20th January 2015: Changing our thinking

Aims

This month, the meeting asked 'Does the way we think need to change?' and our aim was to use the interests of the panel of three witnesses to explore new ways of thinking about the impact of land use change on the supply of natural resources and drivers behind the demand for them.

Witnesses

Charles Godfray, Hope Professor and Director of the Oxford Martin Programme on the Future of Food at Oxford University joined **Georgina Mace**, Professor of Biodiversity and Ecosystems and Director of the Centre for Biodiversity and Environment Research (CBER) at UCL, and **David Nally**, a Senior Lecturer in Human Geography in the Department of Geography.

Research gaps

Charles focussed on food production and as **"now is the endgame on land allocation", production on existing land needs to be expanded through intensification**. He argued that other competing land uses such as those for bioenergy production are not as important and should therefore be curtailed and food production through sustainable intensification must be prioritised. During the open discussion, he stressed that in his view, diet is a "small player" in the challenge to meet food demand. Instead, the macroeconomics of food and developing win-win scenarios for biodiversity and for food production should be our focus.

Georgina finds the current way of framing discussions about land use too narrow and argued that **there is a need to put the discussion in broader context that looks at the entire suite of benefits that we get from the land**. She does not see the need to view biodiversity as something that we have to tension food production against. Instead, we need a more sophisticated view of both the demand side from society and the supply side from ecosystems and to find ways to overlay them onto each other at relevant spatial and geopolitical scales so that we can harness all the benefits that ecosystems can provide. She wants to see a renewed focus on the regulating and cultural benefits of ecosystems and how to manage these in concert with provisioning services to increase the capacity of landscapes to support resilient & productive human societies.

David's introduction also focused on framing, particularly the **framing of the global food security debate**. He argued that myths surrounding food security overlook the underlying structural dynamic that causes hunger and starvation in the first place, indicating that the efforts are in the best case only treating the symptom of the problem – the amount of food available - and in the worst case making matters worse by assuming technology can fix the problem. He led a series of small group discussions in the Parallel Forum and they agreed that the assumption 'more people = more requirement for food' is a simplification and may even be used to make people fearful and justify inappropriate use of land.

Wicked problems and questions generated by the open discussion included:

- This month, **some argued strongly that addressing food distribution was crucial to food security whereas other meetings have focused more on food production or consumption**. Are we in danger wrestling with artificial distinctions and how can we think about questions and narratives that address and leverage change across all of them?
- **Within any discipline, there is a tendency to simplify a solution and bring it into a framework that it is familiar with** so social scientists will generate one solution, political scientists another. If we are going to either look at a landscape scale or for place-based solutions and policies, how can we escape from this way of thinking in silos and get to the heart of the problem?
- **The 'elephant in the room' in food security discussions is always consumption**. This prompted David to ask - is development about raising the floor or lowering the ceiling?
- **Food supplies and markets**: how can we manage land to ensure that it delivers what it does best, at the right time in the right place as well as providing other benefits?
- **How do the local or the micro-level needs and issues of 'sustainable intensification' link with concerns at the global, macro level?**

Cambridge Forum for Sustainability and the Environment
Connecting biodiversity, energy and food security: Notes on the discussion

Witnesses

Professor Charles Godfray	Hope Professor and Director of the Oxford Martin Programme on the Future of Food at Oxford University
Professor Georgina Mace	Professor of Biodiversity and Ecosystems and Director of the Centre for Biodiversity and Environment Research (CBER) at University College London (UCL)
Dr David Nally	Senior Lecturer in Human Geography in the Department of Geography at the University of Cambridge

Professor Charles Godfray

Charles Godfray is a population biologist with broad interests in the environmental sciences and has published in fundamental and applied areas of ecology, evolution and epidemiology.

He is interested in how the global food system will need to change and adapt to the challenges facing humanity in the 21st century, and in particular in the concept of sustainable intensification, and the relationship between food production, ecosystem services and biodiversity.

