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Centre for Food Policy
Shaping an effective food system

Plant food waste valorisation: Part of the wider food systems policy solution?

Plant Food Waste Valorisation – Opportunities and Challenges
Hybrid Event hosted at the
Newlyn Building, University of Leeds, UK
11th-12th September 2023
13:35-14:00

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Today is a work in progress and part of wider research on FLW policy solutions.

- All input warmly received.

(Feedback, questions, your thoughts.)

- Who should I be talking to?

Dr Christian Reynolds
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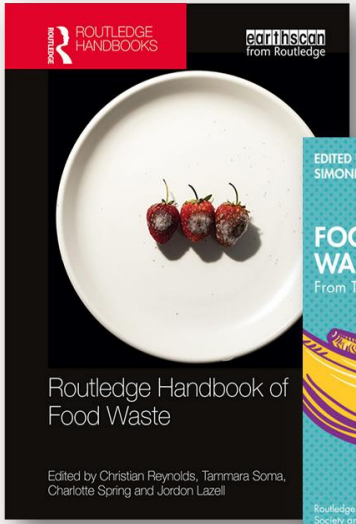
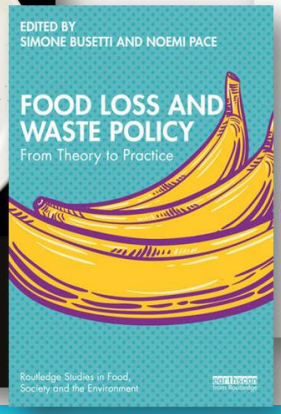
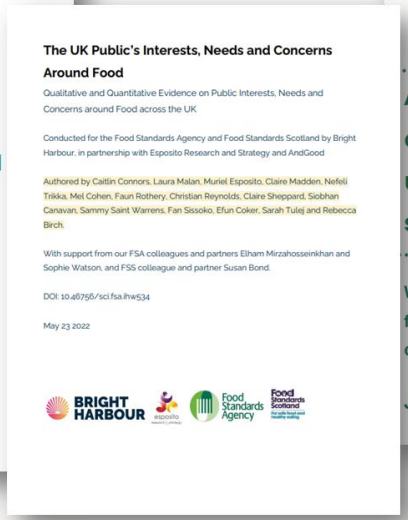
Who am I?

Reader at the Centre for Food Policy.

- Focus on sustainable food systems and food waste.
- Supporting the FSA/Defra through research projects. Scottish food systems research (ZW Scotland). Household Simulation modelling (WRAP). Local food strategy development.
- Nutrition Society Food Systems theme lead. IFST Sustainability working group.
- Recent publications





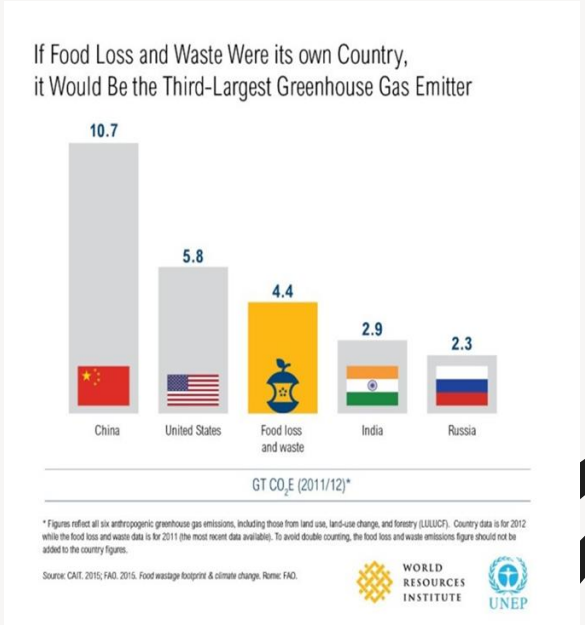


THE NUTRITION SOCIETY
Advancing Nutritional Science

Institute of Food Science + Technology
ifst

To me, food loss and waste is a climate issue.

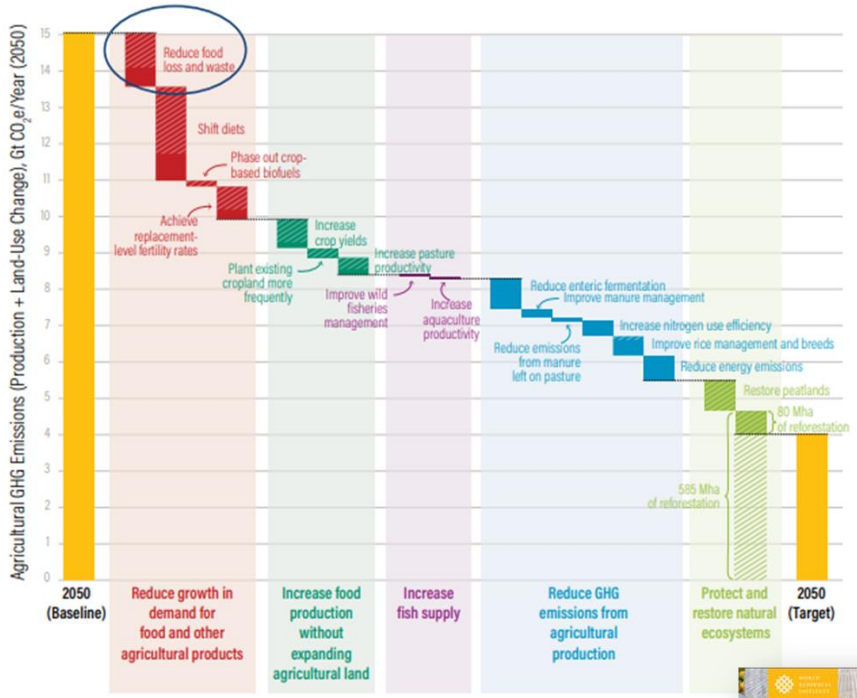
- Responses to FLW need to think about climate change



FLW reduction is one of the biggest actions we can take to reduce global GHGE

- The two biggest reductions we can make to agricultural GHGE to achieve a **2° C** warming target (4 Gt/year) or **1.5° C** warming target (0 Gt/year) are through:
- 1.Shifting to sustainable diets
- 2.**Reducing Food Loss and Waste**

Figure I.2 | Reducing Food Loss and Waste Can Play an Important Role in Eliminating the Projected 15 Gt of Greenhouse Gas Emissions from Agriculture and Land-Use in 2050 (CO_2 equivalent)



Note: Solid areas represent agricultural production emissions. Hatched areas represent emissions from land-use change.
Source: Searchinger et al. (2018).

