How Sustainable are Irish Livestock Systems

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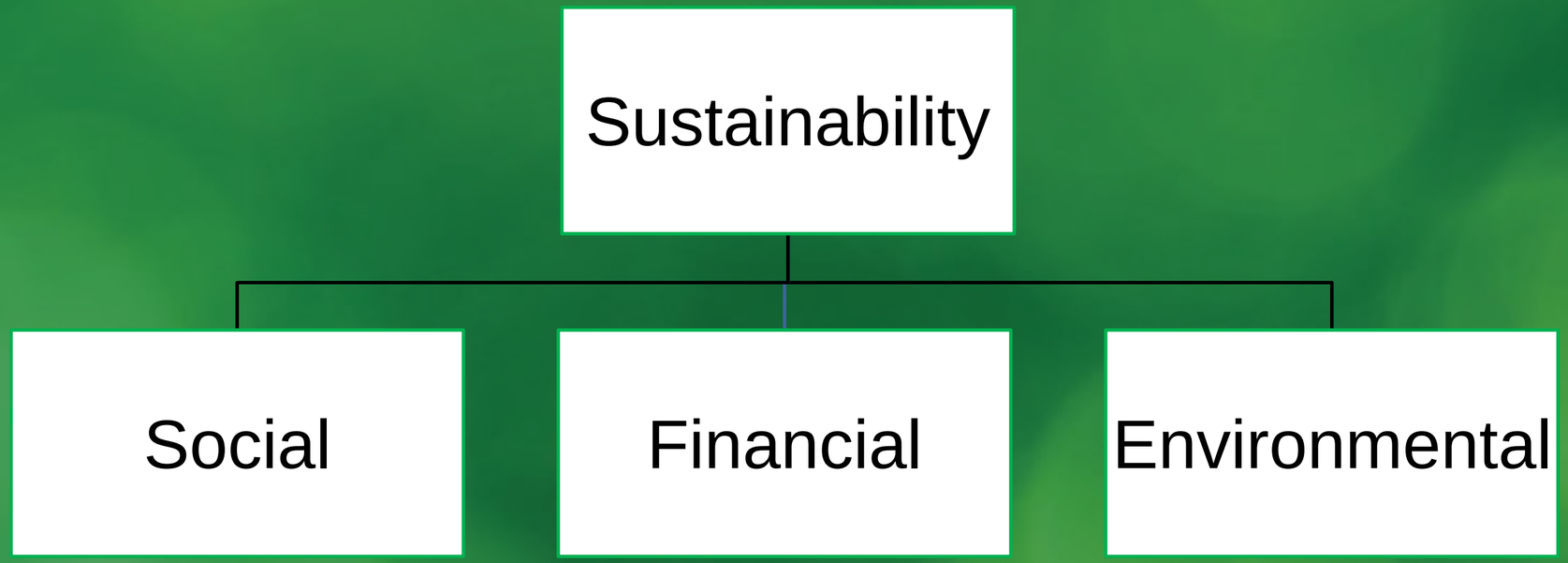
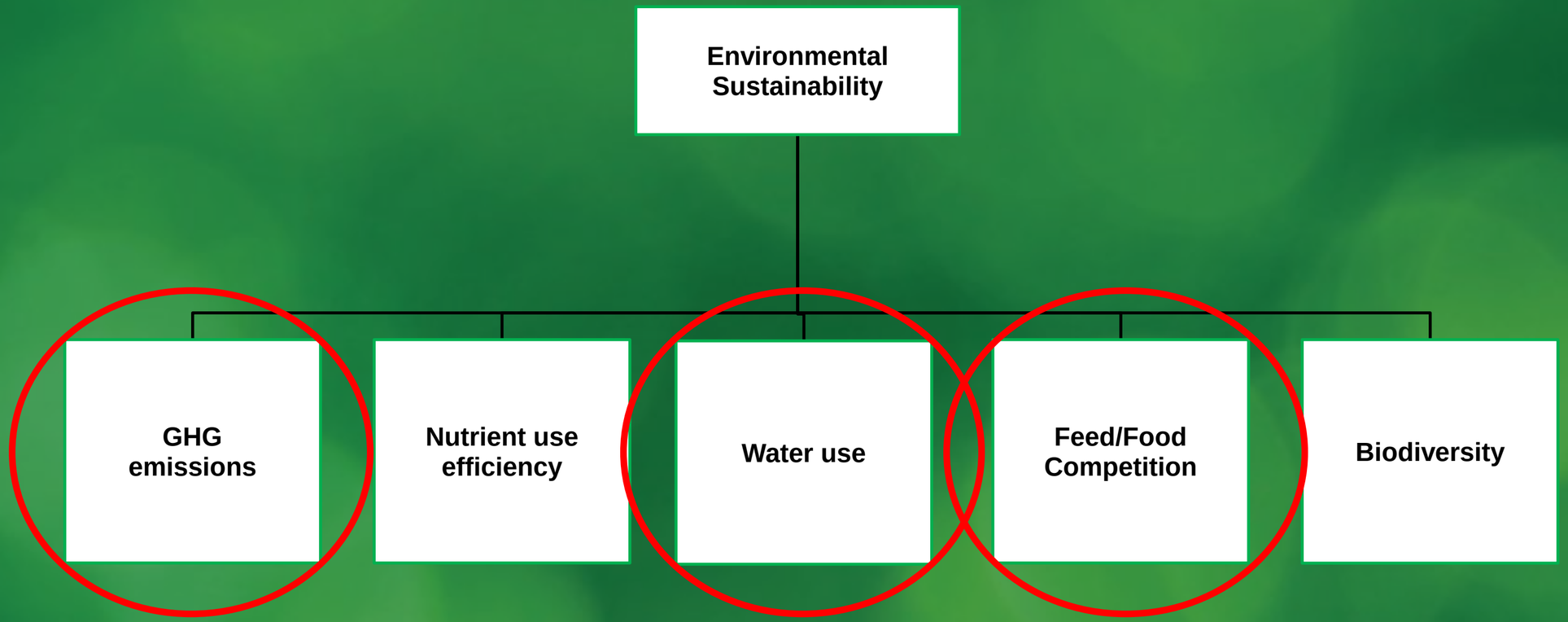
What is Sustainability?



