

Environmental Audit Committee

Oral evidence: [Planetary health](#), HC 1803

Tuesday 29 January 2019

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Members present: Mary Creagh (Chair); Mr Philip Dunne; Caroline Lucas; Kerry McCarthy; Anna McMorrin; John McNally; Dr Matthew Offord; Alex Sobel.

Questions 50 - 130

Witnesses

I: Professor Sir Charles Godfray, Director, Oxford Martin School; Professor Claire Heffernan, Director and Professor of International Development, Royal Veterinary College; and Dr Philip Thornton, Flagship Leader and Principal Scientist, CGIAR Research Programme on Climate Change, Agriculture and Food Security.

II: Dr Sonja Vermeulen, Associate Fellow, Hoffmann Centre for Sustainable Resource Economy, Chatham House; Professor Tim Lang, Professor of Food Policy, City, University of London; Judith Batchelar, Director of Sainsbury's Brand, Corporate Responsibility and Public Affairs, J Sainsbury's PLC; and Simon Billing, Executive Director, Eating Better.

Examination of Witnesses

Witnesses: Professor Sir Charles Godfray, Professor Claire Heffernan and Dr Philip Thornton.

Q50 **Chair:** Apologies for the slight delay; we were signing off a fashion report. I welcome our witnesses. I welcome in particular a delegation from the Georgian Parliament. I am not sure how you say “welcome” in Georgian, but you are very welcome and I hope you enjoy our session.

Today is the second session in our inquiry into planetary health and we are going to be looking at food systems. Would the panel introduce themselves, please, starting with Professor Godfray?

Professor Sir Charles Godfray: My name is Charles Godfray. I am Director of the Oxford Martin School at Oxford University and I lead the Oxford Martin programme on the future of food.

Professor Heffernan: I am Claire Heffernan. I am Director of the London International Development Centre, I am a Chair of the Royal Veterinary College and I have a joint appointment with the London School of Hygiene and Tropical Medicine.

Dr Thornton: Good morning. My name is Philip Thornton. I work for CGIAR, basically through the International Livestock Research Institute in Nairobi, although I am based in Edinburgh. I lead a flagship programme on climate change, agriculture and food security. It is one of the research programmes of the CGIAR.

Q51 **Chair:** Thank you. Can I ask you all to tuck your chairs in and sit forward and project so that we can hear you and the microphones can pick you up?

I will make a start with you, Professor Godfray. What do you think is the likely impact of environmental change on food systems globally? What should policymakers be doing about it?

Professor Sir Charles Godfray: There are many ways in which environmental change will affect food systems, and one of the greatest is climate change. We still don’t know exactly what those effects will be, but modelling that we have done in Oxford suggests that by mid-century there could be in the order of 500,000 deaths that would not otherwise have occurred because of climate change. I would not want to defend that particular number in great detail, but I think it is significant as an order of magnitude.

Q52 **Chair:** Do you mean excess deaths? Is that an excess deaths number?

Professor Sir Charles Godfray: Yes. By mid-century fewer people will be dying of diet-related diseases, largely because people will be getting wealthier. There is an underlying good news story that when people come out of poverty they are able to afford a better diet, yet that progress will



be held back by climate change of the order, as the model suggests, of about 500,000.

More important than the headline number is to boil down to try to see where that comes from. Climate change is likely to affect food production and to work through the economic system to make food more expensive. The good things that happen as people come out of poverty will be slightly lessened by increases in the price of food.

One of the areas where we are least certain about the model—and that is one of the valuable things that comes out of an exercise such as that—is the role of fruit and vegetables. The clearest evidence we have epidemiologically is that fruit and vegetables are very good for our health. We worry in particular about the effects of climate change on fruit and vegetables, that they will be harder to grow, they will be more expensive and people will eat less of them with the effects on the environment.

Professor Heffernan: I think that we need to understand the context to answer that question. We know that by 2050 we will need 50% more food than was grown in 2012, we know that two-thirds of the global population will live in urban area and we know that by 2100, of the 11 billion people that populate this planet, 9 billion will be in Africa and Asia. That is the forthcoming context. If we look at food production today, 60% of agricultural land and 80% of world trade is focused in the G20 countries. The livestock sector offers a very good example. In 2012 the top 12 countries, which were northern and BRIC, produced 70% of the total global product and Africa produced less than 10%. We have this emerging disparity in where food is going to be able to be produced.

How that will show up is in the short term we know that we are going to see increasing yields in some crops that are sensitive to carbon dioxide. In the medium term we know that things are going to happen to the world's rangelands and we are not quite sure what that is going to be. There is the notion of an unstable savanna where trees go into the rangelands and make them less of a carbon sink.

Q53 **Chair:** What is a rangeland?

Professor Heffernan: Some 40% of the world is covered in rangelands. They are areas of the world that are really only suitable for livestock. They are grassland areas. In the longer term—and this is around 2100 and is my opinion—I think we will be seeing transfer of food from north to south. I don't think we will be able to see growth. Food growth will be in temperate countries. That is my vision of what I think will happen.

Q54 **Chair:** Which countries do you think will be particularly affected or most vulnerable?

Professor Heffernan: India is a very good example of a very vulnerable country. They predict that the groundwater sources of India are going to dry up by 2050. That is not very far away. The whole dairy industry in



India is based on smallholder farmers who depend on that water. That is a whole continent where the dairy industry will look fundamentally different. What is happening now to protect these animals against climate change is an increase in infrastructure. You are seeing the rise of the airconditioned dairy barn in India and clearly that is unsustainable. There are a lot of things that we need to think about with global food systems.

Q55 **Chair:** Dr Thornton, do you think there are going to be spillover effects that will affect social stability, leading to conflict, migration? What do you think is going to happen?

Dr Thornton: Very much so. To underline what Charles mentioned, we are starting to see and the models are becoming a little bit better at projecting some of the more hidden effects of climate change. When we think of climate change, we tend to think of long-term changes in mean temperature, for example, or changes in rainfall amounts and patterns. All of these things can have a big impact on length of growing periods, growing seasons, for example, but then there is a lot of projections that are suggesting that there is going to be increases in climate variability in the future.

In general, this whole issue of increasing frequency of extreme heat events, increasing floods, increasing droughts are things that are not very well-captured yet in our models of what is likely to happen. Many people believe that we are somewhat underestimating what some of the effects of climate change may be on food systems in the coming years. I think the models are getting better, that we are starting to be able to look at some of these changes in the future. For example, by the 2060s, 2070s, if we carry on with the current greenhouse gas emission trajectories, if we get to, for example, plus 4 degrees of temperature shift, even without the climate variability effects, that means rain-fed agriculture south of the Zambesi will essentially disappear.

The question is are there ways that we can help smallholder farmers, even commercial farmers, to adapt to those kinds of circumstances? The spillover effects are potentially very large.

Professor Sir Charles Godfray: You also asked about possible policy responses to this and I can sketch three. One is very broad, which is that everything that we can do for climate change will have very positive effects on the food system. Within the food system there is the issue about converting land, especially tropical rainforest and other forest, to agricultural land. I think Lord Stern said a few years ago that the most efficient way to get carbon dioxide into the environment was to cut down rainforests. There are some clear things that we must avoid doing there.

As we think about the mechanisms for reducing carbon emissions, in the past agriculture has been left out as too hard a sector to include. I think that is untenable going ahead, given that it is a sector that produces 30% of greenhouse gas emissions if one includes land conversion in that. Specifically within the food system, one has to look at issues of



adaptation and I think that there are many things that can be done there. One is the genetics of crop and livestock breeding. In the past we have rather concentrated on just one aspect, increasing yields. I think that increasing resource efficiency and resilience is going to become increasingly important. One has to look at the labour component of agriculture as well. As my colleagues have said, one has to look at some of the issues about labour functioning in an environment that is going to be more challenging for people to work in; it will be impossible in some areas, but where it is marginal.

Finally, an area that I think is extremely important and something that might be the first area where climate change affects the food system is the increased frequency of rare events. We saw a little bit of this in 2008 and 2010 when there was major volatility in food prices, but well within what is possible to happen. One could get much greater volatility through a combination of bad harvests in a couple of areas. You can imagine a scenario where one also has, for example, an area without rest. I worry about these multiple things happening at the same time.

If one looks in particular at sub-Saharan Africa, where over the last couple of decades one has seen these enormous mega-cities, which at the moment have to be fed to a large degree from global commodity markets, in the future, hopefully, indigenous agriculture will be more important. One of the things that keeps me awake at night is the resilience of the global food system. It is largely commercial companies doing it and it may be absolutely fine, but I would like to see the ability of the global food system to respond to a multiple breadbasket failure to be stress tested at this stage, to have a conversation with the global commodity traders, the type of conversation one wishes one had had with the banks in the early 2000s.

Q56 Caroline Lucas: The picture you are painting is really scary. It is a real wake-up call. But I was slightly surprised that in response to what we should be doing, you did not mention, as far as I heard, the fact that we feed about a quarter of the world's grains to animals. Would you say anything about our dependence on meat-based diets in particular?

Professor Sir Charles Godfray: I was concentrating particularly there on climate change, but on broader things that I believe could be done on the food system, there is waste, which I won't go into in detail about because that is so obvious. I think globally we have to eat less meat, but I would not want to be accused of demonising meat.

There are two caveats on that, and Phil Thornton is an expert on this. First, in developing countries there are many communities that rely on meat and I would not want to say the type of dietary change that we have to do in the rich world would apply to them. Secondly, if we have learnt nothing from the political upheavals of the last couple of years, it is really important to understand who are going to be the losers in this area. Much of livestock production in the rich world is on the economic margins at the moment. We need a narrative that involves a reduction in



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the consumption of meat that does not generate a large political caucus that will argue against it. I think there are interesting ways that can be done, but that is a challenge as much in the political sphere as in the research sphere.

Caroline Lucas: I look forward to that conversation at some point. It sounds interesting.

Q57 **Chair:** You said there are ways of doing that. What are they?

Professor Sir Charles Godfray: Many of the livestock farmers are farming in areas that can produce public goods.

Chair: It is the whole story of soil, heat, bog restoration. We have written a report on that, so we will move on.

Q58 **John McNally:** I would like to move on to planetary health and population health. We have heard from previous witnesses that environmental damage is now affecting human health and prosperity. Howard Frumkin explained that the trends in earth systems pose “grave threats to human health and wellbeing, affecting every category of health outcome”. In your opinion, Professor, what would be the effect of environment change-induced changes in food availability on population health? What will be the effect for the UK in particular?

Professor Sir Charles Godfray: As I mentioned earlier on, our modelling suggests that some of the most major effects will be on the consumption of fruit and vegetables and also restricting people from coming out of calorie hunger. People are largely hungry because they cannot afford food, if you put on one side people in conflict zones. If climate change makes food more expensive, fewer people will come out of poverty and so there will be the effects on them.

I am more sanguine about the UK because we spend 9% of our income on food. Historically, probably at no time since money was invented, has a society spent less on food than we do at the moment. I am sanguine largely, but I worry about the bottom decile of the income cohort in this country. The interesting question is does one ensure that they are okay by working within the food system or does one use other safety nets to bring those people out of poverty so that they can afford food?

