

Sustainable Diets and Biodiversity:

The challenge for policy, evidence and behaviour change

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**Keynote / opening paper to the International Scientific Symposium:
Biodiversity and Sustainable Diets: united against hunger, held at the Food
and Agriculture Organisation, Rome, November 3-6, 2010**

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SLIDE TITLE

It is a deep honour to address this Symposium with so many distinguished scientists. And to do this in the FAO, a key global food and farming institution, is a double pleasure. And to do it here in Rome, where I first lived after schooling in the UK, a triple and special pleasure.

I am probably an oddity here – no bad thing in biodiversity! – in that I am a social scientist, and one who watches the complex area not of biodiversity but of policy.

Whereas we all celebrate diversity in the biophysical world, in the policy world, I frequently find myself wishing there was more coherence, more order, less bizarre behaviour.

So I want here to ask if our policies, our institutions are, as we say in English, ‘fit for purpose’, i.e. appropriate for the task of mixing sustainable diets and biodiversity.

Are we addressing and resolving this problem well?

My honest answer is ‘no’. And that is why our Symposium must come up with new ideas for what is necessary.

I want to see tough guidelines on Sustainable Diet:

- Do I eat meat? How much? Grass yes; cereal fed no?
- How do I eat nutritionally well and low carbon & water?
- Do I eat fish? Nutrition says yes; stock analysts no

I want to propose we set up a new process to define a sustainable diet. We have been trying to do this in the UK, via the Sustainable Development Commission, on which I sit.

And an Integrated Advice for Consumers programme across Government.[1-3] Alas, both have been abolished by our new Government! So I am in sober but determined mood.

The SDC report, incorporating work at Oxford University found different categories of ‘fit’ or match between health and sustainability. If you haven’t seen the report, please do.

But a real notion of Sustainable Diets must include multiple environmental measures, including biodiversity. All are equally pressing: water, energy, soil, land use, biodiversity, climate change etc.

This is true ecological thinking not just thinking about ecology.

My own University’s Centre for Food Policy response to this problem is to suggest that the food system needs to pursue and be judged against multiple goals and values.

I have called this a food system based on ‘poly-values’ and aiming to deliver ‘omni-standards’. ‘Poly’ meaning multiple or many. ‘Omni’ from the Latin for all.

SLIDE: Food systems + Poly-values → Omni-standards

We cannot just pursue increased production at all costs, any more than we can say the environment comes first. Multiple goals need to be pursued.

A key reason for this proposal is that too often topics which actors in the food system do not think are important get ‘traded off’ for ones they do.

Thus health proponents, for example, might now accept that climate change or water are important, but that ethics or animal welfare are less important.

Or environmentalists might accept that food safety is very important but that food’s impact on non-communicable diseases (heart disease, strokes, obesity) is not so important.

In truth we need a food system which meets poly-values and works to omni-standards.

Not low carbon or biodiverse but both! And healthy. And safe. And just etc.

SLIDE: Issues to address in food – ‘Omni-standards’

And it must build these in to the economic rules.

Economics must serve humanity and humanity not drive them.

Where does this take us?

SLIDE The need to define Sustainable Diets

Just as we have witnessed the long processes to improve food security and biodiversity, so we need to articulate and clarify what sustainable or low impact diets are.

There are many models by which this could be done.

- An International Assessment, such as the joint World Bank and FAO's International Assessment of Agriculture Science, Technology Development (IAASTD)[4]
- A commission, such as the Commission on Social Determinants of Health[5]
- An International Conference, such as the 1992 International Conference on Nutrition[6] or the 1992 Rio Conference[7]
- A committee of experts
- Regional rather than global bodies

This Symposium is an important international step in that process.

But it just a start. Where might it go?

SLIDE: Possible Processes: Experts → Conventions

Do we need a Convention on Sustainable Diets? Could the Convention on Biological Diversity spawn a new sub-section?

I see today's symposium as beginning a process of putting clarity in sustainable diets.

- Building on work done eg *Livestock's Long Shadow* [8]
- Accelerating processes mapped for this Symposium

We need to dare to do for SustDiets what's been done for food rights with the landmark 2004 *Voluntary Guidelines*. [9, 10]

SLIDE: Evolution of Food Rights

These stem from the 1948 Universal Declaration of Human Rights, but really from a mere 15 years work, which began with the UN 1989 Study, and grew via the 1999 Committee General Comment, the 2000 UN Resolution and the Millennium Development Goals. In 15 years huge progress was made with quasi legal formulation.