He chaired the Lead Expert Group of the UK Government's Foresight Project on the Future of Food and Farming and is a member of the Strategy Advisory Board of the UK Global Food Security Programme and the Steering Group of the UK Government Green Food Project. He is also a member of the writing team for the UN's Committee on World Food Security, High Level Panel of Experts report on Climate Change and Food Security.

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Professor Georgina Mace

Georgina Mace is Professor of Biodiversity and Ecosystems and Director of the UCL Centre for Biodiversity and Environment Research (CBER). She joined UCL in 2012 from Imperial College where she was Director of the NERC Centre for Population Biology.

Her research interests are in measuring the trends and consequences of biodiversity loss and ecosystem change. She led the development of criteria for listing species on IUCN's Red List of threatened species, and was a coordinating lead author for biodiversity in the Millennium Ecosystem Assessment (www.maweb.org). Recently she has worked on the UK National Ecosystem Assessment (uknea.unep-wcmc.org/), was a co-investigator on the NERC Valuing Nature Network, and Associate Director of the Ecosystem Services for Poverty Alleviation Programme, funded by DfID, NERC and ESRC (www.espa.ac.uk). She was elected FRS in 2002, and was the 2007 winner of the international Cosmos prize. She was President of the Society for Conservation Biology from 2007-2009, and President of the British Ecological Society from 2011-2013. Currently she is a NERC Council member, member of the Council of the Royal Society, and Chair of the science committee for the DIVERSITAS global change research programme.

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David Nally

David Nally is a human geographer and member of the Natures, Cultures, Knowledges and the Population, Health and Histories Research Groups. His research interests include the political economy of agrarian change; the economic and socio-cultural dimensions of colonisation; the history of subsistence crises; and the geopolitics of disaster relief.

He recently completed a monograph, Human Encumbrances: Political Violence and the Great Irish Famine (University Notre Dame Press, 2011) and a co-authored textbook, Key Concepts in Historical Geography (Sage, 2014). David teaches courses on historical and contemporary human geography, research methods, and the politics of hunger. He was the editor of the RGS-IBG's monograph series on Historical Geography from 2007-2011.

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Setting the scene

Charles Godfray, Hope Professor and Director of the Oxford Martin Programme on the Future of Food at Oxford University, is interested in how the global food system will need to change and adapt to the challenges facing humanity in the 21st century, and in particular in the concept of sustainable intensification, and the relationship between food production, ecosystem services and biodiversity. He recommended that we should read a Science paper, that looks at ways in which sustainable intensification could help meet the challenges of increasing demands for food from a growing global population.

Georgina Mace, Professor of Biodiversity and Ecosystems and Director of the Centre for Biodiversity and Environment Research (CBER) at UCL, suggested we read her recent Science Essay on 'Whose conservation?' about changes in the perception and goals of nature conservation over the past 50 years. She would also like to talk about how to make the "people and nature" framing more operational, so she recommended that we should also re-read the paper that Ian Bateman presented to us in November.

They were joined by **David Nally**, a Senior Lecturer in Human Geography in the Department of Geography, who is keen to talk about how food security debates are framed and to explore ways in which recent changes to the global policy landscape will affect agrarian land use. His paper discusses this framing in the context of 'land grabs' and geopolitics.

Background papers

T. Garnett, M. C. Appleby, A. Balmford, I. J. Bateman, T. G. Benton, P. Bloomer, B. Burlingame, M. Dawkins, L. Dolan, D. Fraser, M. Herrero, I. Hoffmann, P. Smith, P. K. Thornton, C. Toulmin, S. J. Vermeulen, H. and **C. J. Godfray** (2013) Sustainable Intensification in Agriculture: Premises and Policies. Science, 341, 33-34

G.M. Mace (2014) Whose conservation? Science, 345, 1558-1560

D. Nally (2014), Governing precarious lives: land grabs, geopolitics, and 'food security'. The Geographical Journal. doi: 10.1111/geoj.12063

Parallel Forum (2nd February)

Each group had a **facilitator** and a **note-taker** and everyone spent 20mins in each one:

Table 1: Charles Godfray and sustainable intensification – **Roz Almond** and **Regina Hansda**

Table 2: Georgina Mace and the values of conservation - **Jon Green** and **Kristen MacAskill**

Table 3: Framing food security with **David Nally** and **Therese Rudebeck**

Word Cloud

Created by using Word It Out - www.worditout.com – based on the transcript of the meeting (edited to exclude non subject-specific words).