Q59 **John McNally:** What are these safety nets? Can you expand on that?

Professor Sir Charles Godfray: By the safety nets I mean through social security and other broader things outside the food system.

Q60 **John McNally:** Could you come in on that, please?

Professor Heffernan: We need to produce more food in the UK. We are very dependent on imports, but the problem is that from 2000 to 2013, 22,000 small farms have gone out of business. We are underpinning. Our food system is very insecure.



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The average earnings of a farmer in 2017 were about £33,000. This is not a stable system. Small-scale farmers are much more sustainable than largescale, intensive systems and what we are seeing in the UK is this switchover into largescale, intensive livestock systems. There is a lot to think about in protecting and supporting these communities in climate adaptation to enable them to continue to produce food, because in my opinion in the future northern food production is going to be the breadbasket of the world. We need to keep the farmers working.

- Q61 **John McNally:** I love the aspect that you are taking on communities, because everything about the whole sustainability is all dependent on communities working and talking and supplying food to each other. Would you like to comment?

Dr Thornton: From a global perspective, the estimates of being able to feed the planet vary, but by the middle of the century we are going to need maybe 70% more food than we produce at the moment globally. As we have heard, from climate change in effect there are many countries and communities, particularly in sub-Saharan Africa and south Asia, that are going to be extremely hard-pushed to increase food production in a sustainable manner.

It is worth pointing out that for most farmers in the world, particularly in the developing countries, a large amount of food is produced in the rural areas on very small farms of a few hectares or less. In looking at how the future may unfold, it is unlikely that many of those smallholder farmers are not going to disappear. You have quite a lot of urbanisation happening, but what tends to happen is that the people moving into the cities are men primarily.

In large parts of sub-Saharan Africa, for example, the people delivering farming in the rural areas are women. This adds to the challenges of how we can help smallholders in the rural areas in sub-Saharan Africa, who are primarily women, to intensify their production in a sustainable manner. When you are looking at that from the developing country side, there are many issues and challenges that need to be dealt with.

- Q62 **John McNally:** It sounds like we are adding to the complexities even more with these unintended consequences. How aware of climate risks to food security is the UK's population and in particular the political leaders? Are we taking them seriously enough?

Professor Heffernan: There is a lot more that we can do, certainly within the livestock sector. However, it is very heartening that I recently received a communication from the British Veterinary Association, which is launching a report on sustainability issues that veterinarians should be responsible for. There is movement within the sector to look at sustainability in a different way, so I think that is very important. But much more could be done, a lot more could be done.



Professor Sir Charles Godfray: Perhaps I should say that I have the privilege of chairing DEFRA's Science Advisory Council and this is something that we have talked about and I know that this is an area that DEFRA is working on and considering.

Q63 **John McNally:** Working on and considering leaves me a bit dubious about what they are going to produce. We are in 2019 and we are hearing about all kinds of changes. You would think they would have something produced by now. If there is going to be an action plan, I would say it has to be here very soon.

Professor Sir Charles Godfray: Yes. I should say that I am not here to defend DEFRA, but there are elements of this in the 25-year plan for the environment.

Q64 **John McNally:** Elements of this in the 25-year plan. To go to the devolved Parliaments, do you think there are differences in the awareness? Are you aware of any differences in the awareness between the devolved Administrations and the UK Administration? Are you aware, for example, of the differences in the Scottish Government, how they take these things perhaps more seriously than the UK Government do? Is that getting a bit political?

Professor Sir Charles Godfray: I am on a committee in Scotland called RESAS—and I am afraid I can't remember what that stands for—and I tremendously admire some of the work that is going on in the James Hutton Institute in Scotland. In particular it is focusing on crops such as barley and raspberries, where there are particular issues in Scotland. I know it is looking at climate change and also looking at other places around the world with similar climates. There is very fine research going on in Scotland. I can't say about the political side.

Dr Thornton: If I may talk about the smallholder farmers in parts of the world where I interact with them, sometimes in sub-Saharan Africa or south Asia, the awareness of what is happening is very real, even for people who are not necessarily farming as a full-time livelihood. Many people are connected to the land and many people also realise that if they are farming they are not able to do it in the way that their parents or grandparents did it. In other words, they are seeing quite a lot of changes in the environment within which they are trying to produce food, so they are very aware of what is happening perhaps in a way that in some of the higher-income countries many of us are not so connected to the land either culturally or physically.

As Charles mentioned before, there is a lot more work that could be done in trying to raise this awareness. A lot of people are not aware of where food comes from in some communities. There is a lot that could be done through social media, for example, for communications, through gaming, all the food scenarios, particularly in ways to engage the youth is something that we are trying to start to take very seriously, particularly, as I mentioned, this issue of depopulation of the rural areas. How can we



make farming in all places economically attractive so that will encourage people to stay on the land and stay connected and produce food in a sustainable manner? These are issues that we really need to address.

Professor Heffernan: The issue for policymakers is that we need the right information at the right time. The evidence base is often very disjointed in this field. At a policy level we need much more synthesis about different areas of research to identify best practice and the best way forward. I don't necessarily see that happening although there are moves. There is a variety of different groups that are coming together and offering opinion pieces. That is where I think you could get much more value from what is going on. We need to link up the research.

John McNally: I wanted to comment on the Hutton Institute. They produce seed potatoes that go to countries all over the world. They grow them there and they are sent to, for example, Africa to grow in that particular soil. These seed potatoes have to be transported at a certain temperature and the problem with Brexit could be that if there is a breakdown in communications in the ferry terminals we will lose what they are trying to achieve by keeping people onsite to grow these seed potatoes. It could all break down and it is extremely worrying. It is an £80 million to £100 million industry in Scotland and it is world-renowned. Thank you for bringing it up and reminding me to mention it.

Chair: Thank you. Of course we have the world's collection of rhubarb in Wakefield, so I think I will just put that in. The rhubarb season will be upon us shortly and there will be a festival in Wakefield to celebrate those things, along with the liquorice festival in June.

Q65 **Alex Sobel:** I have a supplementary for Philip. One of the things I picked up as very interesting is you said that we need to engage youth in these matters and I assume you meant urban youth. You talked about gaming. How do you see that operating? Are you talking about farm simulators? How do you think that would work in urban youth understanding agriculture better through gaming?

Dr Thornton: I have a couple of colleagues who are working on this in some university departments. With mobile phones, rather than having people play—sorry, I am not very well up on this—whatever it is they are playing, people are starting to develop some of these sort of simulation games. It is trying to get the ideas across to young people who may not have been exposed to agricultural food systems in the past and also getting people to understand some of the very difficult trade-offs that have to be made between say profit maximisation, farming in a sustainable way or doing it in a low carbon way.

I think that there are real opportunities there, not only in higher-income countries. In Kenya, which I know quite well, mobile phone penetration is now something like 95% in an incredibly short span of time. As many of you probably know, there is basically an informal banking system that is based on mobile telephony. There are now a couple of big projects set up



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to provide farming information, climate information services to farmers in the rural areas. When you have that kind of infrastructure, it would be very interesting to set up games that would try to help to engage the youth into the whole agriculture and food system.

Chair: We welcome the Georgian delegation, which I believe has now arrived. You are very welcome. Sorry, I thought it was the ladies in the corner, but you are all British and we do not speak Georgian. I don't know how to say welcome in Georgian, but you are all very welcome here.

Q66 **Mr Philip Dunne:** I remind the Committee of my farming interests in arable, livestock and potatoes in this country.

Professor Heffernan, I would like to pick up on a comment you made. I am going to talk about UK trade policy in a second. You said that we need to increase the proportion of food produced in the UK in order to meet demand and reduce reliance on imports. You also said that farming sustainability of the small farms is a problem. It is a problem, but I do not think that the solution is to be found in increasing the number and range of small farms.

As you pointed out, the number of farmers has declined significantly over the last 15 years or so, but that is because of the inherent lack of profitability and viability of small farming. I do not quite understand how you think increasing small farms is going to help increase food production, which I think was what you were trying to indicate.

Professor Heffernan: Yes. I think that the climatic impacts of small farms are more sustainable than large-scale, intensive food systems.

Q67 **Mr Philip Dunne:** But how do they produce more food?

Professor Heffernan: No, absolutely they do not. They don't produce more food, but you have a collection of farmers who are able to be, for example, dairy farms. We have lost a huge number of dairy farms. I think the small farming sector should be supported. The cost of inputs is extremely high and this is what is forcing people out. There is an economic viability argument; they are not economically viable. Half of their income comes from EU subsidies. That is not economically viable.

Essentially, we are going to let these food-producing groups and people who know how to produce food go under. In the long term, that will not benefit this country. There has to be better ways to train farmers, to make them more profitable, to enable them to participate in adaptation and climate change mitigation activities and to make money out of it. The farming system has to change, but in doing that we need to support these farmers and not just let them disappear.

Q68 **Mr Philip Dunne:** Are you arguing for more subsidy or higher food prices?



Professor Heffernan: I am arguing for a better-trained sector. The average age of a farmer now is 55, I think. It could be slightly higher. We have to attract young people into this sector. We have to look at it holistically from education to training to production systems, how we can make the production systems more financially viable for these farmers. That is what I am arguing.

Professor Sir Charles Godfray: I take a slightly different perspective. A problem that we have in the rich world is that our labour costs affect the financial viability of farming. In different places and different worlds we come up with different solutions, most of which are imperfect economically, whether it is in the States or in Europe. Irrespective of what happens politically in the next couple of years, there are opportunities to try to do it better.

My view is to be clearer about what we are paying for and that schemes such as single farm payments are a silly way of doing it because a huge amount gets turned into land prices. Without opening subjects you have dealt with beforehand, I am very much in favour of putting money into rural economies by incentives for producing something. A corollary of that is that we need far greater geographical granularity in how we do it.

There will be some areas, which at the moment are—as Claire was saying—largely small dairy farms, where one asks them to produce other things, the public goods and such. If one could get that right, one would end up with a more granular agricultural landscape with perhaps fewer constraints on the highly profitable farmers and more money going into the areas that are not profitable and where we make a decision to maintain communities for social, environmental or other reasons.

Q69 **Mr Philip Dunne:** Such as upland areas producing livestock because they can't produce anything else?

Professor Sir Charles Godfray: Yes, although I would say that one has to draw the boundaries quite tight and say that they cannot produce anything else within agriculture, but if you look more broadly at public goods, they could be sequestering carbon, providing homes for biodiversity, providing recreation. We need a mechanism for paying them to do that. What is more, we need to change—

Q70 **Mr Philip Dunne:** But neither of those two alternatives would increase food supplies in this country, which I think was the point that we were driving at.

Professor Sir Charles Godfray: Yes. I am not sure that food supplies within this country should be a primary goal of policy. My view is that the policy goal of food security is that we should have a farming system. If there is a food security issue, the first effect of that would be an increase in prices.