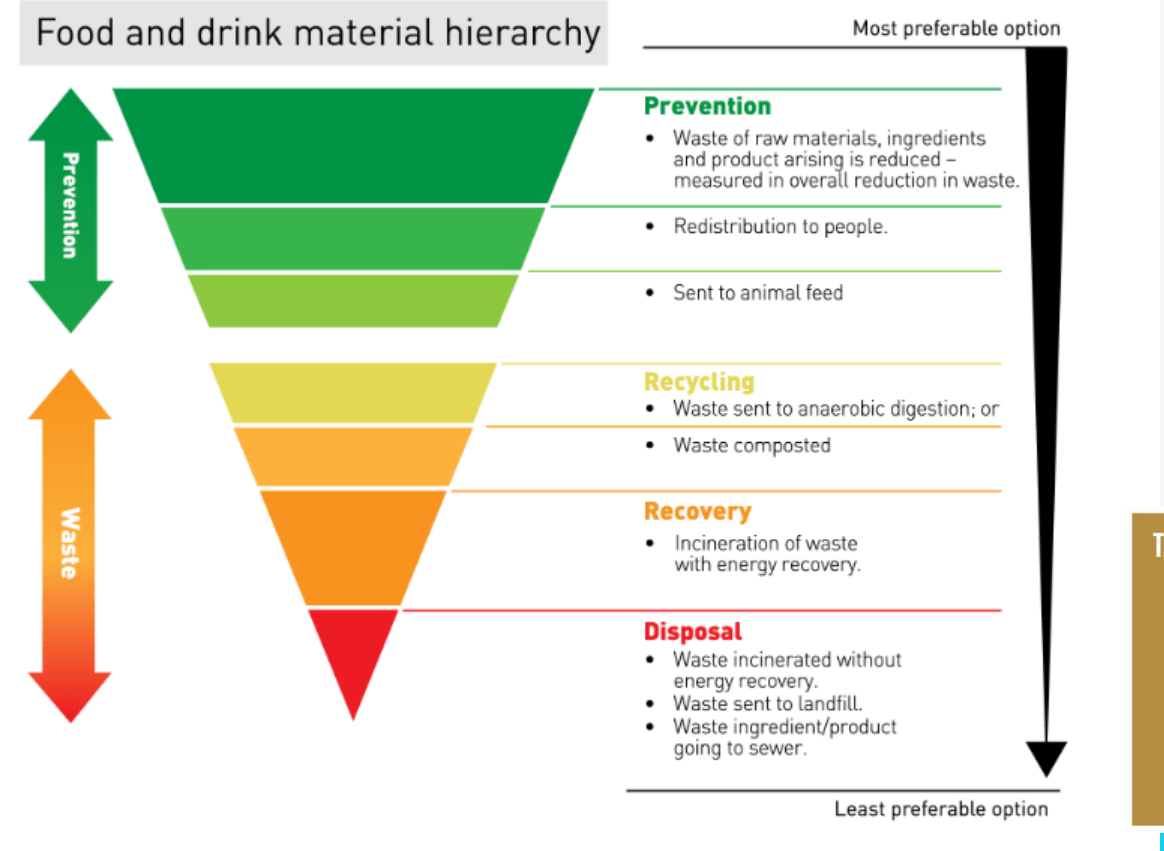
Source: WRI, REDUCING FOOD LOSS AND WASTE Setting a Global Action Agenda https://wriorg.s3.amazonaws.com/s3fs-public/reducing-food-loss-waste-global-action-agenda_1.pdf

Is plant food waste valorisation part of this wider climate change narrative?

Today I want to ask

- How is valorisation currently regarded in UK FLW policy?
- How can valorisation become regarded as part of a wider food systems solution?

Food loss and waste solutions are within a hierarchy



All interventions and policy solutions prevent, divert (recover or recycle), or reduce food loss and waste.

We need a combination of solutions to achieve Sustainable Development Goal 12.3.

Valorisation has "competition" from other solutions

Table 1 Summary of food surplus, waste and related material arisings in the UK, and their respective treatment and disposal routes
(See notes on subsequent page for further detail)

		Household	HaFS*	Retail & Wholesale	Manufac-turing	Farm	Total[1]
	Total food waste	**6.6 Mt**	**1.1 Mt**	**0.3 Mt[8]**	**1.5 Mt**	[0.9 – 3.5 Mt]	**>9.5 Mt**
Preventing food becoming waste	Food (excl. inedible parts	4.5 Mt (£13.8 bn)	0.8 Mt (£3.2 bn)	0.3 Mt (£0.9 bn)	0.8 Mt (£1.1 bn)	nk	> 6.4 Mt (>£19 bn)
	Redistribution & animal feed	0.3 Mt [n/a humans 0.3 Mt pets/ other animals	>0.005 Mt [>4kt to people [n/a to animals]	0.07 Mt [38kt to people] [27kt to animals]	0.67 Mt [35kt to people] [635kt to animals]	nk[9] [7kt to people]	> 1.0 Mt
Waste management	Recycling (AD/composting)	1.3 Mt[2]	0.04 Mt	0.15 Mt[3]	0.44 Mt[4]	nk	> 1.9 Mt
	Recovery (thermal, landspreading)	3.0 Mt[5]	0.84 Mt[6]	0.15 Mt[3]	1.1 Mt[4]	nk	> 5.1 Mt
	Disposal (sewer, landfill)	2.3 Mt[5] [1.5 Mt sewer 0.8 Mt landfill]	0.21 Mt[6] [nk sewer 0.20 Mt landfill]	nk[3,10]	0.002 Mt[4] [nk sewer 0.002 Mt landfill]	nk	> 2.5 Mt
	In addition:						
	Rendering of animal by-products				0.6 Mt	nk	0.6 Mt
	Other food by-products[7]				2.2 Mt		2.2 Mt

* HaFS = hospitality and food service; nk = not known; n/a = not applicable

Other FLW solutions are embedded in the UK.

