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**Citation:** Reynolds, C. (2021). Food waste, sustainable diets and climate change Coherent solutions in the long view. Paper presented at the Food Values Research Group, The University of Adelaide, June 2021 seminar, 28 Jun 2021, Virtual.

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# Food waste, sustainable diets and climate change

Coherent solutions in the long view.

Dr Christian Reynolds

*Centre for Food Policy, City, University of London*



**@sartorialfoodie**

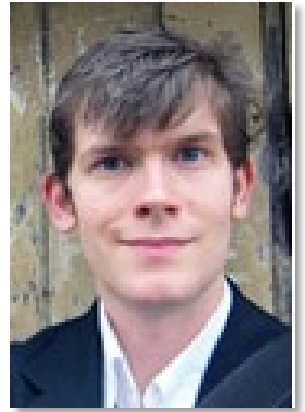
**[christian.reynolds@city.ac.uk](mailto:christian.reynolds@city.ac.uk)**

[www.city.ac.uk](http://www.city.ac.uk)

**Centre for  
Food Policy**

Shaping an effective food system

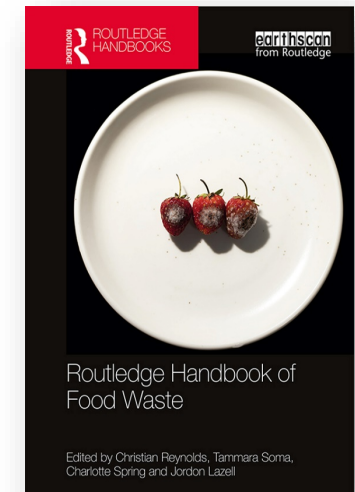
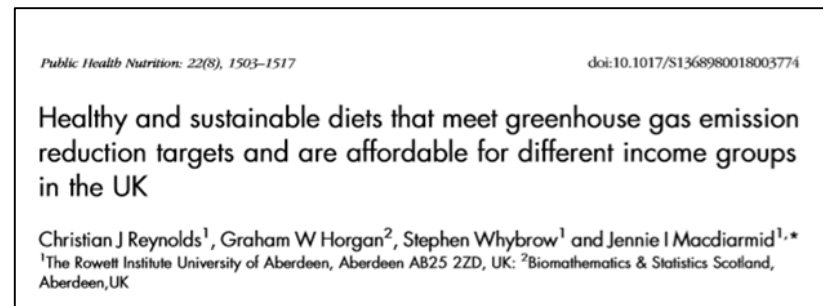
# Who am I? – Christian Reynolds



Senior Lecturer at the Centre for Food Policy



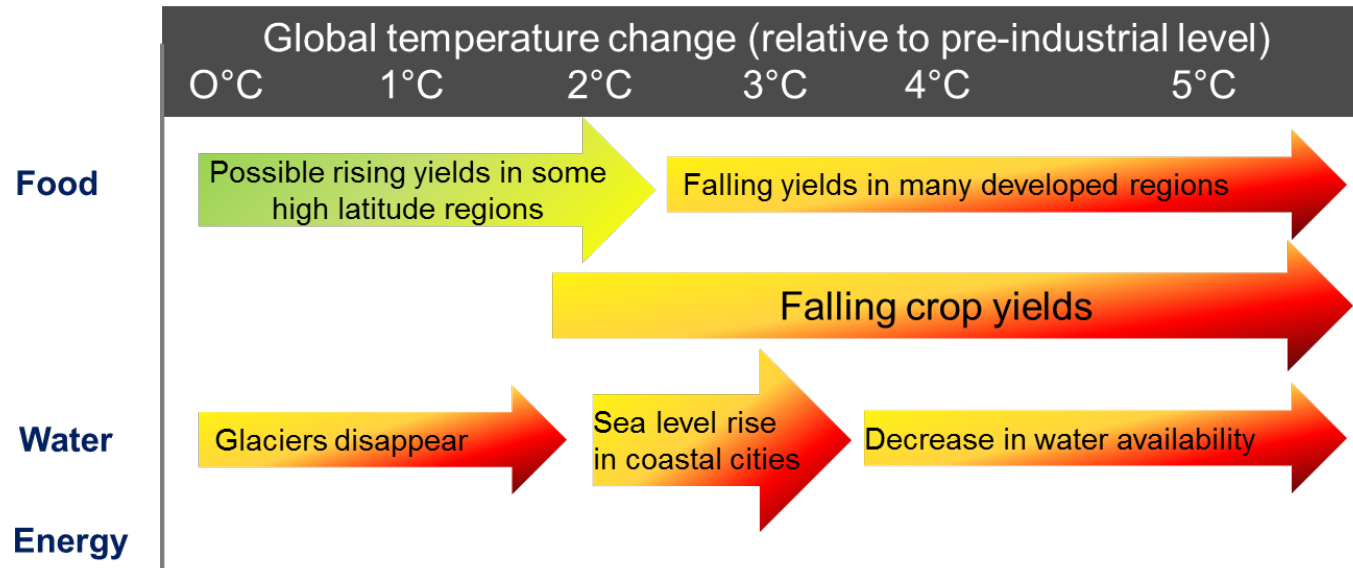
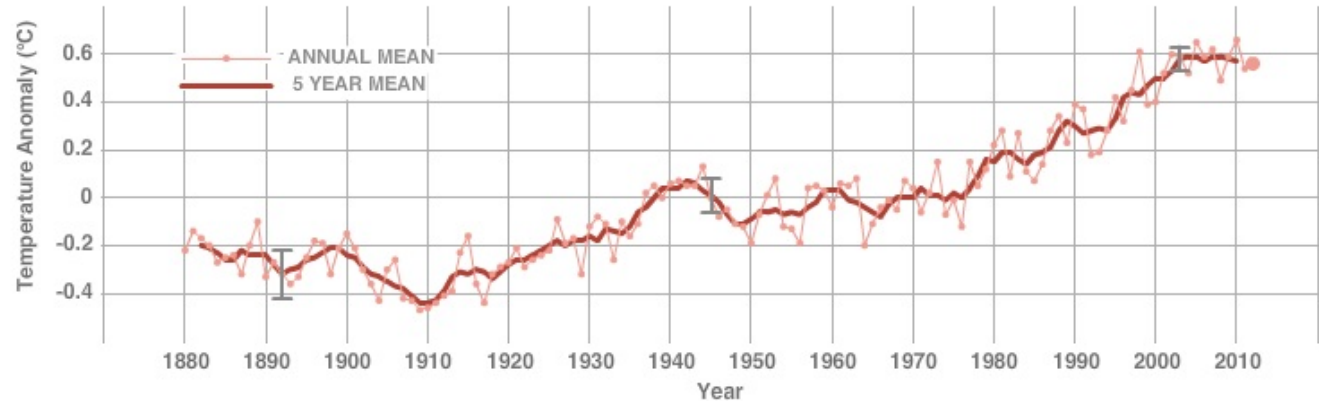
Focus: healthy sustainable diets and food consumption (including waste)



# The climate is changing...

## GLOBAL LAND-OCEAN TEMPERATURE INDEX

Data source: NASA's Goddard Institute for Space Studies (GISS) This trend agrees with other global temperature records provided by the U.S. National Climatic Data Center, the Japanese Meteorological Agency and the Met Office Hadley Centre / Climatic Research Unit in the U.K. Credit: NASA/GISS



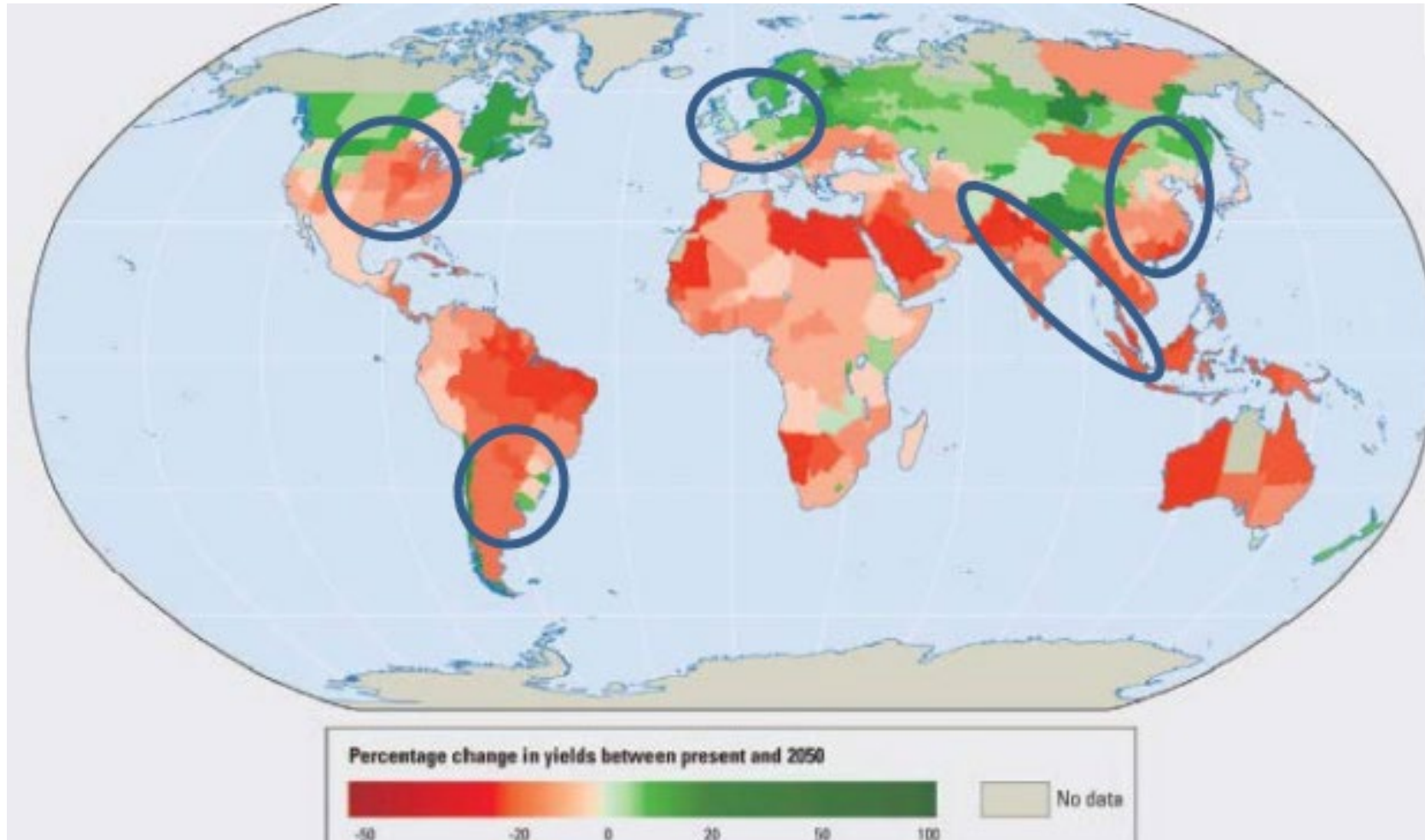
## French winemakers count cost of 'worst frost in decades'

Government prepares rescue package as rare freezing temperatures damage crops and vines



