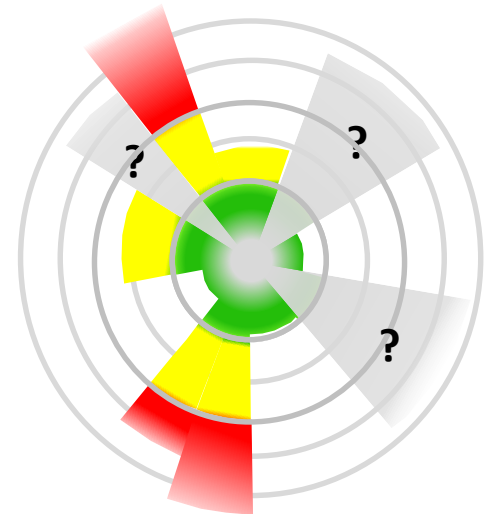


Food Systems, Food Security and Global Environmental Change

Managing what we can measure



John Ingram
Food Systems Programme Leader
Environmental Change Institute
University of Oxford

Food Systems include a set of 'Activities' which can all be 'managed' (= "doing things differently")



Food Systems 'Outcomes' underpin food security ...

"... when all people, at all times, have physical, economic and social access to **sufficient**, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life." *FAO 2002*

Food Security, i.e. **stability** over time for:

FOOD UTILISATION

- *Nutritional Value*
- *Social Value*
- *Food Safety*

FOOD ACCESS

- *Affordability*
- *Allocation*
- *Preference*

FOOD AVAILABILITY

- *Production*
- *Distribution*
- *Exchange*



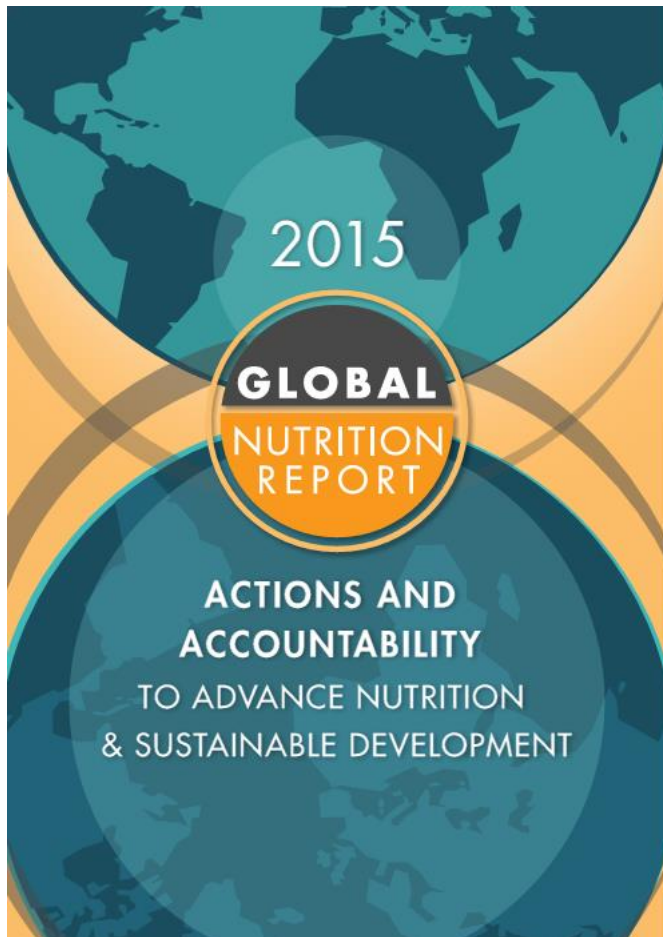
... and we can measure the food security status.

**Insufficient cals
Insufficient nutrs
currently ~ 1 billion**

**Sufficient cals
Insufficient nutrs
currently ~ 2 billion**

**Sufficient cals
Sufficient nutrs
currently ~ 3 billion**

**Excess cals (incl. some
with insufficient nutrs)
currently >2.5 billion**



**Different, overlapping forms of malnutrition:
the 'new normal'**

“Nearly every country in the world faces serious health problems linked to the consumption of either too little nutrient-rich food or too much energy-dense food.”