Such diplomacy and *Guidelines* would be excellent. They need MS support and to happen at national level too.

But we need more and different avenues of policy work too, because the world of food policy is not at peace with the world of biodiversity.

SLIDE: Biodiversity vs Food, or in food production?

As we know, food production, which has flowered from the biodiversity humanity inherited, is now one of its greatest threats. How we eat, farm and manage intensive production systems is a huge force changing the biodiversity which we discuss here in Rome for three days.

I am arguing that biodiversity specialists must inject new measures and new coherence into the vital task of defining a sustainable diet.

We don't know what a sustainable diet is.

But we are eating the planet.

SLIDE: Genetic Diversity

17,291 species out of 47,677 so far assessed are threatened with extinction.[11]

In Europe, the Agri-food chain contributes c 18-20% of GHGs, 30% of a consumer's emissions.[12]

Others suggest food (for the UK, for example) that food is c30% of UK's ecological footprint in total, with livestock accounting for c20% of direct emissions.[13]

In the UK, food represents 23% of a consumer's ecological footprint. We eat as though there are two planets![14]

We know we are altering the web of life, how everything connects. Desire for food led to agrichemical sprays which altered life which affected bees which work for pollination which we need.

So, what are the policy goals that ought to shape the food system for the future?

Is it to eat what keeps a body optimally healthy? Or to eat what we like? Or to eat within environmental limits?

SLIDE: Do we eat for health? What we like? Or within environmental limits?

Nutritional guidelines currently do the first in order to advise against the second.

There are honourable exceptions among nutrition scientists – I think of Annika Carlsson-Kanyama, Tony McMichael, Claus Leitzmann, Michael Krawinkel, Michael Crawford. And others here at this Symposium. But not the vast majority.

And the sad truth is that nutrition science so far overwhelmingly ignores the third. It is not engaged with the environment.

This needs to change. Bridges need to be built. Common discourses and research must be created. What we have called ‘policy cacophony’ – many voices all claiming they represent the key issue – needs to be brought into more harmonious co-existence.

That is why my colleagues and I at City University have worked so hard to promote the notion of omni-standards.

Something needs to help policy makers bring diverse evidence into one framework.

The good news is that thinking in that direction is emerging.

SLIDE: Government Initiatives on Sustainable Diet

I know most about thinking in Europe, such as:

- UK’s 2008 *Food Matters* [15] leading to *Food 2030* [16]

- Sweden's 2008 *Environmentally Conscious Choices* work[17]
- Germany's long-term advice on sustainable shopping[18]

But these are tentative steps, reliant on consumerism and choice ideology, as though those are not part of the problem.

Thus subject to political whim and cuts, as we've got in the UK.

We must now face the tension between consumerism, biodiversity and sustainable diets. Consumerism must be tempered by citizenship.

SLIDE: some NGO initiatives on Sustainable Diet

I think of NGOs such as WWF with its ambitious work on One Planet Diets.[19]

I think of the pioneering work by the Food & Climate Research Network, led by Tara Garnett.[20]

I think of Sustain's experimentation with complex labelling.

And the Vancouver or Fife Diets, trying to rebuild local systems. Real citizens experimenting with culture change; rebuilding links to biodiverse land use.

SLIDE: Corporation activities – Barilla / Tesco et al / SAI etc

Corporations, too, are beginning to be worried and engage. Cynics see this as to avoid litigation. But some are thinking more structurally. They want to be around in 40 years time.

Barilla, the large pasta group, has launched an environmental pyramid.

SLIDE: Barilla pyramid

A group of giant global corporations came together on sustainable agriculture in 2002. Another in 2009.

In 2008, Tesco, the world's 3rd largest food retailer, set up Manchester University's Sustainable Consumption Institute. It needs facts. Government wasn't helping. SCI is now beginning to analyse where greatest gains in reducing food's footprint might come.[21]

Others have openly adopted 'choice-editing' ie being open that they filter food offers against values. Marks & Spencer's Plan A. J Sainsbury's (unpublished) scorecard.