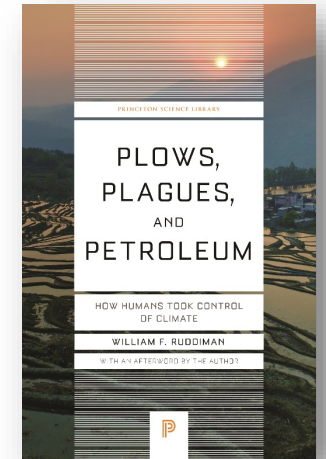
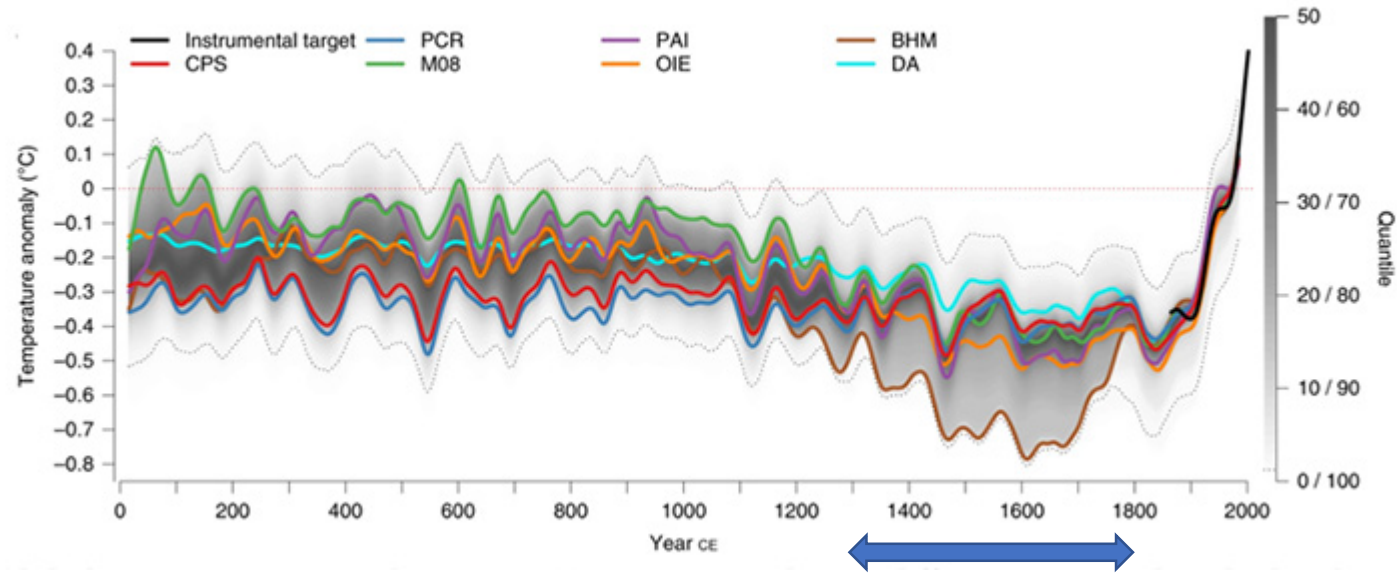
▲ Burgundy vines have been set alight to fight against frost. Photograph: Etienne Ramousse/Zeppelin/Sipa/Rex/Shutterstock

# Food production and climatic change are linked

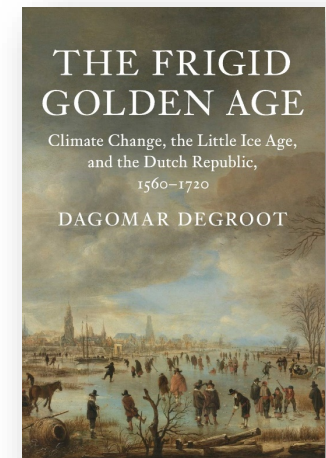
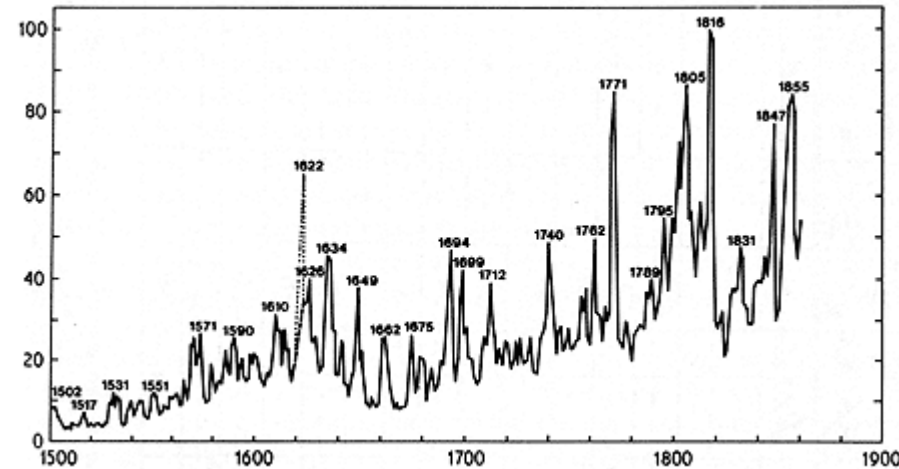
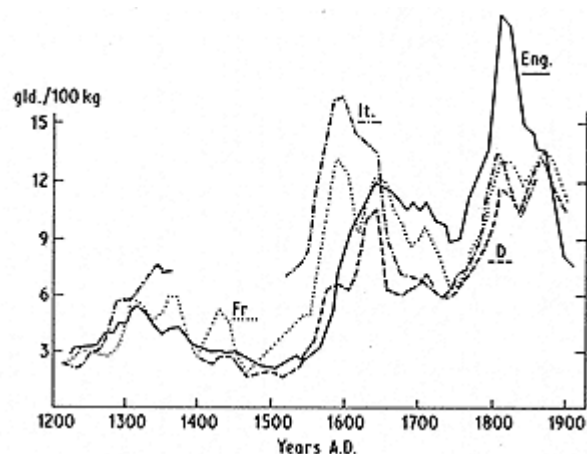


Wheeler, Tim, and Joachim Von Braun. "Climate change impacts on global food security." *Science* 341.6145 (2013): 508-513.

# Food and climate have always been linked!



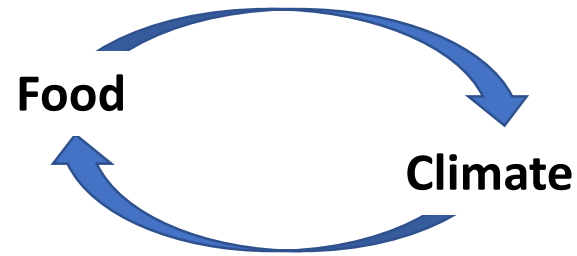
Global temperatures over the past 2,000 years, according to different statistical methods. The black line represents modern warming, as measured by meteorological instruments. Global cooling in even the chilliest decades probably did not exceed 0.5 degrees Celsius. <https://aeon.co/essays/the-little-ice-age-is-a-history-of-resilience-and-surprises>



Prices of **wheat** expressed in Dutch guilders per 100 kg. in various countries vs. time. Price of **rye** in Germany vs. time expressed as an index. (Source: Lamb, 1995) [https://www.sunysuffolk.edu/explore-academics/faculty-and-staff/faculty-websites/scott-mandia/lia/little\\_ice\\_age.html](https://www.sunysuffolk.edu/explore-academics/faculty-and-staff/faculty-websites/scott-mandia/lia/little_ice_age.html)

# Feedback loops of food and climate change

Food production and consumption impacts upon **climate**



**Climate** impacts upon **food** production and consumption

- The "little ice age" of 1500-1700, or "age of extremes" of 1310s-1810s, changed what Europeans (etc.) farmed, ate, cooked, modes of production, consumption etc.
- Created resilient societies. (Lots of war, famine etc. !)
- Led to the start of the current European (and global) dietary patterns, and food regimes.

These (**cool**) food systems, crops, modes of production, and diets are foundational for the modern food system.

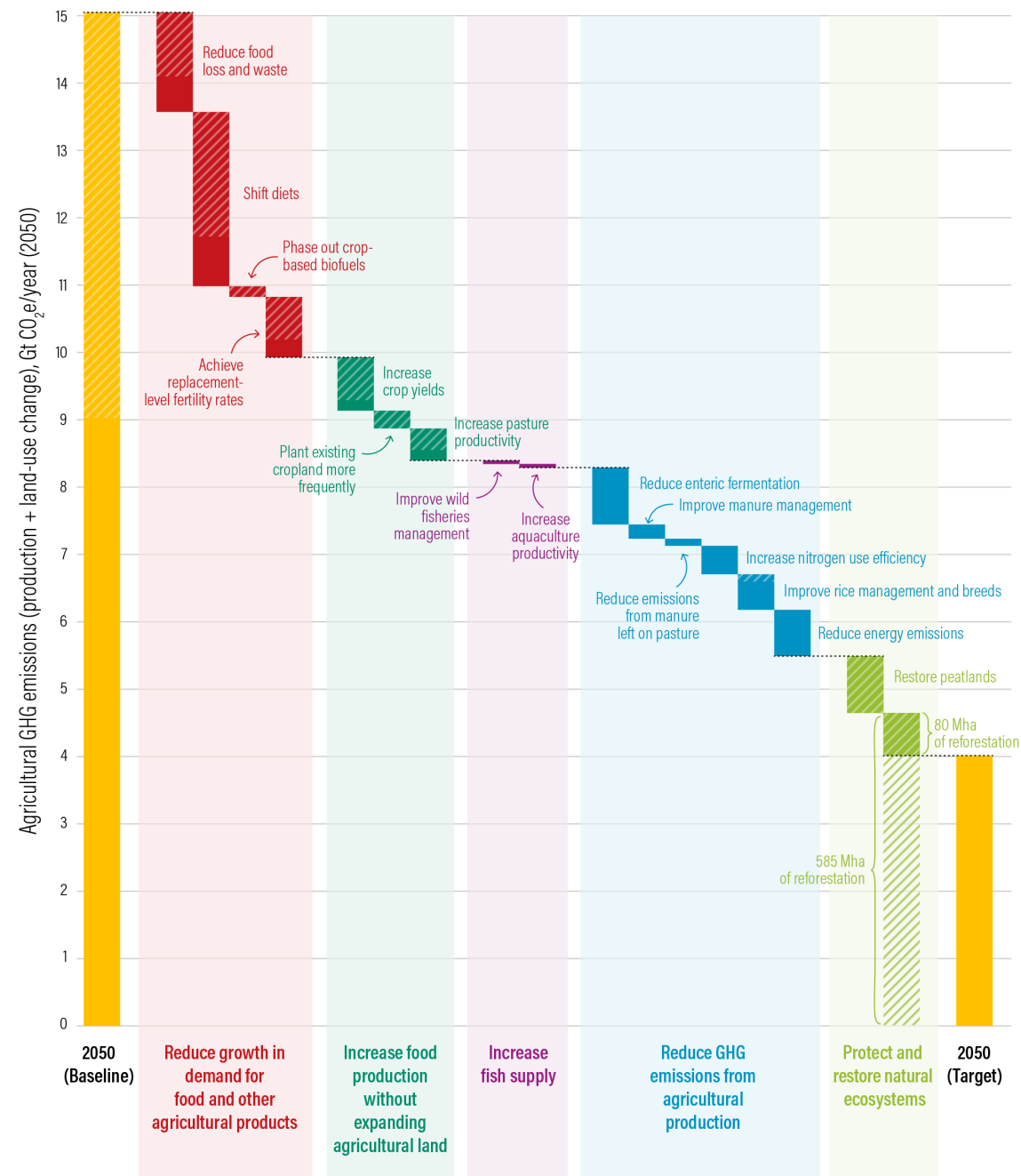
**Probably only ever a max 0.5°C cooling!**

# The emissions reduction challenge – A **warming** food system

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. Reducing Food Loss and Waste**
- 2. Shifting to sustainable diets**

The rest of this talk will be focusing on these two interconnected actions, and how we can use **coherence** between solutions to help.



Note: Solid areas represent agricultural production emissions. Hatched areas represent emissions from land-use change.

Source: GlobAgri-WRR model.

Source WRI, [World Resources Report: Creating a Sustainable Food Future](#)



# Food Loss and Waste (FLW)

6% of global greenhouse gas emissions come from food losses and waste

Our World in Data

Emissions from food that is never eaten accounts for 6% of total emissions



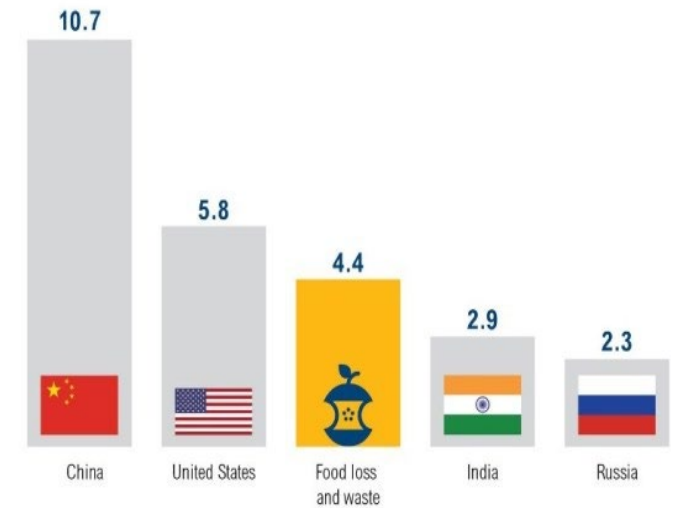
Note: One-quarter of food emissions comes from food that is never eaten: 15% of food emissions from food lost in supply chains; and 9% from consumer waste.

