House of Commons

Environment, Food and Rural Affairs Committee

Defra Science

Oral and written evidence

Oral evidence taken on Wednesday 17 March 2010

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Environment, Food and Rural Affairs Committee

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Oral evidence

Taken before the Environment, Food and Rural Affairs Committee

on Wednesday 17 March 2010

Members present

Mr Michael Jack, in the Chair

Mr David Drew	Miss Anne McIntosh
Lynne Jones	Dr Gavin Strang
David Lepper	Paddy Tipping

Witnesses: **Professor Bob Watson**, Chief Scientific Adviser, Defra; **Professor Alistair Hetherington**, member of Defra Science Advisory Council; **Dr Timothy Hall**, Head of Unit for Agriculture, Forestry, Fisheries and Aquaculture, EU DG Research; **Mr Steve Visscher**, Deputy Chief Executive, Biotechnology and Biological Sciences Research Council (BBSRC); **Ms Miranda Kavanagh**, Director of Evidence, Environment Agency; **Mr Henry Robinson**, Vice-President, Country Land and Business Association (CLA); **Dr David Gibbons**, Head of Conservation Science, The Royal Society for the Protection of Birds (RSPB), **Ms Joyce D'Silva**, **Dr Alan Gadian**, **Ms Joanna Wheatley**, **Professor Rick Battarbee**, **Professor Jack Winckler**, **Dr Christopher Atkinson**, **Dr Jonathan Clarke**, **Dr Tina Barsby**, **Professor Chris G Collier**, and **Ms Magda Ibrahim** gave evidence.

Q1 Chair: Good afternoon, ladies and gentlemen. I am Michael Jack, the Chair of the Committee. May I welcome you to a unique occasion in terms of the Committee holding a seminar on Defra Science. We have not undertaken this type of exercise before. For those of you who are regular aficionados of the work of the Committee you will understand that we have a formula where on occasions like this we have some witnesses normally sitting at the table in front of you all and we ask a lot of questions; they provide copious answers; we write it all down; and then at some point in the future we issue a report. Today, however, we are doing something different. We have decided that because of the importance of science underpinning a vast amount of what Defra as a department does and indeed the work of this Committee, that we would try and do something that would enable us first of all to have a discussion on the subject of Defra's future science policy, particularly in the light of the publication of the *Evidence Investment Strategy* by the Department but also to do something by means of bequeathing a legacy to the Committee that will follow us, because obviously we are now in the last few weeks of this present Parliament, but it is important that we as the outgoing Committee put some markers down about the whole question of things which are scientifically important, in the hope that our successor Committee will pick those matters up as part of its future work programme. Also, as you will see, and I will introduce them in a moment, we have a number of individuals who are going to be commenting on current policy approach as well as responding to it, and as a result of the presentations we will then throw the meeting open to all of you who have been kind enough to come this afternoon. We very much want this to be a dialogue. Some people have already indicated by means of correspondence what they want to ask. Others no doubt will have questions that will arise from the presentations and from time to time the Committee will want to intervene to make some of its own points. Let me just say that everything you say this afternoon is on the record and the proceedings of this afternoon's events will be published for everybody to see, so there will ultimately be a record of what we have said. Can I move to the beginning of the formal part of this afternoon's proceedings and welcome firstly the three witnesses who are going to introduce the policy side of things. On my almost immediate left is Professor Bob Watson, the Chief Scientific Adviser for Defra, who I think since his appointment has been carving out his own mark, he has been very busy, and there have been some important things he has achieved which he will no doubt want to talk about in outlining what underpins Defra's *Evidence Investment Strategy* and other relevant issues. Defra gets a lot of advice but principally from its Science Advisory Council, and representing their interests is Professor Alistair Hetherington, and I am very grateful Professor that you are able to join us. In the work which Defra does much of the policy framework is fitted within work that comes from the European Union, and the European Union has a very important role to play in determining what the science agenda is for Member States, and therefore we felt it would be remiss in looking at policy issues if we did not have a contribution from DG Research in Brussels, and I am delighted to welcome Dr Timothy Hall, who is the Head of Agriculture, Forestries, Fisheries and Aquaculture Unit. I am most grateful to you, Dr Hall, for coming from Brussels and being with us here today. When we have had those three presentations, each one of which will be about 10 minutes long, what we thought it might be useful to do was to subject them immediately to some informed comment. I will not say critical appraisal because that may not be what our panel has in mind. To that end, let me introduce Steve Visscher, who is the Deputy Chief Executive of the Biotechnology and Biological Sciences Research Council followed by Miranda Kavanagh, the

