



Global livestock sustainable transformation

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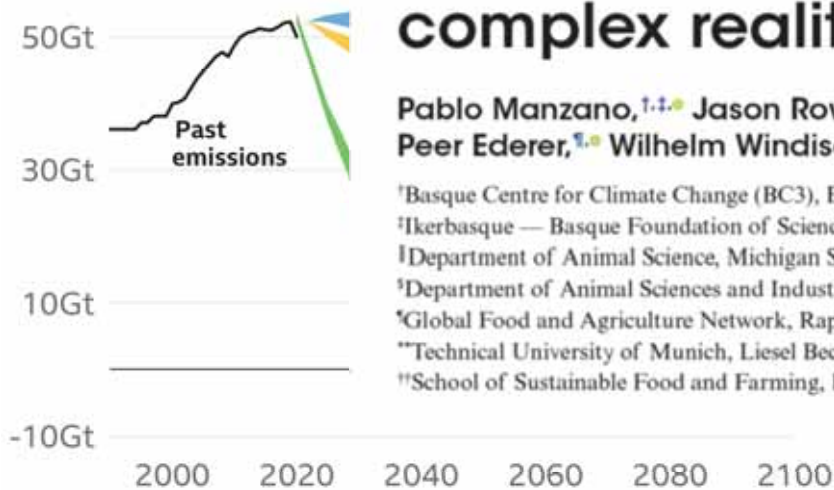
Climate Change Urgent Action is needed to reduce and off-set emissions

Featured Article

Challenges for the balanced attribution of livestock's environmental impacts: the art of conveying simple messages around complex realities

ant pillars

How close is the
Projected greenhouse
levels vary by actions



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ECONOMY (PROFIT)

ENVIRONMENT (PLANET)

Emissions measured in gigatonnes of carbon dioxide equivalent

Source: Climate Action Tracker, Dec 2023. Broad lines show possible range **BBC**

Approaches to Sustainable Agriculture Not Binary!

Sustainable Intensification

- **Goal:** Increase yield and efficiency (produce more with less) while reducing negative impacts like pollution and resource use, staying within ecological limits.
- **Methods:** Often involves precision agriculture, improved crop varieties, optimized fertilizer use, and integrated pest management to minimize inputs.
- **Focus:** Mitigation and efficiency within often larger systems, maintaining productivity without degrading resources.

Regenerative / Agroecology

- **Goal:** To produce food alongside nature, rebuilding soil organic matter, restore biodiversity, improve the water cycle, and enhance ecosystem health, creating a net positive impact.
- **Methods:** No-till/reduced-till, cover cropping, crop rotation, composting, integrated livestock, diverse plantings, and agroforestry.
- **Focus:** Restoration and renewal, addressing root causes of degradation and building natural capital for long-term resilience and profitability.

Trade offs – why we need both!

Criteria	Measure	SI	RF/AgroE
Animal/crop performance	Daily weight gain/yields	▼	▲
Carrying capacity	Animals per hectare	▼	▲
Nutritional quality	Nutrients per hectare (e.g. calories, protein, minerals)	▲	▼
Nutrient and soil loss to water	Losses per hectare per day	▲	▲
Soil Health	SOC	▲	▼
Greenhouse gas emissions	CO ₂ (or equivalent) per unit of animal product	▼	▲
Sulphonation	(S and P equivalents)		
Eutrophication			
Animal/crop health	Costs of preventive veterinary care and treatment of diseases	▲	▲
Animal Welfare	Negative and Positive assessment	▲	▼
		▲	▲
Biodiversity	Range of wildlife and plant species	▲	▼
Inputs (fertiliser, machinery, labour)	Purchase cost	▲	▼
Outputs	Sales value	▼	▲

• **Nutrition** – key asset
 • **Sustainable livestock** –
 • **How to assess?**

CROPS

• Current LCA approach of
 • g/kg product – not
 • Does NOT deal with
 • Non-environmental sustainability
 • parameters (social, economic)
 • Gross not net emissions
 • Disaggregating emissions (e.g. reporting)
 • Value of nutrition (nLCA)
 • Land use efficiency
 • Flow of nutrients – circularity/valorisation
 • Low-cost biomass (LCB)