Data source: Joseph Poore & Thomas Nemecek (2018). Reducing food's environmental impacts through producers and consumers. *Science*.

OurWorldinData.org – Research and data to make progress against the world's largest problems.

Licensed under CC-BY by the author Hannah Ritchie.

If Food Loss and Waste Were its own Country, it Would Be the Third-Largest Greenhouse Gas Emitter



GT CO<sub>2</sub>e (2011/12)\*

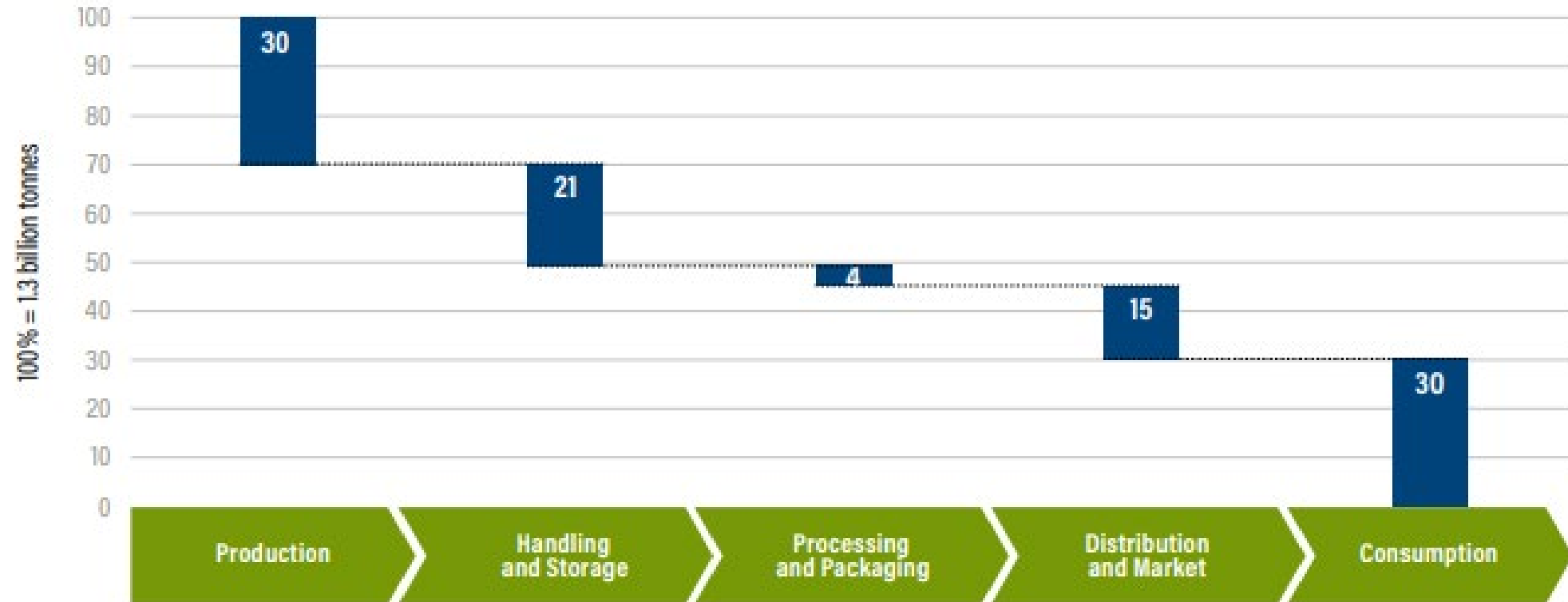
\* Figures reflect all six anthropogenic greenhouse gas emissions, including those from land use, land-use change, and forestry (LULUCF). Country data is for 2012 while the food loss and waste data is for 2011 (the most recent data available). To avoid double counting, the food loss and waste emissions figure should not be added to the country figures.

Source: CAIT, 2015; FAO, 2015. Food wastage footprint & climate change. Rome: FAO.



# FLW Spread across the supply chain

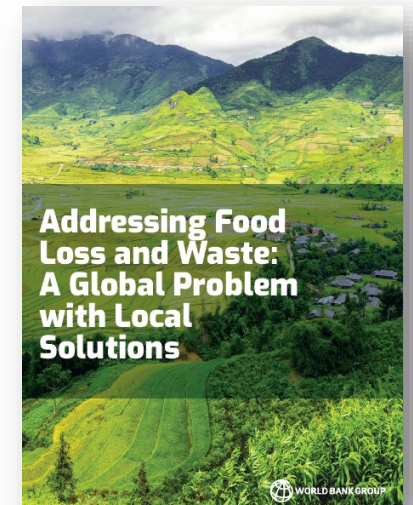
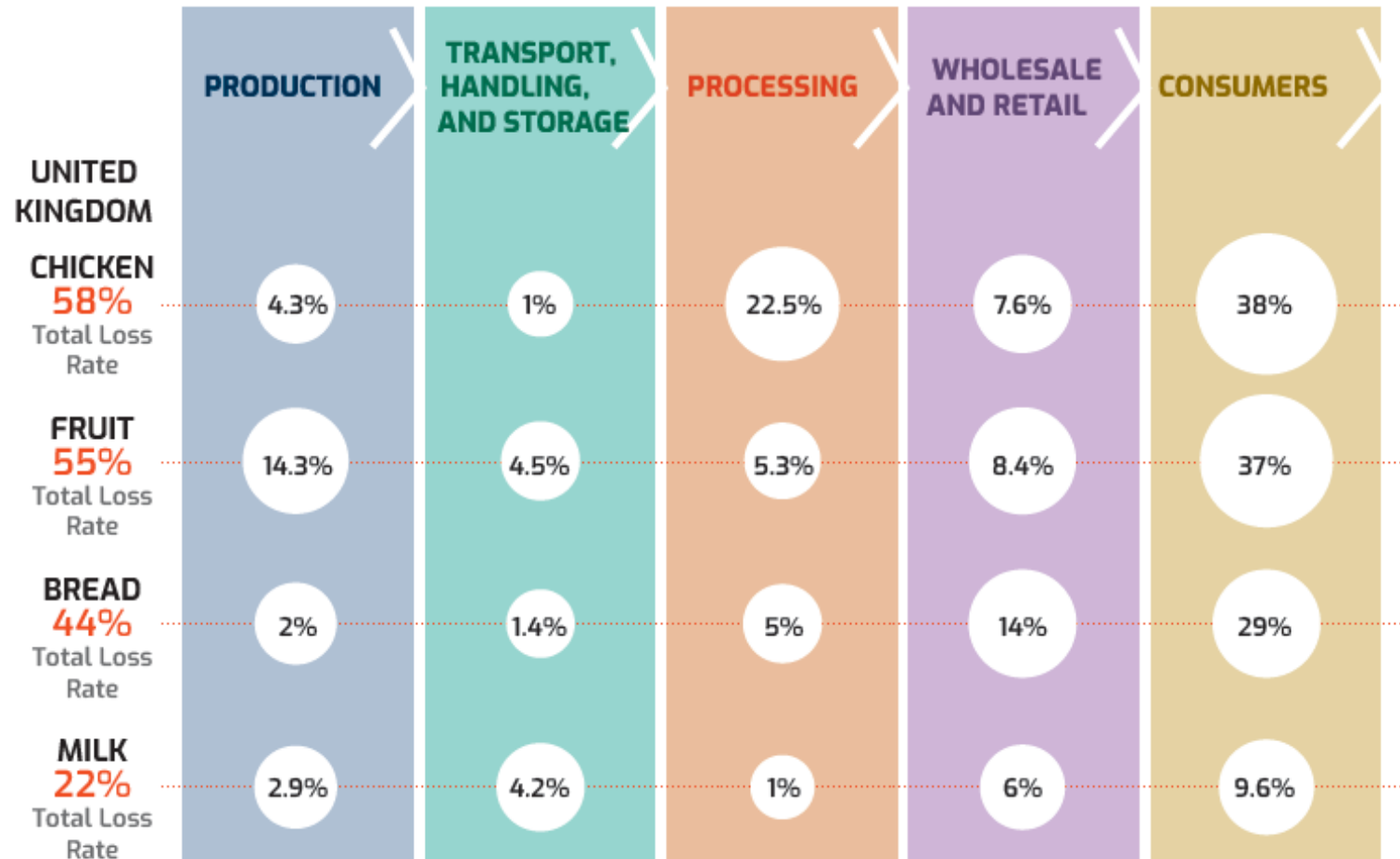
Figure 1.7 | Distribution of Total Global Food Loss and Waste across the Food Supply Chain (2007)



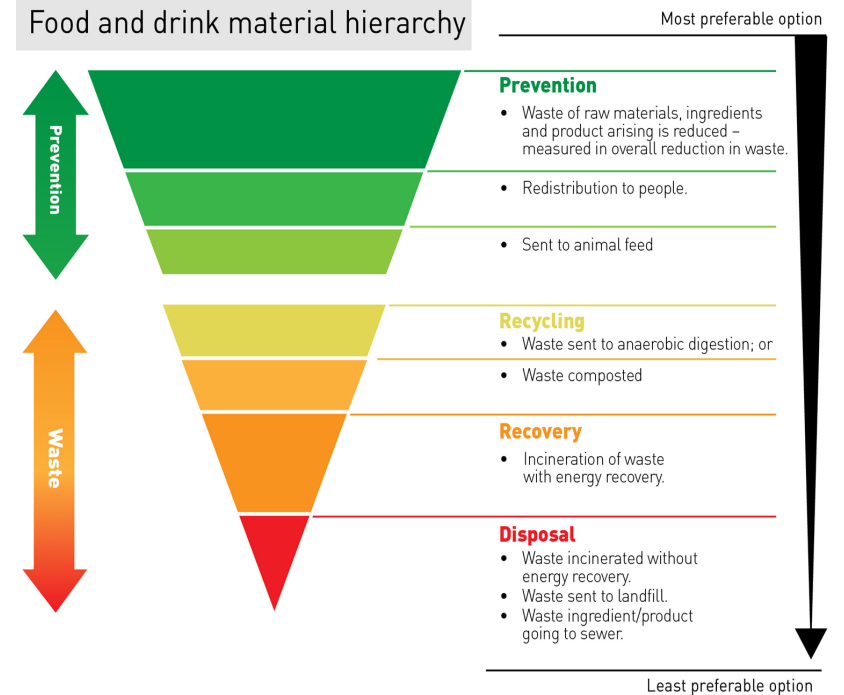
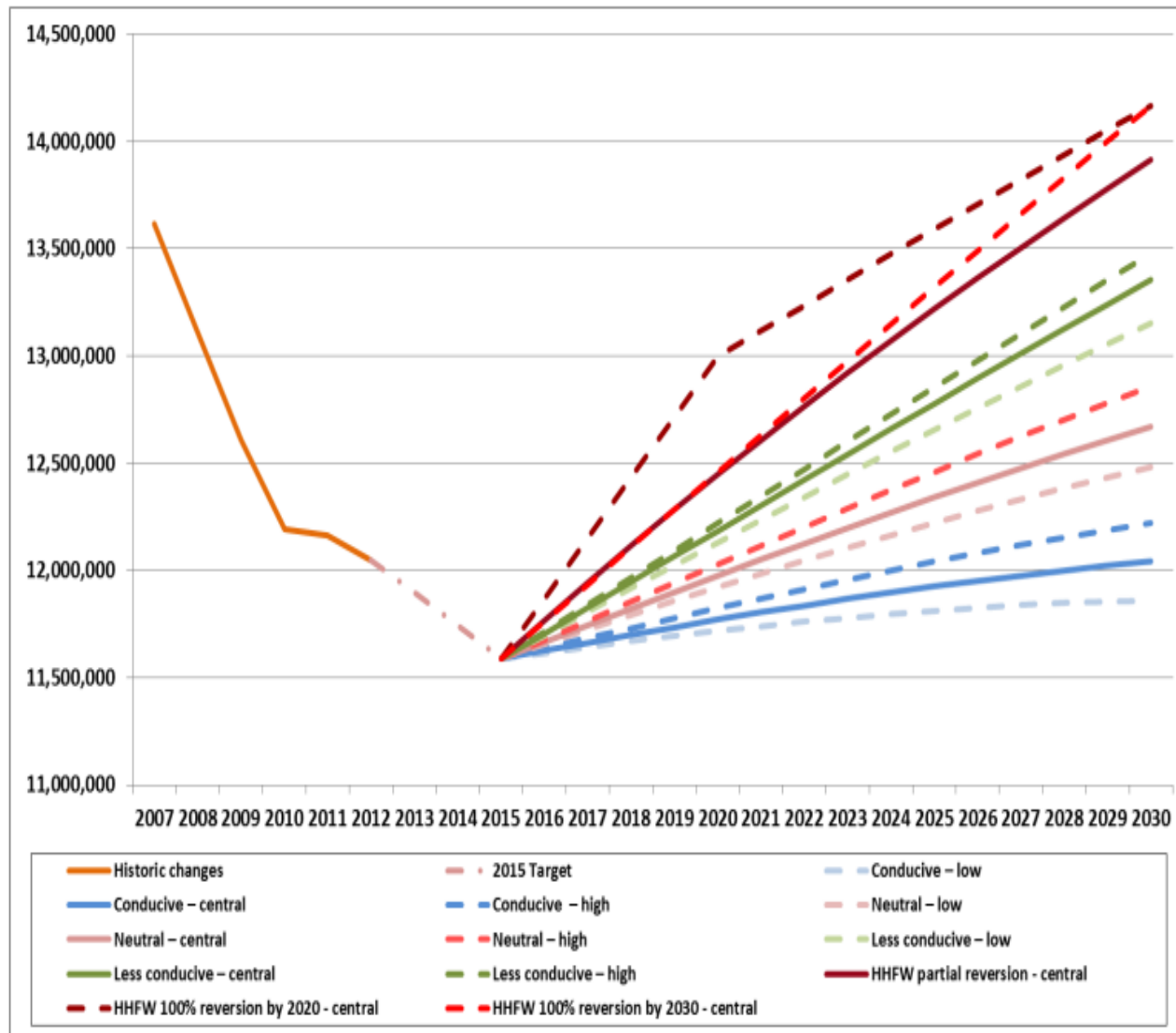
Source: WRI analysis based on FAO (2011).