The farming community, just by economics 101, will respond to that. Where there are possibilities for market failure, policy should come in to



make certain that the response to the market signals is efficient and I would say efficient in two ways. The first is economically, and that goes into providing the human capital, social capital, so that we have a highly professional farming system that can respond to price signals. I would say environmentally efficient as well, because while we would have to produce more food from this country because of price signals going up, we need to do it in a way that will not undermine our capacity to produce food in the future.

Professor Heffernan: There are two countries, Spain and the Netherlands—I am not sure; you might have been over this—that supply 69% of the fresh vegetables in the UK. That is a very risky scenario. There are four countries that produce 44% of the fresh fruit. We have to be very careful, if we are not producing our own food, where we are getting it from and that puts a variety of different stresses on food systems. That would be something if I were a decision maker.

Q71 **Caroline Lucas:** I was a little bit shocked by Professor Godfray's response about not being that bothered about food security in this country. Surely everything that you have just described to us shows a more dangerous world where there is going to be even less ability to depend on sustainable exports into the future. Working out how we can produce more in a sustainable way here at home surely would be the first step in trying to build our own resilience.

Professor Sir Charles Godfray: I think about the food system as globalised. I very much follow commentators such as Stiglitz, who say that the food system is globalised and the real challenge is not to reverse it, but to get it to work for the public and especially for the poorer sections. If one was a food minister in Egypt or Singapore—countries that will never feed themselves—talking about food sufficiency, it is so important that we have a globally efficient and working system. I do see that we have a role in that, but the role I see is that we can respond efficiently in the two dimensions that I said to increased global stresses.

Q72 **Caroline Lucas:** Increasing our own resilience is not incompatible with ensuring that there is greater global resilience. Surely those two things are working in the same direction. If we are taking less of the food that would otherwise be needed to go to somewhere like Egypt, which for whatever reasons is not able to produce more of its own food, surely that is a net positive.

Professor Sir Charles Godfray: I think we may be saying the same thing. To me the resilience is not, for example, doing production subsidies and things like that, but looking for where there are market failures. To me, the market failures seems to be obviously around the environment, but also around our capacity to be able to respond to a food crisis and respond to whatever that food crisis is in a way that is resilient.

Q73 **Mr Philip Dunne:** You have touched on what is happening in the next two years with Brexit and negotiating trade agreements around the world



for the UK. What do you think the UK should be looking to do in relation to food security as part of negotiating new trade agreements?

Professor Sir Charles Godfray: It is very hard to do this without being political. Claire mentioned how much food we get from Spain and the Netherlands and Poland as well. In my view, we need to make certain that we have as frictionless trade as possible with those countries.

Q74 **Mr Philip Dunne:** Trying to develop new trade policies to shift the balance of imports and exports, we have an opportunity at the moment to do something different. Frictionless trade is doing more of the same. Professor Heffernan, you were talking about our over-reliance on a small number of countries. If some of those are in the EU, that is part of the negotiation, but many of them are outside the EU, in Africa and the Caribbean. Would you be pushing policymakers to make some changes to the way in which we approach trade negotiations with those countries?

Professor Heffernan: The kind of decision-making and the arguments coming out of the literature are is the UK going to be a showcase for animal welfare issues, for high-value livestock in particular or are we going to go for production at all costs? There are two roads that we can take here in these trade negotiations. I think that our consumers demand that animals are produced in a welfare-friendly way to the best of their ability, so we should go that way.

We should be making deals around sustainable farming systems. For example, I think 95% of the lambs are sold into Europe. We have these trading relationships that are pretty much holistic. We do need to get to the bottom of how we are going to continue with these relationships and what they are going to look like.

Dr Thornton: You are right: we do have an opportunity to make some big changes. We heard earlier about some of the likely impacts of climate change in the future. What this means is that we are already seeing big changes in crop suitability or areas that were previously well-suited to a particular crop becoming unsuitable in the future. You could look at that at a global level and then say perhaps we should be encouraging production of particular crops in particular areas that are not necessarily ideally suited right now but could be in 10, 20, 30 years' time.

We have the models and the tools to be able to do that in a reasonable way, but that opens up all kinds of political issues about food sovereignty in say many countries in sub-Saharan Africa, where government policy has for many years been around self-sufficiency. That is going to become extremely difficult, not only because of population growth, but because of climate change.

You are right in a way that there is an opportunity to start looking at how the global food systems might adapt themselves. It is not just smallholder farm adaptation, but can the global food system adapt so that it is better aligned with likely future climate and we can make these



massive gains in production and productivity that we know are going to be needed to feed the planet?

Q75 Chair: I am bit confused. We are talking about production at all costs, then we are talking about the amount of food and vegetables that we produce and then we are talking about high animal welfare. Yet we are saying it is not compatible with upland farming and we should pay farmers for public goods and sequestration of carbon and peat bog restoration and all of that. But I do not get a blueprint for policy from your answers. It sounds to me like you are saying lots of different things, some of which are mutually incompatible. Are you saying that we should grow more of our own fruit and vegetables, given that we are very reliant on imports, or are you saying if frictionless trade continues that is fine and carry on with the beef?

Professor Sir Charles Godfray: I am not a believer in the argument that we should be self-sufficient or we should move towards that. We should be part of the global food system. I strongly support what Claire has said—and this relates back to Ms Lucas's question earlier about meat consumption—that meat consumption needs to go down. Some people choose to be vegetarian or vegan. I personally, and I think many other people, would choose to be flexitarian and eat much less meat and the meat that we eat should be at the very highest standards of environmental production and welfare.

That would be my policy priority: not to concentrate on self-sufficiency or increasing production per se, but to make certain we have a very efficient rural sector that provides multiple goods, food and the many other things we talked about, that will be geographically varied and will provide rural incomes to vibrant rural economies, especially in areas such as the uplands where there are few alternatives.

Professor Heffernan: I think that we have to get away from this notion that beef is uniformly bad for the environment. There are very many types of livestock production systems and they all have very different impacts on the environment. The kind of research that is going on now is really exciting and I think it can dramatically change the outcomes of greenhouse gas emissions from the livestock sector. We know that feeding seaweed to cows lowers their methane emissions by up to 90%. It is a very small study that has been done at the University of California. There are technologies, there are resilient and more sustainable ways that we can grow these animals and I think that is what we have to move towards at a policy level.

The movement in livestock is called low carbon livestock development. It is a sustainability frame where you are looking at bioecosystems and sustainability within that and you link those up to get a more resilient food system. In my opinion, the food system has to change.

Q76 Caroline Lucas: Health is a big issue here and it seems perverse to me to be finding out more ways of doing more beef production when we



know that in the rich countries we need to massively reduce our red meat consumption. It feels like the policies are not joined up.

Professor Heffernan: When we look at animal source food within the global south there is a major gap, certainly if we look at stunting. My core argument is that where the food will come from in the future is the global north. You do not have to eat the beef, but there are people in the global south who will want that animal source food because they have no other ways to get it. This is the big picture in the future. I think that resource use in the livestock sector has to change. It is far too resource intensive.

Q77 **Caroline Lucas:** But transport—beef going from one end of the world to the other end of the world? At the same time as we are talking about a climate-constrained world, we are not going to be having this massive food swap of food going from one pole to the other. That is not going to be sustainable, is it?

Professor Heffernan: No, absolutely, of course it is not. But what I am trying to say is that the ability to grow food in the global south is going to be extremely limited. The breadbasket of the world today is the global north. This is where most of the food is produced. If we ignore that dynamic and continue to think that we are going to support these small-scale farmers and that suddenly they are going to be completely self-sustaining, that is the problem. We need ways to grow food and to transport food more sustainably across these sectors in the global food system. In some respects, I absolutely agree with you.

Q78 **Chair:** But we are still going to have to transport food between countries. We have been feeding lambs on salt marshes for hundreds of years, so maybe that has been an accidental low-carbon bit of land production. I know it tastes good.

Dr Thornton: There are many livestock producers in the global south who are hardly connected with markets at all.

Q79 **Chair:** That is where the waste occurs because there is no refrigeration, there is no salting, there is no drying, there is no education.

Dr Thornton: Right. In fact, the livestock are kept as they are massively important for livelihoods because they provide assets. They are a mobile bank and they provide milk and blood for diets and so on. There are something like 400 million—at the last very rough count—livestock keepers who are almost totally dependent on livestock as one of their few or only assets. We cannot ignore them.

The other point I was going to make was around new technology. Claire has mentioned seaweed. There are alternative protein sources for feed as well as for human food. There is a lack of evidence around how effective some of these things are and what impacts they have on the environment, their greenhouse gas emission potential or how they use natural resources. There is a lot of evidence that could be generated



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about methanogenesis in ruminants and how to reduce that, again not only through diets, but through other means.

There is a whole raft of technologies that are in different stages of development, but there are many things that could be done that can have a big effect on the food system in general, not only in production but also in marketing, processing and storage. Again, these are things that are extremely important in the global south and they tend to be areas of research that have not been done. There is a real lack of evidence on how sometimes quite simple things can make a big difference.

Q80 Chair: Like access to a radio, so you can get the weather forecast and your crop yield improves by 17%.

Dr Thornton: Or a mobile phone or very simple storage methods that can cut down on waste. These are all examples of things where the food system in the large has to change.

Q81 Kerry McCarthy: Can I ask about the carbon footprint of agriculture? I think you said that if you include land conversion, it is about 30% of greenhouse gases. Does that just apply to the farming end of the food chain and not to manufacturing, transportation and those issues?

Professor Sir Charles Godfray: I can read the exact figures into the transcript if you like. My memory is that that is the food chain.

Q82 Kerry McCarthy: During the horsemeat scandal, we were hearing about these 99 pence lasagnes that seem to have done a tour of Europe, going through literally 15 different countries on their way to being sold in the UK. I have no idea how you can do that and have them still be worth 99pence, but at each stage of that process there is obviously a carbon impact and transportation costs. I wondered if it was things like that or if it was just beef being transported and the raw produce being transported.

Professor Sir Charles Godfray: That is a very complicated field, as you have hinted at, and when it is done well it includes all those things. There are complexities because we both import and export chicken, but we import the cuts we like and export the cuts we do not like, sometimes to the Far East. That has a negative carbon footprint, but then it is positive in the sense we are not wasting any part of the chicken. It is very hard to make generalisations, but one has to look carefully at specific food chains. Again, transparency and getting the data out there is important.

Q83 Kerry McCarthy: Am I right in thinking that our progress against emissions targets are judged according to production rather than consumption of food? How does that work? Our fossil fuel use or whatever is in this country, but if there is fossil fuel use abroad or land conversion abroad, does that count when we are looking at whether we are meeting our emissions targets? Is the fact that we might be importing soya to feed British cattle from a Brazilian former rainforest



factored in at all?

Professor Sir Charles Godfray: Yes, it is.

- Q84 **Kerry McCarthy:** It is? I thought the figure was just production of emissions rather than consumption. For anything we consume in this country, the carbon footprint of that would be factored in?

Professor Sir Charles Godfray: I look to my colleagues in case they are experts in this, but as foot-printing and carbon assessment and auditing has advanced as a subject, it is becoming better at including these up-chain effects.