What is Sustainability?



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Background

Irish grass based systems

- Unique in EU context (Diet >80% plus from pasture)
- Nationally in bottom third of N surplus at EU level
- Focus on pasture utilisation and proportion of forage in diet
- Manure largely returned directly by animal – little option to separate manure within system
- Soils have large stores of carbon
- Policy requirement to reduce emissions by 25% relative to 2018
- Grazing system efficiency dependent on grass utilisation

Feed-Food Competition - Dairy Cow Diet

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https://doi.org/10.3168/jds.2017-13604

A national methodology to quantify the diet of grazing dairy cows

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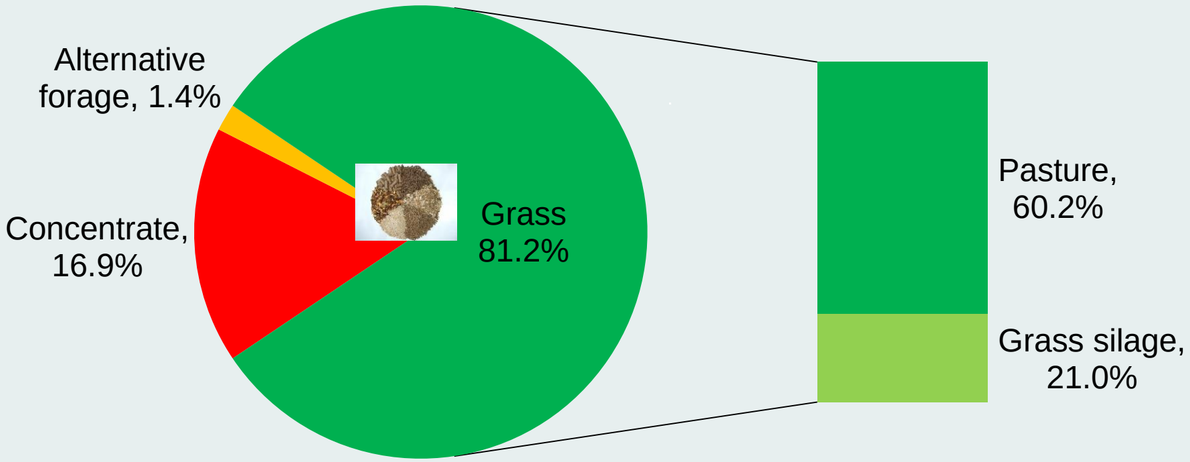
Mean Annual Cow diet 2013-2023
% of Dry Matter



Grass Fed Dairy

Approximately 30% of the concentrate offered could be classed as human edible
<6% of the overall diet of the dairy cow could be classed as food

Origin Green IRELAND

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Feed-Food Competition - Metrics

Edible Protein Conversion Ratio = $\frac{\text{Human edible proteins produced}}{\text{Human edible proteins consumed}}$

Net efficiency

1 — **Net producer**

0 — **Net consumer**

Land Use Ratio = $\frac{\text{Human edible protein potential of animal diet}}{\text{Human edible proteins produced by animals}}$

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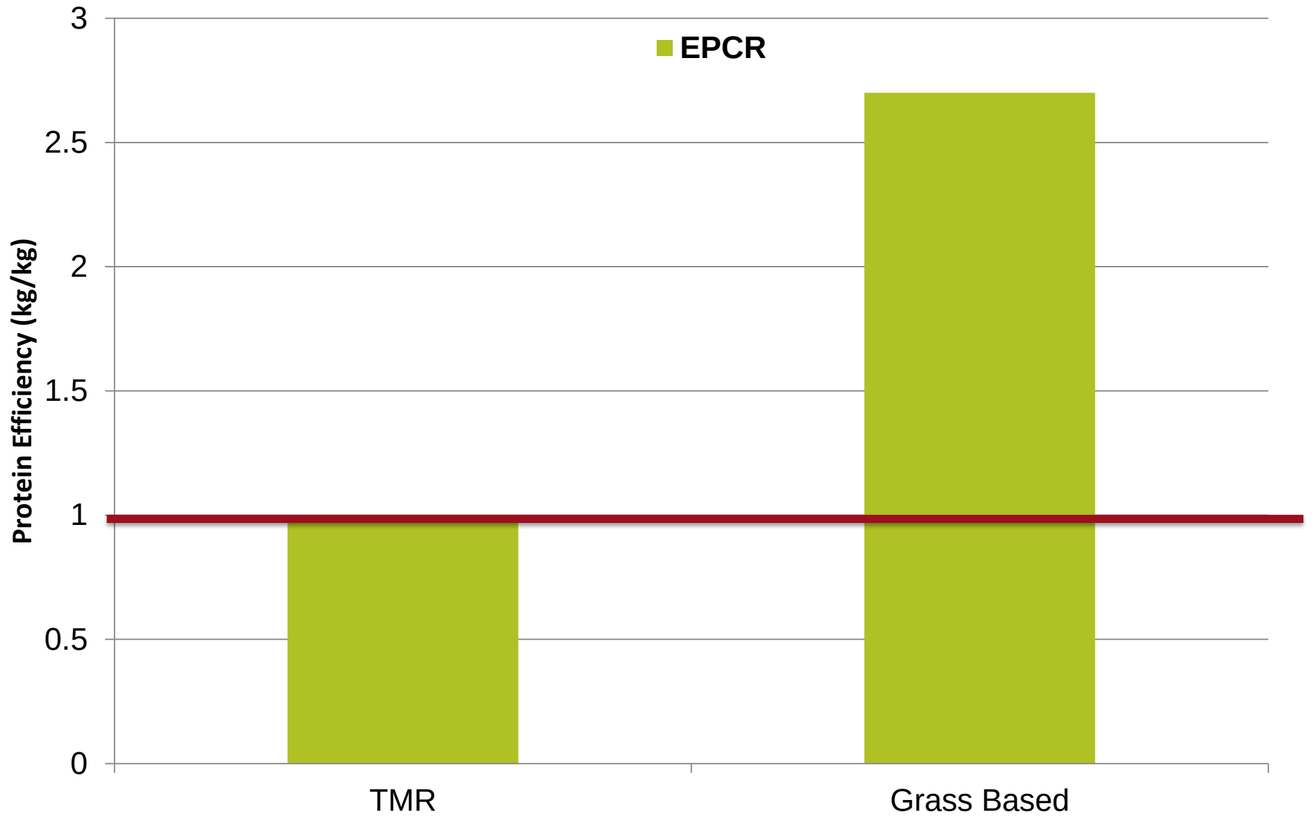
Grass fed – Edible Protein Conversion Ratio