These are cautious but hopeful steps.

But the urgency is not there.

The integration is not there – for the whole food system

The required scale and leap are not there.

No-one is leading the push to change culture rapidly.

Indeed, mainstream politics is currently centred on trying to encourage developing countries to consume more and developed country consumers – currently worried about debt and uncertainties – to resume consuming.

But 'business-as-usual' policies are not right. They are part of the problem.

We need to change the game, as we say. Change the direction of travel.

Part of this has to be how to change behaviour.

Citizen consumers need new 'cultural rules' and norms of eating, which integrate biodiversity in the notion of sustainable diets.

Globally, the trends are in the opposite direction. Let's be clear, if measured by:

- Water
- Energy use
- Climate change
- Soil
- Biodiversity (of course!)
- Health

Nutrition science needs help!

SLIDE: Three scientific traditions of looking at nutrition

In our book, *Food Policy*, [22] my colleagues and I argued that nutrition has three grand traditions focused on:

- biochemistry, mining 'down' the life sciences;
- social justice, attempting to address social dimension of needs;
- the environment, addressing the reliance on the natural world.

Today, the life sciences tradition is in the driving seat. The excitement with the ‘omics’ - genomics, nutrigenomics, psychogenomics, etc – is bubbling.

Yet evidence as to food’s impact and reliance on the environment is overwhelming.

In policy circles, the term ‘evidence based policy’ is much revered. Who could want policy not based on evidence?

Actually, we now argue that often a bigger problem is:

- Evidence looking for a policy
- Policy with partial evidence
- Competition between evidence
- Eminence-based policy, not evidence-based

Surely in biodiversity, the evidence is overwhelming. The problem is what to do about it?

We need not just science but strategy, policy not just research programmes.

How much evidence about biodiversity and dietary impact do we need before policy engages?

By the entrance of this FAO building in Rome – famous to all of us in the world of food – is the statue of a great policy thinker, John Boyd Orr. He was the first FAO Director General, and won a Nobel Prize, not for medicine (for his pioneering work on food, health and income) but for Peace.

SLIDE: J Boyd Orr

That connection between food and social justice needs to be in our minds at this symposium.

For we meet at a time when the world of food faces huge and complex challenges.

I smile ironically every time I see his statue as it captures him in a pose no medical doctor would like to be portrayed in today. He is smoking! In my photo here, too.

But it is appropriate to pay homage to people of the Boyd Orr generation. It is their legacy that we both need to think about and to revise.

Our task of defining sustainable diets is partly because they (unintentionally) created the problem. They saw the environment as something to be mined for food production. Their moral driver was to increase production, to meet unmet needs.

Perhaps it is unfair to say they ‘created’ the problem, but their legacy has certainly colluded with it.

They were the generation which essentially promoted what we, in food policy, call the productionist paradigm.

SLIDE: Productionist Formula

This is the view that science + capital could increase the land’s output.

Science + capital → production
+ distribution → cheaper food
→ health = progress

This policy formula could both meet human needs and defeat once and for all Thomas Malthus' pessimism.

SLIDE: Thomas Malthus

In his 1798 *Essay on the Principle of Population*, the Rev Dr Malthus had articulated a challenge which has troubled the world, periodically, ever since.

Population could outpace the capacity of food supply to be increased.

As we know, the systematic attempt to increase food productivity in the modern scientific sense long pre-dates Boyd Orr. It goes back to the development of settled agriculture itself.

SLIDE: 10k Years of Food Supply Change

We are at a point today where food has to face multiple problems.

So we are meeting here at this Symposium on Biodiversity when....

Other meetings for decades have outlined other fundamental challenges:

- soil, water, energy, climate change, etc.

- hunger, obesity, mal-distribution, etc.
- unaffordable food, and food that is too cheap.
- And so on...

In fact, a common theme has emerged in recent years.

The ghost at all these meetings is not just Malthus but the need to reframe the problem.

The problem is our failure to achieve a sustainable fit between production, distribution and consumption.

The Boyd Orr generation argued that under-production was the policy challenge. How to unlock potential to produce more.

We now know that is an inadequate analysis.

We need sustainable diets from sustainable food systems. We aren't delivering either.

Part of the problem is that we are locked into the oil era.