- Q85 **Kerry McCarthy:** There has been some concern that we are exporting the problem, to an extent.

Professor Sir Charles Godfray: Yes. Carbon is quite good. What is harder is water and then, as you have looked at in the past, concepts such as virtual water, which we are bringing in, are beginning to enter the analysis.

Dr Thornton: The science of lifecycle assessment is advancing all the time and it is true that we are getting much better at being able to do these. We can get an overall systematic estimate of what is happening.

- Q86 **Kerry McCarthy:** That is helpful. We know that the agriculture sector has not seen much progress at all and as other sectors like energy and waste have improved, the proportion of agriculture responsible for our carbon footprint has gone up. Why do you think that is and what are the key things that would help us make progress?

There have been all sorts of reports and I did a debate in 2009 about the livestock sector's environmental impact. I have to say that we were widely ridiculed for it, but it was when the UN did the "Livestock's Long Shadow" report. We have had quite a lot of reports since then, but I do not see any signs that in terms of political action it is being taken seriously.

Professor Sir Charles Godfray: There is the beginning of political momentum to bring agriculture into the international climate frameworks. There are two issues holding it back in this country. First of all—and this is not just the agricultural sector—we do not have a proper price on carbon. If we did and if that included agriculture, it would be hugely valuable. But even if we had that, we would then need to have a mechanism such that many people at the lower end of the income spectrum in this country who are livestock farmers, especially the smallholders, had an alternative way of surviving or making their income and making a living. One needs progress on the technical side and also on the social side. I do not have to tell you these are hard political problems.

Dr Thornton: If you look at the data, you will see that efficiency of production, if you measure efficiency in terms of greenhouse gases



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emitted per kilo of product, say for milk or meat, there have been enormous increases in efficiency. But part of the issue is that if there is increased production, each animal itself may be more productive and more efficient, but if you are increasing the number of animals you are still going to see an overall increase in greenhouse gas emissions.

To me, this highlights again the importance of trying to make agricultural production as efficient as possible, but that means we have to do the other side of the equation, which is reducing the numbers, in this case reducing the numbers of livestock in the intensive systems, for example.

- Q87 **Kerry McCarthy:** When people say “efficiency”, I tend to think of intensive farming where you are trying to get as much as possible out of as many animals as possible in as small a space as possible, but then you mentioned sustainability. What is the answer or are they incompatible? Should it be the more sustainable agroecological approach or is it all down to economies of scale and doing more with less?

Dr Thornton: No, it is very much down to addressing some of these trade-offs. Efficiency, yes, is important, but Claire has mentioned animal welfare and sustainability. These are quite difficult balancing acts, in a way, and we cannot do one thing without the other, but there are ways in which these things can be traded off. There are analyses and models that can show the most appropriate levels of inputs for particular levels of outputs. Also, as Charles has said, the importance of a decent price on carbon would make a huge difference.

- Q88 **Kerry McCarthy:** In terms of the agroecological approach, that is lower inputs. People have not mentioned things like fertilisers, for example, which would have an impact. Is that something that you think would make a significant difference if you were farming in a more sustainable way so that there were less inputs in terms of what you then produce?

Professor Sir Charles Godfray: I am going to give an answer that I realise is rather unsatisfactory because that is very context-specific. I do not think that all intensive farming is unsustainable. Some is tremendously good; some is awful. The same applies to smallholder farmers. If one had a mechanism that could pick out the best of the more intensive and more extensive farming, which will be different in different parts of the country, that would be the way to get the greatest sustainability and reduction in carbon footprints.

Professor Heffernan: The context that is happening in the UK is the swing towards intensification. There are 789 mega-farms now and that population is growing. The issues around environmental pollution and climate change are more significant when you are talking about this number of animals. It is not impossible to have a low-carbon strategy, but we do need to have a low-carbon strategy for these units.

- Q89 **Alex Sobel:** We have talked about or questioned about the adaptations needed within farming, but what other adaptations are required in the



food system, particularly here in the UK, outside of farming?

Professor Sir Charles Godfray: Very briefly, I think that industry has done a lot already and some of the same tools that we have talked about like proper pricing on carbon will help there.

There is a great challenge in the home. If we look at where the majority of food waste is, it is in the home. One of the encouraging things is changing social norms. We talk much more about food waste than we used to. There are programmes on the television and such. Just making people more aware of that issue and making it less socially acceptable to waste food is the best work we can do there.

Q90 **Alex Sobel:** In a previous inquiry, we had Adam Smith from Real Junk Food from Wakefield. He talked about how in the food industry particularly items like bread were just going into the waste system and were not being utilised by people. It did not sound from his evidence that the food industry was moving—and I take the point about homes—towards having a low-waste or zero-waste food system. We hear about the French law and then charities being unable to cope in France with the amount of food being dumped on them by manufacturers and so that is clearly not a holistic solution. What do you think the solution is though for that end of the market?

Professor Sir Charles Godfray: That is interesting. I was thinking more of some of the retailers. That is a challenge for Parliament to get the incentives right because there is some economically rational waste from the point of view of the individual business if that is the equivalent of a landfill tax, but in a more sophisticated way. This is an area where industry is highly responsive to signals and such. Getting the regulatory environment right would be the way to progress that.

Q91 **Alex Sobel:** That was very helpful. In terms of technologies, that is a legislative method and an economic method that we can use. What do you think are the most promising technology developments in food systems for adapting to environmental changes? We hear about things like lab-grown meat. Is that something that we might want to consider or are there other developments?

Professor Sir Charles Godfray: My group in Oxford has done a report from the World Economic Forum on alternative proteins, which I am happy to submit if that would be useful. We have some tremendously valuable alternatives to meat, largely plant-based alternatives at the moment, which will come increasingly to the fore and will have major environmental benefits, I suspect more environmental than health. My guess—and this is a guess—is that within a decade possibly, within two decades certainly, we will be able to produce in the laboratory meat that essentially looks like a steak in front of you.

To me, it is still very hard to assess the environmental component of that. Certainly the people who are more optimistic think that the environment component will be much better. The social science rather



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than the natural science will determine what will happen and whether we flip over into thinking that this is fake meat and “yuck” or whether we flip the other side to think that this is a major contribution to environmental things.

Again, going back to my point, it is absolutely critical to have a pathway for the people who are going to lose out on this, the people who are producing livestock at the moment.

Dr Thornton: There are a couple of things here. One would be utilising new technology to tell consumers what has actually gone into the food that they are eating or the food that they are purchasing. I know we have talked about the difficulty of doing lifecycle assessments for greenhouse gas emissions, but if we could come up with relatively simple measures, you could go to a supermarket and get some beans grown locally or beans grown in Kenya. You can give the consumer some information on which he or she can make some more rational decisions. There are some new technologies coming that could be used for that.

The artificial meat issue is extremely important and we are involved in a study that I am also happy to submit the Committee about blue sky technologies and how these may affect different aspects of the food system in the coming 10 to 15 years. One of the issues around that is, if you like, social licence. What does society agree is reasonable in terms of how our food system may evolve? Is this idea of artificial meat something that is socially acceptable if it is from stem cells, for example? Is that a thing that society can all agree is a way that we can move forward?

It is similar to the GM debate in sub-Saharan Africa. These kinds of things can be utterly constraining or, on the flipside, they can help to open up enormous opportunities for making massive changes to the food system. These are things that need to be looked at.

Q92 **Alex Sobel:** I suppose it is a sociocultural debate about both of those things, plant-based proteins and alternatives to meat and lab-grown meat, which might be slightly outside the remit of our inquiry.

What do you think the role of the private sector is and what do you think their research needs might be in terms of transformation of the food system around food waste or reducing the environmental impact of the industry?

Professor Sir Charles Godfray: The private sector is leading at the moment in some of the new ideas around alternative proteins and plant-based substitutes. It is sad to me that although some of the original IP comes from the UK, most of the activity in this area is in the United States, the Netherlands and Israel. I would like to see us be a bit more adventurous in investing in some of these alternative proteins.

Q93 **Alex Sobel:** The government clearly could have a role in the research councils.



Professor Sir Charles Godfray: Very much so.

Dr Thornton: And helping to provide an enabling environment for innovation, perhaps a very small scale for pilots that could be run and, if successful, then scaled up massively.

Q94 **Chair:** That was helpful, thank you. Coming back on the food waste, one of the things when I visited the Junk Food Project was to see pallets of bread piled up and they were being decanted out of their bags and going to a pig farmer. None of it is going into landfill, but some of it is not being redistributed to families. It is going to pig farmers because of the volumes of bread. That allows the supermarkets to say, "That is fine and nothing is going to landfill" but then you have a charity struggling to get the stuff out of the door as the mountains of bread arrive on a daily basis. It is quite extraordinary.

Professor Sir Charles Godfray: It would be very interesting to examine some of the issues around sell-by dates and some of the rules about whether waste can go to insects or whether waste can go to pigs and whether we can push things further up the waste hierarchy, as WRAP says, and of course prevent the waste in the first place.

Chair: Yes, we have been going along and taking pallets and giving them out at the school gates. You find that people are very happy to take two-day old bread and out-of-date crisps. It has not been a problem redistributing it. It is a question of linking the markets with the excess waste. It is that linkage that is difficult to make and the destigmatisation as well, because no one wants to shop on what is called "waste" even though some of this stuff is perfectly sellable.

Great, thank you all very much indeed for that. It has been a very interesting panel with lots of food for thought.

Examination of Witnesses

Witnesses: Dr Sonja Vermeulen, Professor Tim Lang, Judith Batchelar and Simon Billing.

Q95 **Chair:** I call our second panel to order and ask them to introduce themselves, starting from my left with Dr Vermeulen.

Dr Vermeulen: My name is Sonja Vermeulen. I am an Associate Fellow at Chatham House and I have also worked on CGIAR and WWF, the charity, recently. What I think I bring to the panel today is knowledge on environmental impacts of food systems at the global scale.

Professor Lang: I am Tim Lang. I am Professor of Food Policy at City, University of London's Centre for Food Policy. I do not know what I bring to this panel; that is for you to decide. But like Sonja, I have been on the EAT-Lancet Commission report on "Food in the Anthropocene", which is probably relevant to this Committee.



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Judith Batchelar: I am Judith Batchelar. I am Director of Sainsbury's Brand, Corporate Responsibility and Sustainability. I am also a non-exec director of the Environment Agency. To Sonja's point, what I bring to the panel is the customer end of this and being a practitioner in this space.

Simon Billing: I am Simon Billing, Director of the Eating Better alliance. It is a civil society alliance of more than 50 organisations from across the health and environmental field, working to make sustainable diets very much the norm.

Q96 **Chair:** Thank you. I noticed you all sat in on the first panel. We had a report out on hunger and malnutrition in the UK a couple of weeks ago as part of our work on the sustainable development goals. What policies or structures do we need in this country to make sure that all people have access to a healthy diet and an environmentally sustainable diet?

Professor Lang: It would help to have a national food policy. Back to John McNally's point earlier about Scotland and the devolved Administrations, both Wales and Scotland have been doing much more interesting and dynamic things. It would also help if we had a clearer connection between national policy and local policies. Local policies are having to pick up on the messes of food poverty and waste and they are underfunded. That is not delivering any coherence to the food system at all.