- Landfill (decline)
- Redistribution and AD (ascendent)


wrap
Food surplus and waste in the UK – key facts
Updated December 2022

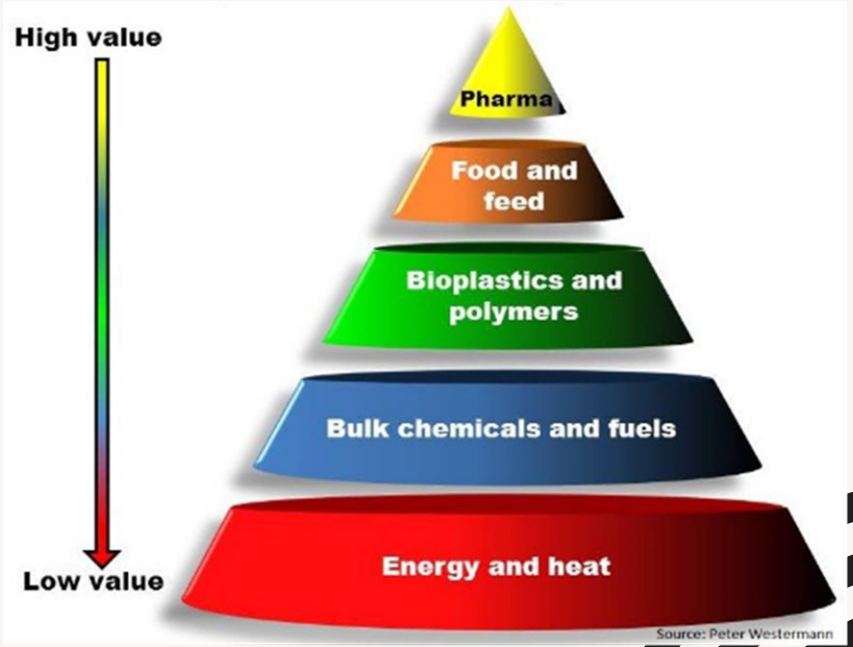
https://wrap.org.uk/sites/default/files/2023-01/Food%20Surplus%20and%20Waste%20in%20the%20UK%20Key%20Facts%20December%202022.pdf

Valorisation has positive system impacts

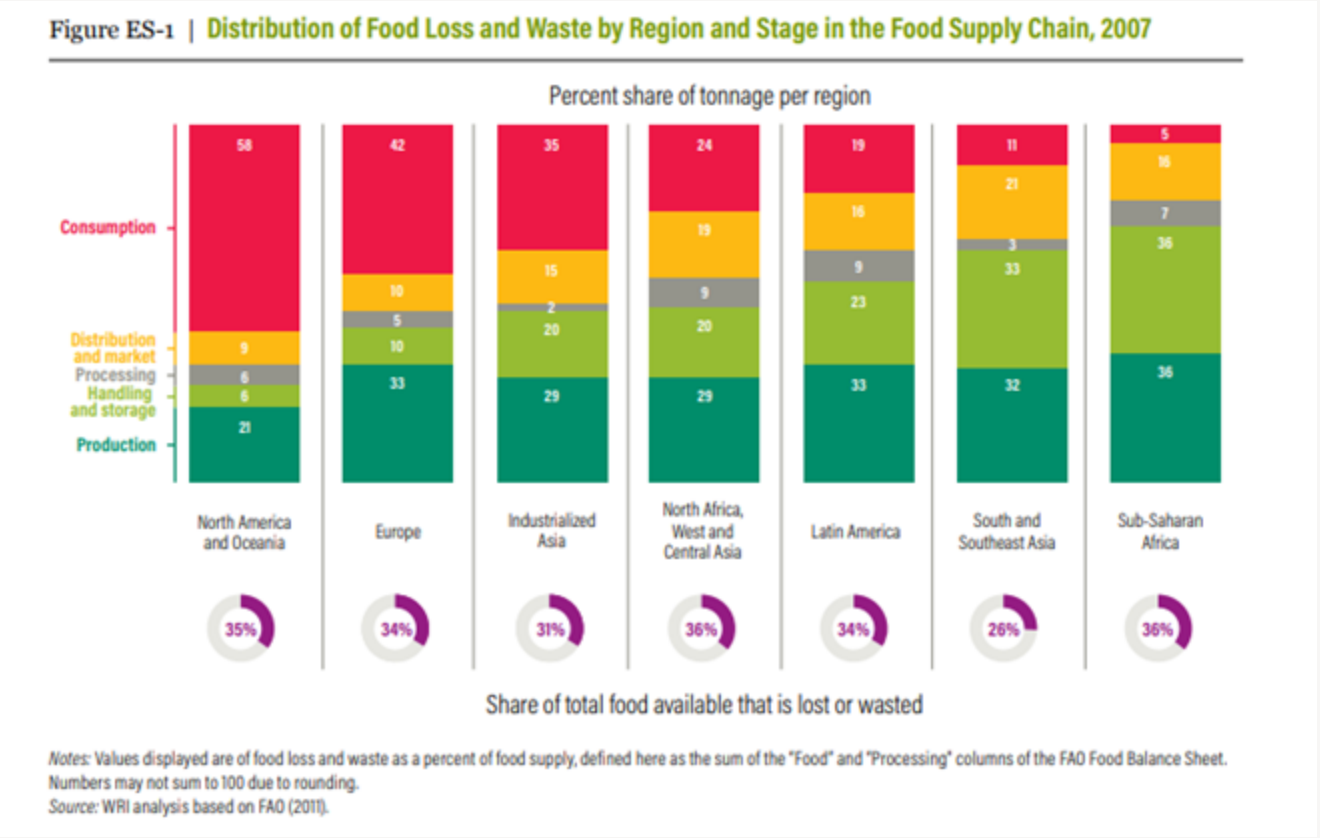
- but is currently "too small" for the previous table. Why?

- Policy Focus is on **avoidable** waste - what we should be doing with the unavoidable 40% of food waste ?
- Policy focus is on **Energy** and **Heat**. Less focus on converting food waste materials into higher value products including:
- Chemicals, materials, and fuels that could displace fossil derived products
- Higher value food, pet food and animal feed products

Valorisation is many solutions and so has many places in the net-zero and FLW policy landscape.



FLW Spread across the globe and supply chain



Only a certain % will ever be suitable for valorisaiton.

This is due to the challenges of mixed vs separate waste streams

But there are many types of valorisation...