CIRCULAR AGRO FOOD SYSTEM

LIVESTOCK

LAND



Food and Agriculture
 Organization of the



Decarbonising and Net Zero (2050 across all sectors)



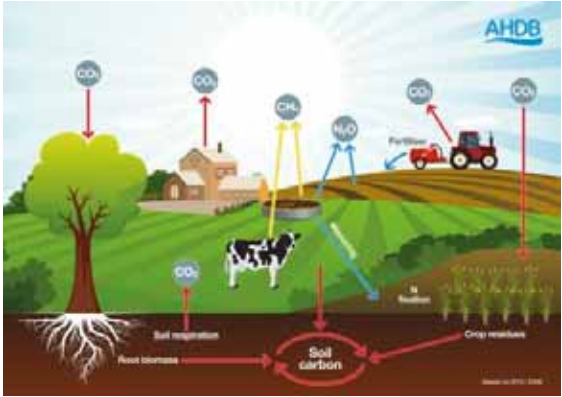
Energy and Transportation sectors are decarbonising

Removing Thermogenic Carbon (fossil fuels)



Nature exemplifies Net Zero

Carbon emissions equal carbon removal (sinks)



Agriculture Targeting Net Zero

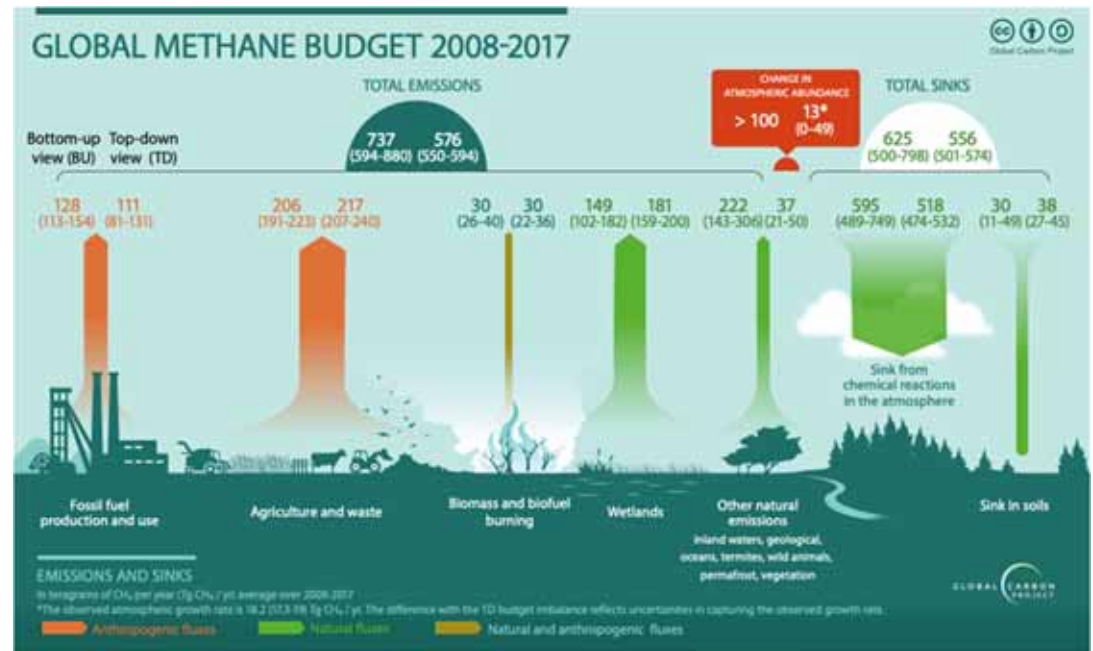
Removal of Thermogenic sources and balancing Biogenic emissions