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Grass fed – Edible Protein Conversion Ratio

	Dairy	Dairy Beef	Suckler Beef
EPCR	**5.5**	**2.4**	**3.4**
LUR	**0.47**	**1.08**	**1.25**

Percentage suitability for arable	Dairy and it's beef	Suckler beef
0%	0.25	0.28
20%	0.47	0.97
40%	0.69	1.67
60%	0.91	2.37
80%	1.13	3.07
100%	1.35	3.77

The Journal of Agricultural Science

cambridge.org/ags

Animal Research Paper

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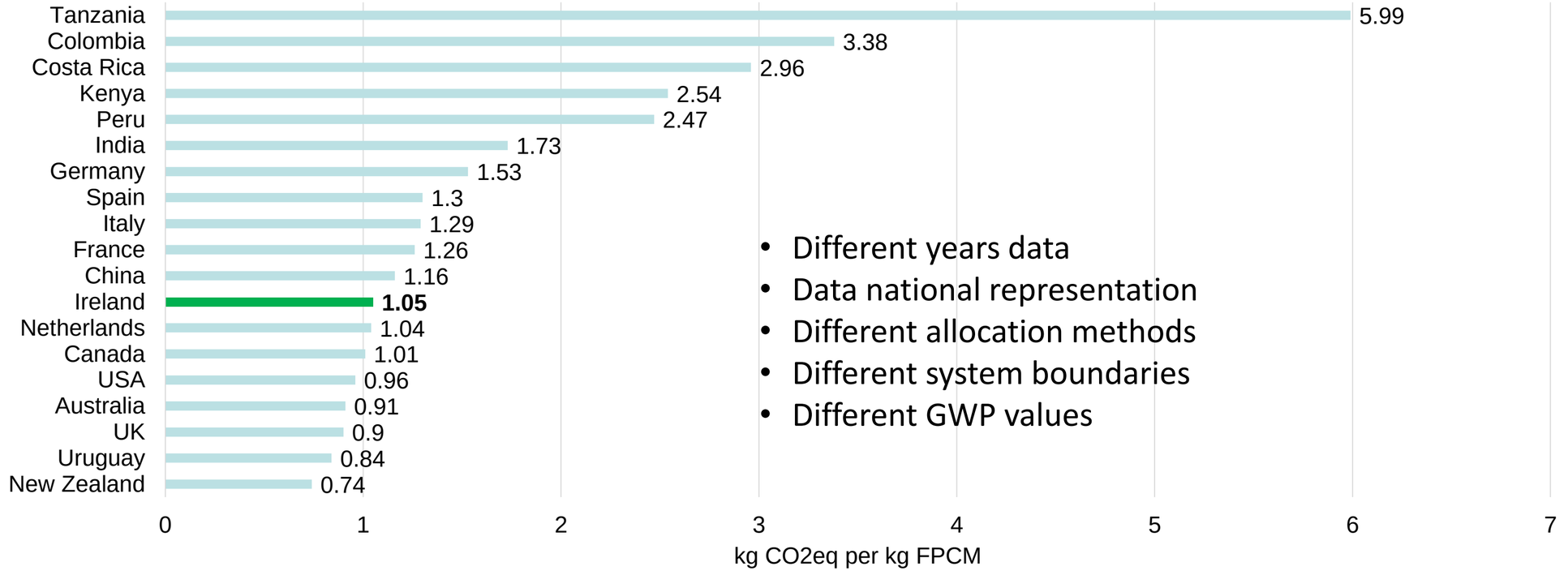
The net contribution of livestock to the supply of human edible protein: the case of Ireland

D. P. Hennessy[1,2], L. Shalloo[2], H. H. E. van Zanten[3], M. Schop[1] and I. J. M. De Boer[1]

[1]Animal Production Systems Group, Wageningen University & Research, P.O. Box 338, 6700 AH Wageningen, the Netherlands; [2]Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co., Cork, Ireland and [3]Farm Systems Ecology Group, Wageningen University & Research, P.O. Box 430, 6700 AK, Wageningen, the Netherlands

GHG comparison New Zealand Approach



- Different years data
- Data national representation
- Different allocation methods
- Different system boundaries
- Different GWP values

J. Dairy Sci. 105:9713–9725
https://doi.org/10.3168/jds.2022-22117

Mapping the carbon footprint of milk production from cattle: A systematic review

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[1]AgResearch Limited, Lincoln Research Centre, Lincoln 7674, New Zealand
[2]AgResearch Limited, Ruakura Research Centre, Hamilton 3240, New Zealand