SLIDE: John D Rockefeller

Oil and energy fuelled the C20th food revolutions, our ecological experiment.

Oil fixes nitrogen and mines the earth for minerals which enhance plant growth.

Oil drives the trucks, ships and planes which distribute the food.

Oil enables consumers to get into cars, get to the supermarkets and buy cheap food, and then waste it.

But it's also a cultural not just an oil problem. We waste food.[23, 24]

In the UK, about 30% of food bought fit to eat is thrown away.[25]

In the USA, USDA says it's 25%, [26] but Tim Jones at the University of Arizona talks of 40-50% of food ready for harvest being wasted. An estimated \$1 billion is spent disposing of US food waste each year.

This is the food model of progress which assumed limitlessness.

The policy tectonic plates trembled in 2006-08 when global food commodity prices rocketed. This electrified the political classes – and excited stock markets globally. For a moment, food came to the forefront of mainstream politics.

Many people used that moment to re-assert the mid 20th century formula and to argue it should be given yet another twist. Another tightening of the screw.

The new term is 'sustainable intensification'. [27]

My own country's Chief Food Scientist Prof John Beddington who has created a major review of the world situation, about to be published, has written movingly:

“The world must produce 40 per cent more food, with limited land and water, using less energy, fertilizer and pesticide — by 2030 — at the same time as bringing down sharply the level of greenhouse gases emitted globally, and while coping with the impact of climate changes that cannot be avoided.”[28]

While I applaud the urgency – which we all share – I am nervous that diet is too often being left as a fixed variable.

But diet is malleable. It is plastic.

Advertisers, marketers and giant food companies know that.

Why is it assumed, then, that meat and dairy consumption will go up? IFPRI’s 2020 vision did that too.[29]

Steeply rising meat may be the current trend. But is it right? Do we accept that? Surely policy is not about maintaining trends but giving frameworks for future satisfaction.

Meat and dairy have their place. Many people like them. But if a phenomenal rise in output requires 50% or so of grain to be fed to animals, is this good land use? Or water use? Let alone, public health nutrition policy? I think not.

SLIDE: New Fundamentals

Let us be clear. The 21st century food system must be based on all the New Fundamentals. It cannot ‘cherry pick’, choose what it likes.

What we eat and how we eat it has changed phenomenally in history.

When meat and dairy, ie fat from fields, is ubiquitous and cheap, humans lap it up.

Even meat-rejecting cultures have rocketing dairy consumption.

But they also shift from drinking water to soft drinks, ie sugar.

SLIDE: Modern Food Culture: marketing, supermarkets etc

The nutrition transition, the shift from restricted to more liberal diets, is a triumph of consumer capitalism, a triumph of marketing and food choice culture.

And then the pattern of ill-health follows that troubles WHO and Ministries of Health, and burdens healthcare costs.

Here is why we need to join up policies currently in silos.

Both food production and consumption need to be sustainable in the 'omni-standards' and 'poly-values' way of thinking. It needs to meet all health, environment, socio-cultural and ethical values. These need to dominate economics not the reverse.

SLIDE: Food Policy and competing demands

To achieve this requires clear frameworks. We lack these at present, not least since food policy is pushed and pulled by competing goals and aspirations.

This then is the context for our discussions of biodiversity.

Sustainable diets have too few champions. But the good news, I repeat, is that the discourse is growing. 10 years ago, did I or others think this Symposium would be possible?

For policy-watchers, the key issues are:

- What do we mean by sustainable diet?
- Are there any frameworks to deliver it?
- What measures are used?
- Which institutions cover this terrain?
- Is there coherence?
- Do consumers buy it?

What would diet centred on biodiversity look like?

Do I drink espresso coffee I learned to love when I lived in this city in 1967? Italians claim the best coffee. Its genetic roots are Africa probably Ethiopia.

Now it's a billion dollar business (like tea and sugar before it).

Do I drink it, if I pursue a sustainable diet?

Do I choose 'bird-friendly' conservation coffee? Organic coffee? Fair traded coffee? Low pesticide coffee? The cheapest or most expensive?

Do I drink none, since it's such a high water using product?

One 125 ml cup (not espresso) takes 140 litres to get to my lips, according to one study.[30]

Or drink fair trade coffee to support low income croppers to live at all?