Back to the previous panel's very interesting discussion, personally I would say that what we need is a multi-criteria approach. That sounds very pompous, but it is about putting together all the bits that we have evidence on. We cannot say that it all has to be about the environment or all about health. It has to be about both and also about social values and ethical issues and economic realism as opposed to trust in consumer attitudes. We do not have that thinking.

We have bits. One of the many things I am critical of DEFRA for is that it does not provide that leadership. I would like you in this report to say that we could do with a food policy. I have said to Mr Gove personally that I no longer call him the Secretary of State for DEFRA, I call him "DERA" because he never talks about food. We have an Environment Bill and we have an Agriculture Bill that has a basically environmental land management approach, which is very good and excellent and long overdue. But unless we balance that with the discussion you were having earlier about whether Britain wants to produce any food at all or whether we are just going to become a neo-colonial country, there has to be some direction on this and we do not have that at the moment.

For me, that would be the number one thing: a multi-criteria approach. A national policy would help. Brexit or no Brexit, we are showing that we do not have that. Look at the desperation of the retailers and the food industry. We are not being clear about the labour policy. Personally, Sonja and I have spent three years on the EAT-Lancet Commission report, which says very clearly that if we want to feed 10 billion people by



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2050 we are going to have to eat very differently—all sorts of ways you were hedging around in the previous panel—with much less meat, much more fruit and vegetables, much more plant growth at the farm level without using up more land, direct to humans, cutting down the waste.

That is not going to be easy, but Britain has to take a lead on it, not least because our default is always to let someone else grow the food for us. I am afraid that the modelling shows that that is unacceptable. We have to grow more food here. It is sliding down. DEFRA is not even clear what the figures are. Some of DEFRA's figures, HMRC and ONS-derived, are that we are producing only 49% of our own food. That is less than we ended 1945 on. Others say that it is about 61%. If you are in the Arctic Circle, maybe that is excusable. If you have fantastic soil, fantastic rainfall, fantastic variability of climate, we could grow more better. That does mean to say intensively or with huge carbon emissions, but we have to balance it all: biodiversity, water, soil, good carbon emission controls, alongside good for public health.

We are not doing that at the moment. The NHS is being damaged inexorably by diet-related disease. The gap between rich and poor is at more than Victorian levels. We are living longer. The gap between the super-rich and the super-poor is wider than it was when this building was built. This is an unacceptable situation for a rich country to be in. I want a national food policy that puts those criteria together. It is possible.

Q97 Kerry McCarthy: There have been lots of reports that have come to similar conclusions to the EAT-Lancet report. The good thing about the EAT-Lancet report is that it covers the environmental side, which Chatham House did a good report on a few years ago or did a whole series of work, but it covers the public health angle as well.

It gets the press coverage, but what response have you had from Government Ministers? Has anyone invited you in to talk about it at all? Have you asked if you can go in and talk about it? It straddles a couple of Departments in that it is health and food and farming and we always have this problem that BEIS covers the manufacturing and the supermarkets' role, but have you had any sign that Ministers are going to do anything with it? That is my frustration.

Professor Lang: We have not had anything officially. I am looking at Sonja. I do not think we have had anything officially.

What we can say is that there is huge interest in it. In different parts of the world it has been picked up by governments, picked up by business, picked up by civil society. In Britain it has mostly so far been picked up by civil society and the professions like public health, environment and the NGO work. Indeed, food companies have been much more supportive.

To be fair to the Government—perish the thought that one is ever fair to the Government—they have other things on their minds. The EAT-Lancet



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Commission report was good timing. Here is a vision that a British Government could and should run with. There are things happening from it in this country. The Food, Farming and Countryside Commission of the Royal Society of Arts is jointly holding a meeting next month about it, getting Ministers to come to it and things like that. A process is developing. It should have happened.

Other countries—the Netherlands, Sweden, the Nordic Council—have already run with it. The Norwegian Government is pursuing and funding development in pursuit of this and trying to build on it.

Q98 **Kerry McCarthy:** EAT is Swedish, is it not, or it has a conference in Stockholm each year?

Professor Lang: EAT is a Norwegian foundation, but the Nordic Council and the governments are much more interested. For example—and I think Sonja was there—the EAT Foundation and Lancet held a consultation meeting in Bangkok last year that was huge. Governments were there and wanting to run with it. There is much more interest in this from governments than we hoped three years ago. That is my view.

Dr Vermeulen: There is particularly strong take-up in Sweden.

Q99 **Chair:** Why do you think that is?

Professor Lang: It has a commitment to it. From 2000, Mary, the Swedish Government set out a commitment to try to address the 1992 UNCED Agenda. Sweden was delegated by the European Union and offered to the European Union to be the lead member state for the European Union on dealing with and addressing climate change and the UNCED Agenda from 1992. Sweden has a long track record of taking this seriously before the rest of the European member states.

But having said that, Britain was heavily involved in a very interesting consortium of northern European member states that was emerging in 2007, 2008, 2009 and 2010. I regret to say it stopped sharp in 2010, but the other member states—the Netherlands, France, Germany and the Nordics—are still running with that. They are being much more proactive, if you look at those governments. Sweden, Spain, Italy, France and Portugal are beginning to pick up and run with it too.

Q100 **Chair:** Dr Vermeulen, what do you think needs to happen? Do you think the UK is prepared for what is coming?

Dr Vermeulen: I did warn the people organising this that I would not count myself as an expert on UK policy, so I will look at it from a global perspective and bring in this EAT-Lancet report. This future world that we spell out has been given a lot of attention from the red meat perspective, but it goes far beyond that. To take that full picture, we advise actions in five areas. Three of those are to do with production, one of them is to do with dietary change and the last is to do with food waste.



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First of all, we have three messages around the production side and those issues around how we are farming and what we are growing. The first strong message there is that we should change the emphasis on farming from maximising cheap calories to producing healthy foods.

Secondly, we should optimise use of inputs in that production. This goes back to the intensification question.

Thirdly and very importantly, we need to think about the governance of areas that we are reserving from farming. For example, we propose that 10% of all marine areas that are currently wild fished would be completely protected from that. You have very large agendas around environmental management and management of funds. Additionally, the food waste one I feel is a little overemphasised, but it is there.

Then around diets, let us think about that future of diets. Our diet spells out around one portion of red meat per week, around two of poultry, which can be swapped out for eggs, for instance, and then around two of fish. It also spells out massive increases in intake of certain plant products. Let us go into those in some detail because a lot of that is around eating more pulses and eating more nuts. These are very under-produced things at the moment globally, so we would need to be shifting production towards those. They are of course not without their own environmental issues.

For instance, those of you who are familiar with California will know that the almond farms there are very water-intensive and also require pollinators to be shipped from the east coast to the west coast every year. We would need to be preparing already for a world of farming where we could, for instance, have far lower emissions, but we would be dealing with a number of more local environmental issues and should be prepared in advance.

Similarly, with meat, I think most of us on the panel would agree that we are certainly not looking at a completely vegan future. The scientific evidence is that a mixed farming system with some animal production is in fact the most sustainable at the global level, with a huge amount of regional variation.

With fisheries, this is again an interesting one. This is part of the protein question. If we envisage a future with much greater fish consumption, we will also be needing to look at that coming out of fish farms. Where are those located and, most importantly, what are those fish being fed? We go back to this huge technology space. I believe one of Simon's areas of expertise is looking at the future of feeds for fish and other livestock.

What I have attempted to spell out to you, without saying what I know about British policies at the moment, is that I think we need to be highly anticipatory in terms of diets, what we are growing on our farms and how intensively we are managing those. I do think that Britain is well-placed



to put an immense advance research effort into that side. I back up the previous panellists on that.

Q101 **Chair:** Ms Batchelar, what is the food industry doing to make preparations for this brave new world?

Judith Batchelar: The first thing is to say that what we are talking about is highly complex and interconnected. While we are a UK retailer, we are a global business. We are sourcing from over 70 countries around the world. We have to think about things on both a global and a national level—and indeed at a local level—and as far as our customers are concerned, at an individual level in terms of how we can help customers make those choices. Because of that and because of the fact that science and technology is evolving, our access to data is unprecedented.

There is that lovely statistic that 90% of the world's data was created in the last two years. The information that we have at our fingertips is enormous, therefore how do we bring all of that together to solve it? We talk about the grand challenges and indeed the grand challenges for the whole sector right from soil health all the way through to what happens to a product or packaging at the end of its life, which is requiring us to stop thinking about things as a value chain in a linear sense and to start thinking about food systems. That is difficult because quite often we have not even mapped all of those interdependencies and interconnectedness and then when we do it is mind-blowing.

One of the things that we are starting to do is to ask the Government for more guidance, things like setting targets on food waste reduction through WRAP and the same with plastics and then setting a roadmap that helps us get there, along with reporting protocols. Again, food waste is a good example. We now have a food loss and waste reporting protocol that is accepted at an international level and so how we report on food waste and how our collaborative partners in other parts of the world report on food waste will be the same. We are talking the same language and talking the same currency in terms of metrics.

Provide those enablers to get us to understand the baseline, where we are starting from and where the direction of travel is and set some ambitious targets. Champions 12.3, for example, or indeed the WRAP food waste roadmaps are going to reduce food waste by 50% by 2030. What does that look like? How are we going to get there?

The other thing that the Government have done is to link up the work of the research councils and Innovate UK. Again, the same thing has happened on plastics to ask how we can make sure that NERC or BBSRC or EPSRC are funded around these grand challenges to ensure that we are creating the research that has been missing, informing the technology so that this amazing data we are collecting we can now use in the right way.



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That sounds like a long answer, but until we start to talk about facts, for us as a business, understanding where the materiality is and where we put our efforts for the greatest impact in that complicated system will be wishful thinking. It needs to be much more deep-rooted in data and the technology.

I would also add that that sounds quite scary, but there are some nice examples of where it is already happening. We have just talked about fish. We know that 25% of the world's fish is probably illegally caught, unregulated and unreported, but we have the technology to look at what is happening in the oceans. The satellite catapult at Harwell that is Government-funded has created a tool called Ocean Mind. Ocean Mind can look at the algorithms of fishing vessels and can see where they are registered, the quota for the time of year, where they should be and how they are fishing, and then can track that to what is then landed from that vessel when it lands. We have never been able to see that before.

If you take that and then say that we have a discard challenge around fish that is caught that does not need to be caught, Aberdeen University is doing great work on selective fishing gear that means that you do not catch undersized fish or species you do not have a quota for. If you take all of that and say that even if we have now a realistic view of sustainable biomass in those fisheries, we have a gap. If we all want to eat two portions of fish a week, aquaculture has to fill that gap. How can aquaculture with sustainable feed and good feed conversion rates create a sustainable aquaculture industry that enables everyone to have a healthy, affordable diet? I say that because sometimes we think this is very overwhelming, but there are things where the future is already happening. It is just not widespread and not common practice. It is best practice.