Introductions by the witnesses

Charles Godfray (notes by Elena Kazamia)

In his discussion of food security challenges Charles focussed on the macroeconomics of food production. With current projections of population growth it is not long before we will reach a world of 10 billion people whose diet is shifting towards becoming ever more resource intensive. Charles compared the significance and scale of the challenge to feed such a population to our global fight against terrorism. The focus on increasing production and productivity on land is inevitable. It would be a gamble to think about cutting waste and increasing efficiencies in food delivery/use.

Focussing the discussion on food production Charles highlighted that it would be unwise to convert and assimilate further land into production. This is due to the greenhouse gas emissions that are the inevitable consequence of farming practices and land use change (see Stern report). Therefore we need to expand production on existing land through intensification, in a sustainable manner. Charles expressed the opinion that other competing land uses such as those for bioenergy production are not as important and should therefore be curtailed. We are at the end of land availability everywhere in the world, so food production through sustainable intensification must be an absolute priority.

During the question period Charles stressed that in his view diet is a "small player" in the challenge to meet food demand, and therefore the macroeconomics of food should be the main focus of our work and research. There must be win win scenarios that we can work towards. In this context Charles referred to the work of

Balmford et al (in Cambridge) that investigate scenarios of land sparing and intensification of agriculture. He was very approving of the work.

When questioned on the 2008 food price spike Charles highlighted that research is required into price signals and how they interact with environmental variables. Our markets have an unsustainable response to food price spikes.

Finally, Charles highlighted that the narrative of "duty to produce more food" is outdated and requires more eloquent expression of thoughts that will use the language of sustainability of resource use.

Notes from the Parallel Forum discussion about his paper (by Regina Hansda)

Some of the common themes during the Parallel Forum discussion about this paper included:

- Addressing the *value-chain losses* of food
- *Behaviour change* not just in terms of healthy diet, but also how much we procure, consume and waste.
- *Agriculture research and development agenda* for increasing '*tools in the tool box*' of farmers, for practicing sustainable agriculture.
- Documentation and sharing of *best practices* and up-scaling existing solutions
- Creating new or supporting existing *institutions for support and governance*

Godfray's paper responds to the increasing concerns of future global food insecurity given the complex nature of the challenge. By succinctly laying down the 'logics of agricultural intensification' both on the large and small farms, in the developed and the developing nations and the conditions for achieving it sustainably – it rebuts the charge that 'sustainable intensification' is an oxymoronic term and endeavour.

The group however felt, and which links with the concerns raised by other witness papers – that there is a danger, however, if we uncritically accept the popular narrative about 'food insecurity' based on the various statistics that almost seems like a truism. If we do so, we lend ourselves to believing that the solution lies in 'producing more to feed more' when the problem could be more complex and inter-related with other social and environmental domains. In addition, the question arises producing more of *what* and *where* and in doing so, are we irreverently alienating certain groups in certain societies. If that is the case, can *such food* from such processes and outcomes that find their way in our super-markets and into our kitchen fall within the ambit of 'sustainable practices'?

Some of the other themes, which emerged, were the unattended area of *food waste* and loss of food at the various levels of the *value chain* - both in the advanced, and the developing economies. Additionally, the food fetish of increasing the variety on the shelves of the same item in response to the 'needs of the consumers', and then subsequent wastage without proper recycling essentially leads to producers and consumers incurring double costs – of having to produce more, and then later to trash even more, both at the supermarket and household level. Many of the food we consume or waste has a transnational carbon footprint, and it is not an issue that can be viewed as 'not in our backyard problem'.