CH₄ as a GHG GWP* vs GWP100

30% < total CH₄

	Annual CH ₄ emissions	Total equivalent CO ₂ emissions	
		Using GWP ₁₀₀	Using GWP*
WARMING	<p>1 tCH₄/y Rise by 35% 30 years</p>	987 tCO ₂ -e =33 tCO ₂ /y for 30y	982 tCO ₂ -we =33 tCO ₂ /y for 30y
STABLE	<p>Fall by 10%</p>	798 tCO ₂ -e	-10 tCO ₂ -we
COOLING	<p>Fall by 35%</p>	693 tCO ₂ -e	-562 tCO ₂ -we

Sources of CH₄ vs sinks (OH-)



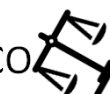
CO₂e – Carbon balance based assessment (snap shot of time)
 – National inventories

CO₂we – Carbon Impact on warming (long term impact) –
 Paris Climate change agreement (1.5°C)

Biogenic CH₄ (Natural + Agriculture)

Biogenic CH₄ + Thermogenic CH₄

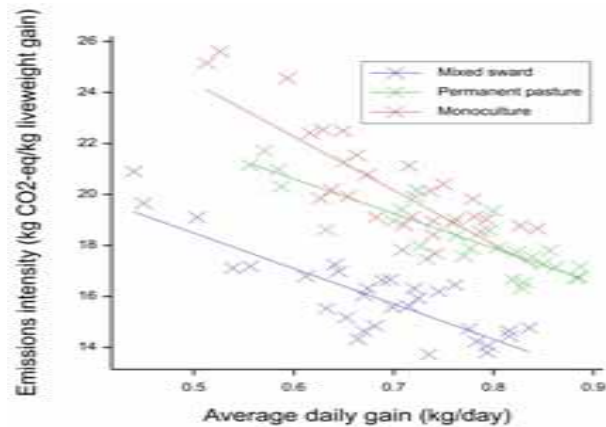
Biogenic CH₄ + Thermogenic CH₄ + CO₂



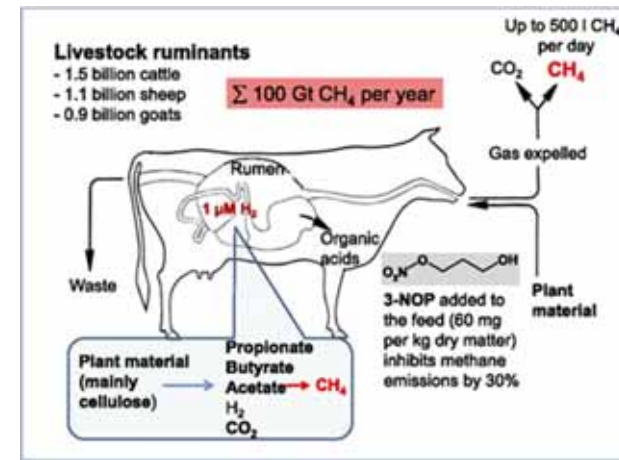
OH-

Approaches towards Net Zero (4 step approach)

1. Animal/Crop



2. Inputs



3. Land

Table 3. Carbon sequestration for different types of UK plantations.

Species	Yield Class (t/ha/yr)	Rate of storage ¹ (Mg C/ha/yr)	Equilibrium carbon storage ² (Mg C/ha)			
			Stems	Wood/products ³	Leaves	Soil
<i>P. abies</i> / Sitka spruce	24	1.6	60	43	34	80
	22	1.5	68	41	32	80
	20	1.4	76	40	30	82
	18	1.3	84	39	28	82
	16	1.2	92	38	26	82
	14	1.1	100	37	24	82
	12	1.0	108	36	22	82
	8	0.7	144	34	20	82
<i>P. sylvestris</i> / Scots pine	24	4.6	67	51	39	84
	22	4.2	75	49	37	84
	20	3.8	83	47	35	84
	18	3.4	91	45	33	84
	16	3.0	99	43	31	84
	14	2.6	107	41	29	84
	12	2.2	115	39	27	84
	8	1.4	151	37	25	84
Poplar	12	7.3	66	36	23	87
	8	1.8	111	19	6	85
Non-foliar	16	4.6	40	17	27	86
	12	3.0	52	24	19	75
<i>P. radiata</i>	16	7.7	53	26	19	82
	8	3.7	44	19	15	78
<i>P. radiata</i>	4	2.4	65	26	27	87
	4	1.8	88	29	30	88