Source: WRI, REDUCING FOOD LOSS AND WASTE Setting a Global Action Agenda https://wriorg.s3.amazonaws.com/s3fs-public/reducing-food-loss-waste-global-action-agenda_1.pdf

Action needed at different points in the supply chain, for diff. products/countries…

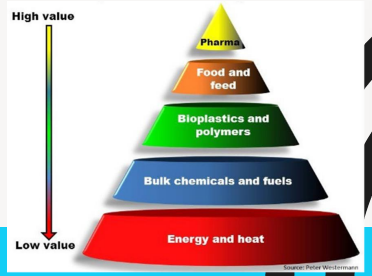
FIGURE 14: Rates of loss and waste at each stage of the supply chain — UK, Rwanda, Vietnam

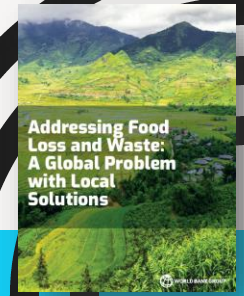
UNITED KINGDOM	PRODUCTION	TRANSPORT, HANDLING, AND STORAGE	PROCESSING	WHOLESALE AND RETAIL	CONSUMERS
CHICKEN 58% Total Loss Rate	4.3%	1%	22.5%	7.6%	38%
FRUIT 55% Total Loss Rate	14.3%	4.5%	5.3%	8.4%	37%
BREAD 44% Total Loss Rate	2%	1.4%	5%	14%	29%
MILK 22% Total Loss Rate	2.9%	4.2%	1%	6%	9.6%

Only a certain % will ever be suitable for valorisaiton.

This is due to the challenges of mixed vs separate waste streams

But there are many types of valorisation...





https://openknowledge.worldbank.org/handle/10986/34521

Many types of valorisation solution

	Waste reduction potential	Savings per tonne of waste reduced		
		Climate	Water	Costs
Products, processing and food waste solutions				
Animal feed from insects	■	●	●	●
Processed food waste to chicken feed	■	●	●	●
Dairy waste to animal feed	■	●	●	●
Processing technology to improve shelf life	■	◆	■	◆
Standardised date labelling	◆	■	■	■
Better information for longer shelf life	◆	■	■	■
Fibre products from food waste	◆	●	◆	●
New food products from processing waste	●	●	●	●
Nutrient extraction from processing waste	●	●	●	●
Packaging size and design adjustments	●	■	■	■
Relax produce specifications at retail	●	●	●	◆
Efficient business operations and supply chain solutions				
Waste tracking and analytics	■	◆	■	■
Improved cold chain management	■	◆	◆	■
Whole crop purchase contracts	◆	●	●	●
Centralised and 'dark' commercial kitchens	◆	◆	■	■
Manufacturing line optimisation	●	●	●	●

	Waste reduction potential	Savings per tonne of waste reduced		
		Climate	Water	Costs
Education and behaviour change solutions				
Household behaviour change programs	■	■	■	■
Hospitality and food service solutions	◆	■	■	■
Waste audits at hospitality and institutions	◆	■	■	■
Food rescue, recovery and redistribution solutions				
Business-to-consumer platforms	■	◆	■	■
Increase food rescue across supply chain	■	◆	■	◆
Secondary resellers	◆	◆	●	◆
Legislating food rescue at retail	◆	■	●	■
Sustainable catering guidelines and procurement	●	■	■	■
Online platform for surplus products	●	◆	●	◆

■ High impact ◆ Medium impact ● Low impact

The Path to Half (Victoria, Au) 25 solutions

ReFED (USA) 73 solutions

Australian food waste strategy 41 solutions

Recommendations for Action in Food Waste Prevention (EU Platform on Food Losses and Food Waste) 47 solutions

https://assets.sustainability.vic.gov.au/asset-download/Report-The-Path-to-Half.pdf

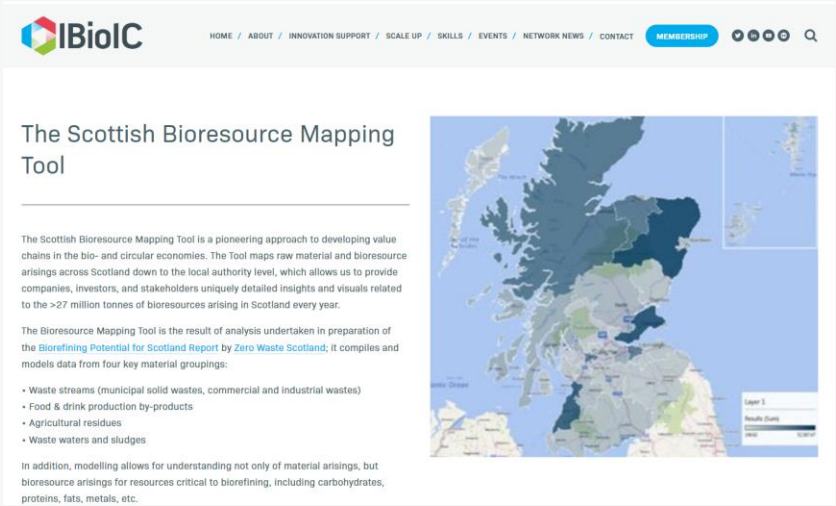
Some possible issues with valorisation as a "new" FLW solution

- Internal competition (Animal Feed and Biofule vs other higher value valorisation types)
- Providers work in specific areas, and may lack the ability to scale.
- Valorised products may be more costly than conventional products, which can limit the customer base. (Until a market shock – Ukraine war?, Climate change?)
- End products vary greatly by the feedstocks used, so the economics and diversion potential vary depending on location (England vs Scotland vs Wales vs NI)
- Businesses selling their feedstock (waste) may not have the capacity to store product for extended periods of time.

Do we know the UK's current or maximum capacity?