# 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



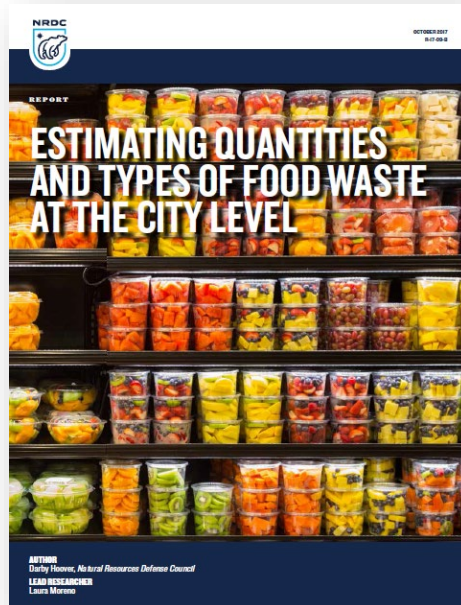
# FLW Reduction is not enough



# FLW action can be at multiple government levels

## City/LA level, National, Global

### Prevention



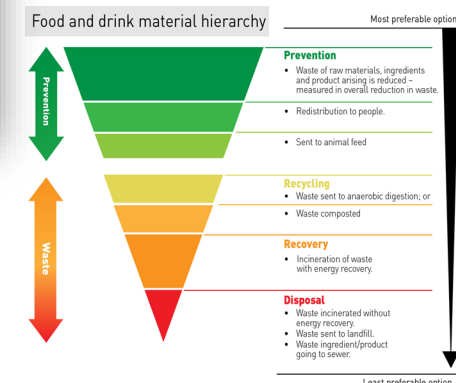
### Diversion



### Redistribution (Food Security?)



Activities in each of these areas can help in the other two.  
*But, is there coherence in solutions across scales?*



# Many (food systems) solutions to FLW

	Waste reduction potential	Savings per tonne of waste reduced		
		Climate	Water	Costs
<b>Products, processing and food waste solutions</b>				
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
<b>Education and behaviour change solutions</b>				
Household behaviour change programs	■	■	■	■
Hospitality and food service solutions	◆	■	■	■
Waste audits at hospitality and institutions	◆	■	■	■
<b>Food rescue, recovery and redistribution solutions</b>				
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

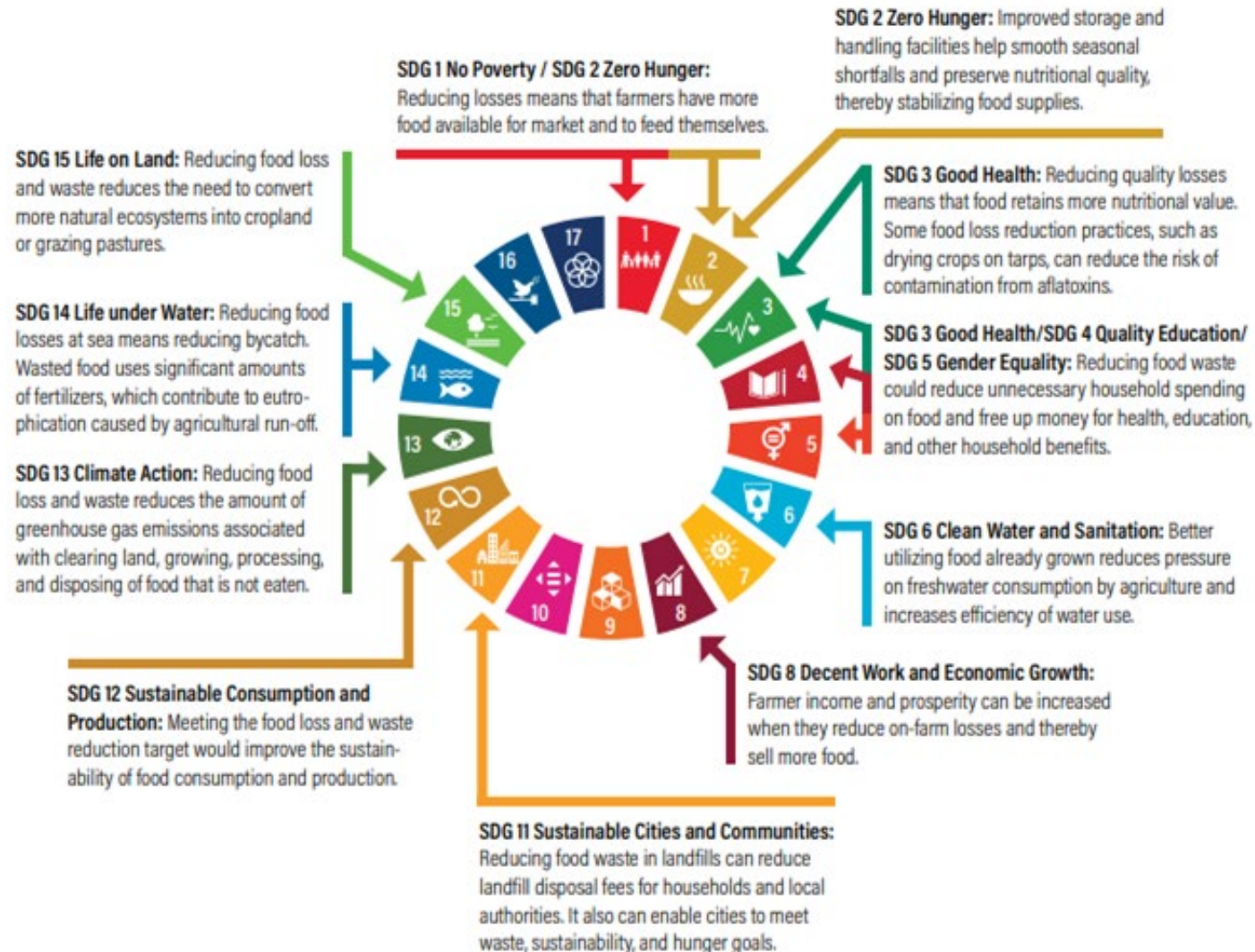


The Path to Half 25 solutions

ReFED 73 solutions



# FLW solutions can help multiple other areas



Source: WRI analysis.

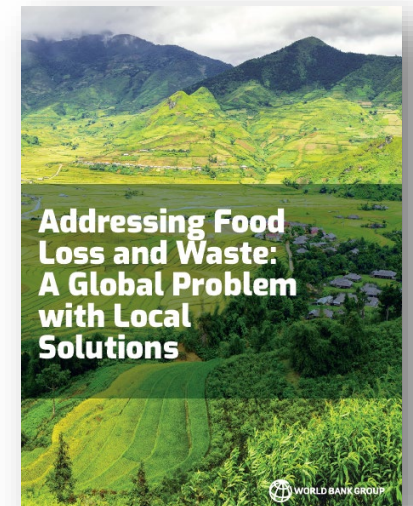
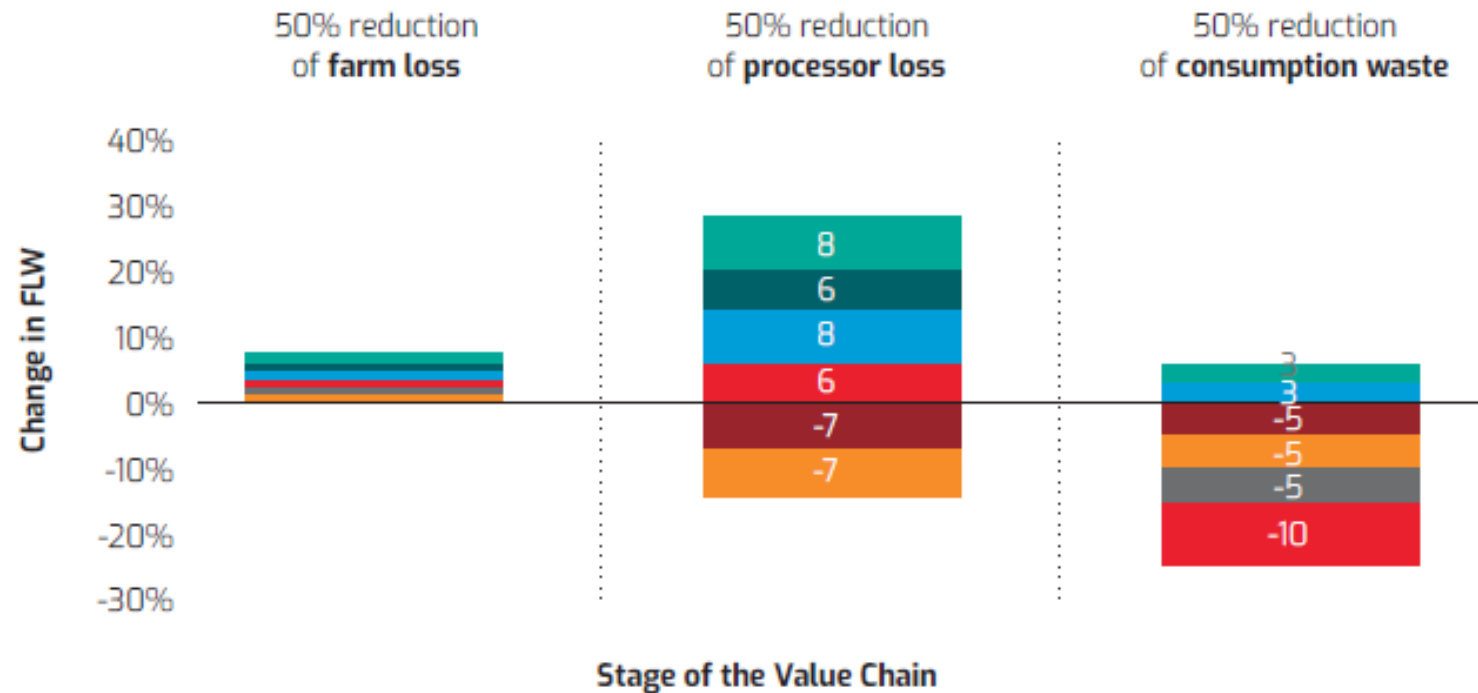
# Not all solutions are created equal