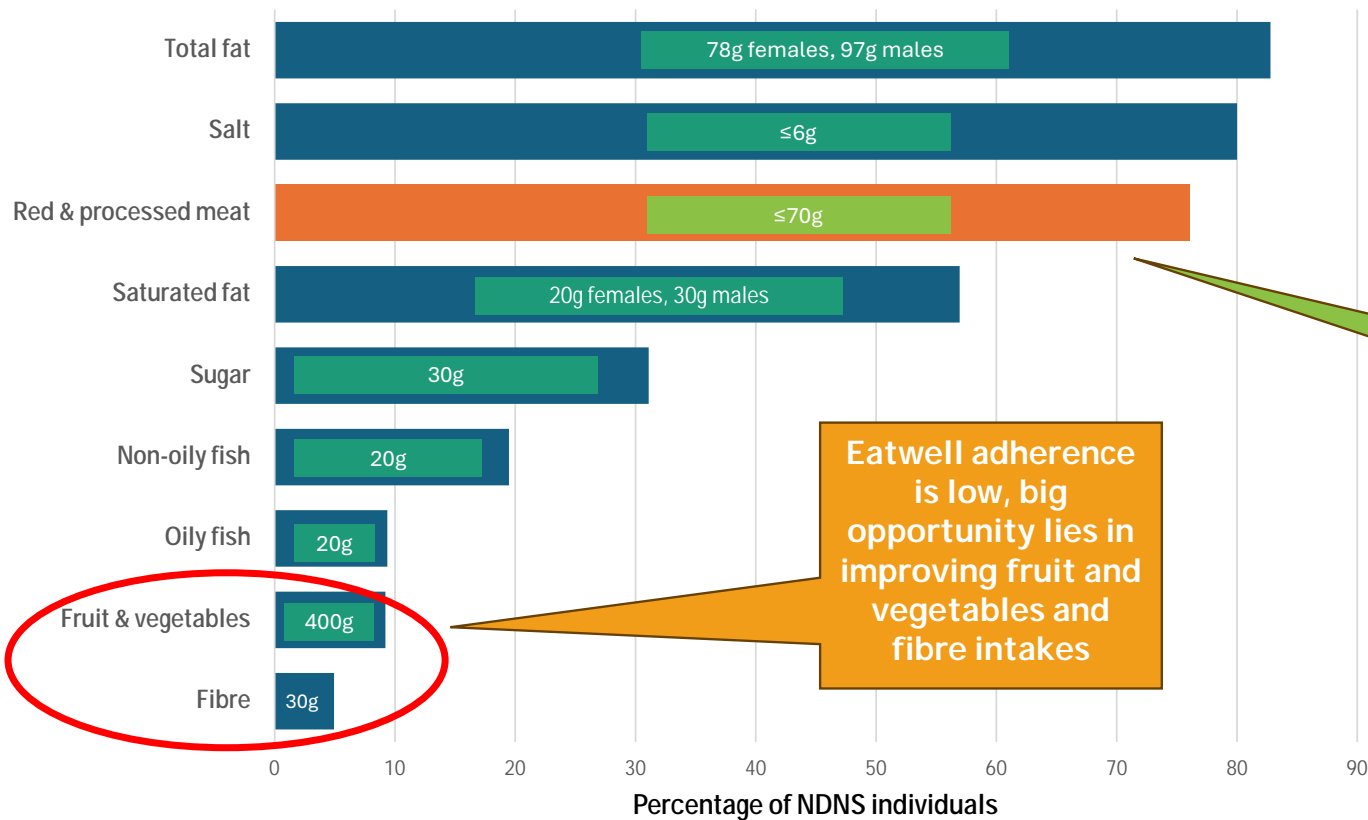
¹ Initial rate of increase in total carbon storage, calculated as total C storage at end of first rotation divided by rotation length. ² Total average storage of carbon at equilibrium. ³ In the case of forest lands, conversion to the wood product pool from stem biomass at a calculated average 5-year lifespan. ⁴ 2.5m initial spacing. ⁵ 1.8m initial spacing.