Q102 **Chair:** Thank you. Simon, you are the expert on sustainable feed.

Simon Billing: Yes. First, our interest is about dietary change, which has been touched on a lot across the last hour and a half. We welcome working with the Government. We are 50 organisations from some of the biggest environmental, wildlife, animal welfare and health organisations. We are pushing along less and better, for a step-change reduction in meat, aligned very closely with the work that has been advocated by the EAT-Lancet Commission. We would like to support the Government to create the right environment to get us on that journey.

I echo Tim's point: the first thing that would help us would be a joined-up conversation across the Government and an integrated food strategy. The Climate Change Committee is looking at diet; DEFRA is looking at diet; PHE is looking at diet. There are 12 Departments across the Government that are interested in livestock. I encourage the Committee to bring that conversation together and offer some leadership for an integrated food strategy.



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I encourage us to focus on the Eatwell Plate. Many people come to me now and say, "I have a beef with beef". I say, "Stop that. Look at the Eatwell Guide". If we woke up and ate better, which is my mantra now, we would eat closer to the Eatwell Guide, but we are not eating that now.

I encourage—and it is great to see Judith and Sainsbury's announcing—a greater range of options for both plant-based and better meat. We do think we want to see a growth of better meat. We did a survey of ready meals, which nine out of 10 of us, to be honest, eat. Only one in four of those are non-meat options and only 3% of them are plant-based. We need to improve the accessibility. That needs to quickly now move into public procurement and public spaces. Many of the alliance are now calling for vegetarian default. If you go to a committee meeting, you have to ask for meat if you want meat; change the conversation.

Then we should be exploring fiscal measures—a number of people across the House have been having a conversation around that—and looking at the incentives for eating better, eating more plant-based meals within a sustainable, healthy diet. We need to bring the health and environmental agendas together. I would have thought we were there, but I still do not quite think we are.

Chair: Thank you. That is very helpful.

Q103 **Caroline Lucas:** I wanted to go back to the EAT-Lancet Commission just for a moment. You have probably already answered most of this, but is there anything more that you would say about the Great Food Transformation"? In a minute I want to ask you what the obstacles would be to that Great Food Transformation. Is there anything you would say about what is meant by that? You have already explained that you are doing far more vegetables and nuts, moving away from meat, but is there anything else you would like to say about that before we move on to the barriers thereto?

Professor Lang: I was wanting Sonja to go first, but she wants me to go first. Since I coined the phrase, I have to defend it. The reason why we came up with that phrase was that there needed to be something that summarised the fact that the world is going here and we now know it needs to go there. There are very interesting things happening everywhere, as Judith has said, Simon has said and Sonja has said, at all different levels in all countries—farmers are doing interesting things, restaurateurs and chefs are doing interesting things—but it is not being joined up. This is the point that Simon was just making, very rightly.

We suggested in the discussions of the policy committee that I chaired in the EAT-Lancet Commission that somehow we need to bring all of this together and not stipulate what countries should do, regions should do or industries should do, but say the broad direction of travel. How you do it in China, in India or in Rajasthan as opposed to Sri Lanka is up to you. If you are a city like London, as opposed to a town like Bristol or Brighton, your area, how you do it is going to be different, your mechanisms and



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your measures, the point that Simon was making. A city can do some procurement work, but cannot do taxation. Only Government can do taxation and fiscal measures. All of that has to be in some coherence. That is what the phrase the Great Food Transformation was saying.

Just to remind you—I do not think either Sonja or I said—the remit, the brief of the EAT-Lancet Commission was to say, “Is it possible to provide a healthy diet and feed 10 million people by 2050 without further damaging—and indeed trying to improve the health of—the environment?” I confess I was quite dubious, but by the end we showed that it is possible.

It is possible, first, to stipulate, from the intervention of your Committee adviser, who is a very eminent person in this area. We know the broad public health picture; we know broadly the environmental data. Can we put those together? It has not been done well enough in the past. There have been other reports that have done bits of it, but it has not been brought together, and the bit that was missing is the social bit, people. This is what Simon was raising. Will consumers buy it? What are the cultural signals? The phrase was to try to capture all of that.

Q104 Caroline Lucas: How do you think Governments could and should deliver it? In a sense, what you have described is a very holistic view, which is exactly what there should be because that is what the world is like. However, as you all know, certainly the way we organise ourselves in this Government and Parliament is in silos. How would you hope, if we focus just on the UK for the moment, that the UK Government would respond to this? Do they need to set up a multifaceted cross-governmental committee that covers all of the very many areas of this? The trouble is that if it just goes to DEFRA or if it just goes to BEIS it does not have the connectedness that seems to be at the heart of what you are describing.

Professor Lang: Forgive me, Caroline. I was only answering in terms of the EAT-Lancet Commission, which was global. I will speak as me, as Professor of Food Policy. What we need is new structures. DEFRA is not working. The advisory system is not co-ordinated. We lack advice in some areas where we should have it. We do not have good consumer advice. The Committee on Climate Change is exploring that. There is no consumer committee that can address sustainable diets. We ought to have a sustainable dietary guideline in Britain.

There have been 20 years of fight at the Food Standards Agency and Public Health England levels to get environment at least included alongside public health. This was talked about many years ago. We have it creeping in at the bottom of the Eatwell Plate, as Simon said, rightly, we should use. There is a little bit about, “Be careful about red meat consumption and processed meat consumption”. That came out of joint work by PHE and the Carbon Trust. Let’s have joint working like that, which Simon was calling for, I agree, but my own view is that we should borrow the Nordics.



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We should have a food policy council. We should have a national council that provides expert advice on this holism and what is missing in it. We do not have that at the moment. The Nordic countries have that. No wonder they are streets ahead. They are taking it seriously. They are bringing together data, they are calling together people. You are a very unusual Committee in that you collect information across the disciplines. Most Select Committees, as you said, are very siloed. Some co-ordination mechanism the British Government should lead. We need a legal basis for that and many of us are looking in Britain at the effectiveness of the Welsh Assembly's—

Anna McMorris: Future Generations Act.

Professor Lang: Future Generations Act. I think it is a very good Act, but quite frankly it is not getting the legs that it deserves. It is not being translated. However, that is partly because Wales has to turn to England because that is where it gets a lot of its food. It exports meat, but it imports its fruit and vegetables. We are not joined up at the UK level and that is fundamentally what is missing at the moment. I hope that is one of your recommendations in your Committee report. We need a national food policy which integrates these things, we need new institutions and some cross-fertilisation and joint working of those institutions. It is not happening at the moment.

Judith Batchelar: Can I just add to that point?

Professor Lang: Do you agree with it?

Judith Batchelar: I do. I know we have also tried that in the past and you were part of that. It may be worth us trying to understand why, when we have tried that approach in the past, it has failed.

Professor Lang: Sorry to interrupt you. The Council of Food Policy Advisors was a tentative step in this direction, not like the Nordic Nutrition Council or the Danish Food Council, proper and institutional, or like the Sustainable Development Commission, 55 staff, proper commissions with Parliament and Prime Minister's appointments. We need something with some clout. Sorry.

Q105 **Chair:** I agree. Did you want to come in? Why did it end?

Professor Lang: Politically it was cut.

Judith Batchelar: Yes. Two things. There was not the burning platform that there is now because we were still hopeful about the things we would do to combat obesity and some of those longer-term health issues associated with diet. We did not know anything like the information that we know now around the environment and the impact of our food system on the environment. We are in a very different place and there is that sense of urgency.



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The biggest thing that group would have to address, in a very intelligent and data-informed way, is, “What does that transition programme look like?” I think we all know where we are trying to get to. The question is how we get there in the most efficient and least disruptive way.

Professor Lang: Can we get the public to buy it?

Q106 **Caroline Lucas:** How do you generate the political will as well? I know, yes, one way to do that is to get the public to demand it, but it just feels so frustrating. The much quicker way would just be to have a word with the people in power and get them to change the legislation.

Professor Lang: Caroline, we do not have a Climate Change Act equivalent in food. The Climate Change Act has a big impact on food. We need biodiversity. We have biodiversity commitments that are not being translated into practice. In everyday cultural terms, we know—Sonja and I know, having spent years on this—that we have to get biodiversity into the field, not just on the edge of the field, but into the field and down our throats. That is the kind of thing we have to do.

Q107 **Chair:** We did recommend that in our report on the future of the environment.

Professor Lang: I know you did. It was excellent, but now where is the leverage? Where is the legal basis? Where are the benchmarks?

Q108 **Chair:** The Environment Act.

Professor Lang: That is what Judith is saying and rightly so. We need to start at 2050 and slice back. How are we going to begin this process of change?

Q109 **Chair:** We are looking at the Environment Act, but so far we only have the principles of governance to look at.

Professor Lang: We do not have a Food Act, Mary.

Chair: No.

Professor Lang: That is what we need. If the Government does not want a Food Act, why?

Chair: We are going to talk about consumers with some questions from Alex about whether people are ready to swallow it.

Q110 **Alex Sobel:** Yes. We have talked a little bit about the EAT-Lancet Commission, but do you think there is any evidence the population is ready to make these major changes to their diet? Are we in a cultural or sociological space to make these changes?

Simon Billing: What is exciting and what people need to be aware of here—Judith can back me up on this—is that there was a groundswell of interest, particularly among younger people, around diet. We have never seen this swell of interest. Different people are tracking and our own data is tracking that about 40% to 45% are either reducing their meat or



looking at their dietary change. There is a groundswell of interest. Business is responding. You can see all the major retailers doing things. Food service is responding. The climate is there. It is good.

I would give a little warning that there are still lower levels of awareness about the impacts of food production and climate change, which is a challenge. We need to build awareness still around people's understanding that food production, particularly livestock, impacts climate.

I do think we need to find smarter ways of talking about it, the language. Some of that is around balance. There is, possibly built on by the Lancet, a very emotional discussion going on outside these doors now around the future of food. We are looking for Government to be quite rational. Again, that is why I point back to the Eatwell Guide, balance and the absolutely critical importance of Government leadership right now. You have interests both from the farming community and those from a more plant-based future that are being played off in the mainstream media. We need to find ways of talking about it, particularly around balance, particularly addressing food waste and the things that we all care about. There is interest.

Alex Sobel: We are obviously just coming to the end of Veganuary and I noticed, including in Judith's supermarket, the huge increase in range of plant-based alternatives to meat, which is very helpful—I thank you, as a vegetarian. Like last year's Veganuary, did we see a continuation of that? Was there a long tail effect? Obviously Sainsbury's and other supermarkets will have the data for this year. What is the trend? What is the reality?

Q111 **Chair:** Can I just ask also, is this just the worried middle class? Is this the middle class worried well? In my constituency, when I am giving out bread at the school gates, people are choosing white over brown. I am not sure that these health messages about meat reduction are necessarily getting through at every level. What evidence is there?

Judith Batchelar: There is a long-term trend, a very long-term trend, of less red meat consumption, more poultry consumption and more fish consumption.

Q112 **Chair:** Across all social groups?