Some of the questions therefore, in view of this growing narrative about food security that warrant consideration and further work: are we clear in terms how the local or the micro-level needs and issues of 'sustainable intensification' link with the concerns at the global, macro level? Can we think of developing contextualised strategies for each level, which is affordable, accessible and inclusive? Farmers – whether large or small, from developed and many food insecure developing nations who are largely implicated in this intensification debate respond to any seeming crisis based on the available '*tools in the tool box'*. Therefore, can we think of increasing such tools for the farmers in their toolbox, through research and development; and/or by collating and sharing best either practices or solutions available in different parts of the globe? What about rethinking the way agriculture research and development agenda is shaped and money spent. Can there be a way where institutions that are interested in addressing this growing global challenge work in a synergy instead of duplicating or nullifying efforts? After all, there are enough evidences to suggest that concerns of food, energy, health, water and biodiversity are different ends of the same spectrum. Moreover, can we think of doing *scenario modelling* that can give us indication of how pressure on production of certain kind of input-intensive food can be reduced; if certain percentages of the population were to turn complete or sparingly vegetarian? Based on some of the findings if we can get governments to encourage such change in consumption behaviour through awareness and education?.

The crux is, it time for *action*, without waiting for the perfect answers and solutions. Some of the problems are structural, while others behavioural. What is needed is to begin doing what is possible at various levels. More than money, it is the will to change and work collaboratively and inter-disciplinarily towards addressing this common global problem.

Georgina Mace (notes by Roz Almond)

Georgina opened her introduction by stressing that the growing number of people, the increasing demands that they will have and the pressing need to eliminate inequalities in standards of living across the world will result in huge and increasing pressures on natural resources and especially on the land. Those pressures are in most areas going to be further intensified by various global change processes, including climate change, globalisation and demographic shifts of people across the world.

Over the last few years, these challenges have largely been presented as being pressures on food, water and energy or the 'nexus' between them. She argued that the current way in which discussions about land use have been framed is too narrow and we need to put the discussion in broader context that looks at the entire suite of benefits that we get from the land. Landscapes have been radically altered to provide these essential goods but because of the competition for land, it will need to be managed so that it delivers multiple benefits. For example, as well as producing food, land needs to be simultaneously managed for carbon, soil quality, for water management. In contrast, artificial landscapes are demonstrably less effective at these multiple functions.

Turning to conservation, she does not see the need to view biodiversity as something that we have to tension food production against. Some kinds of biodiversity are essential underpinning for other benefits such as provisioning, regulating and supporting benefits. Natural ecosystems also buffer people from natural hazards, storms, floods, droughts and heat-waves and they provide resistance to pests and diseases. Society has identified important conservation targets such as threatened species, protected areas and endemic species lists. She suggested that we simply add this list of benefits to all those others that we need from a landscape rather than making a choice between one or the other. She gave the example of Bateman et al. (2013), where including a goal to maintain bird species richness placed only a small additional constraint on land use when it was prioritised against a broader set of objectives related to farming. She argued that setting such a goal would meet many conservation targets as well as bringing other broader benefits to the food production system.

In conclusion, she argued that we need a broad-based inclusive framework that allows people and nature to live, grow and develop harmoniously with their environment and for people to exploit these positive feedbacks and synergies with natural systems.

Thinking about gaps and future research, she sees the need for a more sophisticated view of both the demand side from society over the coming decades and the supply side from ecosystems. Those who study ecosystems tend to look too much at the supply side and some of the food dialogues tend to look too much at the demand side. Somehow those need to be overlaid on each other at relevant spatial and geopolitical scales so that we can harness what ecosystems can provide. She would also like to see a renewed focus on the regulating and cultural rules of ecosystems and how those can be managed in concert with these provisioning services to increase the capacity of the landscape to support resilient and productive human societies.

Notes from the Parallel Forum discussion about her paper (by Krtisten McAskill)

Key themes:

- Valuing ecosystem services
- Impact of our change in attitude towards conservation & towards our general interaction with the environment

Georgina Mace, in "Whose Conservation?" published in *Science* magazine, traces the changes in attitudes or "framing" of conservation in the past 50 years. She identifies four different phases in framing of nature. The phases have reflected in a shift in emphasis from species to ecosystems and from viewing nature as separate from humans to considering direct benefits that nature can provide humanity. Mace suggests that analysis tools and techniques have not always kept pace with changes in framing and draws attention to the challenges surrounding appropriate evaluation of the benefits of nature for economic analysis.