4. Energy and Buildings



According to the NDNS how well do we follow the Eatwell guide?

Adherence to the EWG daily recommendations



Red meat recommendations is to Eat 70g (cooked weight) day 500g a week of red or processed meat, but limit processed ([Department of Health and Social Care](#)).

"If consuming > 90g a day to decrease to 70g per day to lower health risks."

With 76% of individuals (4 yrs+) eating the recommended <70g red and processed meat, it shows high adherence to the EWG and unwarranted demonisation

Eatwell adherence is low, big opportunity lies in improving fruit and vegetables and fibre intakes

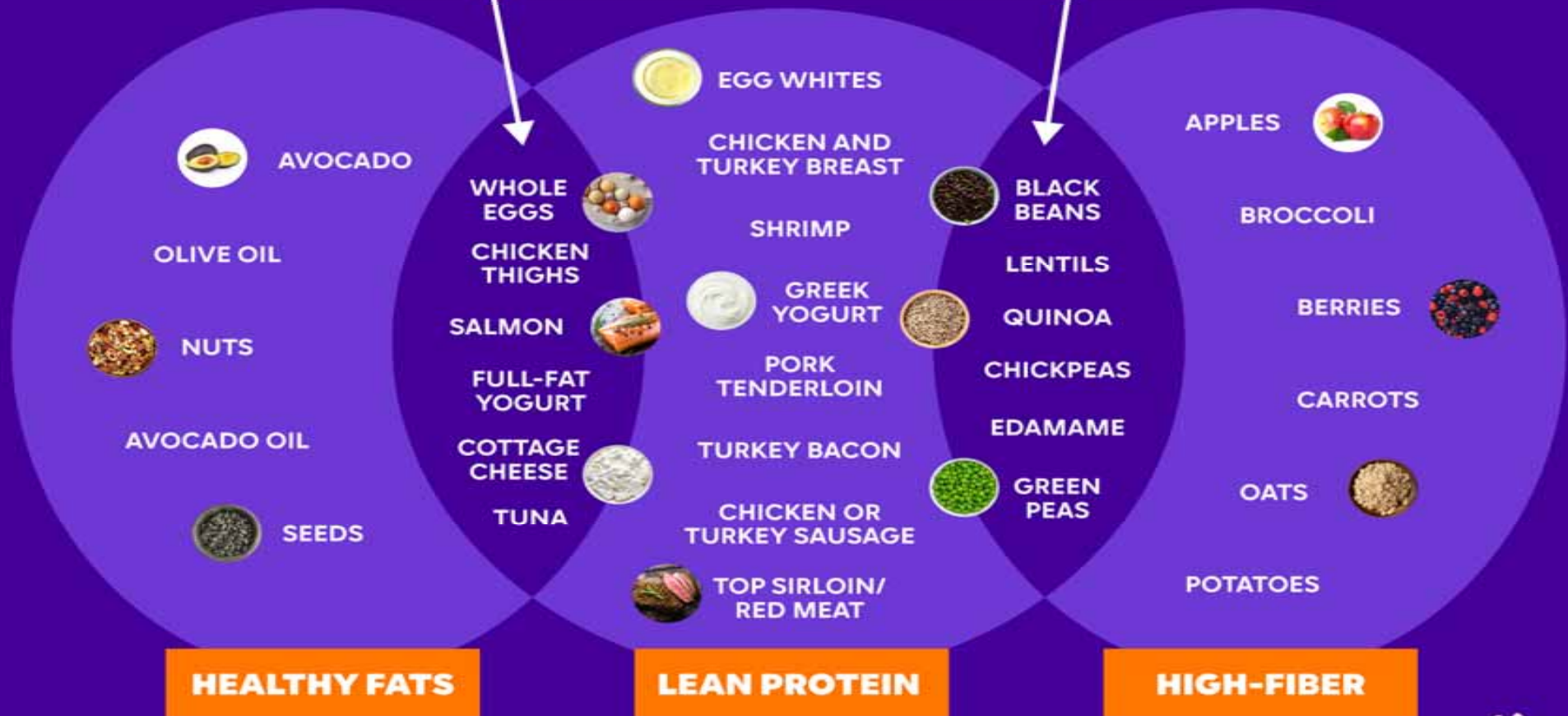
Rather than a one-size-fits-all 'eat less meat' message, guidance should be grounded in the Eatwell Guide, with a clear focus on closing gaps in targets for fruit & vegetables and fibre intake.