Director of Evidence for the Environment Agency. When I first heard the Director of Evidence was coming, we have done a lot of inquiries into things like waste and fly tipping and I thought for one moment you had drawn the short straw and had come along to talk about that, but you have a wider remit and we are very grateful to you for coming to join us. Henry Robinson is the Vice-President of the Country Land and Business Association. We wanted to make certain in commenting on the presentations we had people from the user side of the house as much as anything. Equally, in that vein, we are pleased to welcome Dr David Gibbons, the Head of Conservation Science at the RSPB. Without further ado I am going to ask Professor Bob Watson, Chief Scientific Adviser for Defra, if he would be kind enough to open our seminar.

Professor Watson: First let me thank you and your Committee for putting on this seminar. Like you, I think that science, technology and evidence are absolutely critical for informed policy formulation and policy implementation. We have just issued, as you have said, an *Evidence Investment Strategy*. We talked to a large number of people—policy makers, scientists, the private sector, other government departments, Research Councils—to try to get a good feeling for where did they see the high priorities. The figure on page 6 is what I would say frames the whole report. After a lot of discussion we came to the conclusion from a Defra perspective that there were three major areas of interest: the first is climate change, both adaptation and mitigation; the second is sustainable food supply; and the third is protecting ecosystem services. These three issues are totally inter-related. That is to say climate change affects our ability to produce food but in turn the way we produce food affects climate change through the emission of greenhouse gases—methane for example from ruminant animals, and nitrous oxide from the use of inorganic fertilisers. Equally, climate change affects our critical ecosystems, our grasslands, our mountains, our lakes, our rivers, et cetera, and in turn if we do have changes in our ecosystems and the genetic species ecosystem level it can feed back on climate change. Equally, there are links between our ability to produce food and our ecosystems. The first point to note is there are three major issues within the Defra mandate which are all strongly inter-connected. Within Defra the scientists and policy makers who work on climate change have to work hand-in-glove with those who are working on food supply and those who are working on ecosystems. The first point is we need to be very joined up within Defra both from a knowledge, science and technology perspective and from a policy perspective. We then asked ourselves the question what will it take to actually have a good understanding of these three issues to make sure that we have the knowledge base for informed policy formulation. The first point was all of the work must be inter- and multi-disciplinary. That is to say this is no longer just the domain (if it ever was) of the natural scientist. We need natural scientists, social scientists, economists, statisticians and technologists, and they have to work together as a team both within Defra and outside of Defra. So inter-disciplinarity and multi-disciplinarity are absolutely essential. One area where I would argue that Defra has not been on top of the game to the degree it should is understanding behaviour of whether it is consumers, whether it is farmers, whether it is the public at large, whether it is the industry, so we felt understanding behaviour was critical. In the climate change area it has often been thought that if you get the technology and policy right we will have solved the climate change issue. I would argue that would be incorrect if we do not understand behaviour at a multitude of levels. Thirdly, we have to be innovative, both in the way we procure research and evidence, the way we use evidence, and the way we embed it within the policy cycle within Defra. Figure 1 recognises the major issues and recognises how we need to deal with them. The first message then was we need to put priorities on our programmes. If one looks at page 28 of our document you see a two by two matrix that asks where we believe there is growing evidence need; issues such as adapting to climate change. We believe that while there is a fair amount of knowledge out there we need even more knowledge. How will climate change impact on water resources, agricultural protection, coastal erosion, biodiversity itself, and therefore how can we adapt to climate change? We therefore feel there is a need for more evidence to have truly informed policy formulation. Equally, there needs to be a better understanding of soils and a better understanding of biodiversity and water. We also felt there are some areas where maybe there are decreasing evidence needs. These are very important policy areas, things such as noise, pesticides, transmissible spongiform encephalopathy (TSEs), animal welfare. There are other areas where we wanted to continue to review our programme, for example marine monitoring. It is absolutely critical to understand the marine system and it is absolutely critical to monitor it. The question is, are we monitoring it in the very best way or are there even better ways to do it? We have a two by two matrix and the question is how can we prioritise our spend. That is a matrix where if there was an increase in funding we would know how to spend it, if it stayed level we would know how to spend it and in the unfortunate case there was less money for evidence we would again apply that matrix to see where our priorities were in a period of decreased evidence spend. We have to prioritise our investment and make absolutely sure that we are procuring the right evidence. In other words, we need a line of sight between the policy challenge of today and the evidence that we need. Whether that is evidence we procure or whether it is evidence through the Research Councils and the other government departments, it does not matter, but we must make sure that we have a line of sight between