Judith Batchelar: Yes. What you are seeing to overlay on top of that is now a real spike in customers. People talk about the growth in veganism and vegetarianism and it is huge, but it is still a very small base of customers—tiny. What is the real trend is those people looking for meal occasions that do not involve meat, which Charles Godfray—

Q113 **Chair:** Isn't every meal an occasion?

Judith Batchelar: It is, yes. He called it "flexitarianism". It is the 35% of meat eaters that are having fewer meat occasions during the week. They



are not necessarily doing that for overt environmental, health or animal welfare reasons. They are doing it because the opportunity to eat those foods is greater. Pasta, for example, with a tomato sauce technically is a meat-free, dairy-free option, but it is just a really nice pasta dish. If you look at the choice that is out there, it is huge.

What we are trialling at the moment, which will be quite interesting—I am very happy to share the results—is part of the Wellcome Trust “Our Planet, Our Health” work. It is displaying meat-free alternatives, things like mushroom burgers and other meat-type products in the meat aisle for customers to actively switch out. That is different because historically you would have put a lot of those products on their own in a special part of the store where customers who want those things go and look for them. We are also looking at our online shop, so if someone searches “burger”, putting the meat-free burger top of the search list. We are looking at those kinds of nudges to understand whether customers are receptive to that. Generally our customers are eating less red meat.

Q114 Kerry McCarthy: I will come in on that. Are they only in the meat section? People like Alex, Matthew and I would not be looking in the meat section. We might be missing out. I am worried about that.

Judith Batchelar: They are across the store. If you go and shop Italian, there would be meat-free Italian options. This was specifically looking at a burger, sausage or typical processed meat customer and what they might look for.

Just to add to that, there is a big responsibility from a nutrition and health perspective to ensure that customers who make those choices do not miss out from a nutrition point of view. One of the things we have done—and it comes back to controlled environment growing and investment in technology—is a mushroom that gives you your entire source of vitamin B12, which vegans and vegetarians would miss out on. By treating it with ultraviolet light, you can get a vitamin D mushroom as well. You can kill two birds with one stone. That is one of unintended consequences, if we are not careful, of wholesale changes in diet, what customers might miss out on.

Chair: Very quickly, Dr Vermeulen.

Dr Vermeulen: I would just add that I am very encouraged globally by the speed of change in diets. That can transform over a generation. We tend to focus on the negative parts, the rise of obesity or diets becoming more globally similar, but just a few points here. One is that the typical diet of a normal person in the world has become more diverse over the last 50 years with a much greater range of foods.

Secondly, these changes, such as reductions in meat, are not necessarily fashions or blips. In the United States since 1970 there has been a 40% reduction in per-capita beef consumption. They still need to eat about an



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eighth of the beef they are eating right now to be really healthy, but nonetheless it is impressive and sustained.

Chair: That is very helpful, thank you.

Q115 **Alex Sobel:** I am the main shopper in our household and we have a mixed-diet household. We have a vegetarian and we have meat eaters. When I shop for protein, my vegetarian protein is more expensive than, for instance, the cheaper end of the chicken protein. This is a barrier for people switching. Is there any Government action that could encourage dietary changes through subsidies or taxation maybe to level that playing field of price, of cost?

Judith Batchelar: I am not sure is the answer, because a lot of these things are around economies of scale and what is the norm. The things that we are developing now are pretty small scale. While the trend is there, they are not mainstream. The challenge for is to make those things more mainstream and that pace of change, so that those economies of scale can—

Q116 **Chair:** And competition. It is like pasta sauce was 20 years ago. No one bought pasta sauce. You had Heinz Ketchup and pasta sauce was not invented. Now there are 60 different types of pasta sauce.

Judith Batchelar: Yes. That will naturally evolve. I do feel though that that pace of change is again unprecedented. I have never seen, in 30-odd years, changes in the way our customers are buying and consuming food like we have today.

Simon Billing: To Alex's point, maybe differing to Judith, I would not discourage us thinking about incentives to make that accessible and affordable, particularly if we take the gauntlet that has been put down by EAT-Lancet and the fact that we need to eat more vegetables and more plants in general.

I see your point and see your challenge and it has also been put back to us. When we want to talk about the better meat, how do we address the income inequality around that? I would not rule out fiscal options and I think the Government should be exploring that. Where there is absolute agreement across the piece, certainly across our alliance, is on processed meat, for example, from both the health and sustainability perspective.

Q117 **Alex Sobel:** We should tax it, is that what you are suggesting?

Simon Billing: Potentially looking at different fiscal measures. Tax is one way that has been discussed quite a lot. Certainly pricing would help because meat is—

Q118 **Alex Sobel:** Do you mean meat pricing, like alcohol?

Simon Billing: Potentially something to consider.

Q119 **Dr Matthew Offord:** I want to ask you about approaches needed in order to reduce the impact of the food system on the environment. When



I say “approaches”, I am including technological, business and behavioural approaches. Who would like to start?

Professor Lang: I think we will all chip in. I think we are all saying, all of us on this panel and indeed the previous one, as I heard it, that Government and policy have to use all the range of measures, which we are not. We are locked into the softest, weakest, least effective end: advice, information and labelling. Their track record is not very good for the sort of big systems change that the data suggest is required.

Behaviour change: usually when you ask a question like that, you are meaning behavioural economics and usually they mean the soft version of behavioural economics. The hard version of behavioural economics is exactly where Simon and Judith were taking us in response to Mr Sobel’s question, which is fiscal measures, incentives and market shifts. For example, let me just float an issue around the meat issue. There is a lot of discussion about meat when we should be focusing, Sonja and I would argue, much more on the doubling of fruit and vegetable consumption and a huge expansion of horticulture that Britain should be doing. That is maybe something that should feature in your final report.

What if one put restrictions on the amount of grain that could be fed to an animal? What if you incentivised grain production direct for human use as opposed to cattle, poultry or pig use? What if you put a tariff on to importation of soya? These are measures that are possible and that would almost certainly have immediate effect on the profligate use of land to feed animals, inefficient converting animals particularly. In the Lancet Commission report we started looking at that and beginning to model that. If you notice, if you have seen it, we do recommend a big switch away from beef and sheep towards poultry and pig.

We have a section that has not been commented on very much in the annexes—pages 24 and 25, Mary, if you want to go to sleep—about using waste to feed animals. That is an issue that goes back to Mr Sobel’s question. Not at the moment, for very good reasons, including foot and mouth disease. DEFRA had really big difficulties with having to slaughter millions of animals because of that. We have to sort out the technology of using waste that humans cannot use, not handing out two-day old bread, but which could be converted by pigs or poultry. If we switch from farm use for grain to having, as we called it in the annex of the report, livestock from leftovers, that is a very interesting policy.

Q120 **Dr Matthew Offord:** That is certainly a very interesting approach, but I understand that to produce a kilo of meat it would take 13 kilos of CO₂. That is like burning 6 litres of petrol. I certainly get that argument.

Professor Lang: Whether you look at carbon, you look at land use, you look at labour use or just inefficiency of conversion, it is better to grow the plants and then we eat them direct. If you want meat, have it using other land that cannot grow grain.



Q121 **Dr Matthew Offord:** How realistic is that approach, both in the United Kingdom and on a global scale? What would governments need to do?

Professor Lang: If we do not act—let me be very stark—the data from the IPCC, let alone the WRI, let alone the InterAcademy’s report, let alone the Lancet Commission report, shows that it will hit us in about 20 or 30 years’ time. The whole purpose of doing this sort of thinking is to say, “What is a good food system going to look like for 20 or 30 years’ time?” We are now pretty sure what that looks like. I am sure things will change slightly, but in the last 10 years the science has not changed much.

Q122 **Dr Matthew Offord:** Just explain to me, when you say “hit us”, in what area?

Professor Lang: Climate change runs out of control.

Q123 **Dr Matthew Offord:** You mean climate change?

Professor Lang: Water use runs out of control, biodiversity flips. We know it is beyond planetary boundaries already. These are unstoppable changes that will lead to mass migration on a level that most people on the planet cannot even conceive. It will lead to destruction of ecosystems on which humanity depends. There are the new Malthusians who say, “Well, so be it. Let Darwinian processes occur”. I personally—and I am sure my fellow panellists and I am sure you—do not want that to happen. We humans are pretty stupid, but we are not so stupid we cannot read the writing on the wall, I hope.

Dr Vermeulen: I would come at it a little bit more technically, as an environmental scientist. In the modelling that we did for that paper, which matches well to other studies that have been done, we looked across five different environmental parameters, which were climate change, biodiversity, nitrogen, phosphorus and fresh water use. Then we looked at what kinds of changes across diets, production and waste caused the most difference. What you see is that dietary change has a phenomenal impact on greenhouse gas emissions but less, surprisingly, on, for example, our fertiliser use, which then takes us into the area of managing how we do agriculture. The first point is that we need to act on both of those together.

When you look at the kinds of changes that might have to happen in agriculture, particularly around managing those kinds of biodiversity and nutrient cycles, you can then pick out hotspots around the world where it is out of control at the moment. What I mean by “out of control” is that farmers are using fertilisers in excess of what is helping them to increase yields and to increase returns from farming. The United States, Pakistan and China particularly stand out. Then you can go into looking at what Governments there have tried to do to bring that down.

China is a very interesting case in point. Farmers are using far in excess of what is creating the yields and that is leading to enormous run-off. The



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Government has gone into an enormous agricultural extension programme to, first of all, try to educate around this, but then also to explore. Farmers are obviously doing this as risk management. That expense on the fertiliser is well worth it for them just to absolutely assure some yield at the end, to try to also explore whether there are different kinds of risk management, insurance of products for these farmers that can help them cope in other ways.

For each of these, you can dive in: in many cases the kinds of technologies we know will work are already there. Of agriculture's big ones around that, first is soil fertility management. The second big area is around animal management and the management of their manure. The third very big area globally is around methane emissions from rice fields, which you can control through irrigation management. My point there is that for many of these problems, we have affordable solutions and so a lot of it is about Government thinking it through and providing the right incentives to farmers to implement the solutions.

Professor Lang: In Britain we do not do that; we think it is everyone else's problem. The point of your Committee report, if I may say so, is that you must say that it is Britain's problem too. We no longer have an agricultural extension service, for example. China does, India does, Britain does not. It is pathetic.

Judith Batchelar: Adding to that, we can model what that would look like for the UK within the global system. We know where we are now because we have the data to be able to do it. The data says we know what the gap is. If we were to look at the gap and ask, "How do we get from here to here?" my view on that is that you would incentivise both ends of the chain—you would incentivise both producers and consumers—but you would also analyse what are the risks to that plan. It goes back to the earlier point that was made about fruit and vegetable consumption.

Our biggest trade gap is in fruit and vegetables; it is £9 billion. The only other thing that comes close is red meat. If you were to ask, "What is the biggest risk to that plan?" it is our horticulture system. The fact that it is very vulnerable to climate change, particularly in southern Spain, where we get a lot from, and the technology exists to be able to produce those products in a closed, controlled environment, that has lots of upside in terms of food waste, shelf life of the product and so on.