** The recommendations within the bars differ by age, but those indicated are for adults aged 19-64 yrs

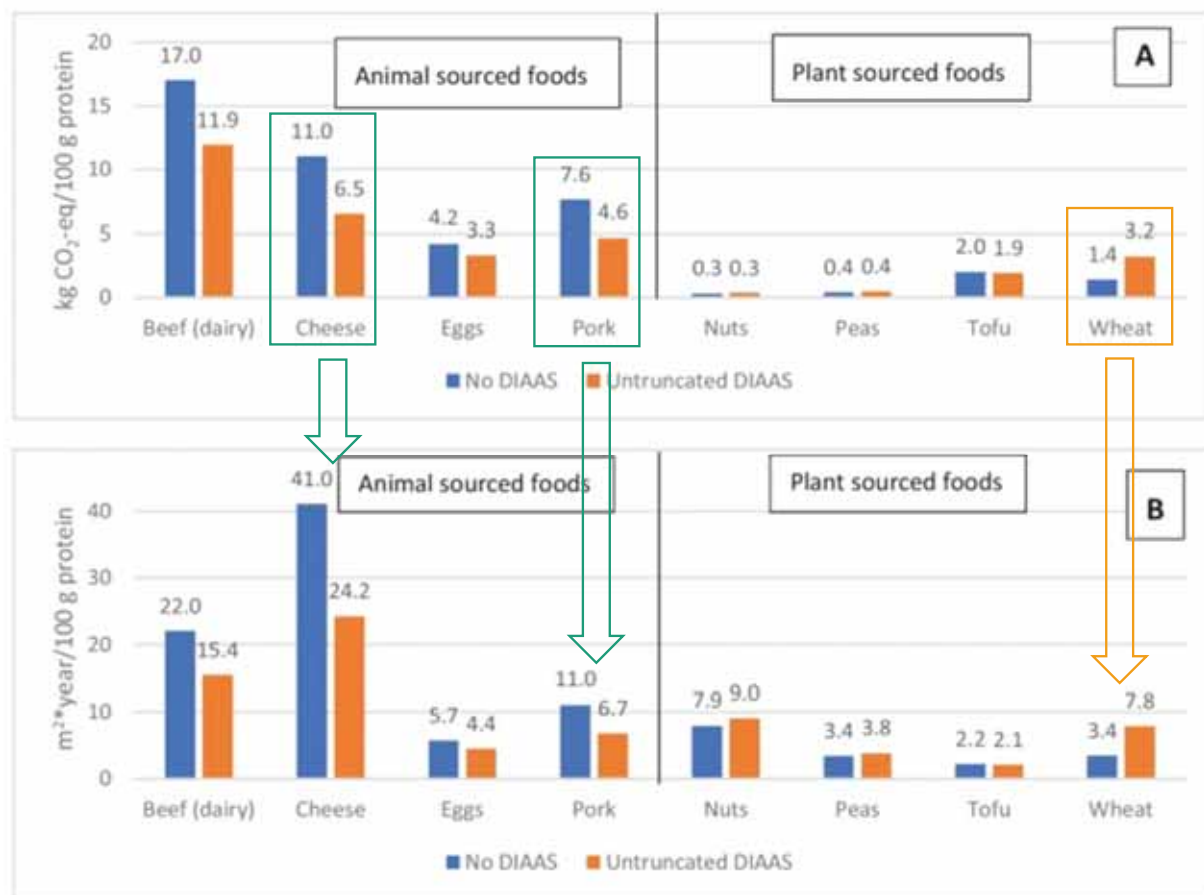
We need to drive behaviour change & adherence to the Eatwell Guide

GLP-1 FOODS TO MEET **YOUR NUTRITION NEEDS**

When building a GLP-1 nutrition plan, look for foods that double-dip!