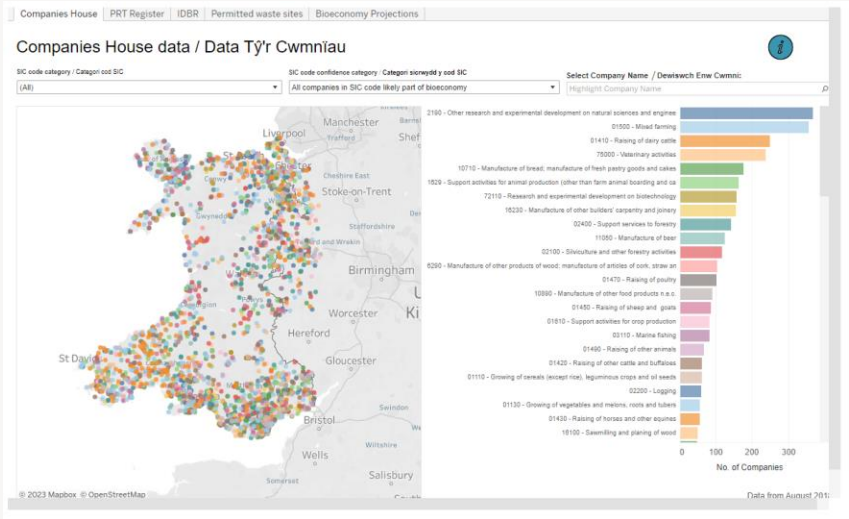
- Scotland

https://www.ibioic.com/scottish-bioresource-mapping-tool



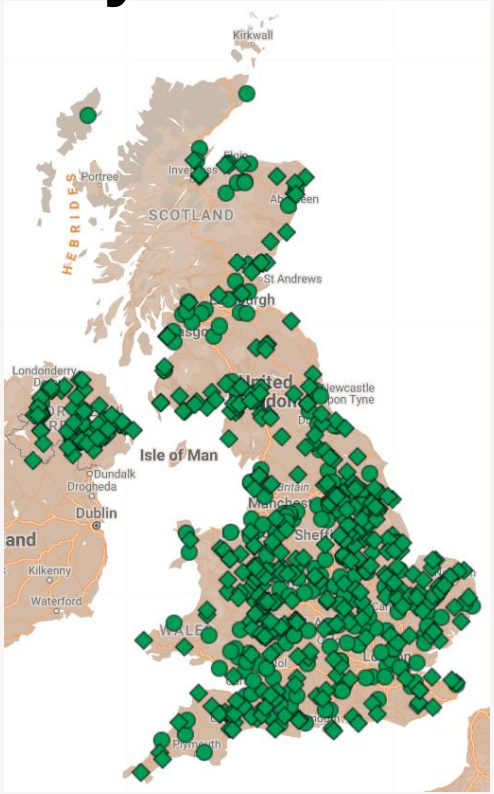
- ⑩ Wales

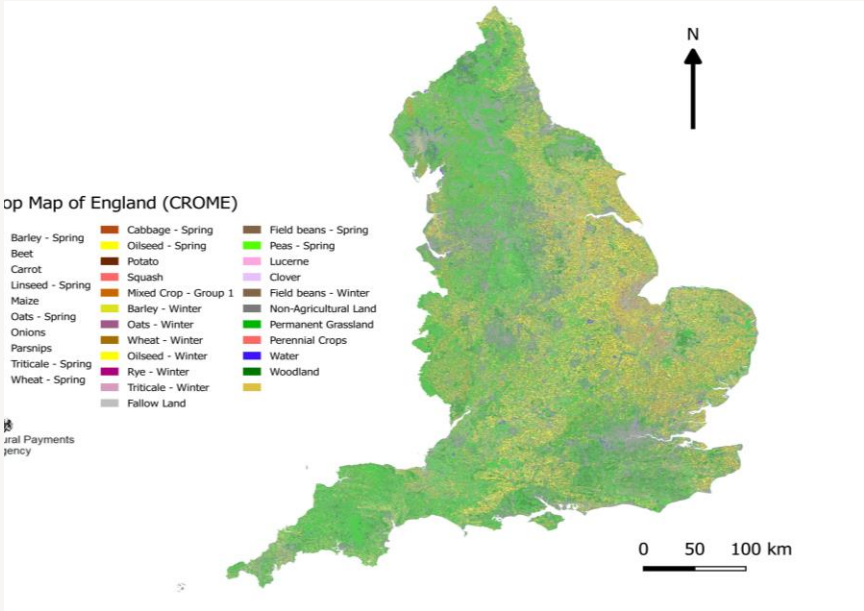
https://w rapcymru.org.uk/resources/tool/valorisation-tools



Geographic tension: AD is where the feedstocks are. AD has already been invested in.

All operational anaerobic digestion plants in the UK (excluding water treatment facilities). April 2023





Crop Map of England (CROME) 2020

https://www.biogas-info.co.uk/resources/biogas-map/

https://www.data.gov.uk/dataset/be5d88c9-acfb-4052-bf6b-ee9a416cfe60/crop-map-of-england-crome-2020

In 2017, valorisation was on the UK agenda

"A key area of focus for WRAP's Courtauld Commitment 2025 is to identify the best ways to recover products from food waste with the remaining wastes still being recycled in the most appropriate way." WRAP **2017**
https://wrap.org.uk/resources/case-study/getting-more-value-waste-and-surplus-food-drink

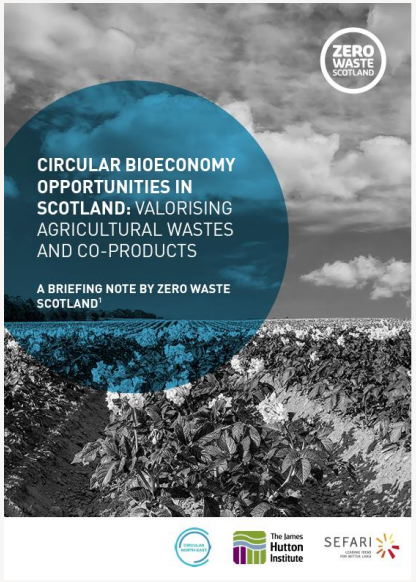
But in 2023 valorisation is somewhat absent from UK FLW documents (Courtauld) etc ...

but not from Wales and Scotland, or other countries...

Scotland

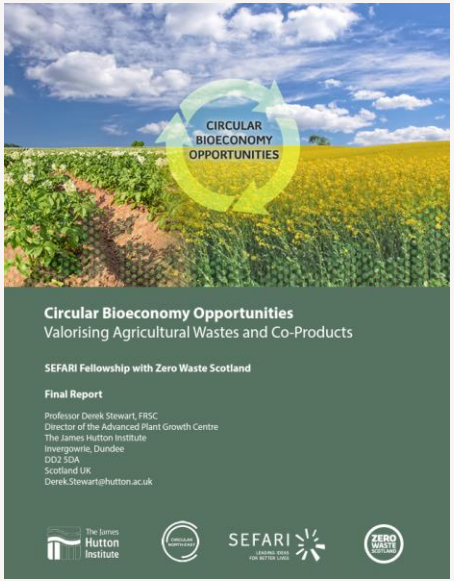
27 Mt. of bioarisings, 16.7Mt. agricultural-related bioarisings .