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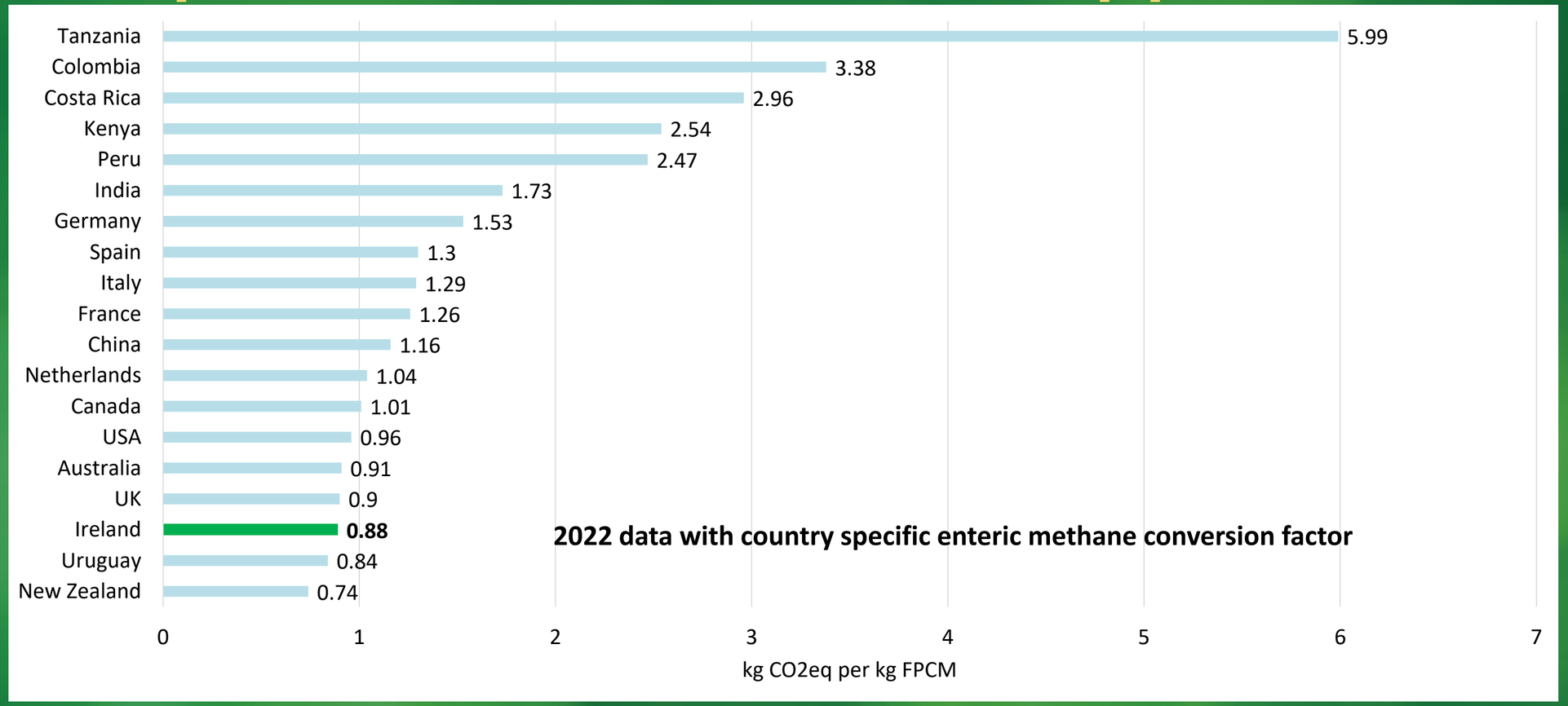
GHG comparison New Zealand Approach - Update



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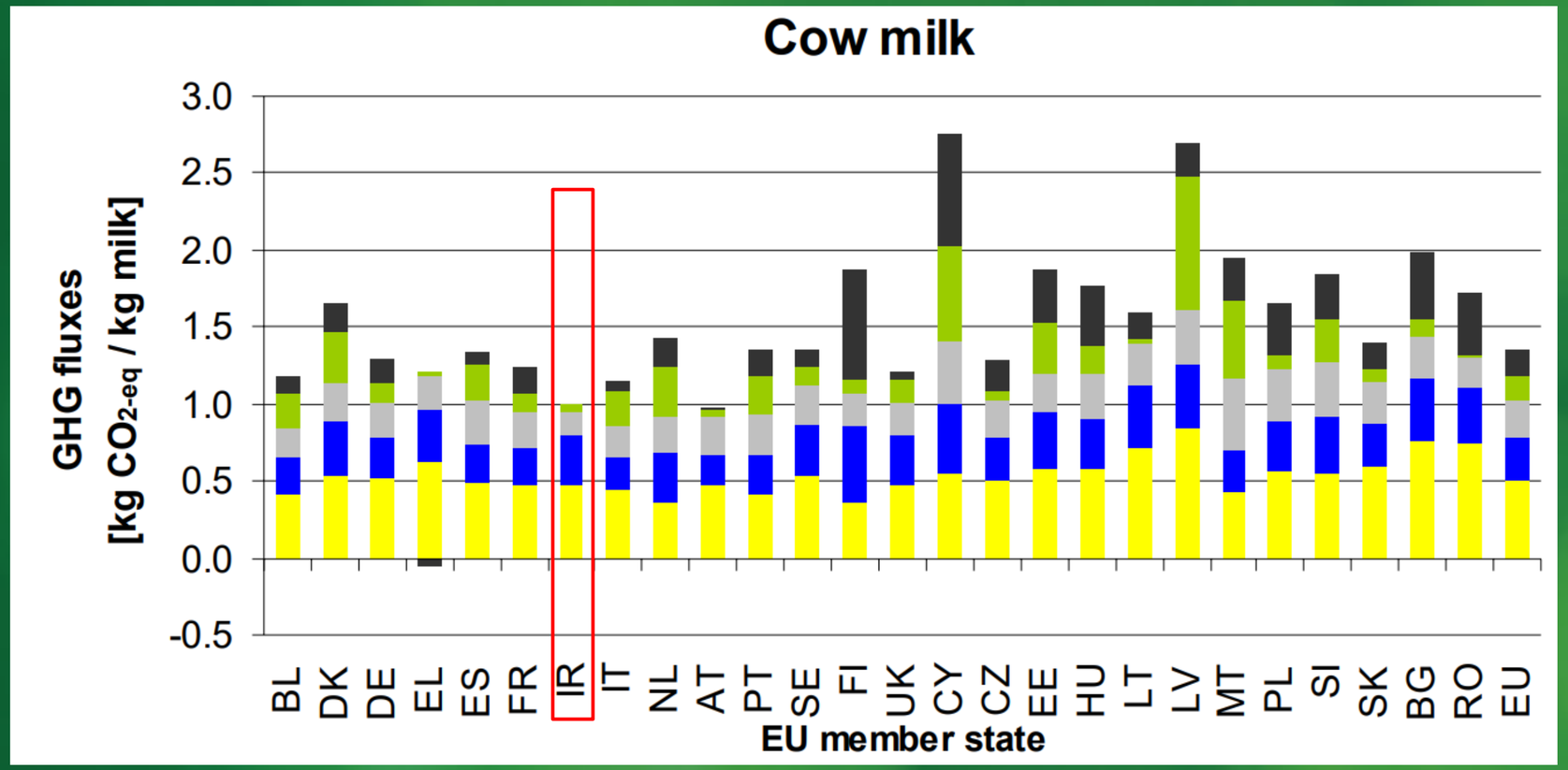
Carbon footprint of Milk – JRC 2010