This led to a series of reflective discussions around how we understand nature and the impacts of how our attitudes impact on government policy. While our models and framing of nature seem to have become more complex over time, we have not necessarily become more effective in managing a more sustainable relationship between humans and nature.

The idea of how to value ecosystem services was the source of much deliberation. *If* one could quantify effects of changing land use on a range of services, decisions could be more informed as to the trade-offs

between benefits and losses. However, while there is evidence of attempts to do this at a more local or regional scale, many challenging questions remain, including: how do we put a price on conservation at a broader scale given different attitudes and values in different locations? What possible hidden parts of the system are we not valuing? How reliable are the statistics and tools we use as the basis of measurement? In terms of determining "value", there is also an issue where expressions of value may depend on the question framing.

A psychologist in the group found interest in how our views on the interaction between society and the environment have changed; raising the question: how has this affected the way we live?

Ideally, humanity should take a balanced approach towards the relationship between nature and people, but there remains tendency towards focusing on what nature can provide for people, rather than what we can do for nature. Perhaps there is a new way of making connections, for example developing products that align with the idea of conservation; that is, products that ultimately contribute back to the environment, rather than being down-cycled or thrown out as waste.

Mace's paper reflected what we identified as a western view on the conservation and the environment, rather than a global one. Perhaps more research is needed on how people view the environment and how we should interact with it.

David Nally (notes by Therese Rudebeck)

Dr Nally's talk focused on the framing of the global food security debate. In his talk, he posed the argument that the manner in which any issue – in this case 'food security' is framed impacts on the manner in which it is being solved. In other words: to frame an issue in a particular way does not only defined the actual issue, but also formulates a particular solution.

Dr Nally argued that in the present time, there is a consensus among the dominant players in the field (e.g. IMF, the World Bank, G8, the World Economic Forum and large Agribusiness) for how to tackle global hunger, and it is through high-tech large-scale agriculture embedded in the capitalist system. In his talk, Dr Nally illustrated how this consensus – i.e. this solution – is directly derived from a particular framing of the issue of food security.

He argued that this solution is justified through a number of myths, that is, through a number of assumptions that we have come to accept as true. The first one of these myths is the assumption that food insecurity is always an expression of scarcity. In other words, that poverty is always causally related to hunger. When framed in this particular way, the problem becomes a monetary one and the solution that follows is naturally more investment. The second myth is the assumption that a solution can be reached through technology. Thus, the solution becomes a question for engineering, e.g. the genetic modification of crops.

However, the problem is that both of these myths overlook the underlying structural dynamic that causes hunger and starvation in the first place, indicating that the efforts are in the best case only treating the symptom of the problem, and in the worst case making matters worse.

Thus, the next set of research questions ought to be:

1. How do we re-evaluate small-scale peasant knowledge and integrate this into the narratives?
2. How do we design adaptive pro-poor technology?
3. Are there alternatives to commercial Intellectual Property Rights?
4. How do we farm *with* rather than *against* nature?
5. How do we re-embed markets in society so they serve social functions rather being than commercial players?

Notes from the Parallel Forum discussion about her paper (by Therese Rudebeck)

David Nally's paper was used to inspire the group to take a step back and look at the bigger picture to question some fundamental assumptions.

Global food security has been identified as one of the greatest sustainability challenges of the 21st century. Many areas already experience severe food shortages, and with the human population steadily growing, expected to reach approximately 10 billion people in 2050, the demand for food will only increase. This places a huge pressure on available land, a pressure that is further exacerbated by climate change, and the pressure to use arable land for other purposes such as e.g. growing biofuel. It has become a truism that this yield gap – i.e. the difference between demand and supply – exist, and that the only way to close it is to produce more food, and to do so more efficiently. However, examining the present situation, the problem is not one of

supply, but of distribution. We are already producing enough food to feed the entire population, and yet, over 800 million people wake up hungry every day. As noted by Amartya Sen, hunger is not caused by there not being enough food, it is caused by some people not having enough to eat. Thus, we need to ask ourselves, will the production of more food really lead to global food security and equitable distribution, or is the hard truth that in a system where food circulates according to market power, more food will simply lead to more food inequality?