## A 50% reduction in waste... at different stages

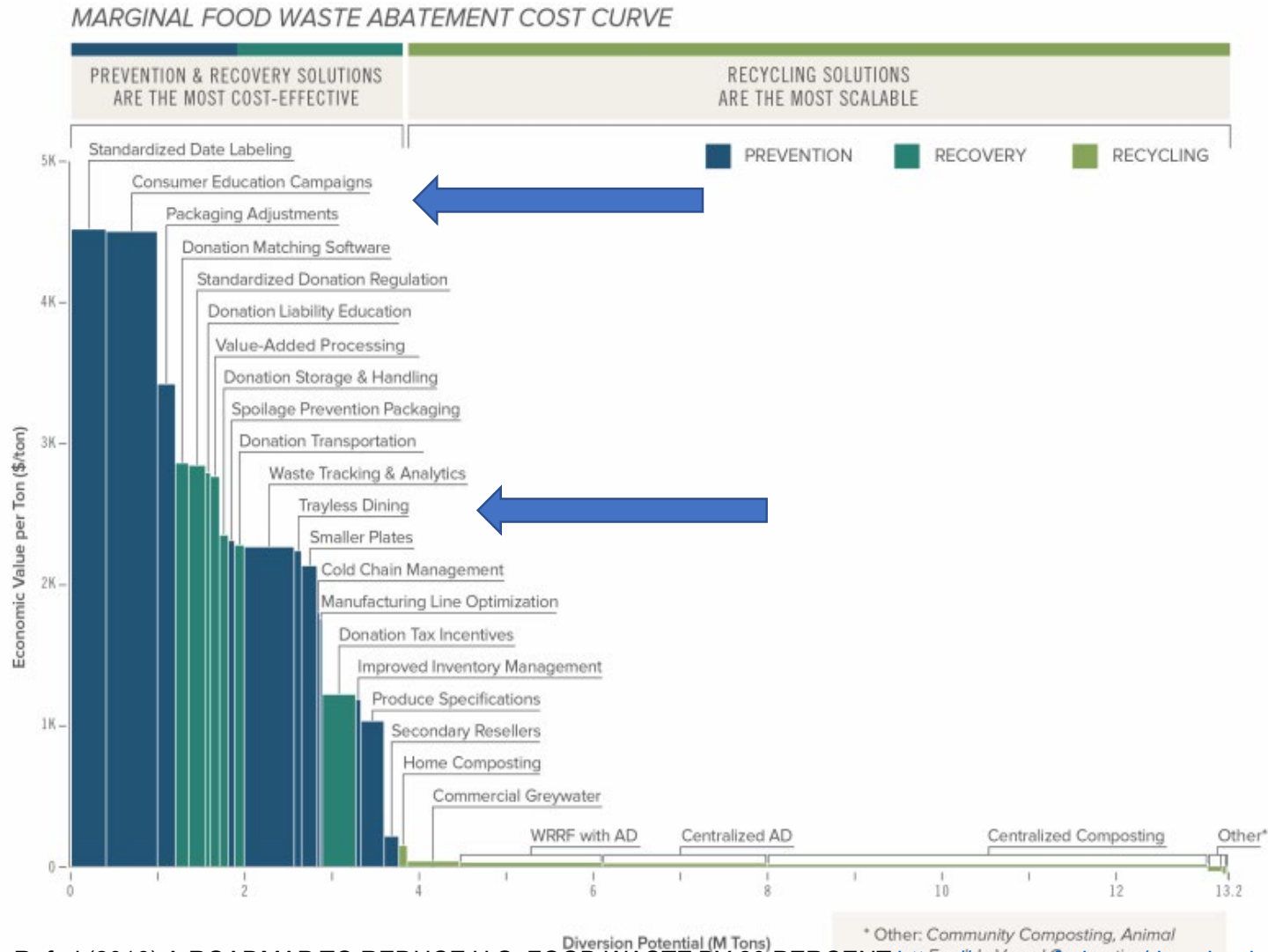
**FIGURE 26:** The cascading effect is additive

Effect of a 50% FLW reduction at the farm, processor and consumption levels (UK chicken, closed economy)

■ Farm  
 ■ THS  
 ■ Processor  
 ■ Retail  
 ■ HRI  
 ■ At-home consumption  
 ■ Away from home consumption



# Many food waste solutions are dietary changes

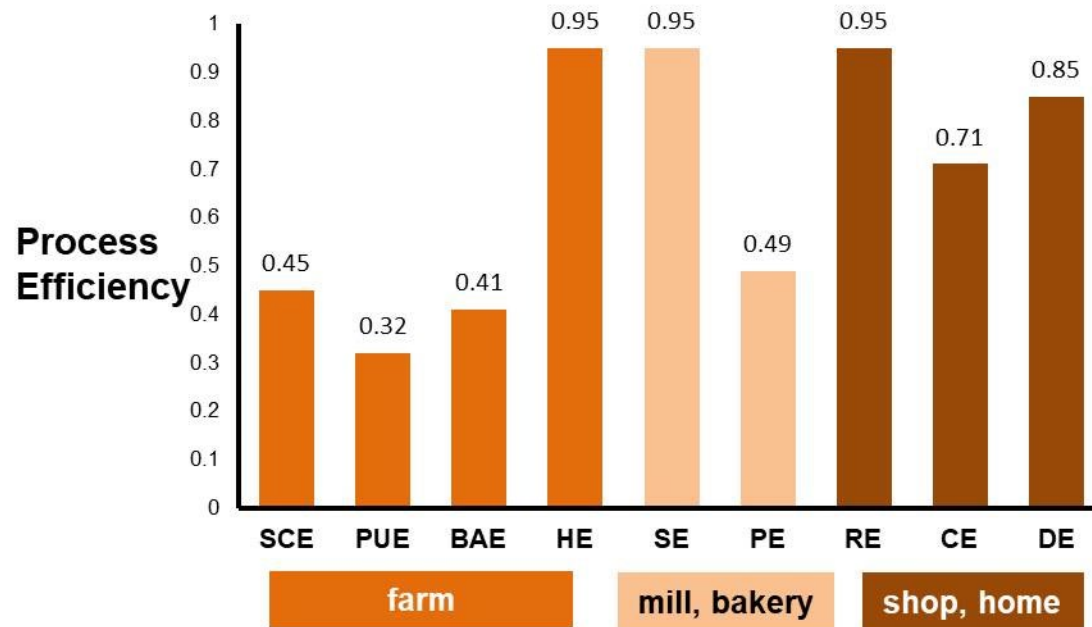


- **Nudges** – reducing plate size, providing social cues. 20% ↓ in FW *Kallbekken, (2013)*
- **Changing canteen menus**, ↑ consumption, 18% ↓ in vegetable FW *Schwartz et al (2015)* (see also shape of veg too!)
- **Weight/ of plate** changes the amount of food eaten and wasted *Williamson et al (2016)* \*\*
- **Information based campaigns**, *Schmidt (2016), Manomaivibool et al (2016) Devaney, Davies (2016)\*\**
- **Packaging and portion size change** *Kandemier (2020)*

**\*\* Self reported results.**

Self reported results generally give lower estimates of food waste compared to waste compositional analysis. For diaries – one of the more accurate methods – around 40% less food waste is reported compared to waste compositional analysis. *Høj (2012)* Measuring food waste via caddies or photos gives similar results to diaries. *Van Herpen (2016)*

# Diet and Overconsumption can also impact on FLW



Retail Efficiency (RE) – in-store waste 5%  
Consumption Efficiency (CE) - cooking waste 29%  
Dietary Efficiency (DE) - **overconsumption?** 15%

*Additional calories of bread eaten above and beyond 2500kcal per day per person in UK population.*

(Increase in fruit and veg may lead to increased inedible food waste)

# Sustainable diets and The EAT–Lancet report

Setting Scientific Targets for Healthy Diets and Sustainable Food Production.

2500 kcal daily diet.

↑ consumption of fruit (100 -300g/day) & vegetables (200-600g/day)

↓ consumption of animal products

## The Planetary Health Plate



#foodcanfixit #EATLancet



# The EAT–Lancet report - A Critique

## The EAT–Lancet report - A Critique

- Lack of consideration of local and traditional diets, food ways or systems of production.
- Limited suggestions on how to implement the ‘global healthy sustainable diet’. (only photos see →)
- Minimal discussion of cooking.

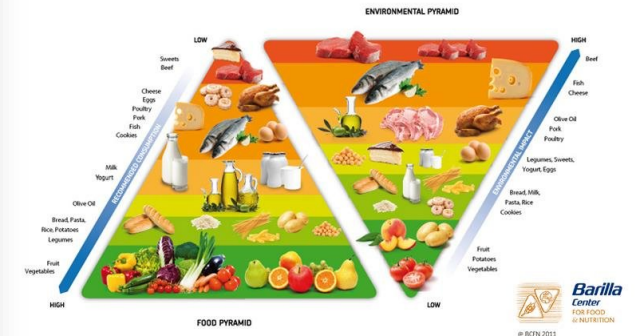


Is gastronomy and cooking important?