Several common valorisation technologies identified.



https://www.zerowastescotland.org.uk/resources/maximising-value-agricultural-waste

https://www.sdi.co.uk/media/tweijlm2/biofinery-roadmap-for-scotland-2019.pdf

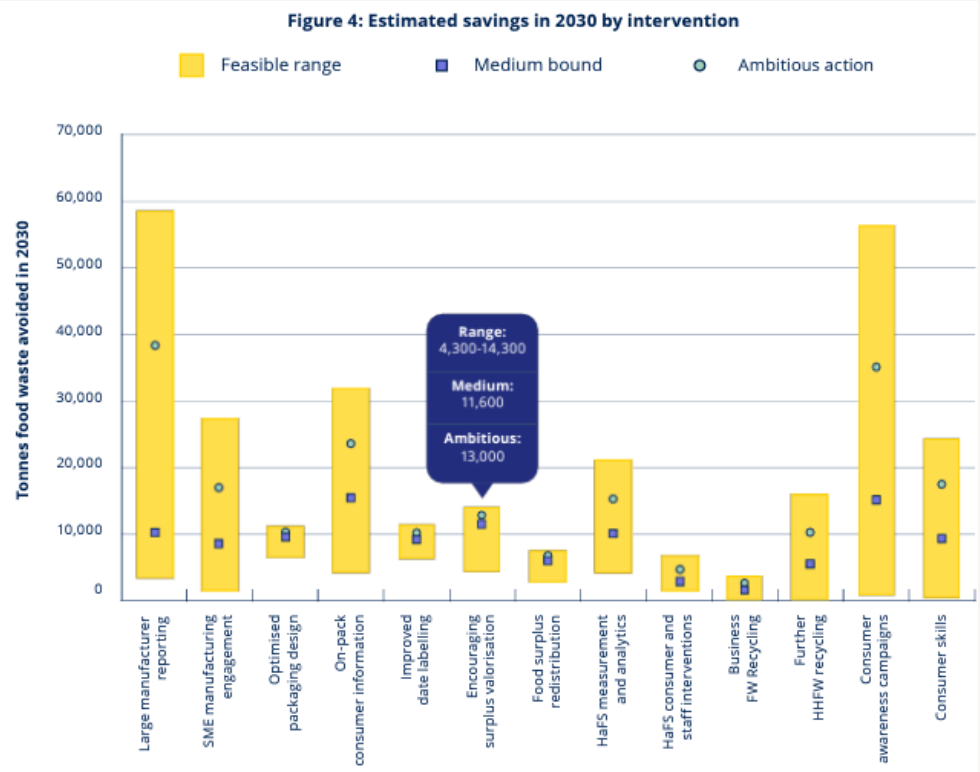


https://sefari.scot/sites/default/files/documents/SEFARI%20Gateway_Fellowship_%20Agrbyproduct_FINAL.pdf

https://www.zerowastescotland.org.uk/resources/report-biorefining-potential-scotland

Welsh FW Routemap: *3rd largest reduction solution*

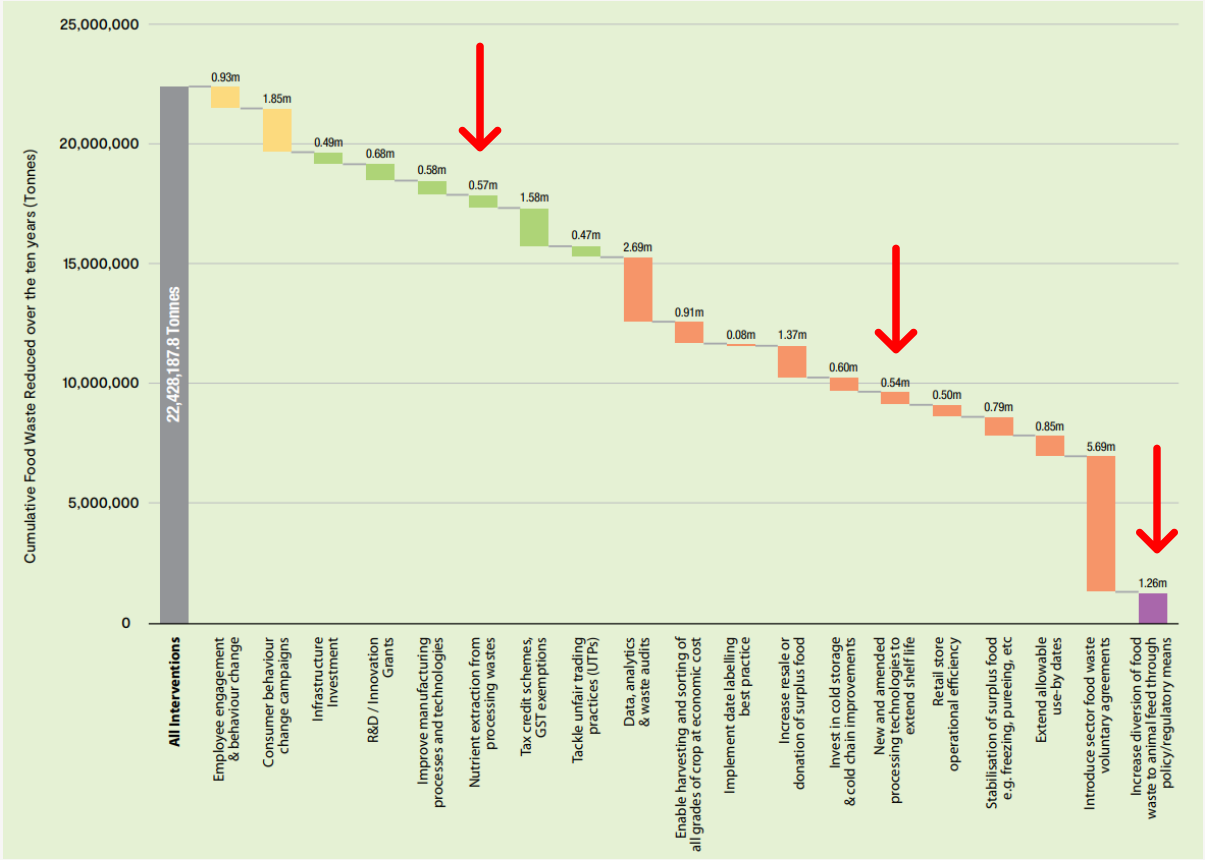
"Unless action taken very quickly, <valorisation> is unlikely to have most impact until after 2030"