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Institute for the Protection and Security of the Citizen (IPSC)
Institute for Prospective Technological Studies (IPTS)

Evaluation of the livestock sector's contribution to the EU greenhouse gas emissions (GGELS)

- Final report -

Administrative Arrangements AGRI-2008-0245 and AGRI-2009-0296

Valuable research relevant for its ti
Activity data is from 2004
This data source is out of date

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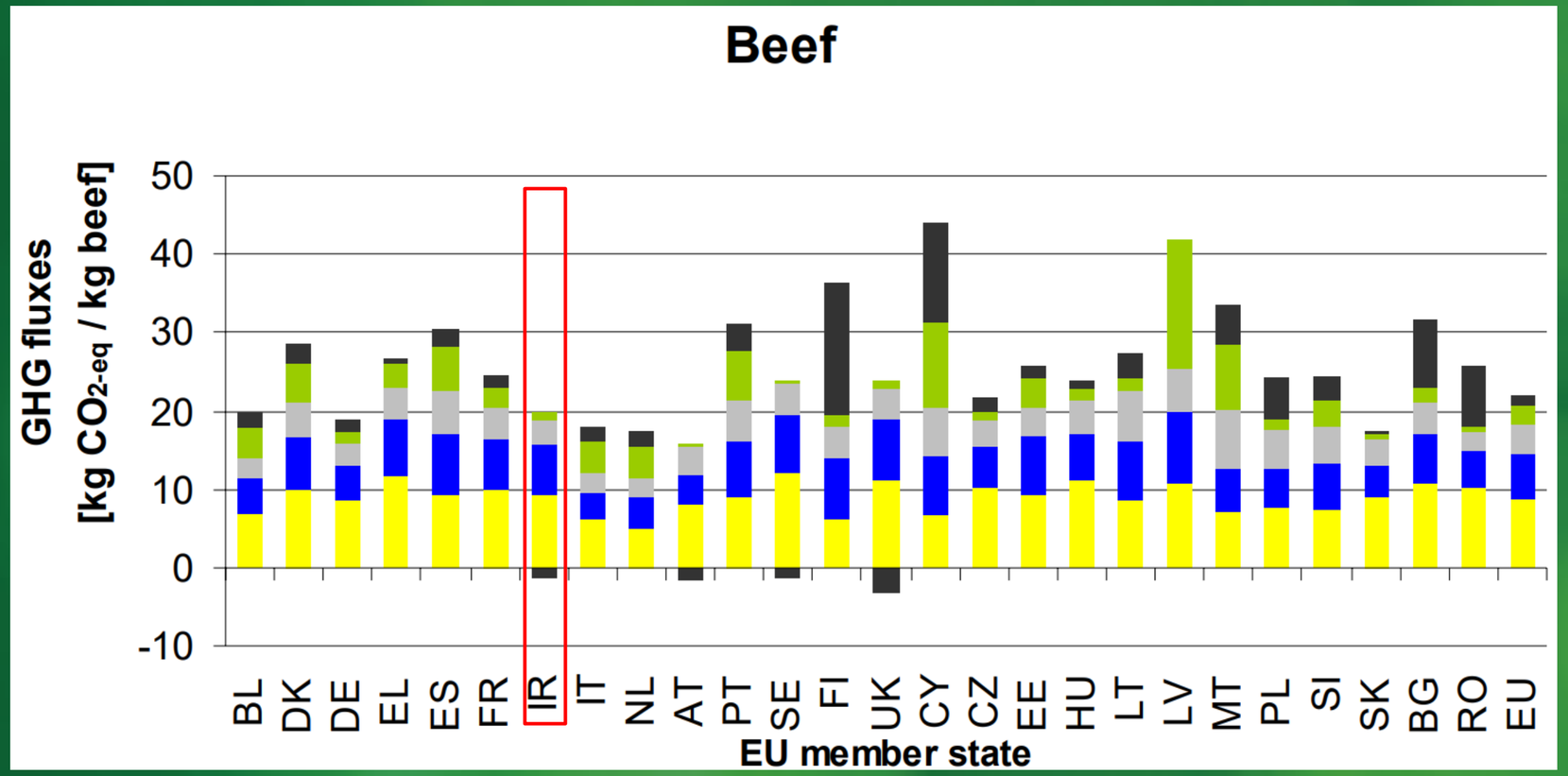
Carbon footprint of Beef – JRC 2010



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Factors influencing carbon footprint on milk production on dairy farms wit different feeding strategies in Western Europe (Sorley et al 2024)

Item	Grazing	Mixed	Housed	SEM	P-value
GWP 100					
FPCM-CF, kg CO2e/t FPCM	1,129 b	1,237 b	1,519 a	38.5	***
Methane, %	58%	56%	54%		
Nitrous oxide, %	18%	15%	13%		
Carbon dioxide, %	24%	29%	32%		
GWP20					
FPCM-CF, kg COe/t FPCM	2,444 b	2,646b	3,199 a	88.3	***
Methane, %	80%	79%	78%		
Nitrous oxide, %	8%	7%	6%		
Carbon dioxide, %	12%	14%	16%		