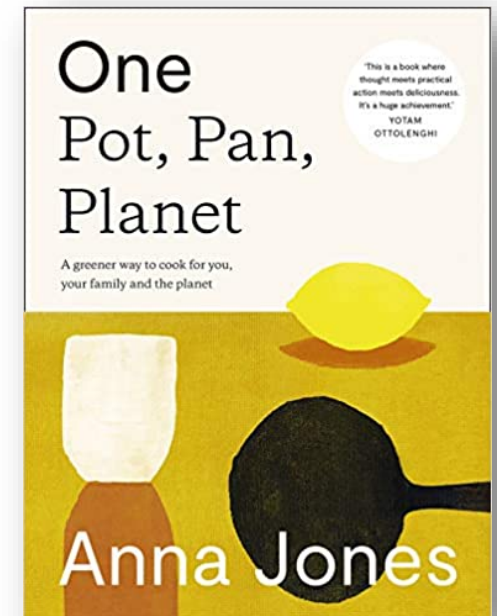
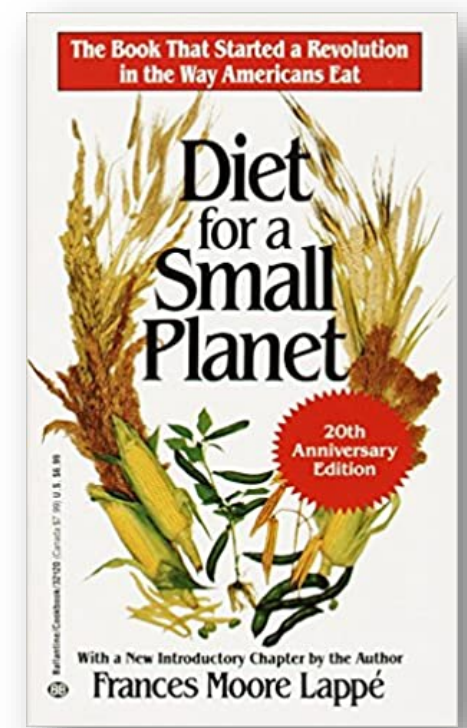
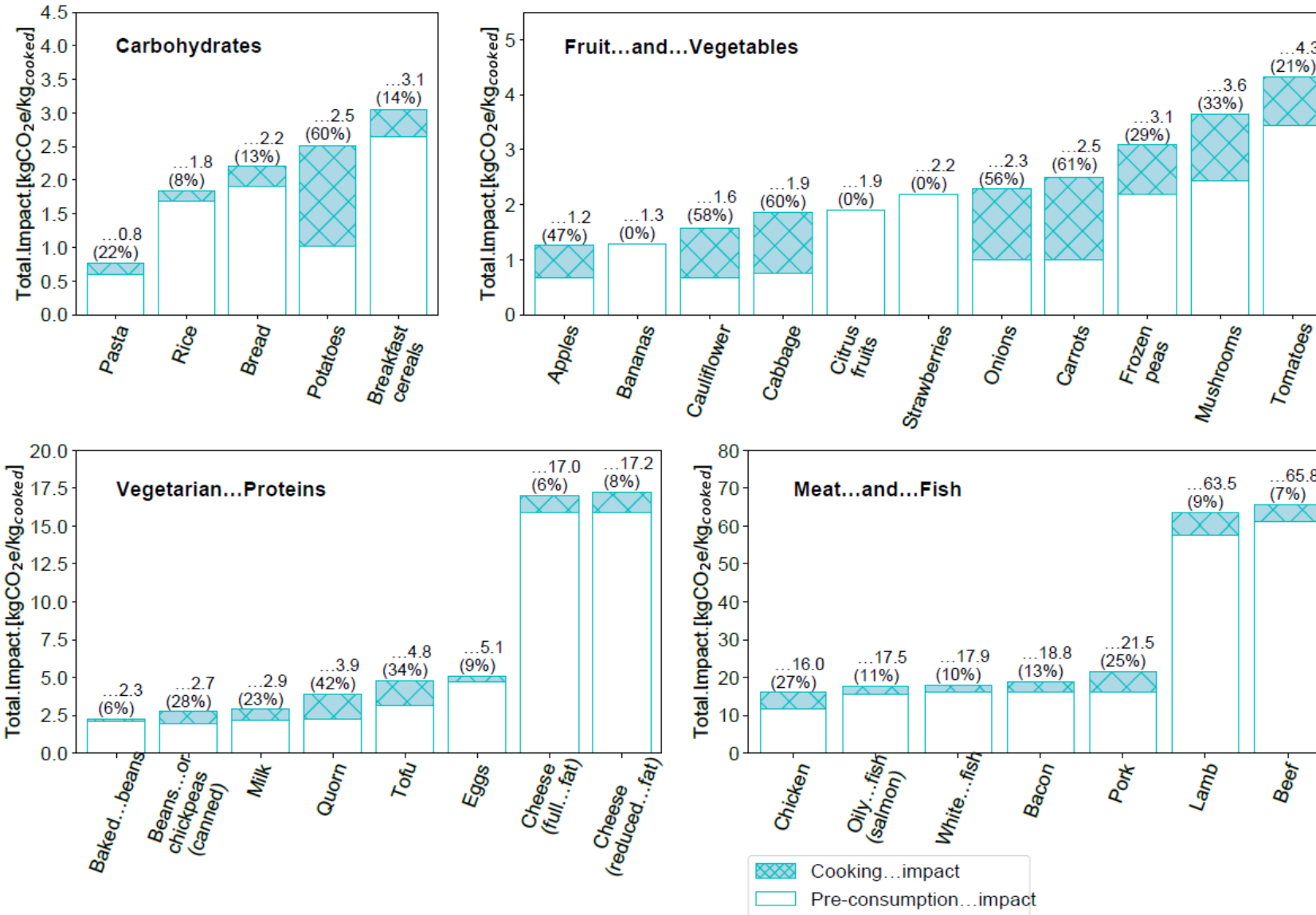
## Eating habits are a cultural issue

Barilla Center for Food and Nutrition

7 different cultural pyramids, specific geographical area (Africa, Western Asia, Eastern Asia, Latin America, the Mediterranean, Nordic countries and Canada, United States).



# How we cook matters!

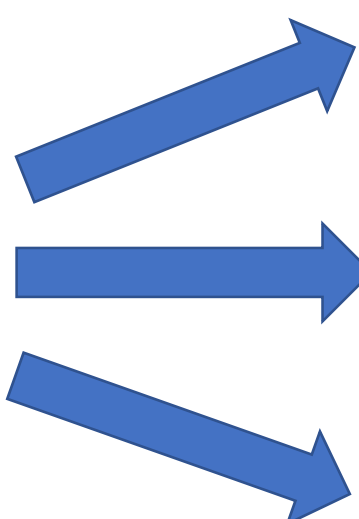


# Disrupting eating (and cooking) for lower carbon emissions

Current guidelines focus on

- 1) Reducing consumption instances
- 2) Smaller portion sizes

0-28g per day for beef, lamb or pork



1) Typical beef portion in the UK 70-90g, once weekly



(Cooking in small batches inefficient)

2) Integrate 28g of beef into other dishes



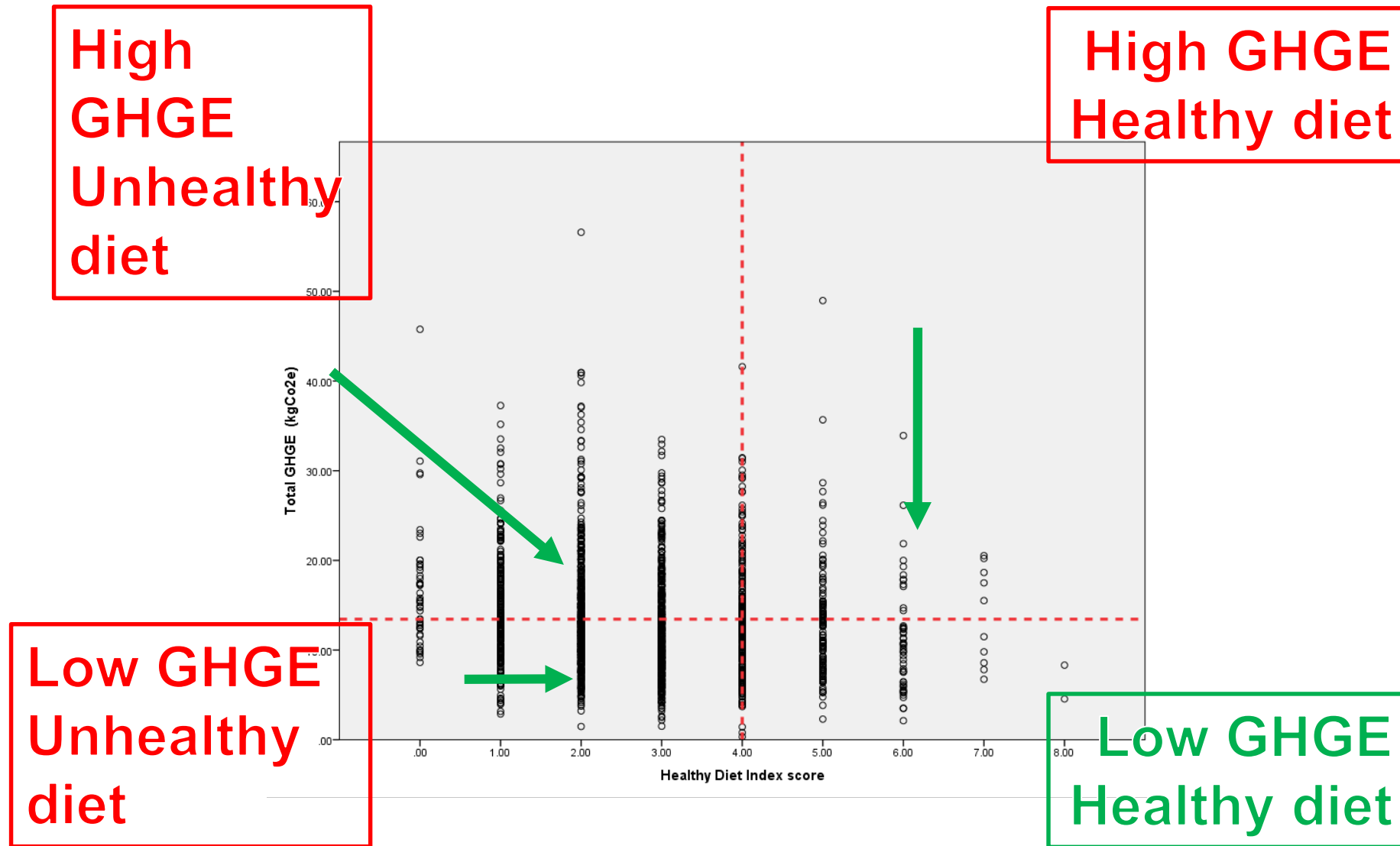
(Cooking in fast/sustainable, Batch cooking)

3) Adapt UPFs trends to be lower emissions. E.g. blend with sustainable protein.



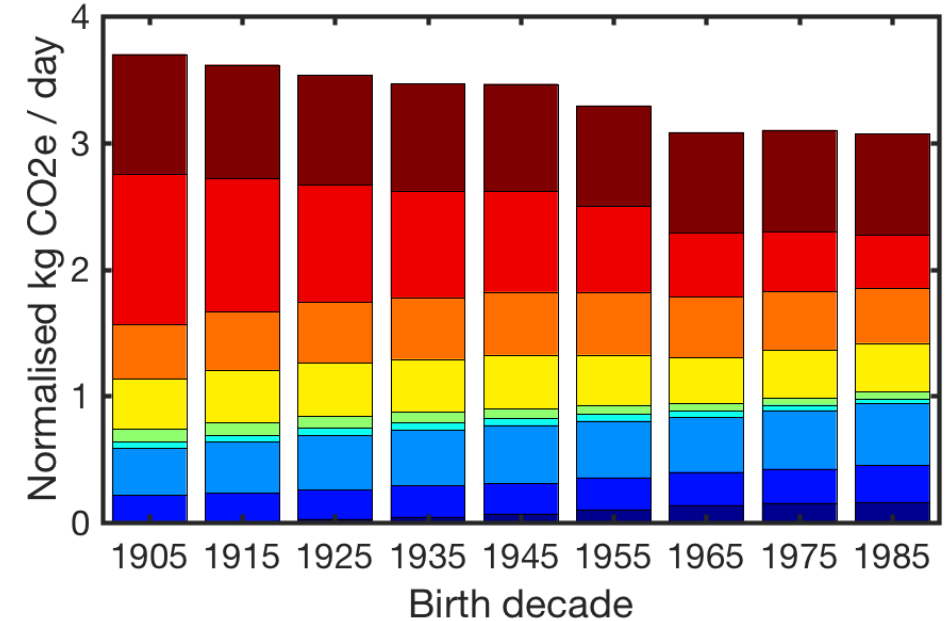
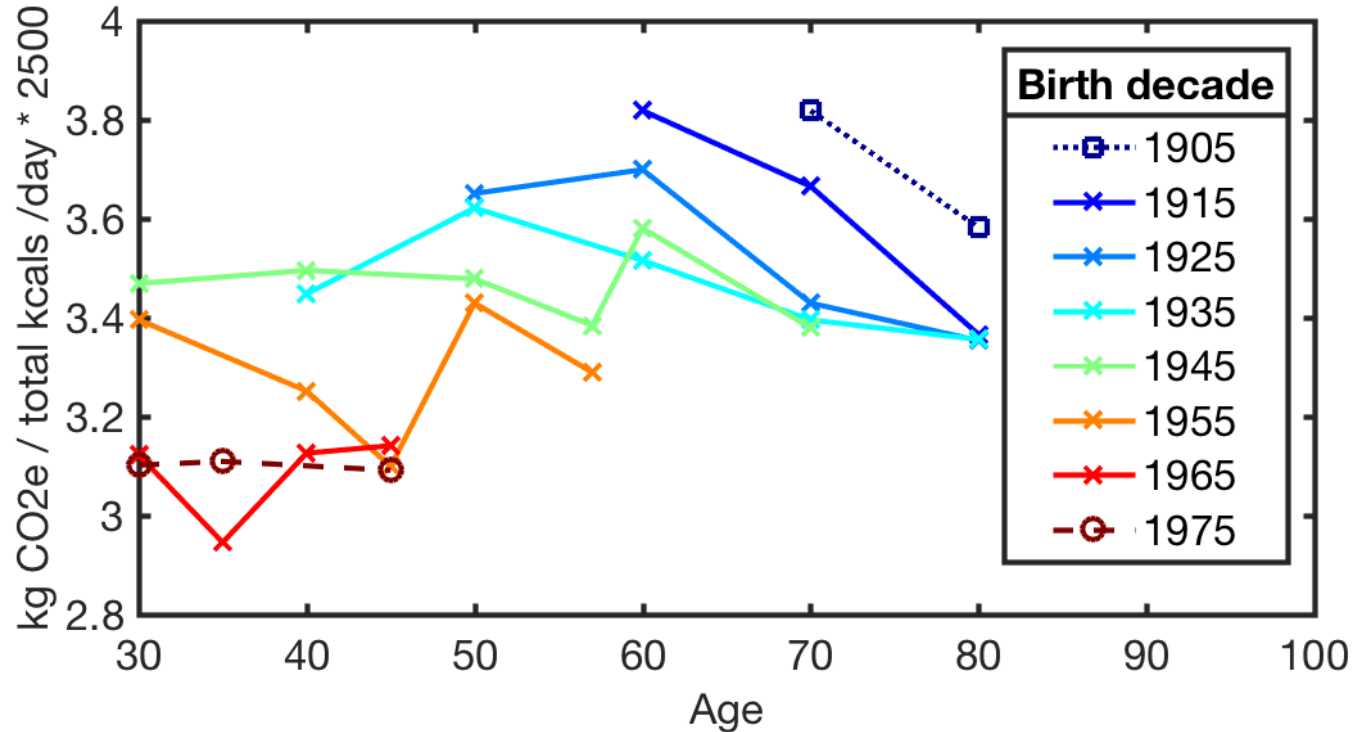
(Encourage reheat?; Batch cooking, leftover (re)use)