- *"Most achievable is to divert **manufacturing and retail waste** up the waste hierarchy, from disposal/recycling to **valorisation into feed**, expected to be substantial*
- *If able to address **contamination risks** associated with household/HaFS food surplus, opportunity becomes significantly larger"*
- *~9% of total (medium) FLW reduction*

https://wrapcymru.org.uk/resources/report/wales-food-waste-routemap

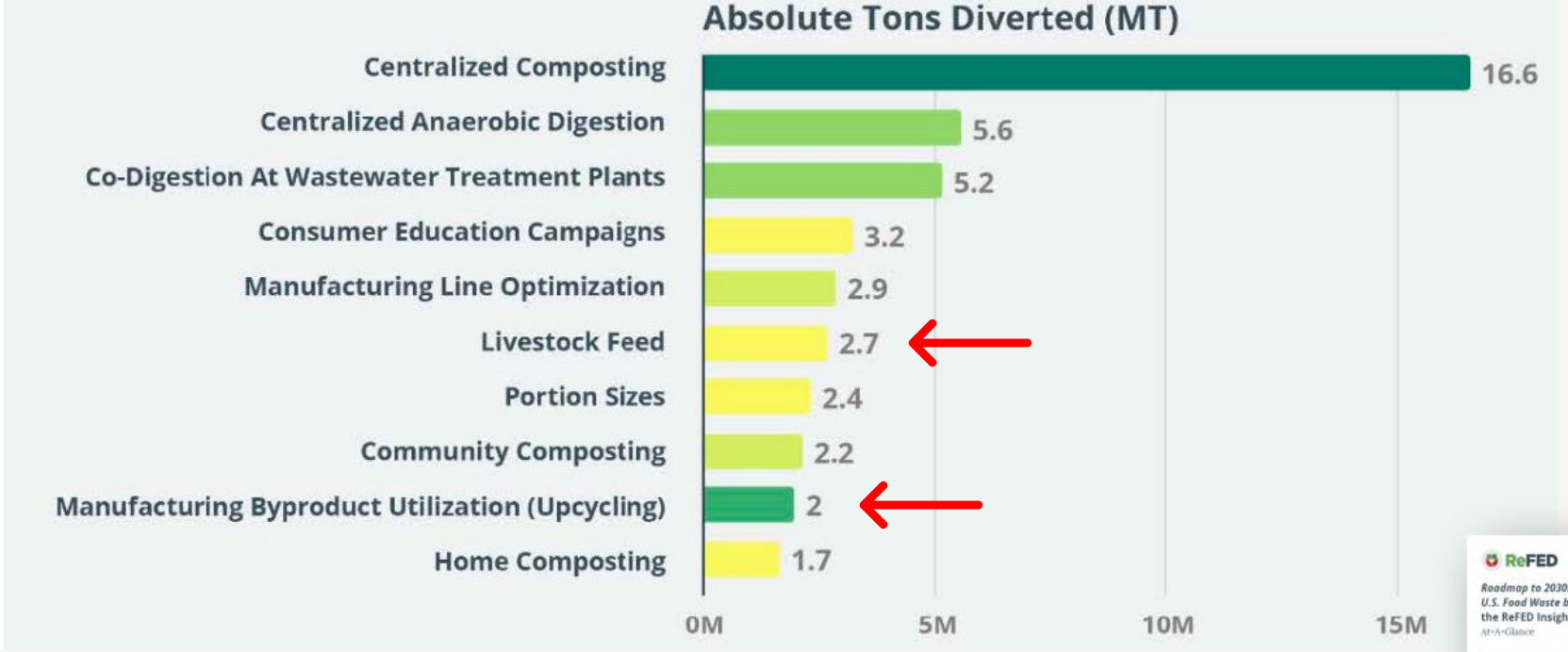
Australian FLW strategy



- *Nutrient extraction from processing wastes (3%)*
- *New and amended processing technologies to extend shelf life (2%) ?*
- *Increase diversion of food waste to animal feed through policy/regulatory means (6%) ?*
- *Combined are **11%***
  3rd largest reduction

https://www.fial.com.au/sharing-knowledge/food-waste

USA – 6th and 9th largest reduction solution



ReFED

https://refed.org/articles/refed-s-new-estimates-on-food-waste-in-the-united-states-2020-2021-trends-and-covid-19-impact/

Currently Valorisation is not framed by UK policy as scalable before 2030.

But it *is* one of the largest FLW solution categories.

We need to reframe to highlight systems benefits.

We need to reduce barriers to scale/access through policy.

We need better policy coherence.

Multiple solutions need policy coherence

Food policy coherence

The alignment of policies that affect the food system with the aim of achieving health, environmental, social and economic goals, to ensure that policies designed to improve one food system outcome do not undermine others.

Food policy incoherence creates problems and misses opportunities.

Health (social) policy goal = to prevent disease and treat and manage ill-health in the population

Environmental policy goal = less deforestation, water pollution, greenhouse gases

Economic policy Goal = growth and competitiveness for income generations and jobs

Policy incoherence

Economic policy or economic policy instruments not fit for purpose in reinforcing environmental and health policy goals

Policy made in different spaces

Parsons K, Hawkes C. Brief 5: Policy Coherence in Food Systems. In: Rethinking Food Policy: A Fresh Approach to Policy and Practice. London: Centre for Food Policy; 2019. https://www.city.ac.uk/__data/assets/pdf_file/0018/504621/7643_Brief-5_Policy_coherence_in_food_systems_WEB_SP.pdf

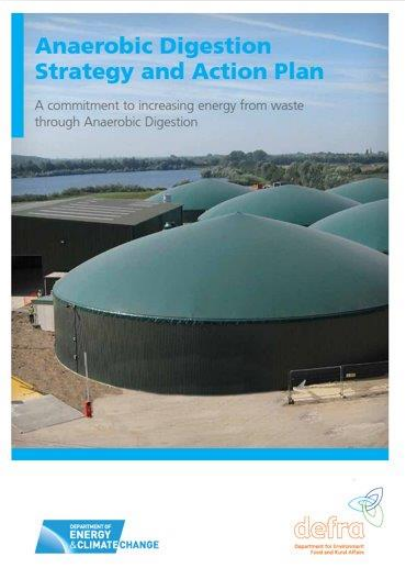
Multiple government departments linked to Valorisation... (but not enough?)