I would not look at the question of whether we need to be more self-sufficient in order to be resilient. I would look at where are the risks to our achieving a sustainable, healthy future, where we are all eating the right things. This is a slightly different lens on the same topic.

Simon Billing: I was brought up as an animal feed expert. I have spent quite a lot of time looking at animal feed, although it is not within my current role this year. It is a bit of a shame that in the EAT-Lancet report, the animal feed question, which is absolutely critical and which we should



be looking at, was kicked into the appendix. I had to be told to look at page 24. I believe the animal feed question is by far one of the most critical areas we should be looking at as we take EAT-Lancet forward with regard to feed.

Livestock on leftovers is a very interesting concept. It would support some of the best agriculture and the better meat of what we are doing here. Some of the projections and some of the discussion we have had this morning, whether it is around aquaculture or the growth of broiler, is all dependent on this imported feedstock, which is neither resilient nor sustainable going forward. I would encourage us to be razor-focused on what we feed animals on in future.

Q124 Dr Matthew Offord: A large amount of our food in this country is produced in climate-vulnerable countries. What responsibility do you feel that the food industry has towards those countries with regard to how they provide us with the produce?

Judith Batchelar: A huge responsibility. We would look at what we would call vulnerable areas—

Q125 Dr Matthew Offord: In terms of what?

Judith Batchelar: It could be a number of things. It could be around social communities, equitable value chains, water and so on. Water is a good one because we would then look at what kinds of interventions would help, for example—something that has been hugely documented over the years—the areas around Lake Naivasha in Kenya, where the levels in the lake go up and down and there are all sorts of challenges.

That situation required a stewardship approach from all stakeholders, including the UK and Dutch Governments. It is good example of where we would work collaboratively with what are normally our competitors to deal with those sorts of challenges, which would be everything from water extraction, licences and the management of water extraction to what is going on with forestry in the upper catchment areas and what is going on with fishing in the lake versus the investment that we had from BBSRC in how we can grow more crops per drop, how we can grow crops with less water.

There are lots of ways in which we can do that and we do have a responsibility to do it. The stewardship approach—and it is not just abroad; it is in this country too—is something that at the moment is very hit and miss. If there were to be some sort of incentive to work more collaboratively across sectors on those things—it does come back to that multi-factorial approach—it would be helpful, because these things are rarely simple and they are rarely single issues.

Dr Vermeulen: I want to add a point of clarification from the first panel. This is in relation to a question Kerry McCarthy asked. There was a discussion about the allocation of emissions across producer and



consumer countries and the answer from the first panel was that lifecycle analysis, which is the scientific method used, includes both of those.

What the first panel did not mention, however, is this: almost any scientific paper that you read from people like us is using a lifecycle assessment and we will include the full lifecycle of the product, right down to how it is used in people's homes. However, that is not what the political mechanism does. The bulk of any particular food's emissions footprint in agriculture will tend to be around 70% or so of its footprint for most products and politically that is, as you were guessing, allocated to the producer country. We allocate to Brazil emissions for beef produced in Brazil. This comes back to your question. The global political mechanism around climate at the moment does not lend itself very well to consumer countries working closely with the places that they are sourcing their food from.

Q126 Kerry McCarthy: So when we are setting carbon budgets and we are looking at how we can meet our targets, we would not be taking into account where the livestock feed is coming from—

Dr Vermeulen: Exactly.

Kerry McCarthy: —which is a pretty big emission, because it is a major part of the product. The more food we import, the lower our footprint could be, but actually—

Professor Lang: That has tended to be the British policy approach to carbon reduction. We have offshored it. We have had other people do our dirty work and that has to stop. In a sense—it is not Judith's responsibility—the food industry is acutely aware now that consumers really have a complete lack of knowledge about the enormous footprint we have in how we eat. You know that. Somehow that connection has to be brought home so that we are not in this fool's paradise of eating in a way that undermines our own children's futures.

Q127 Kerry McCarthy: It is about biodiversity as well as the carbon footprint, is it not, the biodiversity loss?

Professor Lang: What Sonja Vermeulen has rightly said is that we do not have LCAs—lifecycle analysis and assessment—on biodiversity included. What people like me, a mere policy analyst, want are multi-criteria indicators, which can be brought in to analysing what is a good diet. All of us have done work on little bits here and there. Where the EAT-Lancet report really is a useful contribution, it moves forward and brings in more integration, certainly on the environment side.

What we did not do on EAT-Lancet, and I really want to be clear about that, is include the social dimension so much and that is critical. The cultural dimension of food is absolutely critical. People do not go out looking for environment when they eat—well, a few of us do, but not many—they go and get what they want and what the price dictates or what their grannies taught them or if they have had a heart attack or if



they have had a baby, they change. Those big processes of change have to accelerate very fast, bringing consumers in. We are not good at that.

Your earlier question, Dr Offord, about behaviour change was absolutely spot on. What I think all of us are saying, all the scientists and policy analysts, is that we have to include all the approaches, not just leave it to something that is put on a label by Judith's colleagues, which you cannot read. What is the average time somebody looks at a label, Judith?

Judith Batchelar: Six seconds.

Professor Lang: Yes, about six seconds. Most studies show about one second, unless you are pregnant or have had a heart attack, then people start looking. The information model does not work. It is very useful to have information, not least because it makes the producers, the manufacturers and the retailers declare what is in the food, but no label tells you what the biodiversity impact is, no label tells you what the embedded water in your food is, no label says how this has been grown. It is all flipped. You declare it if it is organic, but not if it has been intensively grain-fed in some ghastly short life in a tin shed up the motorway, which is what the label ought to say for much meat; he says, neutrally.

Chair: We are going to move on to the final question.

Q128 **Anna McMorris:** I do want to also welcome your comments on the Well-being of Future Generations Act in Wales because I think working together is something that we should learn from Wales. In my life before I became an MP, I worked in Welsh Government on that Act and helped bring it to fruition. It is so important that we are looking across the board on legislation to help prevent a lot of the things we are discussing now. Your comments on that were very welcome.

Moving back to diet and sustainable and healthy diet recommendations, which typically propose substantial reductions in the consumption of food of animal origin—meat, eggs, dairy and so on—mainly because the disproportionate environmental footprint involves animal production systems, what do you think is the consequence for farming?

Dr Vermeulen: I would like to start with a clarification about how we went about it at EAT-Lancet. We started with health, so the diet that you read there is specified purely on health grounds. There is no environmental consideration within it. We would potentially reduce animal products even more, if that is what we brought in. I want to make that clear. It is a health-based diet, which we then tested against environmental parameters.

I have not gone into impacts on livestock farming. I am going to pass that question.



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Professor Lang: Where do we start? The impacts are enormous across a range of indicators. The critical issue is what do want from our land. It becomes a land use issue.

Anna McMorris: Exactly.

Professor Lang: You are asking a huge question. Do you really want us to spend all our time on it? In very short terms—

Q129 **Anna McMorris:** That is a lot of what the EU policy was set up to do with the CAP and the pillars, trying to frame it in such a way that it would be more environmentally beneficial and land use would be looked at. It would be interesting to hear your view.

Dr Vermeulen: With regard to pasture-fed meat and that kind of land use, that currently supplies a very small percentage—I do not have the exact figures to hand—less than 10% of what we eat globally. I believe that if we wanted to continue those land uses, particularly in Europe, and favoured them through policy, it need not have any impact at all on those kinds of farmers. What we would be looking at would be impacts on the big, intensive feeding operations, feeding crops.

Professor Lang: Economically, the pressures are for the latter rather than the former. That is the political economy problem we have.

Q130 **Anna McMorris:** If the consumption of meat or meat-based products goes down, surely that puts farmers at risk.

Dr Vermeulen: Yes.

Professor Lang: It depends what farming does. The good thing about Mr Gove's Agriculture Bill—it is not an Act yet—is that it is saying, "Let us pay farmers and encourage farming to be about ecosystems and benign land management". That is great, but it has severed policy from food production. If one is sceptical, and perish thought that a professor might sceptical, one could say that there is a tacit policy emerging in England—Wales is different, Scotland is different, but England is quite powerful—to prettify the landscape and get others to feed us.

I am pushing it a bit, but there is a very strong view within Parliament of that, certainly there is a strong view from outside and there is a very attractive model to be presented to consumers to say, "We will get West Africa or the US to provide us with cheaper food, to bring four chickens for £5 from Brazil" where you can get it done with very low environmental standards and how can you inspect it? Not even the mighty Sainsbury-Asda, merged with Tesco, could have the inspectorate in or the satellites and such sophistication to check what everyone in Brazil, rearing poultry, is doing.

It is just not feasible, which is the cultural argument for bioregionalism. You can see it: it is there; it is inspectable. As General Eisenhower memorably said in one of his interventions in policy, "The uninspected



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quickly deteriorates". That applies in food, very definitely. If you cannot inspect something and you cannot measure it, you are not going to be able to improve it. That is what we are going to have to do on all of this.

Judith Batchelar: It comes back to the transitional point: to say how do you move to the system we want to see. I would like to think that it does include food production in this country.

Professor Lang: Me too.

Judith Batchelar: I believe it is possible, but it does have to be done very intelligently and in a well-informed way. At the moment, we do not have the protocols for reporting in place to do that.

Professor Lang: Yes.

Judith Batchelar: We certainly do not have the definitions. For example, if you were to ask our customers what they understand by grass-fed or pasture-fed, there is no standard definition of those things, so anyone can put that on a label. It is not controlled, just as outdoor-bred, outdoor-reared in pork is a real mess and confusion. We have to get those definitions and standards very well-defined and we have to get the reporting protocols that sit behind them commonplace. Then we can start that transition. Without that, it will just be wishful thinking.

Professor Lang: Yes, I agree.

Simon Billing: I echo that. It is a conversation that Government need to hold and lead.

One of the tensions at the moment, and you can see it from my inbox, is that there isn't a proper conversation on that transition going on across the farming community. There are no proper definitions. We have some clear ideas of what we think better meat looks like, but the labelling, definition and vision of where we want to get to and how we get the right support mechanisms all need to happen. It feels like the moment is now. The EAT-Lancet report, the IPCC report: I could send you another dozen reports that over the six months I have not been able to keep up with. The conversation needs to be held by Government, not necessarily the private sector or NGOs.

Professor Lang: Less attention to meat, much more attention to plant production. Meat takes too much time from us. The good news is plant growth. Last week I talked to 300 growers at the British Growers Association in Peterborough, halfway up to your constituency, Chair. This is an industry that turns over £2.25 billion and it has no subsidy, it has no support and Government are removing its pickers, basically. Robotisation, automation, that is 15 years down the line. We have to have a sustainable horticulture policy very fast indeed because every country needs to. That is the good news.



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Meat is taking too much of our policy attention. Let us have more attention on the positive news. Here we are, not far from Kent. My grandmother was from Kent; I was brought up eating Kent cobnuts. That industry has collapsed. The big news from EAT-Lancet was to increase fruit, seeds and nuts by 50%.

Chair: Cobnuts are the way forward.

Professor Lang: Let's send food policy nuts.

Chair: We are going to have to send ourselves off to lunch. This has been a fantastic session. Thank you all very much.