So what determines which 'box' we all fall in?

Insufficient cals
Insufficient nutrs
currently ~ 1 billion

Sufficient cals
Insufficient nutrs
currently ~ 2 billion

Sufficient cals
Sufficient nutrs
currently ~ 3 billion

Excess cals (incl. some with insufficient nutrs)
currently >2.5 billion

CONSUMERS

Constraints on dietary choice and diversity
affordability, preference, allocation, cooking skill, convenience, cultural norms, ...
=> Cals/Nutrient Quantity Consumption by Sub-populations

FOOD CHAIN ACTORS

'Post-farm gate' Food System Activities
processing, packaging, trading, shipping, storing, advertising, retailing, ...
=> Final Cals/Nutrient Quantity and Price at shop

PRODUCERS

Local, Regional & Global Production Activities
farming, horticulture, livestock raising, aquaculture, fishing, ...
=> Basic Cals/Nutrient Quantity and Price at 'farm gate'

Productivity

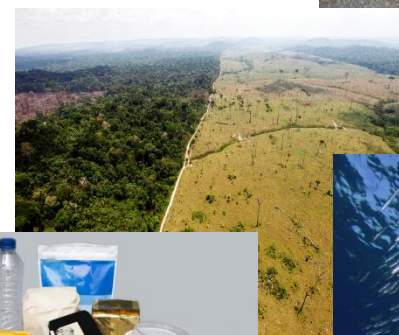
Diversity & Quality

Social, Political, Business, & Biophysical Environments

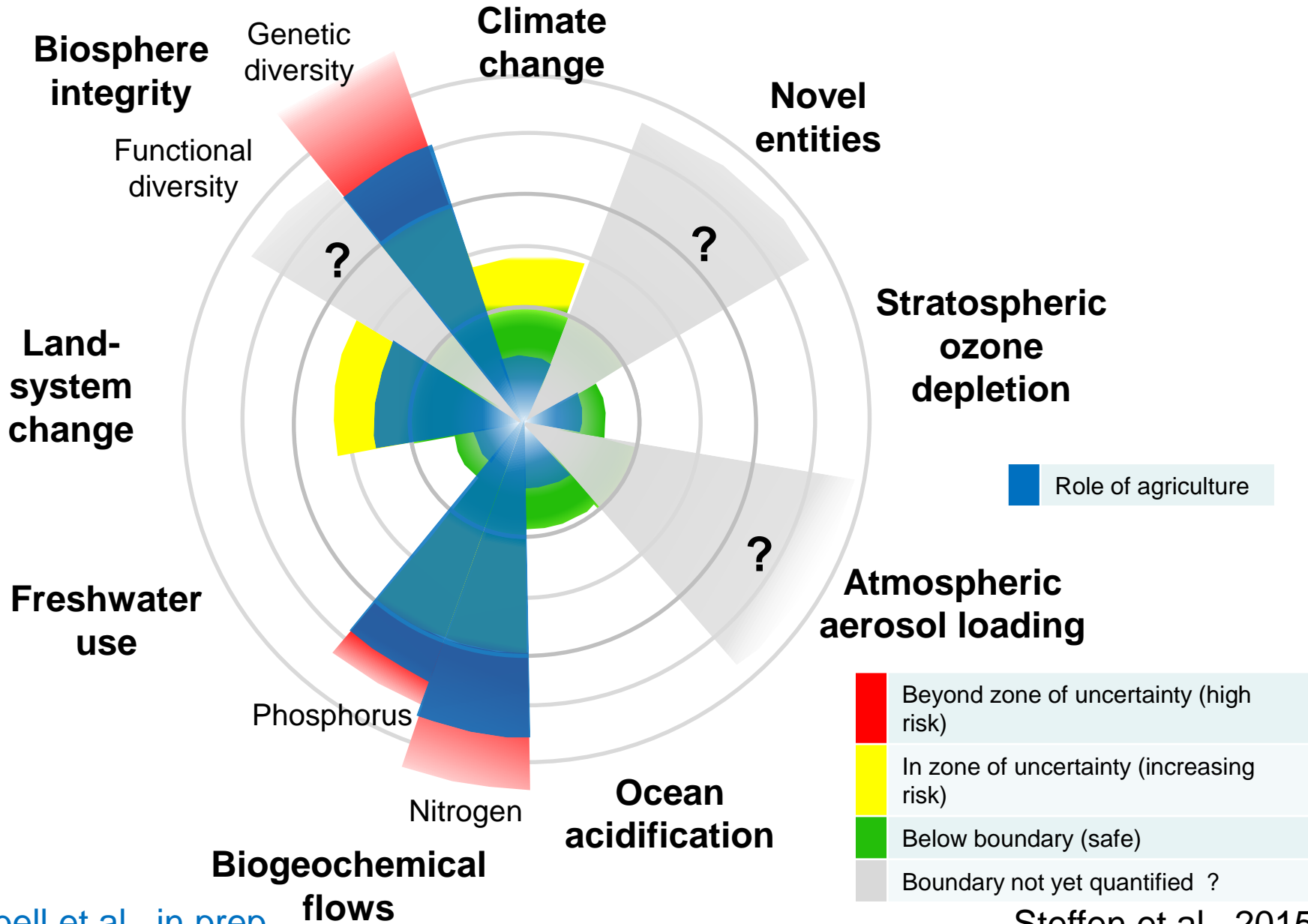
We can also measure many environmental parameters related to Food System Activities ...