# Lots of different paths to a sustainable diet...



Source: NDNS translated to HDI score matched with GHGE from Audsley 2010 (modifications by Horgan, Whybrow, and Macdiarmid 2016)

# The dietary patterns of the each generation are moving... currently more sustainable in the 2010s+



Kg Co2e per 2500kCal per day, per age group (16+), Purchase surveys 1975-2015

National Food Survey, 1974-2000, Living Cost and Food Survey (2000-2018)



(But we have the rise of Ultra Processed Foods from 1950s onwards)

# Multiple synergies between Healthy Sustainable Eating and Food Waste

Integrate Healthy Eating and Food Waste education

- Welsh pilot (Low income communities)
  - 53% increase in Fruit and Vegetable Consumption
  - 7% food waste reduction

Hospitality and food service sector can be “champions” of message (and have major wins themselves).

Portions and Pack size can have an effect.

*This could also apply to allergen redesign*

**But how does this work in practice?**



# In practice... Changing Diets and FLW

## TRiFOCAL

•Transforming **C**ity **F**ood **h**Abits for **L**ife (2016-2020)

WRAP, LWARB, Groundwork London.

London – and 10 replication cities (EU)

Prevent food waste

Promote healthy and sustainable eating

Recycling of unavoidable food waste.



Citizens



Community Groups



Employers



Hospitality & Food Services



Local Authorities



Schools

# In practice... TRiFOCAL



- Transforming City **FO**od h**Ab**its for **Li**fe (2016-2020)

WRAP, LWARB, Groundwork London.

London – and 10 replication cities (EU)

**9% reduction** in avoidable food waste generated per household per week (kg/hh/ wk) between 2017 and 2019. The amount generated fell from 1.59 kg/hh/week to 1.44 kg/hh/week.

**No change** in the weight of unavoidable food waste per household recycled via the caddy. On the other hand, there was a **14% increase** in the amount of avoidable food waste recycled.

**15% increase** in Londoners **demonstrating knowledge** of and reporting taking action on healthy sustainable eating, according to the project evaluation survey



# In practice...

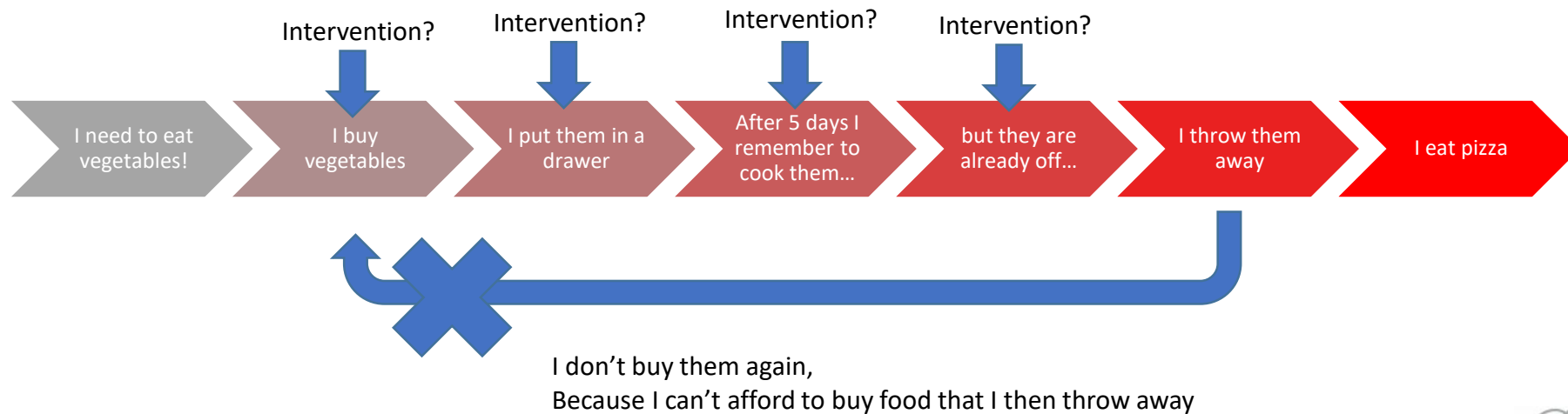
## Multiple solutions needed

- No single solution to reduce food waste, shift diets etc.
- Multiple innovations needed.

Direct Impact (Food waste)

Vs

Secondary Impact  
(Veg consumption opportunities)



- Unintended consequences or benefits...  
Synergies with healthy sustainable eating



# Multiple solutions need policy coherence

## Food policy coherence

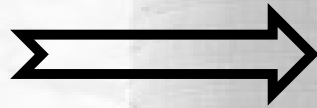
*The alignment of policies that affect the food system with the aim of achieving health, environmental, social and economic goals, to ensure that policies designed to improve one food system outcome do not undermine others. Food policy incoherence creates problems and misses opportunities.*

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

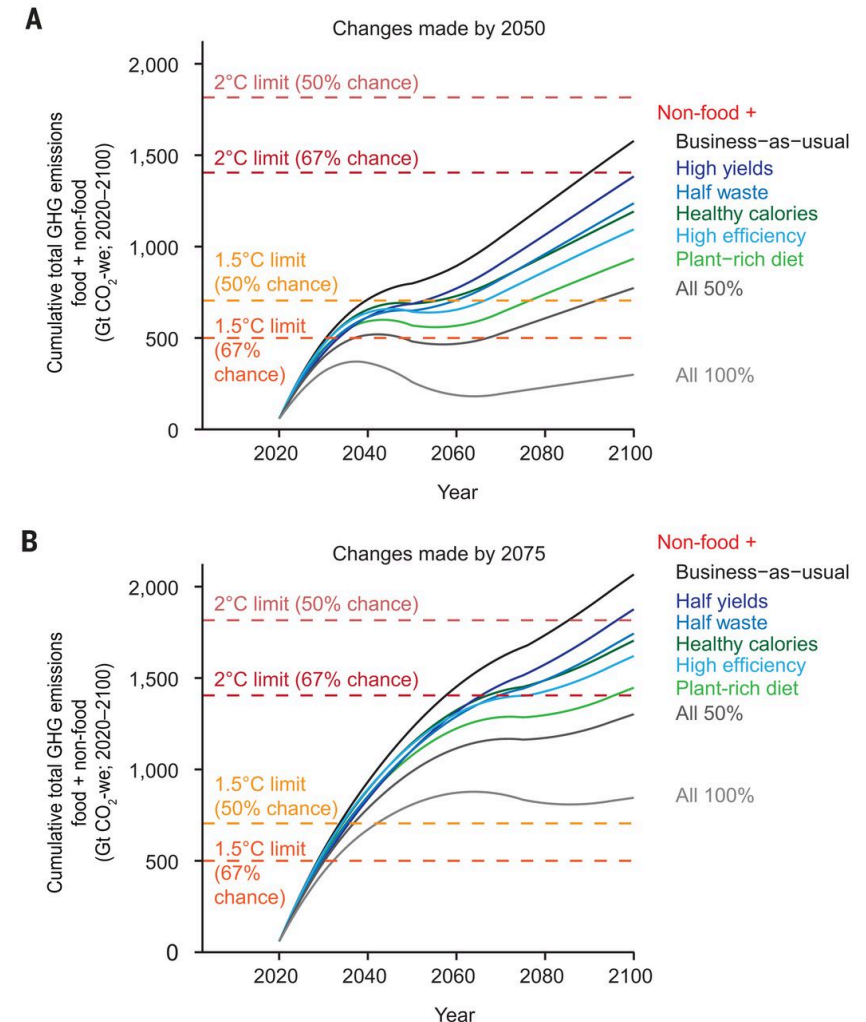


Parsons K, Hawkes C. Brief 5: Policy Coherence in Food Systems. In: Rethinking Food Policy: A Fresh Approach to Policy and Practice. London: Centre for Food Policy; 2019. [https://www.city.ac.uk/data/assets/pdf\\_file/0018/504621/7643\\_Brief-5\\_Policy\\_coherence\\_in\\_food\\_systems\\_WEB\\_SP.pdf](https://www.city.ac.uk/data/assets/pdf_file/0018/504621/7643_Brief-5_Policy_coherence_in_food_systems_WEB_SP.pdf)

# We need to continue engaging with existing trends to identify coherent solutions.

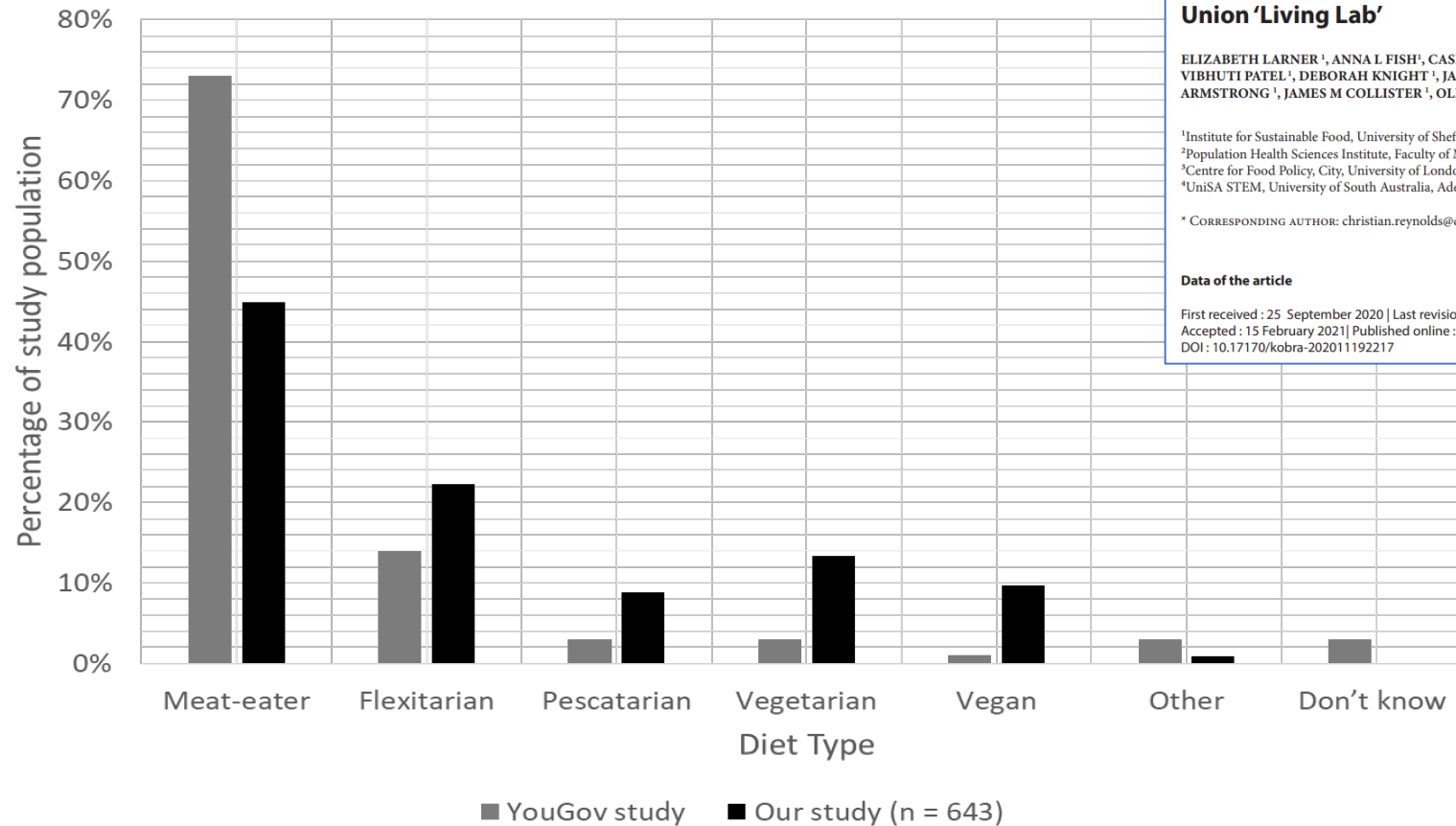
What policies and trends help our (cool) food system to become a resilient (warm) food system?

