysine	Methionine	Cysteine	Threonine	Crude Fibre
Soybean Meal	44-48	2.81-3.20	0.60-0.75	0.69-0.74	0.71-2.00	3.0-7.0
Sunflower Meal	24-44	1.18-1.49	0.74-0.79	0.55-0.59	1.21-1.48	12.0-32.0
Rapeseed Meal	36	2.00-2.12	0.67-0.75	0.54-0.91	1.53-2.21	10.0-15.0
Cottonseed Meal	24-41	1.05-1.71	0.41-0.72	0.64-0.70	1.32-1.36	25.0-30.0
Grass Protein Concentrate	33.9	1.81	0.65	0.18	1.5	6.1

Production of value-added co-products



Downstream (juice) products produced from grass



Compound	Conc (mg/ml)
Glucose	4.79
Nystose	2.53
Fructofuranylnystose	1.14
2-Kestose	0.98

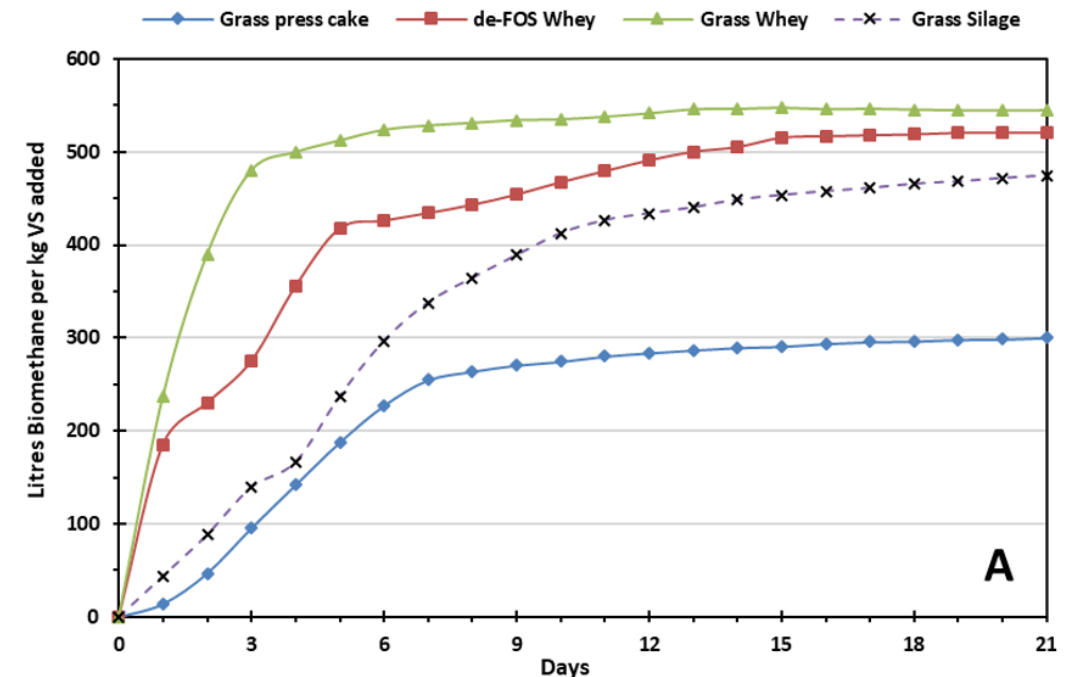
FOS sugars contained in grass

Prebiotic Index			
Probiotic Strain	Grass FOS	Commercial FOS	Inulin
<i>L acidophilus</i>	1.12±1.3	1.09±0.8	0.88±0.6 *
<i>L fermentum</i>	1.67±0.9	1.32±0.8	3.67±0.7 *
<i>L plantarum</i>	1.44±0.5	0.78±0.7 *	-0.354±0.6 *
<i>B animalis</i>	1.89±0.45	2.05±0.11	5.98±0.41*
<i>B breve</i>	3.65±0.98	4.01±1.12	2.76±0.23 *

Prebiotic index comparing Grass-based FOS with Commerical FOS and Inulin

Whey and de-FOS whey as substrates for anaerobic digestion

		Grass press cake	Grass whey	de-FOS whey	Grass silage	Dairy whey
C:N ratio		19:1	17:1	9:1	17:1	-
Biogas and biomethane production (L/kg)	VS	510.7 (300.3)*	895.8 (544.6)*	597.4 (520.3)*	808.1 (479.0)*	(510-600)*
	DM	486.9 (286.2)*	707.7 (430.3)*	478.2 (416.5)*	737.2 (436.9)*	(280-330)*
	FM	189.9 (111.6)*	14.3 (8.7)*	41.5 (36.1)*	132.9 (78.8)*	-
Final weighted biogas composition	CH ₄ (%)	58.8	60.8	87.1	59.3	-
	CO ₂ (%)	43	39.1	14.8	41.1	-
	O ₂ (%)	0.1	0.2	0	0	-
	H ₂ S (ppm)	17.6	6.7			
	NH ₃ (ppm)	0	3.7			
Biodegradability	%	55	70			



Litres of biomethane per Kg/VS of grass whey, de-FOS whey, presscake and grass silage

Special thanks to our amazing farmers



Vanessa Kiely O'Connor



Kevin Ahern



Michael Dullea



Michael Hayes

MICHAEL HAYES



Tim & Shane McCarthy



Cathal O'Donovan



BIOREFINERY
GLAS



James.Gaffey@mtu.ie
www.biorefineryglas.eu