- Soil 33% degraded
- Fresh water 20% aquifers overexploited
- Biodiversity 60% of loss
- Marine resources 29% over-fished; 61% fully-fished
- Minerals >80% losses farm-to-fork

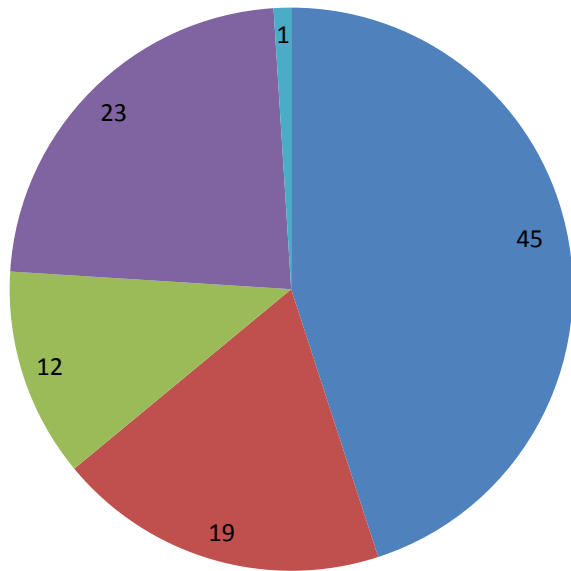
And 24% of total GHG emissions



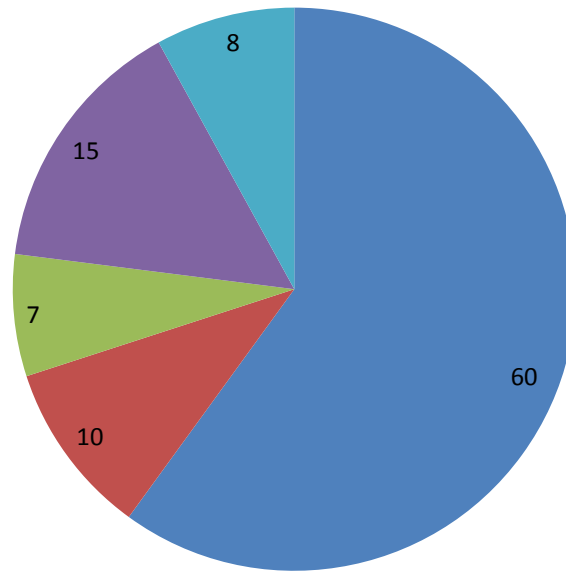
... and map them to crossing the 'Planetary Boundaries'.