Journal of Cleaner Production 435 (2024) 140104

71 commercial farms along Western Europe (6 countries inc. Ireland)

Farm categorised based on time grazing

- **Grazing** = >220 days
- **Mixed** = up to 219 days
- **Housed** = 0 days grazed

Grazing systems had lowest GHG per ha and per FPCM

Large variation within feeding systems

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Irish Studies

Agricultural Systems 107 (2012) 33–46

Contents lists available at SciVerse ScienceDirect

Agricultural Systems

journal homepage: www.elsevier.com/locate/agsy

A life cycle assessment of seasonal grass-based and confinement dairy farms

Donal O'Brien [a,b], Laurence Shalloo [a,*], Joe Patton [a], Frank Buckley [a], Chris Grainger [a], Michael Wallace [b]

J. Dairy Sci. 97:1835–1851
http://dx.doi.org/10.3168/jds.2013-7174

A case study of the carbon footprint of milk from high-performing confinement and grass-based dairy farms

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†Department of Animal Sciences, Washington State University, Pullman 99164
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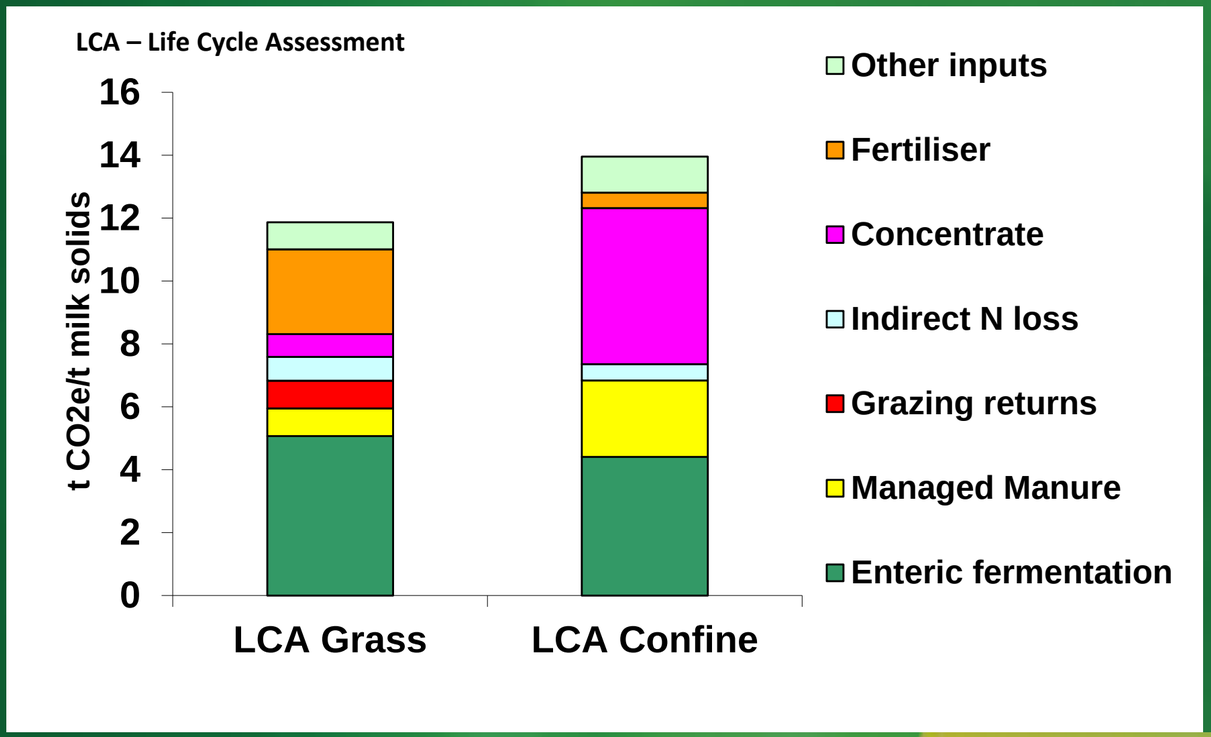