Or is the only sustainable water, not coffee?

Here's an illustration of our problem.

SLIDE: Do we change the menu?

The policy choice I am pointing to is this:

- Is biodiversity served by getting it into the field
- Or keeping biodiversity at the edge of the field and beyond?
- or in Parks and conservation areas?

Is the future one of intensive food production treating that land as a neutral medium, for inputs and outputs?

Or is the future one where we build eco-systems support into the mode of production?

Surely yes. In which case, do we eat that biodiversity – in order to protect it?

Is contemporary policy helping me here?

The answer is no. The language is consumer choice and sovereignty, but the reality is consumer confusion.

SLIDE: Time for Clarification

Don't misunderstand me. For biodiversity, decades of evidence and politicking have yielded much:

- The Convention on Biological Diversity 1992
- The Cartagena Protocol on Biosafety 2000
- Work on patents and Intellectual Property Rights (IPRs)
- Seed banks and conservation

I am President of the UK's organic gardening body, which pioneered preservation of working seeds, heritage seeds, by getting people to join a scheme and then get the seed free. Because old varieties were de-listed, ie made illegal to sell.
[31]

The world's population is being educated, not least by TV programmes, to celebrate biodiversity – but not to connect it to the food they eat while watching the TV!

Good work has been done linking the three Rio Conventions – Biodiversity, Climate Change and Desertification - but the harsh reality is that Biodiversity is being squeezed by:

- Industrialisation
- Industrial food systems, especially agric
- Seemingly inevitable trends to globalisation and regionalisation

Could it be that arguments made to defend biodiversity are too narrow?

Is it possible that those of us who want to bring diets and sustainability into harmony have chosen tactics that are too restricted, if we are not winning consumers over to seeing biodiversity as a key issue in making diets more sustainable?

What attempts and approaches have been made to change behaviour?

SLIDE: Tactics for Behaviour Change

The first line for biodiversity support is often Education, showing that:

- Biodiversity is the source of what we eat
- You never know when or why we might want it

Secondly, we try threats – what the English call ‘sabre rattling’, arguing that biodiversity is collapsing increasingly fast and extensively.

But until recently we haven’t made the connection to how food is driving that loss.[32] The Greenpeace exposé of soya used in Western foods with destruction of Amazonian rainforest showed how effective this can be.[33]

This held powerful corporations accountable and brought them into negotiation over pro-biodiversity supply chains. And it stopped a destructive role.

Thirdly, we invoke financial values, doing complicated estimates as the market values of biodiversity.

Although there are experiments where rich developed countries pay for (or buy) protection, such schemes are minority. They don't address the cultural dimension.

Fourthly, we try to appeal to cultural values, arguing that biodiversity is an end in itself, and has spiritual or moral or symbolic or identity value. This is particularly true for indigenous people still living close to and in biodiversity.

But the problem is that mass, urbanised populations – most of the planet – you and me – us - are now de-racinated. We have gone through or are going through the nutrition transition, the step over the environmental sustainability barrier, which also means a broadening of the range of foods, and its health promises.

Fifthly, we appeal to enlightened self-interest. We state that biodiversity is essential for food security and part of the web of life that matters at the political moment. Look, fellow citizen, we say! Biodiversity is the 'canary' or warning sign for climate change, for planetary change.

These and parallel arguments are clearly not enough. Why is this?

Are they too abstract?

Here is where the role of consumers and consumption becomes important.

Some people argue that we need merely to shout louder! Convince them to change! But do consumers see the connection between food and butterflies?

Where is the label making that connection? Could a label do this?

Labels have not stopped the nutrition transition.

Corporate interests don't like controls on advertising, as we know, yet marketing both shapes and reflects what consumers aspire to.

Labels themselves become a fight. What's on them? Who approves and checks their validity?

I have been suggesting that that approach does not engage enough with:

- Wider food policy
- The drivers which shape land use and food
- And thus, potential change agents beyond the world of biodiversity

Of course, there have been great strengths in the policy work on biodiversity:

- Links with small farmers and growers
- Engagement with seed companies (but this has sometimes been fractious)
- Links between biological scientists and environmentalists

But these have not been enough. Or we would not be here.

SLIDE: Conclusions

I am arguing that as we take stock, we have to do hard thinking.