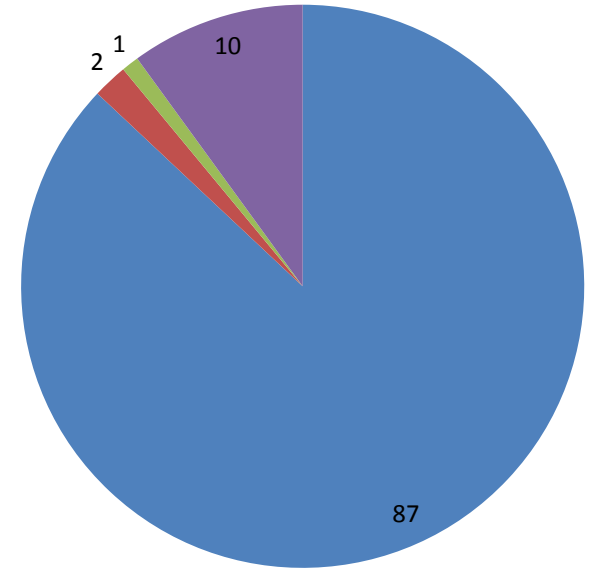
But not all GHG emissions from food systems are from 'agriculture'.



UK



USA



India

Producing

Distributing

Waste disposing

Processing

Consuming

Example: Refrigerant leakage

Refrigerant leakage accounts for 30% of supermarkets' direct GHG emissions

(Environment Investigation Agency, 2010)

Never mind plastic bags - supermarket fridges are a far bigger climate threat

Normal leakage releases chemicals with powerful greenhouse effect

Zoe Wood

Greenhouse gases used in supermarket fridges and freezers pose as great a threat to the environment as plastic bags, according to a study by campaigning group the Environmental Investigation Agency.

Chemicals released by fridges account for 30% of supermarkets' direct emissions, yet only 0.5% of stores have been fitted with greener equipment, according to the report, called Chilling Facts.

The research points the finger at "ethical" grocer the Co-operative Group, which scored the lowest marks of the major grocery chains.

The EIA has faced a struggle to raise awareness of the problem. "Fridges are not sexy," said Fionnuala Walravens. "The environmental impact of supermarket refrigeration is a big issue but little understood ... it is a hell of a lot bigger than free plastic bags."

The EIA is concerned about the widespread use of damaging HFC (hydrofluorocarbon) gases as coolants. Supermarkets are the biggest industrial emitters of HFCs, which were hurriedly introduced in the 1990s as a safer alternative to ozone-depleting chemicals such as CFCs (chlorofluorocarbons) and hydrochlorofluorocarbons (HCFCs).

HFCs do not damage the ozone layer but their global warming potential is significant. One tonne of the widely used gas called R404a has a warming effect equal to 3,900 tonnes of CO₂ over a 100-year period. The level of leakage of the chemicals is equivalent to 1bn car journeys to the average local supermarket. The gases escape in normal use and maintenance.



Chemicals released by fridges and freezers account for 30% of supermarkets' direct emissions, with stores slow to switch to alternatives Photograph: Martin Argles

But the retail industry is already 'managing what they can measure'