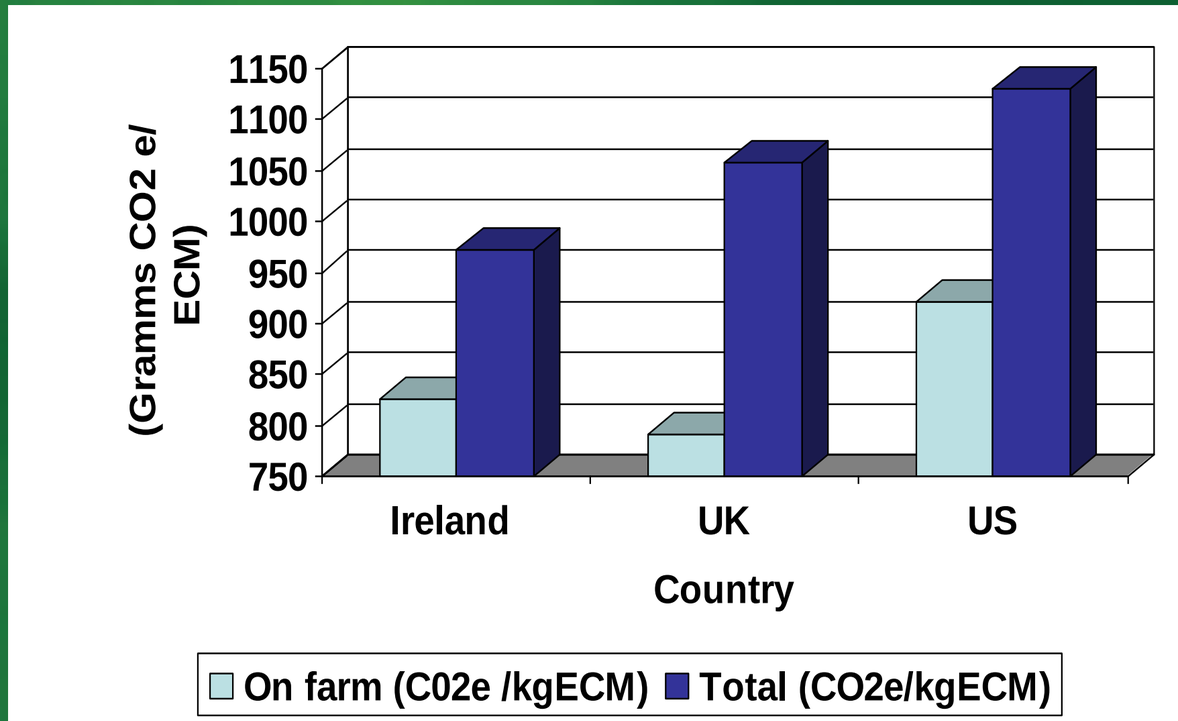

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Global Livestock Environmental Assessment Model (GLEAM)

- GLEAM is a modelling framework that simulates the interaction of activities and processes involved in livestock production and the environment.

- GLEAM uses life cycle assessment

- The model can operate at (sub) national, regional and global scale.

Aim

- to quantify production and use of natural resources in the livestock sector and to identify environmental impacts of livestock in order to contribute to the assessment of adaptation and mitigation scenarios to move towards a more sustainable livestock sector.

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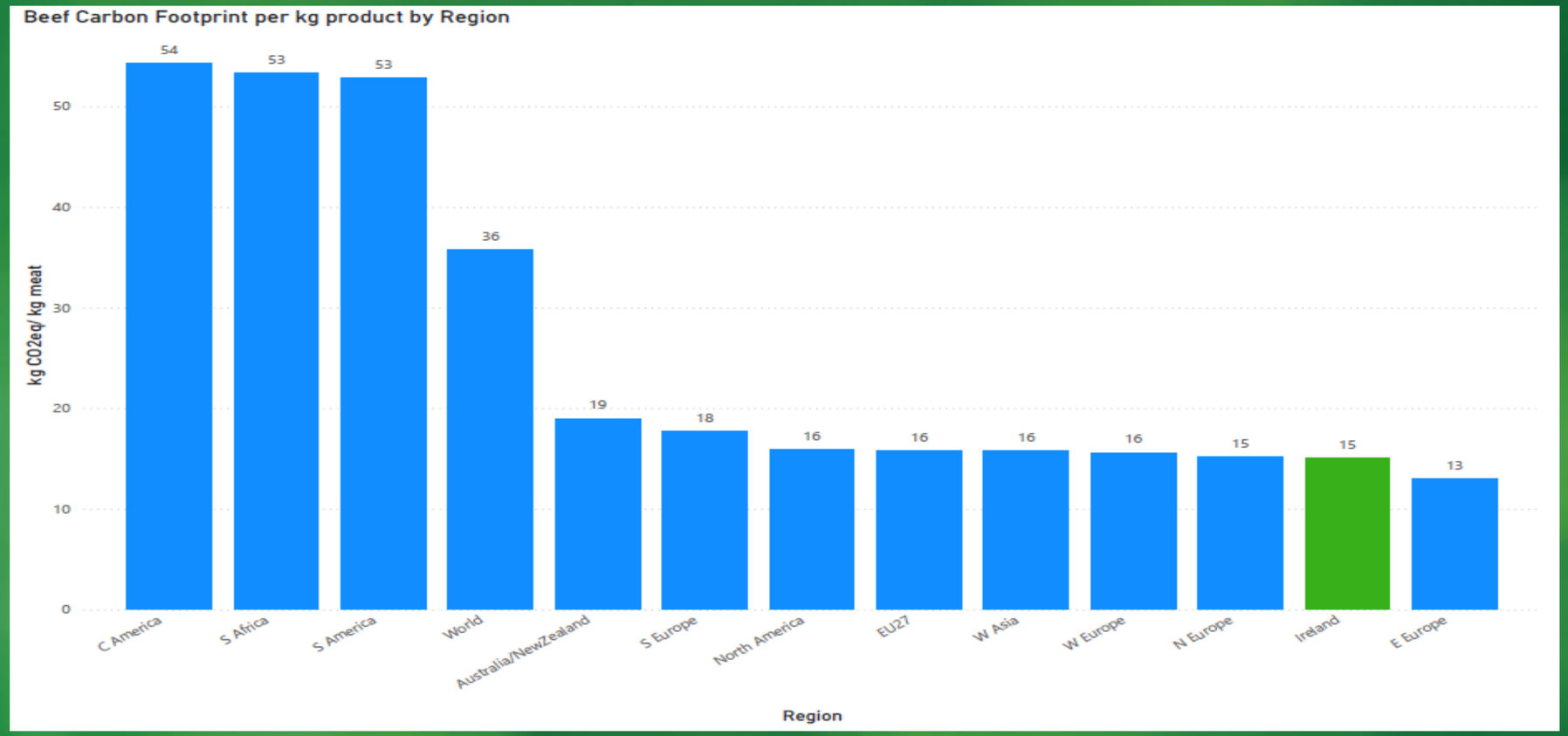
GLEAM Regional GHG comparisons



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Water Use

- The volume of fresh water used to produce a product, summed over the various steps of the production chain