Simple functional unit approaches are flawed even in nLCA



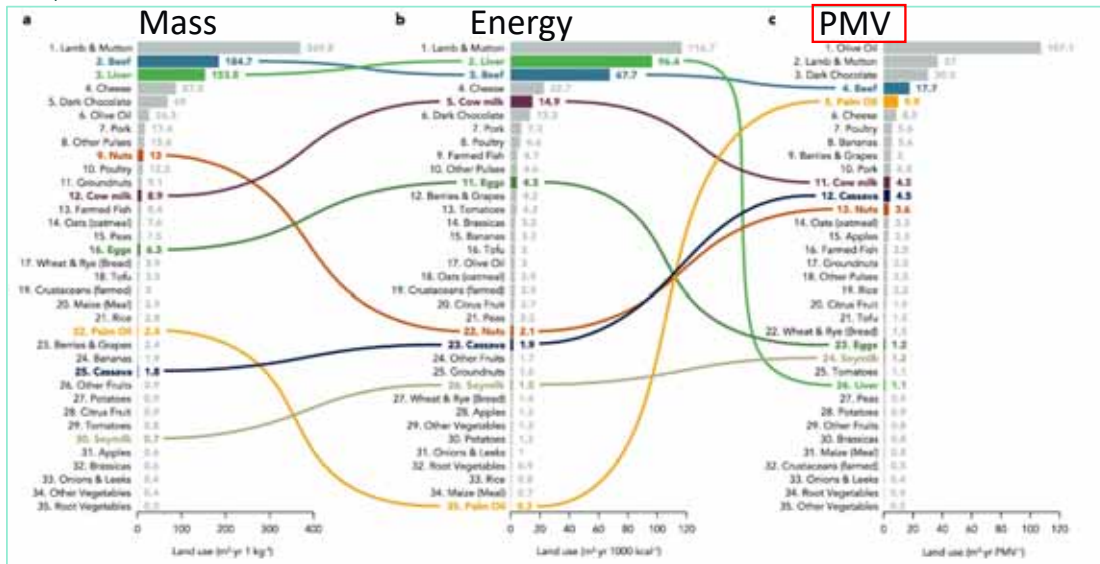
For Example:

Replacing weight with protein for a simple nLCA does not take account the quality of the protein.

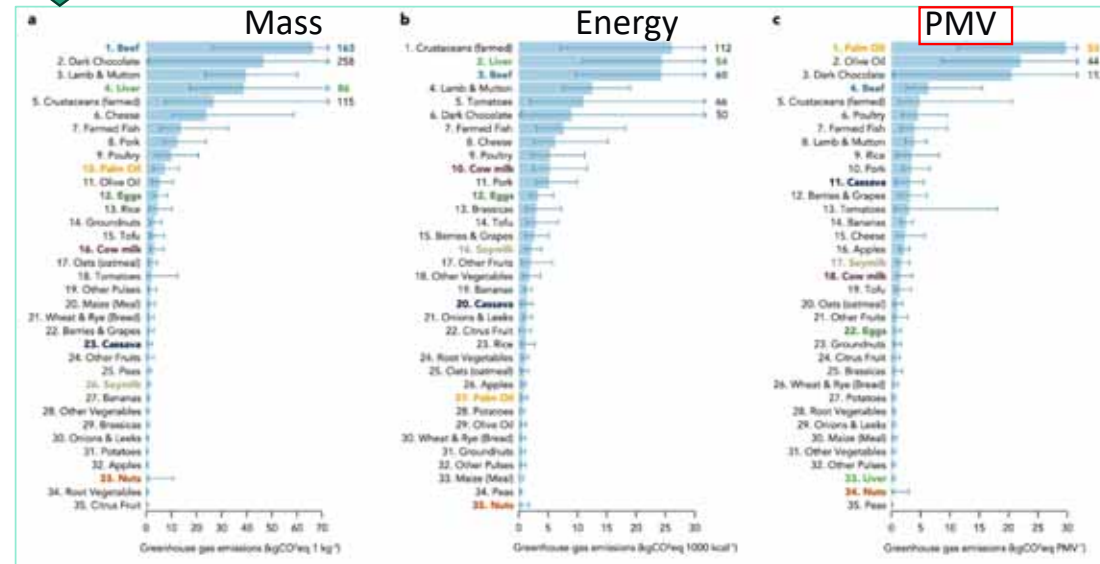
The problem is the **digestibility** of certain **amino acids** combined with **anti-nutritional factors** (ANFs; e.g., phytic acid abundant green veg)