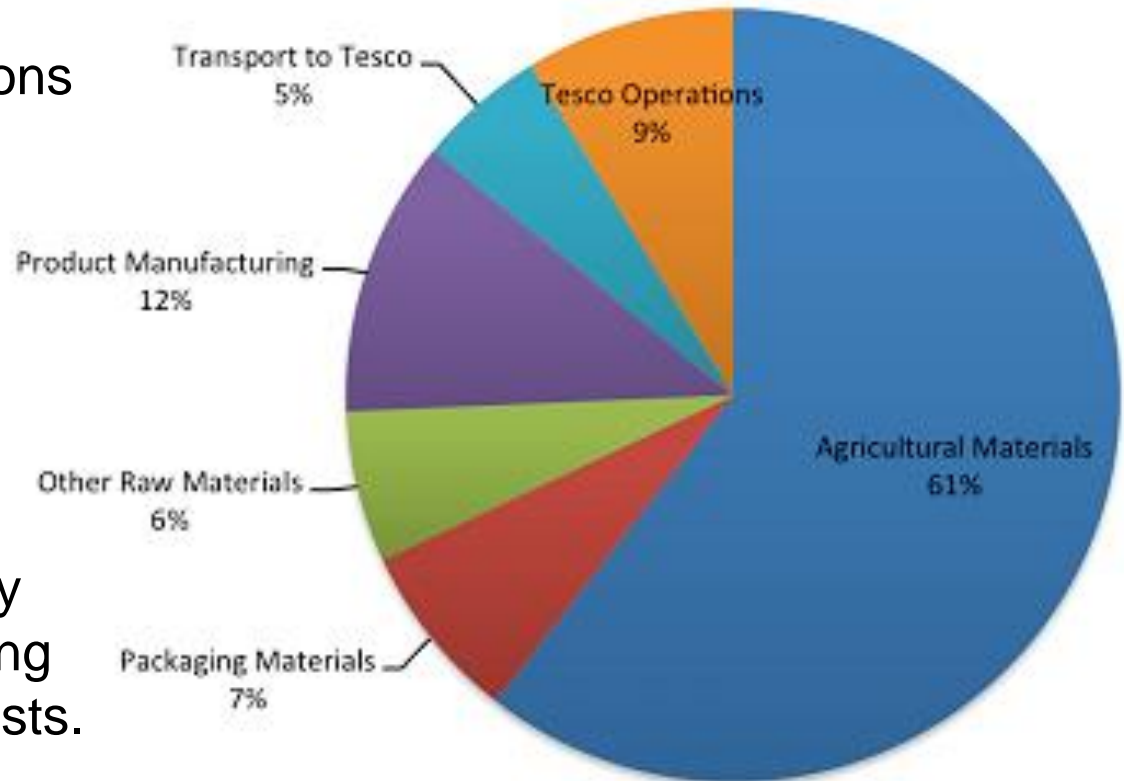


Carbon Footprint

Reducing refrigerant emissions by 26.5% compared to 2006/07.

Reducing absolute carbon emissions by 3.1% year on year.

Investing in energy efficiency programmes that are reducing both carbon footprint and costs.



Food System Activities and Planetary Boundaries

Example contributions of FSAs to PBs	Producing food	Processing & Packaging food	Distributing & Retailing food	Consuming food
Climate change				
N cycle				
P cycle				
Fresh water use				
Biodiversity loss				
Atmos. aerosols				
Chemical pollution				

Food System Activities and Planetary Boundaries

Example contributions of FSAs to PBs	Producing food	Processing & Packaging food	Distributing & Retailing food	Consuming food
Climate change	GHGs, albedo	Factory emissions	Emissions from transport and cold chain	GHGs from cooking
N cycle	Eutrophic ⁿ , GHGs	Factory effluent	NOx from transport	Waste
P cycle	P reserves	Detergents		Waste
Fresh water use	Irrigation	Washing, heating, cooling	Cleaning food	Cooking, cleaning
Biodiversity loss	Deforestation, soils, fishing	Paper/card Metal mining	Invasive spp	Consumer choices
Atmos. aerosols	Dust		Shipping	Smoke from cooking
Chemical pollution	Pesticides	Factory effluent	Transport emissions	Cooking, cleaning