When speaking of this yield gap, it is common practice to focus on the supply side. However, there are at least two other crucial aspects that have to be accounted for. Firstly, the amount of food wasted globally every year is staggering. The United Nations Environmental Programme estimates that one third of all food produced every year is wasted along various stages of the supply chain. Solely examining the United Kingdom, household food waste is estimated to 6.7 million tonnes annually, accounting for about 32% of the food purchased (FAO, 2011). Thus, we need to ask ourselves, is more food really what we need, or do we simply need to manage our available food better? Secondly, we need to critically assess human demand, and distinguish between want and need. From a sustainability perspective, it is clear that a behaviour change is needed, and that we should shift away the meat dominated diet we have today. Although achieving behaviour change is hard, the retail industry that make great financial gains from the current unsustainable trends have demonstrated that it is possible to alter human consumption behaviour. Perhaps it is time that to learn from the industry, and apply similar techniques to alter behaviour in a more sustainable direction?

Key points people took away from both Forums

Questions of scale

- There is scope for thinking about both the big picture and local issues in terms of sustainability. Hopefully they will meet in the middle somewhere!
- I am not sure that multi-function, segregated landscapes are understood or even properly researched. As someone said, we need more metrics. Organisations like the Local Nature Partnerships need clear guidance through tool kits to apply multi-functional sense when striving to advise on achieving sustainable landscapes, with 'nature at their heart' at a county level. Even more so when trying to build in resilience to climate change and other pressures. Also, for this, how would one measure success?
- Chris's mention of spatial structures of food supply/demand and at what scales they operate/become important. The term 'multi-functional landscapes' was used several times, but what do we mean by this? A finer scale in the mosaic of different land uses? Within-field multiple uses?
- Small holders and conservation outcomes: There seemed to be a big focus on the merits of small-holder based farming compared to large-scale intensification. It was not clear to me on what basis these statements were made and it would be interesting to explore how small-holdings fit in with conservation outcomes. Questions here are: Have there been empirical studies on the conservation outcomes of small holdings vs. large scale operations? How do these studies fit with the general assumption that economies of scale bring about efficiencies? Do these efficiencies actually translate into conservation benefits?

Food supplies and markets

- Governance of food supplies/markets etc needs addressing although it was not made clear how. David Nally was clearly very dismissive of the WTO, and yet this is an organisation that the majority of the world's countries have signed up to (a necessary prerequisite for the governance structure to work) - I would think it would be possible to get anything with more teeth in place.
- D Nally and subsequent discussion. Markets (for food, water, energy and others services) are not "free"; they are social constructs. As such they need to reflect changing social goals including sustainability
- Optimisation. This includes making the best use of the land we have and minimising the waste food we produce at the moment. How can we optimise land to ensure that it delivers what it does best, at the right time in the right place? Are crops always grown in the most appropriate place or could that land be better used for other things? How would we know and what criteria could we use to say?

The demand side of the equation

- Want and Need: In the global estimates of food production, how do we measure and balance what we want to consume and what we need to consume. Again, this is probably about waste and over-production. Is it true that in the West we produce more than we need? How could we allow people to make informed decisions about what they actually need to eat versus what they want? Isn't that just market forces or are there alternatives?

- "More" of what we currently do isn't necessarily what we need to solve food security. Does more population necessarily mean the need for more food? Not necessarily. [KM comment- I feel this is more related to other table topics rather than the one had at my table. However, there could be a link made or question raised in terms of perhaps a new phase of conservation linking into new ways of thinking about food security – i.e. these issues impact on each other.] Jon mentioned this during the introduction – while this was not discussed in GM's paper, in her original presentation to the main forum she discussed how our attitude towards nature and conservation needs to be merged with how we need to think about future food security.