How long do we have to implement these policies?



# What are the changing perceptions and practices?

20%+ the (UK) population now Flexitarian



Research Paper

Future of Food: Journal on Food, Agriculture and Society  
9 (1) February 2021

## Reaction to a low-carbon footprint food logo and other sustainable diet promotions in a UK University's Student Union 'Living Lab'

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### Data of the article

First received : 25 September 2020 | Last revision received : 11 February 2021

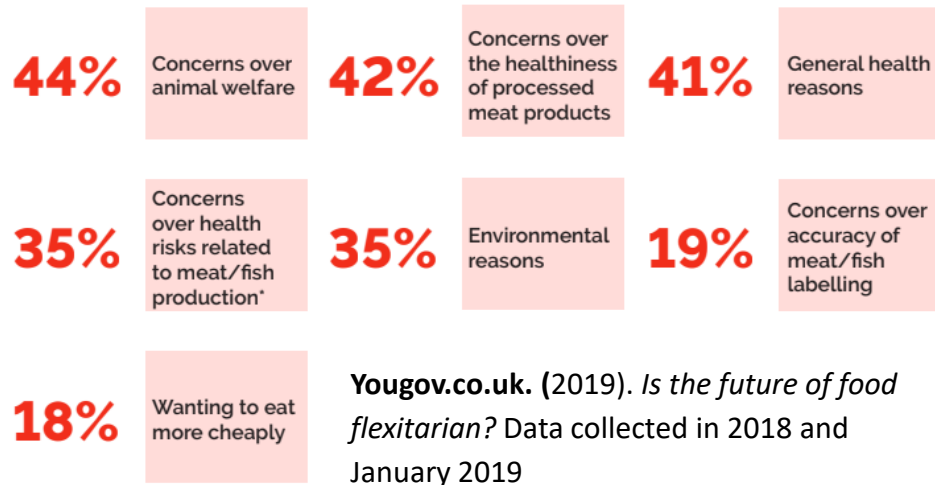
Accepted : 15 February 2021 | Published online : 21 February 2021

DOI : 10.17170/kobra-202011192217



Yougov.co.uk. (2019). *Is the future of food flexitarian?* Data collected in 2018 and January 2019

# Changing perceptions and practices ...to reduced meat intake?

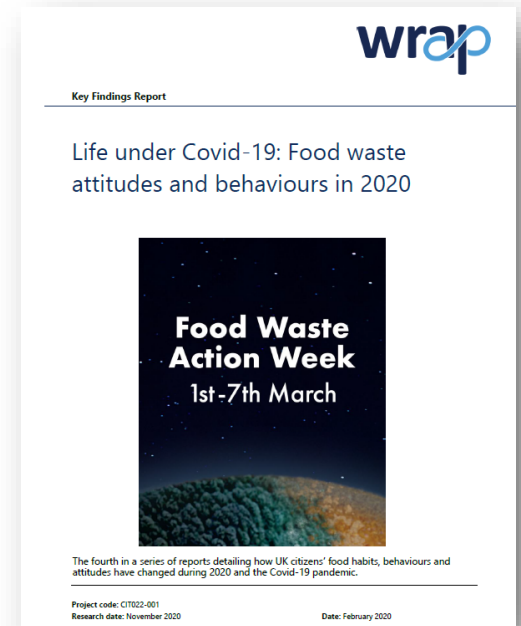
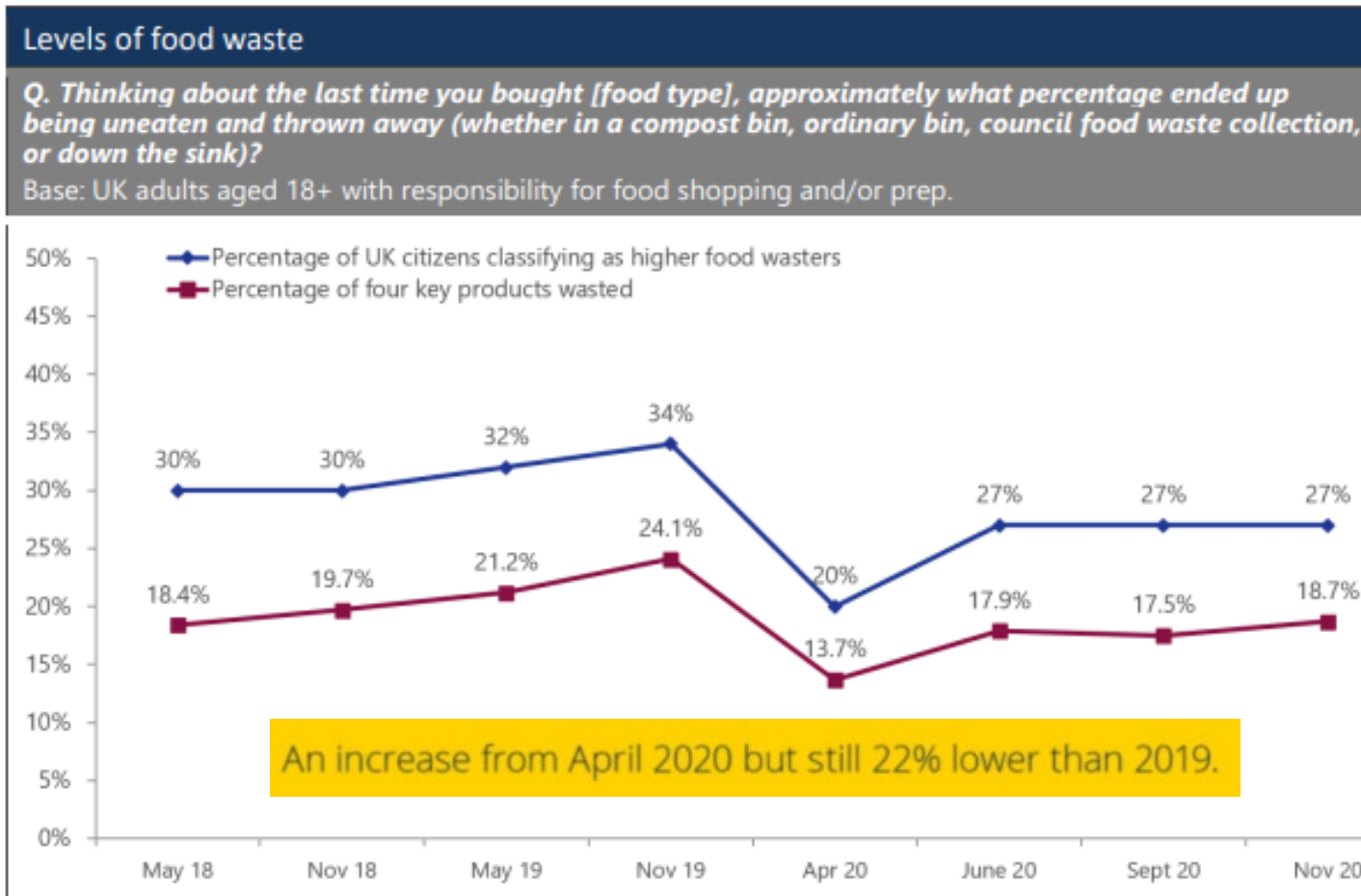


	I do not limit my meat intake	Concern for my health	It's expensive	Animal welfare concerns	Environmental concerns	I do not enjoy the taste of meat	Religious reasons	Other
<b>Brazil</b>	48.2	32.3	18.7	17.1	13.1	6.2	4.2	0.6
<b>Ghana</b>	20.1	65.2	23	10.8	14.2	9.8	17.2	2.5
<b>India</b>	14.8	42.7	12.6	28.9	29.7	13.7	29.9	10.6
<b>Kenya</b>	24.7	55.2	29.4	10.3	10.8	6.2	10.3	2.1
<b>Nigeria</b>	32.2	55.1	22.4	6.8	6.8	4.4	10.7	3.4
<b>Argentina</b>	44.3	29.5	24.5	15.4	11.6	7	3	1.3
<b>Colombia</b>	41.7	39	12.2	16.3	13.4	3.3	2.7	1.7
<b>Peru</b>	40	36.2	15.5	14.2	12.5	5.7	4.2	1.1
<b>UK</b>	37.7	28.4	18.4	31.4	32.1	11.2	1.9	4
<b>USA</b>	58.8	19.6	10.8	9.3	13.1	7	N/A	1
<b>Australia</b>	59.8	17.9	15.9	10.2	9.2	8.2	N/A	3.6

Phase 3 Cooking survey (collected in 2020) Multi county results – Reasons you limit your meat intake. (Being published in 2021)

Different drivers of change can lead to different mixes of policy solutions

# COVID-19 as a moment of change – are we starting to see the new normal?

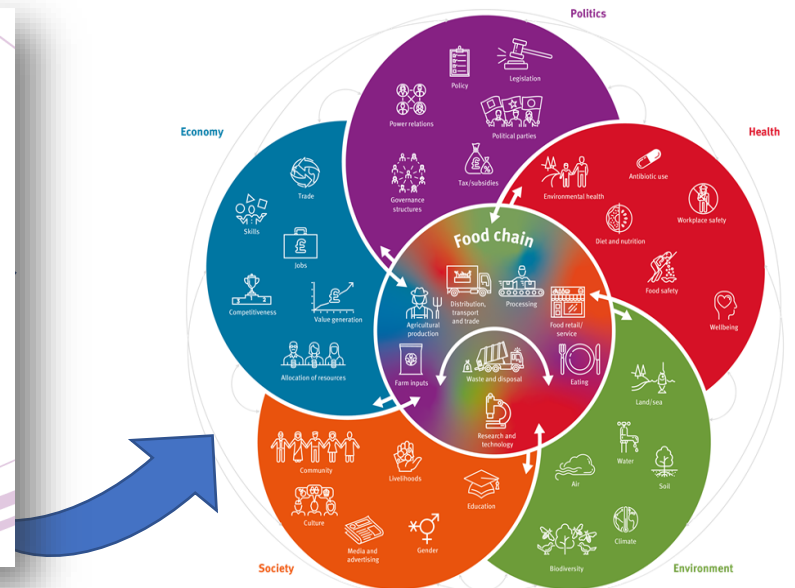


Online survey Apr, June, Sept, Nov 2020 with a nationally representative sample of 4,000 UK adults aged 18+

<https://wrap.org.uk/sites/default/files/2021-02/WRAP-Life-under-Covid-19-Food-waste-attitudes-and-behaviours-in-2020.pdf>

# Final thoughts...

- We need to change diets and FLW as part of creating a resilient food system.
- We have a wide menu of policy options to select from.
- Not all of these solutions are coherent to all food system goals, or right for every geography, culture etc.
- We can use existing trends as a basis to identify the solutions that work and are coherent, and can make a difference in the next 10 years.



# Please do get in touch

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

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