Decisive role for private sector in managing food systems Activities

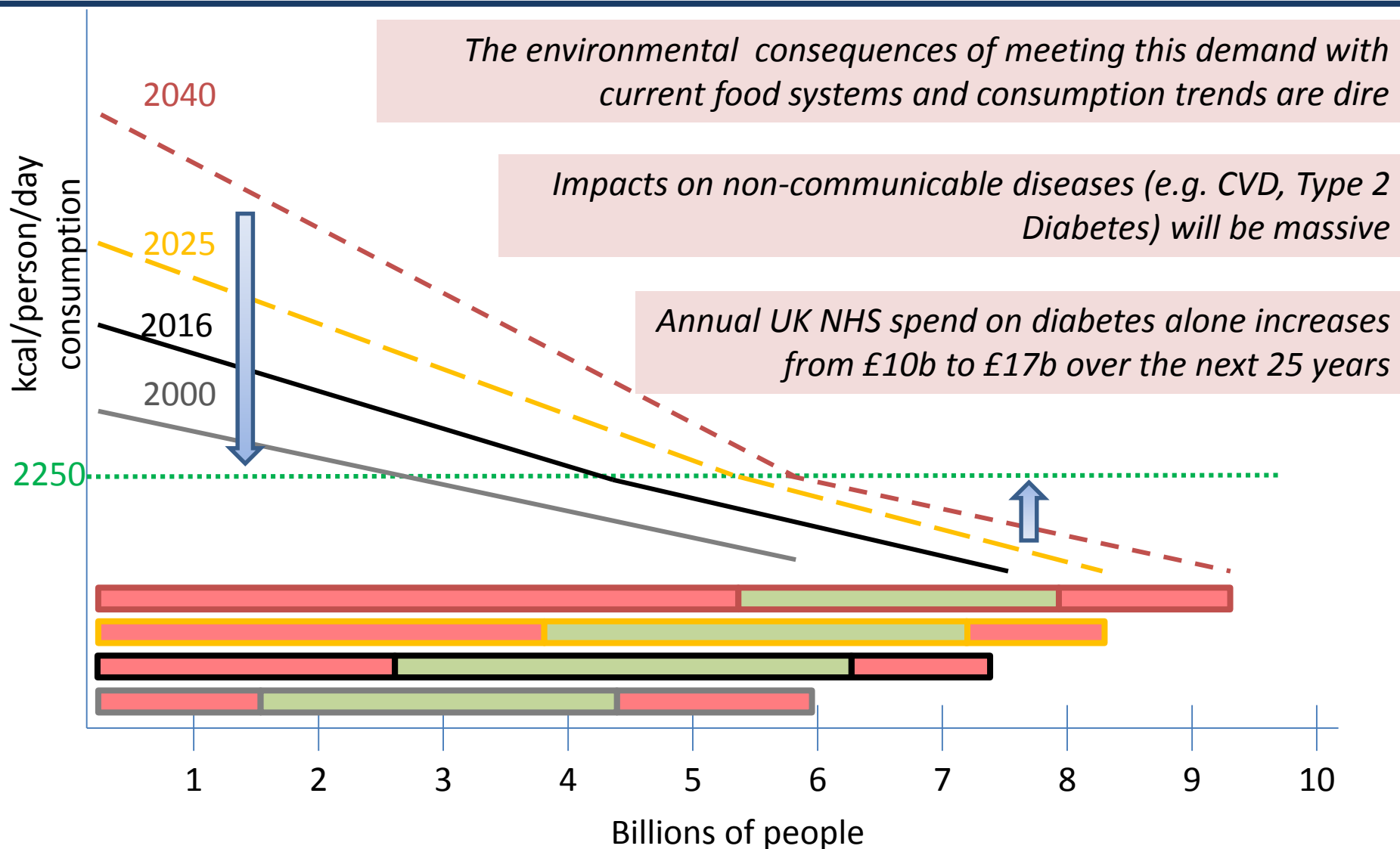
Developing company policies and practice, e.g.:

- ✓ Paying for better management of natural resources; removal of harmful subsidies
- ✓ Helping smallholder farms in developing countries to invest in sustainable intensification
- ✓ Making healthy and sustainable food choices easy for consumers