what is the evidence that is needed in policy formulation and policy implementation and what is the evidence that we are either synthesising from others, which is crucial, or new knowledge that we are procuring ourselves. That is rather crucial. Co-operation is absolutely central to this. We need to work better within Defra and we need to work much more closely with the other Research Councils and government departments. This is where programmes such as Living with Environmental Change (LWEC) are absolutely vital. There are six high-priority areas in Living with Environmental Change, issues such as climate change, biodiversity and ecosystems, food and water security, infrastructure/transportation, human, plant and animal disease and welfare/health, and one of understanding the social dimensions of these issues. LWEC provides a superb platform, in my opinion, for how to move forward. Equally we have other programmes. John Beddington, Chief Scientific Adviser for the Government through Go Science, has the Global Food Strategy. Equally, BBSRC have led a superb effort and released a document in the last few days looking at food and agricultural research. BBSRC led the effort but working with other government departments and other Research Councils, so especially if funds were to get tighter in the coming years, it is this sort of partnership with the other government departments and Research Councils that is absolutely critical, and also to make sure that we have good knowledge transfer to all end users, to the farmer, to the person in the street, to the private sector. Co-operation is absolutely critical. Then we have to ask ourselves the question do we have the right skills? Are we intelligent customers inside of Defra? Do we understand the capabilities in the universities and the government laboratories? The next issue is making absolutely sure that both inside and outside Defra we have the right skills, the right expertise and the right capabilities, so we are asking ourselves some questions: do we have the right skills mix in Defra to meet these incredible challenges? The last part is how do we make sure that evidence is embedded in our policy cycle right from day one? So when we start to think about a policy area, we need to make sure we have the right mix of policy makers and analytical technical expertise, the economists, the social scientists and natural scientists, and make sure we are embedding evidence all the way round the policy cycle, and then ask ourselves whether we have the right procurement practices in Defra to make sure that we are procuring evidence in the most efficient way. In my personal opinion, we can improve this. We have many small projects, some cost tens of thousands of pounds for a three- or six-month project rather than thinking of larger projects over a longer timescale, which is exactly what is needed, in my opinion, whether it is work done in universities, government laboratories, or our own agencies, The Food and Environment Research Agency (FERA), the Centre for Environment, Fisheries & Aquaculture Science (CEFAS) and the Veterinary Laboratories Agency (VLA). In my opinion, this was a rather exciting project to work on. I do believe it has buy-in at all levels of Defra—the management board, our current Ministers and the staff—and I think it has been fairly well-received by others outside of Defra, but of course now what we have to do is make an implementation plan, so what we are working on is a strong implementation plan programme-by-programme. I would hope to have those done in the October/November time-frame to see how we take on this strategy and actually get implementation with monitorable indicators of progress. Thank you, Chairman.

Q2 Chair: Thank you very much indeed, Bob, for starting us off in robust style. Let us move then to Professor Alistair Hetherington. Would you like to continue?