- BEIS (2021) => Department for Business and Trade (DBT), the Department for Energy Security and Net Zero (DESNZ)
- Defra
- FCDO (overseas funding)

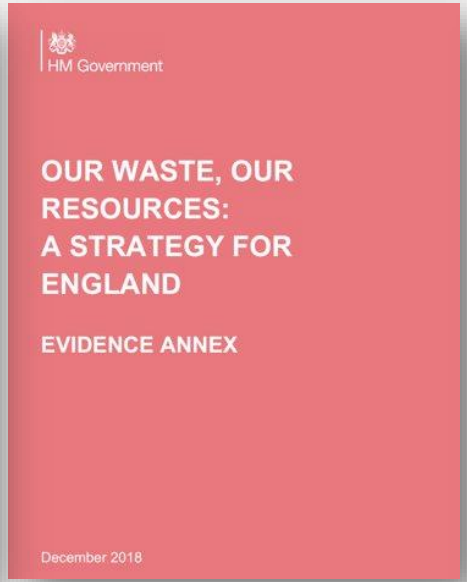
- Are they all talking?
- Who is leading?

https://foodresearch.org.uk/publications/who-makes-food-policy-in-england-map-government-actors/
https://foodresearch.org.uk/publications/how-connected-is-national-food-policy-in-england-mapping-cross-government-work-on-food-system-issues/

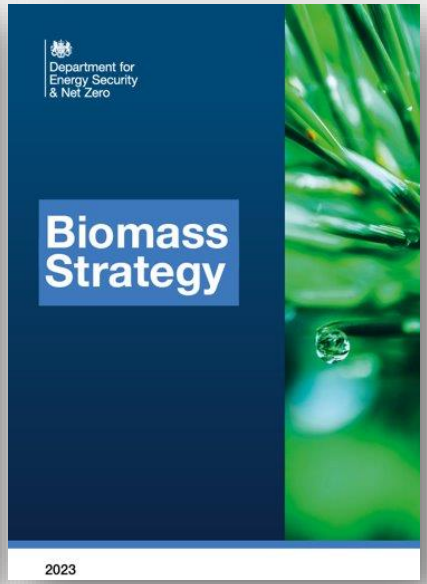
So where is valorisation discussed in the UK?



2011



2018



2023

- Wider circular economy framing.
- Focus on feedstock capacity.
- Energy generation focus
- FSA report provides a systems view.

Food Standards Agency

The Future of Animal Feed

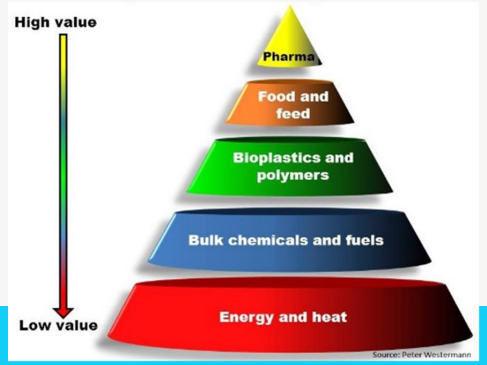
Area of research interest: Emerging challenges and opportunities
Planned completion: 2 February 2023
Project status: Completed
Project code: FS900202
Authors: Dr. Georgios Pexas; Prof. Ilias Kyriazakis; Prof. Bob Doherty
Date published: 28 April 2023
DOI: https://doi.org//10.46756/sci.fsa.gzi586

Why is valorisation incoherent in the UK?

- Until the FSA report there has been little discussion of the **health**, **social**, **net zero** benefits of valorisation in a UK level policy document.

- This lack of wider systems framing may mean that for other govt departments it is not high priority .

- The valorisation community is also not the best at co-ordianting messages and policy work. (food vs feed vs fule)



https://doi.org/10.1016/j.gfs.2019.100330

Do we have the policy environment and scaleability yet for valorisation, bio-economy hubs and spokes etc. ?

- Do we have consistent feedstocks?
- Technical solutions: Solving mixed vs separate waste streams (contamination risks etc.)

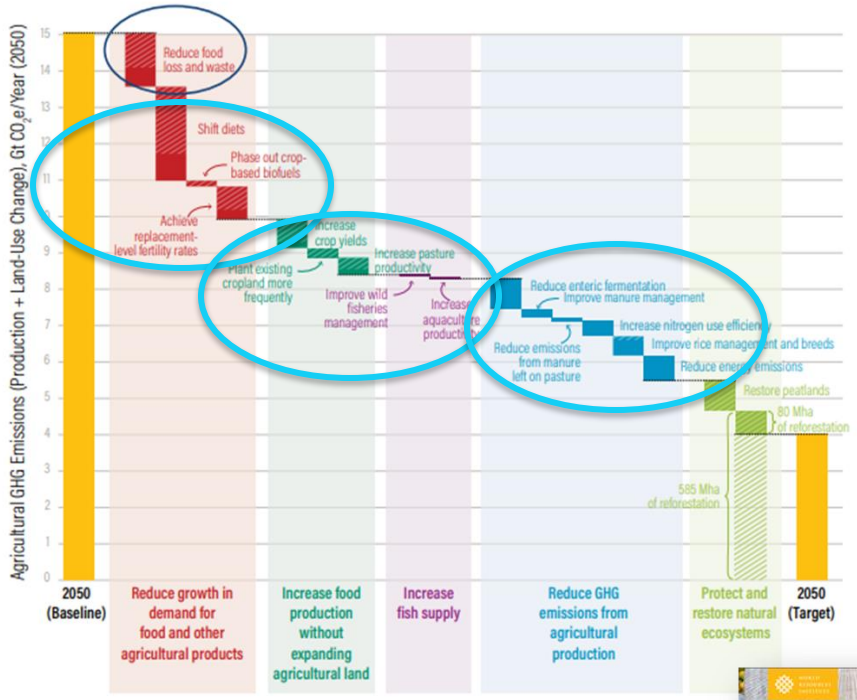
- **What policy framing do we need to get there?**
- Engagement of primary producers and feed stock producers.
- Multiple support mechanisms for different types of valorisaiton
- Farmer and industry diversification into "Net Zero enterprises"
- Protein/crop valorisation as part of wider food system change

End objective:

Can we link valorisation to these wider food systems actions?

Making it a wider food systems solution?

Figure I.2 | Reducing Food Loss and Waste Can Play an Important Role in Eliminating the Projected 15 Gt of Greenhouse Gas Emissions from Agriculture and Land-Use in 2050 (CO_2 equivalent)



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The Centre for Food Policy, City, University of London offers the following courses

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Undergraduate degree

Food Policy MSc/PGDip/PGCert/MSc Distance Learning
Postgraduate taught degree

PhD/MPhil Food Policy
Postgraduate research degree

https://www.city.ac.uk/prospective-students/courses/postgraduate/food-policy

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