but requires policy support



Calorie consumption: dietary changes and links to health and environment



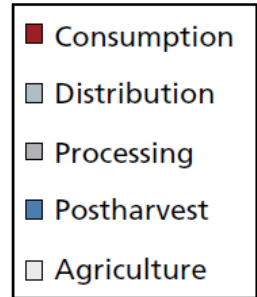
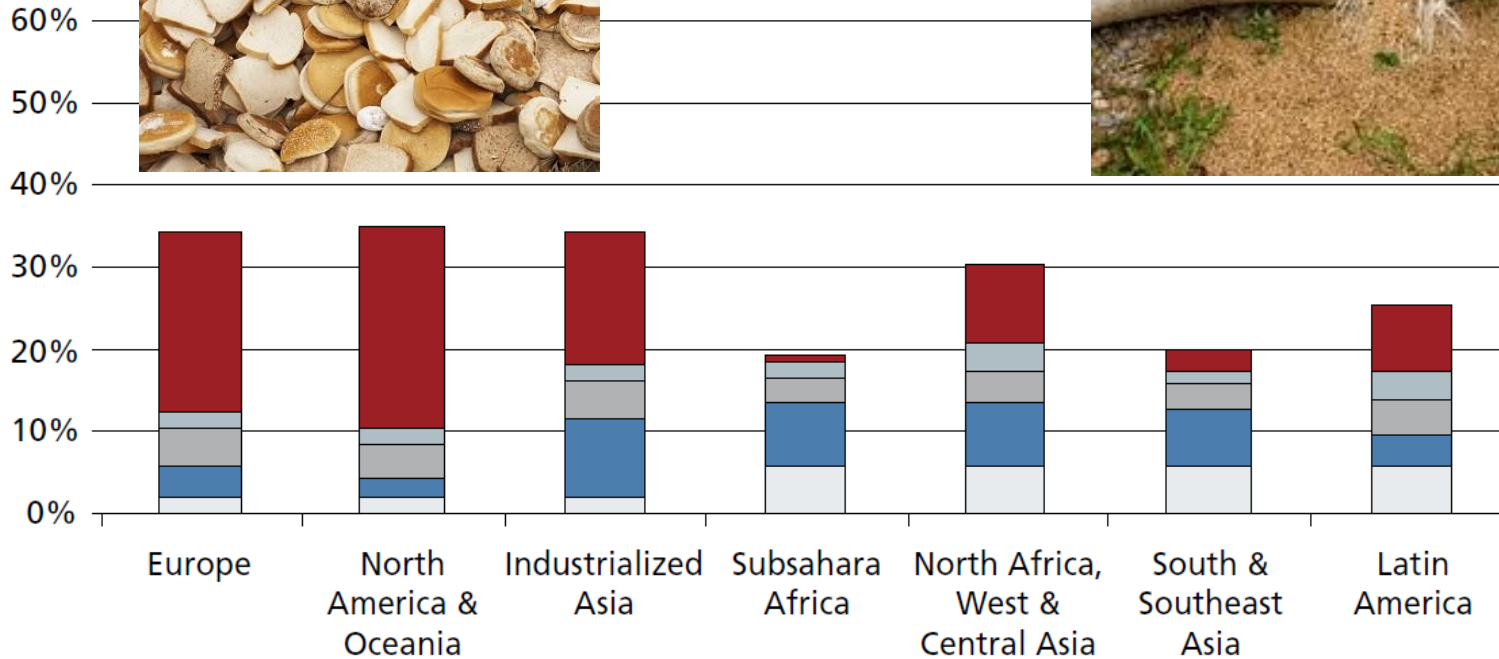
We can measure, and know how to better manage, food losses and waste ...

~ 15% “post farm gate”