Professor Hetherington: The first thing I would like to say is to echo Bob's words, which is to thank the Committee and you, Chair, for giving me the opportunity to come and speak to you today. As you have heard, my name is Alistair Hetherington. In addition to being a member of the Defra SAC, the Scientific Advisory Council, my day job, if you like, is Professor of Botany in the University of Bristol. I thought what you might find useful would be if I divided my opening statement into two sections. In the first part what I would like to do is describe how the SAC works, what they do, how they do it and, most importantly, their relationship to Defra. In the second part of my presentation I thought you would find it interesting if I discussed the specific role of the SAC in the development of the process that has resulted in the production of the Defra *Investment Strategy*. First, the SAC. I have been a member of the SAC for just under a year. As many of you will know already, the SAC is the second oldest of the Scientific Advisory Councils. It was founded in 2004 and I think only the MoD SAC is slightly older. The SAC itself is made up of 14 members and their interests have a broad range. They extend from the social sciences through economics, natural sciences, right the way through to engineering, so a very broad base. We meet about four times a year. One of these meetings is always open to the public. In addition to these meetings of the full SAC there are also meetings of the various sub-committees. The job of the sub-committees is to focus on something which is of particular interest, something the SAC really wants to get its teeth into. Maybe the most important thing I should stress is that the role of the SAC is to provide independent advice and challenge to Defra, and we do this by working with Professor Watson, the Chief Scientific Adviser. How does this actually take place, what are the mechanics here? The process can be initiated by Professor Watson saying to us, "I would find it very useful if you could give me some independent advice in the following areas", or alternatively we may decide as a committee to approach Professor Watson and say, "We think you might find it useful if we gave you

some independent advice in this particular area". It is important, also, for me to stress that we are an independent body. We are also a committee of experts rather than an expert committee. Everything we do is published and is on the web. In addition, I think I have mentioned that we have one open public meeting a year. The last meeting we had was at London Zoo and was attended by a large cross-section of the public and many of our stakeholders. It is an opportunity for the members of the public to hear how we work and also to ask us questions. A point that I guess is probably uppermost in your mind is does the Chief Scientist, Professor Watson, take notice of any of our advice. The answer to that is yes. Let me show you the evidence. Since the inception of the SAC in 2004, the SAC has made approximately 150 recommendations and I am very pleased to say that Defra have accepted 75% of these. The question then becomes what happens when the recommendation is not accepted in full. What happens is we require the Chief Scientist to come back within six months and discuss this with us. Turning now to the *Evidence Investment Strategy* itself, what I am going to explain to you is that the SAC have really been involved in this process intimately. They have been involved since the outset. The SAC were involved in the process by which the *Evidence Investment Strategy* was developed and were involved right from the word go. I believe that the process started in September 2008—this was before I joined the SAC—when Professor Watson hosted a workshop for key stakeholders, including the SAC. The aim of this workshop was to review future challenges and corresponding needs for evidence and innovation. From this came the three major interlinked evidence challenges Professor Watson has just described to you. In January 2009 the EIS sub-group—we established a specific sub-group to work on this topic—met three times during the preparation of the EIS document itself. The role of this sub-group was specifically to provide advice to the Chief Scientist on key stages of development of the EIS. It also commented on the scope, the principles, the processes and, indeed, the outcome of the exercise. It was also invited to comment on the draft and, indeed, the outcomes of what were called the challenge sessions. I do not wish to labour this, but the point I do need to make is that the SAC was thoroughly involved in this process. Although I was not a member of this particular sub-committee I was involved in the challenge sessions. The one that I was involved in was the session relating to adapting to climate change. As many of you will know, this is one of Defra's key and primary strategic objectives. I had the opportunity to ask the senior responsible owner about the robustness and appropriateness of the models that they were using in their predictions. This was particularly in the area of climate change and I was interested in finding out just how robust their models were and whether they were fit for purpose. Indeed, Professor Watson joined me in these questions. Just to close this section on the *Evidence Strategy*, I can also tell you that the SAC members were involved in 11 out of these 20 challenge sessions. The point I need to make is that the SAC have been thoroughly involved in this. They were involved in the last open meeting at London Zoo, which I have mentioned, at which Professor Watson rolled out this particular document and, as such, I think it is fair to say we really endorse the findings. Thank you, Chair.

Q3 Chair: Thank you very much indeed for that important perspective. Now moving to the work of the European Union in this field, Dr Hall.