The policy agenda

- Given the importance of ecosystems in terms of services, not just production, it is crucial to get this sense across in the policy agenda.
- Translating academic ideas into policy implementation: I feel that there was a big gap in our understanding on how to take interdisciplinary ideas and fashion them in a form that is understandable to policy-makers and the public. It would be fascinating to gain an insight into the drivers behind policy-makers, hopefully at a future forum.
- **Policy formation:** The idea of finding a 'good enough' solution rather than attempting to obtain a tried and tested solution prior to implementation. The obvious question to ask would be how to assess what is good enough. I wonder if lessons might be obtained from the business world in this context - often businesses are rewarded for taking a calculated risk (first to market advantage, start-ups etc).

Sustainable intensification

- The way that terms such as 'food security' or 'sustainable intensification' can sometimes become loaded with unintended meaning, or else be used manipulatively to style self-seeking business or political interests as good for the community/environment.
- I liked the concept of sustainable intensification, but what was interesting was the discussion about how that might work in practice. Georgina mentioned that it wouldn't be that hard to influence behaviour through better incentives. However, when it came to discussion over dinner, no one could come up with practical examples of where this is done well. I think this contributes to my feeling that the reality of implementing such an idea feels a while off.
- C Godfray - "now is the end game on land allocation"; the next steps are about intensification. My thought - what does this mean and is it actually do-able?

The next generation of research questions

- I was very swayed by the argument that there should be more 'public good' research and development (by contrast with commercial) for the examples of plant and animal breeding that were given. Could this not be tested/funded by crowd funding or, with the right arguments mustered, philanthropy from high net worth families and individuals?
- I particularly like being reminded of the George Patton quote: 'If everyone is thinking alike, then somebody isn't thinking'. I'm a deep believer in that by challenging the orthodox and the comfortable and, occasionally, pointing out that 'the king's got no clothes' new ideas emerge and we move on. With quite a few of the lines of discussion at the forum there was no consensus, but there is a clear need to arrive at a consensus which inform those that make decisions and fund action. The challenge then is to avoid a 'lower common denominator' consensus which, although safe, may not take us along the action path as fast as the 'problem' requires. This requires strong and well informed leadership and begs the question, do we have it?
- Charles Godfray mentioned the UK food supply system as a priority for further research - Chris questioned whether we should not be focusing on where there was dire hunger - but the retort was that we should understand and address our own backyard before anything else. I thought this was an interesting exchange which supports the idea of a local focus at the March forum meeting.

Incorporating ecosystem services values

- Georgina highlighted in her introduction that a focus on provision of food, energy and water has come at the cost of losing ability of an ecosystem to provide for other values (such as hazard mitigation). She emphasised for discussion to be put into the broader context of benefits to be gained from the land.
- Georgina highlighted the value of supporting ecosystem services other than "provisioning" in sustaining provisioning services. IE a holistic approach is inescapable.

- Discussed concerns re: land grabs and the need to internalise negative externalities. – Currently focusing on buying up land for food production, but what are the ramifications for losses in other ecosystem services?

Framing food security

- David highlighted a gap in structural understanding of food security and the reasons for hunger, framing his thoughts in terms of myths of food security, He highlighted that food security is not necessarily an expression of scarcity.

Food equality

- Although we discussed the assumption 'more people = more requirement for food', we agreed that this was a simplification. In fact it may even be used to make people fearful and justify inappropriate use of land for example. It's possible the case that the volumes and type of food grown now may be sufficient in the future but there may be inequalities in where food is available and transported. This results in food waste in some areas and shortage elsewhere. How can this balanced?

Cities and urban areas

- And a hobby horse - the link to the cities discussion is that cities/polities will have an imperative to protect their own provisioning (food, water, energy) and will be in greater competition with each other for these resources as the proportion of the population living in cities rises above 50%. We need some social scientists, economists and historians to address this aspect. It could lead to aggressive sequestration of services by powerful/rich polities.