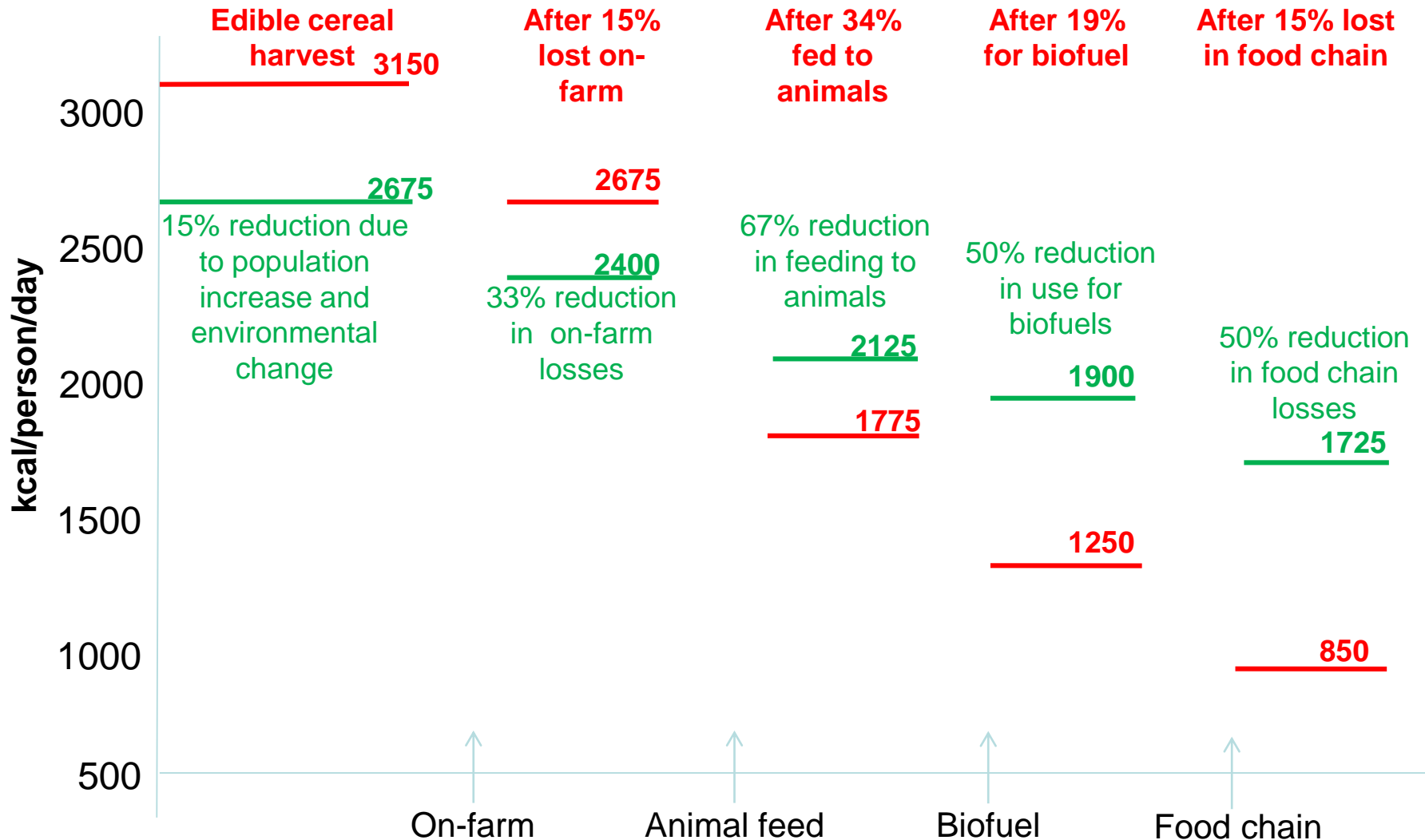
Food losses - Cereals

~ 15% “on farm”



Managing Cereals: A plausible way ahead by 2025

50% more cereal cals/person/day, despite harvesting 15% less/person



Nature of food 'loss' 'Current' data (in red) from FAO; & Luo, 2013

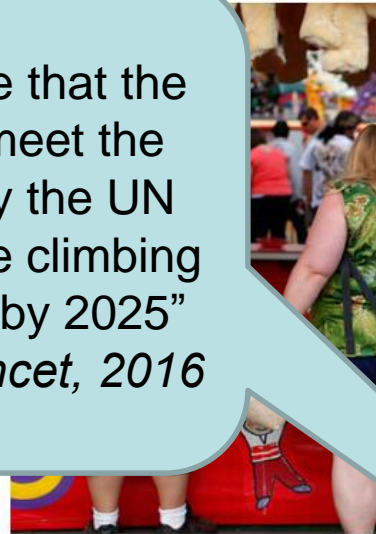
But new thinking is needed on how to manage the BIG issue

Obesity

Global obesity rise puts UN goals on diet-related diseases 'beyond reach'

Westernised diets blamed as figure increase in obesity or diabetes beyond

“zero chance that the world can meet the target set by the UN for halting the climbing obesity rate by 2025”
... *Lancet*, 2016



People attend a fair in Del Mar, California. The

One fifth of adults worldwide will be obese by 2025, predicts study

UK is on track to have the highest obesity levels in Europe, while a fifth of world's obese adults live in six high-income English-speaking countries



By 2025, the UK will have the highest obesity among both men and women in Europe, at 38%, say the researchers. Photograph: Dominic Lipinski/PA

About a fifth of adults around the world and a third of those in the UK will be obese by 2025, with potentially disastrous consequences for their health, according to a study.

The research published by the *Lancet* medical journal says there is zero chance that the world can meet the target set by the UN for halting the climbing obesity rate by 2025.

Food waste issue?
Food safety issue?