nLCA done properly: testing assumptions

Land use

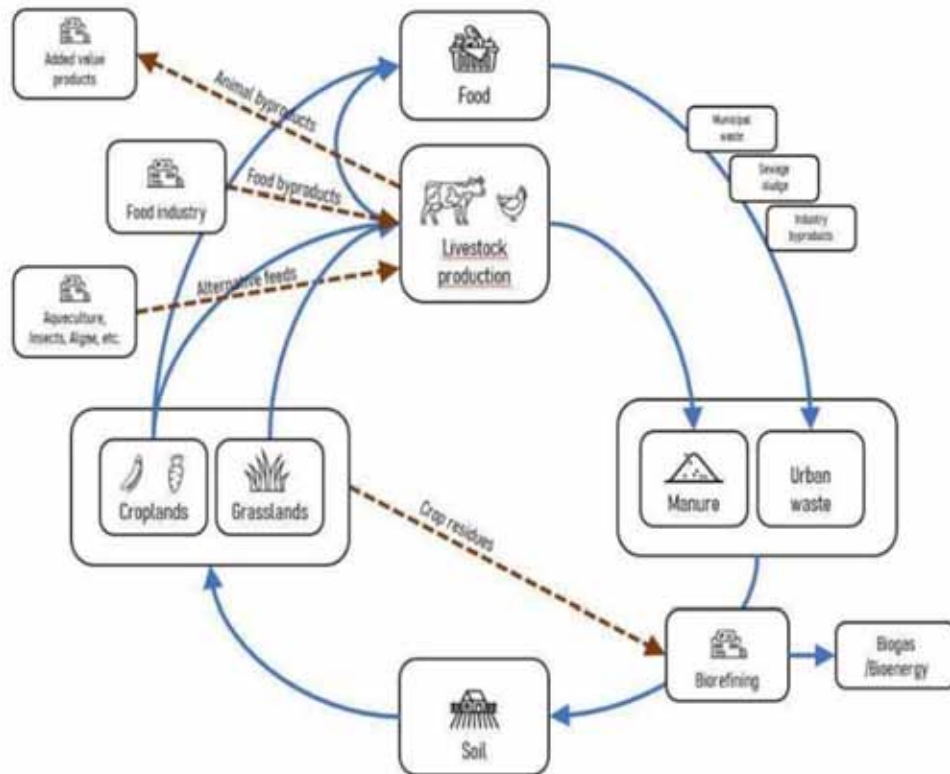


Global warming potential



- Most nutritional profiling used in nLCA studies has relied on secondary data
- Whilst unavoidable largely, nutrients may be cherry-picked to favour one product over another
- The Priority Micronutrient Value – a scoring index which assesses a food for the most globally deficient nutrients
- Only primary data from real-world producers can help scientists unveil the true sustainability of foods

Conclusions and Recommendations



- Metric assessment of agricultural systems cannot be a single simplified approach
- Aspects of nLCA, consequential and attributional are needed (with defined purpose)
- Wider consideration of sustainability are required (not just carbon)
- Food system modelling needs to include circularity (value pyramid)
- Total food system outcomes need to be better articulated than single metric assessments
- Changing demands for food system with the rise of GLP-1



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Food and Farming**

Together we aim to:

“ Educate, Inspire and Empower
current and future farmers to achieve
net zero within a sustainable farming
and food system. ”

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