What does sustainability really mean?

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“Food security, nutrition and sustainable agriculture must remain a priority on the political agenda, to be addressed through a cross-cutting and inclusive approach, relevant to all stakeholders at global, regional and national level.” [G8 statement July 2009]

Stakeholders in:
Academia
Industries
Civil Society
The Public

• We foster a systems’ view across all major public funders of research
**People**

We are determined to end poverty and hunger, in all their forms and dimensions, and to ensure that all human beings can fulfil their potential in dignity and equality and in a healthy environment.

**Planet**

We are determined to protect the planet from degradation, including through sustainable consumption and production, sustainably managing its natural resources and taking urgent action on climate change, so that it can support the needs of the present and future generations.
Food security occurs when all people at all times have access to sufficient, safe and nutritious food that meets their dietary needs and preferences for an **active and healthy life**.

Trends in age-standardised prevalence of BMI categories in women by region

- Very very obese
- Very obese
- Obese
- Overweight
- Normal
- Low normal
- Underweight
What we should be eating
(Harvard's Healthy Eating Plate Model)

- Fruits & Vegetables: 49%
- Cereals and Starches: 20%
- Milk & Milk Products: 8%
- Meat, fish, eggs, beans: 20%
- Oils & Fats: 3%

What we are actually producing
(According to 2011 FAO)

- Fruits & Vegetables: 11%
- Cereals and Starches: 47%
- Milk and Milk Products: 4%
- Meat, fish, eggs, beans: 11%
- Oils & Fats: 11%
- Sugar: 16%

WHO<

Limit

5% Evan Fraser, Guelph, FBS analysis, 2015
Global food losses/waste is estimated to be 1.3 billion tonnes per annum (pa), equating to approximately one third of edible food intended for human consumption.

The total food production of sub-Saharan Africa = EU+N Am food waste (230mt).

Total food waste has enough embedded calories to feed 2-3bn people.

Many reasons for loss and waste: pack size, safety, food is cheap, culture.

Need to recycle “from farm to flush.”
Our food system isn’t sustainable

• Diet is related to ill health globally

• Production of few commodities at large scale is environmentally detrimental (soils, water, biodiversity etc)

• Cheap food produces waste

• Responsible for significant amount of global warming
WHAT IS SUSTAINABILITY?

Sustainability is not “increasing efficiency”
Brundtland Report (1987): “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”
Terminological inexactitude

- Definitions so broad as to be impossible to operationalise
- UN agenda implied equal weighting of three dimensions
- Often implicit assumption that economic and social are correlated
- From a “first principles” perspective can expect envt to ultimately underpin the other two

Brundtland Report (1987): “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

UN Agenda for development (1997) articulated that sustainability has three dimensions: envt, econ and social
Sustaining economic growth

• Does it matter if the world is changing?
Are there limits to environmental exploitation?

• Global output gone up nearly 4x
• Pop size 3bn to 7bn
Sustaining what?

- Growth?
- Whilst minimising impacts?
- Whilst maintaining natural capital?
- Whilst avoiding tipping points?
- Whilst keeping the world as it is?
What does land do?

Sustainability is about maintaining ecosystem services (including climate) at a landscape scale appropriate to place, societal needs and ethical values.
WHY IS SUSTAINABILITY NOT (JUST) ABOUT EFFICIENCY?

e.g. reducing waste, reducing packaging, reducing energy
• Genetic breeding and selection has more than doubled chicken yields at slaughter age (42 days) and halved the feed required
• Feed efficiency continually improving. For the same volume, UK impact in 15 years time as follows:
  o 86,000 tonnes less feed per year saving £10M pa
  o 288,000 tonnes less CO₂ equivalents per year valued at £8M pa

<table>
<thead>
<tr>
<th>Year</th>
<th>1976</th>
<th>1999</th>
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<tbody>
<tr>
<td>Live weight at 42 days</td>
<td>1050g</td>
<td>2600g</td>
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<tr>
<td>Age at 2kg</td>
<td>63 days</td>
<td>36 days</td>
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<tr>
<td>Yield of breast meat</td>
<td>250g</td>
<td>340g</td>
</tr>
<tr>
<td>Feed/1kg breast meat</td>
<td>20kg</td>
<td>10kg</td>
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</tbody>
</table>
Better soil health
Less impact on water and atmosphere
Lower residues in food
More resilient to extremes (e.g. drought)
More biodiversity etc

Changing demand is part of “sustainable”
Recipe-based approaches don’t deliver sustainability *(sensu stricto)*

- Huge number of variables across the three dimensions: “who chooses which matters most”?
- “optimising” formally difficult because “who decides the weights?”
- Every place is different, and the “best thing” to do “depends...” (on place, on neighbours etc)
- Systems also very leaky: stakeholder mapping tricky
Place-based solutions are part of SI

• It is possible to “design” landscapes better to deliver a range of goods

• Governance issues abound
Safe operating spaces
Sustainability in the food system

• No simple solutions (like increase efficiency; zero waste; develop GM; eat local; eat organic).
• Innovation needed in many areas
  – Make ag more sustainable through efficiency of process and in space
  – Maintain ecosystem services
  – Increase equity
  – Waste: Reduce first and reuse second
  – Make diets healthier and reduce demand
NEED FOR CHANGE
Globally, if we carry on as we are...

- We need to produce more food by 2050 than we have done in human history
- This will require 120% more water; 42% more cropland and loss of 14% more forest
- This will emit enough carbon dioxide to create 2 degrees of global warming
- We’ll lose much of the world’s biodiversity
- Food will increasingly be associated with early deaths

Importance of food-demand management for climate mitigation

Bojana Bajželj*, Keith S. Richards2, Julian M. Allwood1, Pete Smith3, John S. Dennis4, Elizabeth Curmi3 and Christopher A. Gilligan3

NCC 2014
How do we make the system “sustainable”?
Leverage point to make space for sustainable agric

The population of all Asia is 4.2bn

Figure 1. Calorie delivery fraction per hectare. The proportions of produced calories that are delivered as food are shown.

E S Cassidy et al

Business as usual is a Jevon’s paradox: more is not enough

Production (unsustainable)
Cheap food
Over consumption
Environmental impact
Increasing demand

Production (sustainable)
“full cost of food”
Less waste
Healthy consumption
Low environmental impact
Managed demand

Sustainable nutrition

\[ \frac{2}{3} \times \frac{2}{3} \times (1 - (\frac{1}{3} \times \frac{1}{5})) = \frac{56}{135} = 41\% \text{ used} \]

Food not lost/wasted/fed to animals or overeaten

The M25 model
Valuing more than price

- Price is the lowest common denominator
  - All being equal price is a good discriminator

- Focus groups emphasise “I don’t understand why sustainability matters; I don’t trust green labels and I didn’t know what impacts my food choices have”
  - All is not equal: how can markets differentiate the “unequalness”? 
Who has the power?
Who has the power to change it?

Fig p 13 from “Environmental Balance” report by the Dutch Environmental Agency
http://themasites.pbl.nl/balansvandeleefomgeving/2012/).
Conclusions

- We can grow more food and reduce its environmental impact
- There is no “magic bullet” but scope for many innovations in many areas (including biotechnology)
- Unlikely we can grow enough food to meet demand sustainably as it is currently projected (without significant inequality)
- Changing demand (or population size) needed to make space for sustainability
- Social change therefore as important as scientific innovation
- Challenges require significant research investment, important to protect budgets
Thank you!

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www.foodsecurity.ac.uk
1. Buy it with thought
2. Cook it with care
3. Use less wheat & meat
4. Buy local foods
5. Serve just enough
6. Use what is left