Are the hard efforts on the Convention on Biodiversity (CBD) transforming culture?

Some of you may argue it doesn't need to. I say it does. Or if not the CBD, other conventions, other guidelines.

And are we talking to appropriate change agents?

Power over modern food systems - a key driver of biodiversity loss - lies with retailers and traders more than farmers.

Greenpeace's campaign on soya and the Amazon was a rarity in targeting the real power forces in modern food: the giant traders, processors and retailers.

SLIDE: Power in the food chain (EU)

Pressure is needed at the point of consumption. Where consumers choice and without thinking destroy biodiversity.

I am saying we need a hard, cold look at the fault-lines and power relations in policy making.

Please note that I am not saying people should stop work on the CBD. I am not saying drop everything and work only on food and biodiversity. Nor am I saying that the only tactic is to focus on consumers.

But I am saying consumers need to be in the frame. We know they have limited attention span. Critical decisions are made in 1 or 2 seconds at the point of sale at the checkout.

And I am saying that any strategy needs to recognise:

1. The world of biodiversity fits within wider changes in the relationship between people and the planet
2. The world of food faces huge and complex challenges, in which biodiversity sits.
3. Biodiversity competes for attention in crowded policy space
4. Biodiversity's voices are loud among biodiversity specialists but weak or drowned in the crowded policy world. can this go?
5. The food challenges ahead are immense
6. the institutional structures are not joined-up
7. Biodiversity is kept in one mineshaft among hundreds in the field.

So where does this take us? Here are my 5 points to make to the President!

SLIDE: Our Tasks

Firstly, we need to define sustainable diets, urgently. We need to set up a process to do this. Perhaps many processes? But it must be formalised. There will be resistance. Some companies

are wary. Others outright hostile. But others see the point. They are already engaging about sustainable production.

Secondly, we need to clarify where biodiversity fits into sustainable diets. Is the greatest contribution of consumers just to eat less? To eat more simply? To cut out meat and dairy? To eat the same everywhere? (I doubt it) All year round the same diet? (I doubt it.) But let's explore those questions.

Thirdly, we need to ensure appropriate institutional structures. Have our countries, regions and world bodies got the right vehicles for these discussions? Can the Convention on Biological Diversity be squared with the advice coming from Health bodies or Trade bodies?

Fourthly, we must research which arguments and factors are most effective in delivering consumer behaviour change. If we don't do that, we fail.

Fifthly, we must fuse nutrition and environmental guidelines to generate new cultural 'rules'. Biodiversity must be part of that picture. Nutrition education is currently biodiversity blind. Even the leading countries wrap it all in 'soft' instruments such as choice. They are kept firmly away from the real change agents such as fiscal impact on price or regulatory frameworks shifting the 'level playing field' on which business can work. The full range of policy instruments to frame choices isn't being applied.

In short, we have much to do.

Thanks!