Water Sources

Blue Water – volume of surface or groundwater

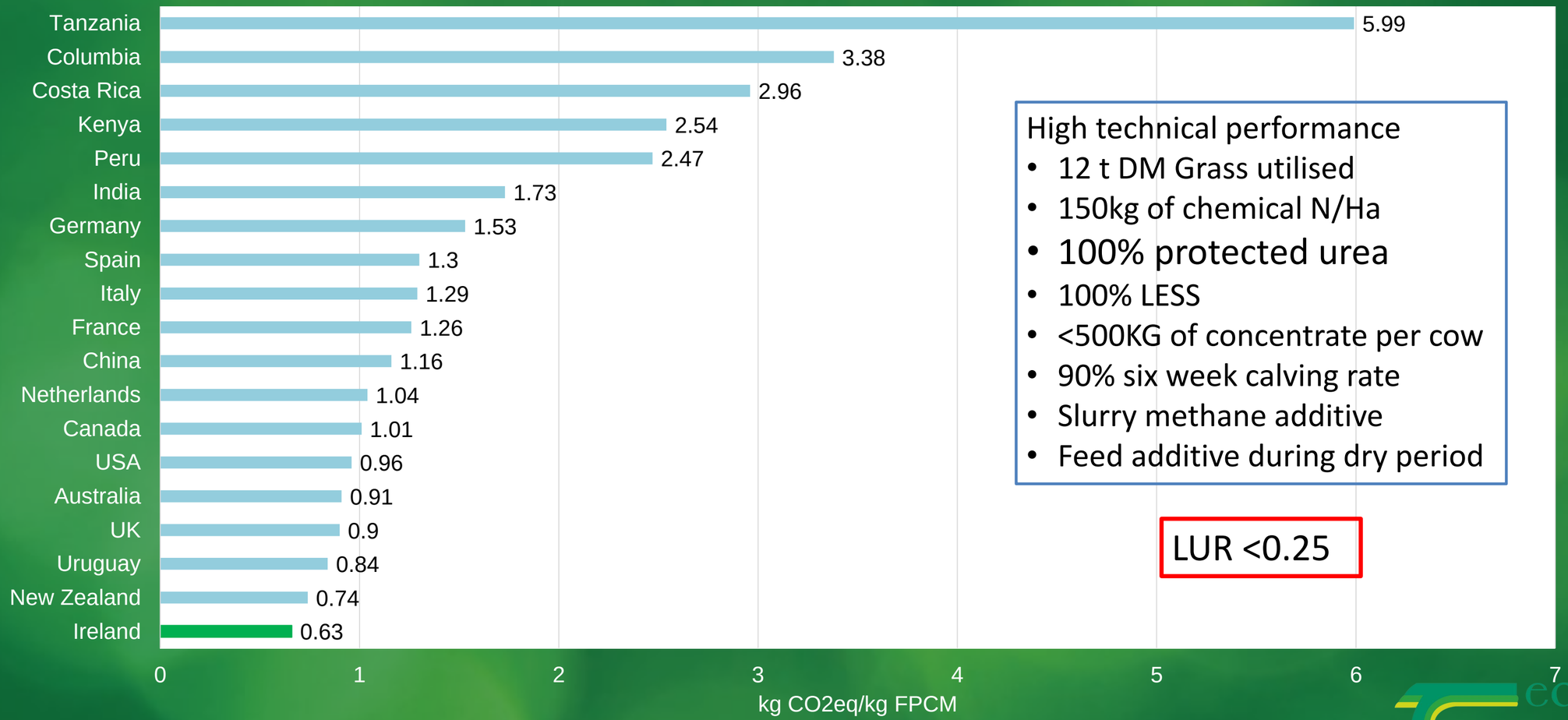
Green Water – volume of rainwater/soil moisture

Grey Water – volume of water needed to assimilate pollutants

Water Use

Murphy (2017) – Irish milk production	1 kg FPCM = 7.65 L of blue water
De Boer (2013) Dutch milk production	1 kg FPCM = 66L = Blue water only Grass and maize irrigated High concentrate use
Rotz (2024) US Milk production	1 kg FPCM = 110L = Blue water only Grass and maize irrigated High concentrate use
Murphy (2018) Irish Beef production	1kg of beef carcass = 169 l of water

Future Developments



High technical performance

- 12 t DM Grass utilised
- 150kg of chemical N/Ha
- 100% protected urea
- 100% LESS
- <500KG of concentrate per cow
- 90% six week calving rate
- Slurry methane additive
- Feed additive during dry period

LUR <0.25

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Need to look across overall diet

Food	Protein g/kg	Digestible Indispensable Amino Acid Score %
Barley	124.8	47.2
Wheat	126.1	40.2
Oats	131.5	56.7
Potatoes	25.7	47.2
Rice	71.3	79.0
Soya	364.9	99.6
Milk	34.8	115.9
Pork	139.1	113.9
Beef	174.8	111.0

Original Article

COACTION

Nutrient density of beverages in relation to climate impact

Annika Smedman[1,2]*, Helena Lindmark-Månsson[2,3], Adam Drewnowski[4] and Anna-Karin Modin Edman[2]

[1]Unit for Clinical Nutrition and Metabolism, Department of Public Health and Caring Sciences, Uppsala University, Uppsala, Sweden; [2]Department of Research and Development, Swedish Dairy Association, Sweden; [3]Department of Food Technology, Engineering and Nutrition, Lund University, Lund, Sweden; [4]Center for Public Health Nutrition and the Nutritional Sciences Program, School of Public Health, University of Washington, Seattle, WA, USA

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EaT Lancet Report

- Seek International and National commitment to shift to healthy diets
- Reorient agriculture priorities from producing high quantities of food to producing healthy food
- Sustainably intensify food production to increase high-quality output
- Strong and coordinated governance of land and oceans
- At least have food Losses and waste, in line with UN sustainable Development goals

EaTLancet missed an obvious focus point by suggesting that food should be sourced from places where there is a sustainable advantage to produce

Summary

- How sustainable are Irish Livestock Systems is a broad topic
- Three metrics evaluated here within the environmental category
- Overall sustainability assessment should include:
  - Social
  - Economic
  - Environmental
- Within the three metrics evaluated Irish pasture based systems perform well
  - Further improvements are possible and will be required to meet sector Targets
- The sustainability debate needs to be at a global as well as a national level to ensure that the appropriate answers are found

THANK YOU

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