1. Sustainable Development Commission, *Setting the Table: Advice to Government on priority elements of sustainable diets*. 2009, Sustainable Development Commission: London. p. 58.
2. Lang, T., *Food Security and Sustainability: the perfect fit*. 2009, Sustainable Development Commission: London.
3. Food Standards Agency IAC Project Team, *Integrated advice for consumers: Discussion and analysis of options*. www.food.gov.uk/multimedia/pdfs/iacreport.pdf. 2010, Food Standards Agency: London. p. 123.
4. IAASTD, *Global Report and Synthesis Report*. 2008, International Assessment of Agricultural Science and Technology Development Knowledge: London.
5. Commission on Social Determinants of Health, *Report of the Commission, chaired by Prof Sir Michael Marmot*. http://www.who.int/social_determinants/en/. 2008, World Health Organisation: Geneva.
6. FAO and WHO, *International Conference on Nutrition. Final report of the conference*. 1992, Food and Agriculture Organisation, and World Health Organisation: Rome.
7. UNCED, *Rio Declaration, made at the UNCED meeting at Rio de Janeiro from 3 to 14 June 1992*. 1992, United Nations Conference on Environment and Development: Rio de Janeiro.
8. FAO, *Livestock's Long Shadow – environmental issues and options*. 2006, Food and Agriculture Organisation.: Rome.
9. FAO, *Voluntary Guidelines to support the progressive realization of the right to adequate food in the context of national food security. Adopted by the 127th Session of the FAO Council November 2004*. 2004, Food and Agriculture Organisation: Rome.
10. FAO, *Declaration of the High-Level Conference on World Food Security: the Challenges of Climate Change and Bioenergy. June 3-5 2008*. http://www.fao.org/fileadmin/user_upload/foodclimate/HLCdocs/declaration-E.pdf. 2008, Food & Agriculture Organisation: Rome.
11. IUCN., *Red List of Endangered Species*. <http://www.iucnredlist.org/news/vertebrate-story>. 2010, International Union for the Conservation of Nature: Gland.
12. Tukker, A., et al., *Environmental Impact of Products (EIPRO): Analysis of the life cycle environmental impacts related to the final consumption of the EU-25*. EUR 22284 EN. 2006, European Commission Joint Research Centre.: Brussels.
13. Audsley, E., et al., *How Low Can We Go? An assessment of greenhouse gas emissions from the UK food system and the scope for reduction by 2050* 2010, FCRN and WWF: Godalming, Surrey.
14. WWF-UK, *Tasting the Future*. 2010, ADAS, Food & Drink Federation, Food Ethics Council and WWF: Godalming. p. Tasting t.
15. Cabinet Office Strategy Unit, *Food Matters: Towards a Strategy for the 21st Century*. 2008, Cabinet Office Strategy Unit: London.
16. Defra, *Food 2030*. 2010, Department for Food, Rural Affairs and Environment: London.
17. National Food Administration, *Environmental-friendly food choices: proposals notified to the EU*. 2009, National Food Administration: Stockholm.

18. German Council for Sustainable Development, *The Sustainable Shopping Basket: a guide to better shopping. 3rd edition.* 2008, German Council for Sustainable Development: Berlin.
19. WWF-UK, *One Planet Food Strategy 2009-2012.* 2009, WWF UK: Godalming Surrey.
20. Garnett, T., *Cooking up a storm: Food, greenhouse gas emissions and our changing climate.* 2008, Food and Climate Research Network University of Surrey: Guildford.
21. Munasinghe, M., et al., *Consumers, Business and Climate Change: Report by SCI with the CEO forum of companies.* 2009, Sustainable Consumption Institute, University of Manchester: Manchester. p. 59.
22. Lang, T., D. Barling, and M. Caraher, *Food Policy: integrating health, environment and society.* 2009, Oxford: Oxford University Press.
23. Jones, T., *Using Contemporary Archaeology and Applied Anthropology to Understand Food Loss in the American Food System.* 2005, Bureau of Applied Research in Anthropology, University of Arizona: Tucson AZ.
24. Stuart, T., *Waste: Uncovering the Global Food Scandal.* 2009, London: Penguin.
25. WRAP, *Love food hate waste: UK Household food waste campaign facts.* 2008, Waste Resources Action Programme (WRAP) <http://www.wrap.org.uk/>; Banbury (Oxon).
26. Kantor, L.S., et al., *Estimating and Addressing America's Food Losses.* Food Review (USDA), 1997: p. 2-12.
27. Godfray, H.C.J., et al., *Philosophical Transactions of the Royal Society - B - Biological Sciences, The future of the global food system.* 365 (1554): p. 2769-2777.
28. Beddington, J., *Food security: contributions from science to a new and greener revolution.* *Philosophical Transactions of the Royal Society - B - Biological Sciences*, 2010. 365 (1537): p. 61-71
29. Delgado, C., et al., *Livestock to 2020: the next food revolution*, in *Food, Agriculture, and the Environment Discussion Paper 28.* 1999, International Food Policy Research Institute.: Washington DC.
30. WWF, *Thirsty Crops: Our food and clothes: eating up nature and wearing out the environment?* 2006, WWF: Zeist (NL).
31. Garden Organic, *Heritage Seed Library.* <http://www.gardenorganic.org.uk/hsl/hsl.php> 2010.
32. International Union for the Conservation of Nature and World Business Council for Sustainable Development, *Agricultural Ecosystems: facts and trends.* 2008, IUCN and WBCSD: Gland.
33. Greenpeace International, *Eating up the Amazon.* 2006, Greenpeace International: Amsterdam.