Dr Hall: Thank you very much for inviting me here. It is a novel experience to be in such a position. As you can tell, I am British, but for the purposes of this meeting I am European so my comments may not always be pro-British, shall we say. I will take a wide perspective on this. I would like to try and address this from two particular points which will be slightly diagonal to the previous presentations. One will be to look at the way the priority setting process works in Brussels from the macro level down to the more micro level, and then to give you a perspective from our side, of how we see Defra interacting with us in Brussels and with the other Member States. For those of you who know nothing about the Framework Programme, which is the big funding package for research, this is now on a seven-year cycle and comes under the overall budget setting process called the Financial Perspectives. At the moment this runs from 2007 to 2013. We are about halfway through the current phase so there is not much opportunity for influencing the way the next three and a half years is going to pan out, at least in terms of the overall funding, but there are possibilities to change or reorient at the micro level—I will come to that later. The whole funding arrangements, of course, are complicated by the other big issues that are discussed at the same time as the research package: the obvious ones are the Common Agricultural Policy, which is always very hotly discussed, and then the Regional Funds—these are the three big packages that take up quite large chunks of the European Union budget. In the Framework Programme that is now running there is around €53 billion spread over the seven years divided into four separate main programmes. One of these deals with cooperation, where we have different types of projects but always with multi-partner arrangements, and this represents something like 65% of the total package. Then there is a bottom-up programme called the "Ideas" Programme and this is very much researcher led. The only criterion is excellence; there are no specific partnership requirements. This has about 15% of the budget. (Incidentally, the UK has done very well in this particular part of the programme, well above the norm.) Then there is a programme called "People", which is really a package of fellowship and exchange arrangements, again bottom-up, and these are

17 March 2010 Professor Bob Watson, Professor Alistair Hetherington, Dr Timothy Hall, Mr Steve Visscher, Ms Miranda Kavanagh, Mr Henry Robinson, Dr David Gibbons, Ms Joyce D'Silva, Dr Alan Gadian, Ms Joanna Wheatley, Professor Rick Battarbee, Professor Jack Winckler, Dr Christopher Atkinson, Dr Jonathan Clarke, Dr Tina Barsby, Professor Chris G Collier, Ms Magda Ibrahim

packages for small funding arrangements for post-doc level people in people. The fourth part is "Capacities", and this is mostly focused on infrastructures—that is, preparing for possible new large infrastructures. I am going to talk more about the "Cooperation" programme because that is where we interact mostly with Defra and it contains one of the sections that I manage. There is a split between the various components in the cooperation programme. It comprises a number of different themes: a health theme, another one dealing with information and communication technologies, energy, transport and the ones we are particularly concerned with here: the ones that interface with Defra are "Food, agriculture and fisheries and biotechnology", and the other one is "Environment, including climate change". The two areas where we interface closely with Defra are in those particular themes. I just want to mention the funding split. The distribution of the funding is very much a political decision taken by the European Council, the Member States in other words, and the European Parliament. It is a co-decision and has been a co-decision procedure for some time. Of course, various different bodies, pressure groups etc., attempt to influence the way that money is allocated to the various themes. While we are talking about the budget, I would say €53 billion sounds like a lot of money, and of course it is a lot of money, but in fact it is only 5% of the total European research effort. If you add up all the individual Member States' research effort across all disciplines it comes out at about 95% of the total while the European Union manages only about 5%. Unfortunately, at the time the budget was allocated to the Framework Programme, which was around 2005, the current problems of climate change, potential food shortages, food security in general and, of course, various wider issues relating to the whole problem of energy supply were not as well perceived as they are now. Obviously we knew about them but it was difficult to get the public, society at large, to be fully conscious of these problems. The two particular themes I am going to refer to are, in fact, not that well endowed with money. There is €1.9 billion over seven years for agri-food, fisheries and biotechnology, and just a little bit less, €1.85 billion or so, for environment and climate change. I should say that these two themes work very closely together—there being quite a big potential overlap in the subject areas—to make sure that we do not duplicate unnecessarily and that there is appropriate complementarity. So that is how the macro level works. At the micro level, or closer to the micro level, we produce annual work programmes every year where we list various topics which have evolved on the basis of a wide discussion. We have an advisory group, a cross-disciplinary group, which is comprised of various academics and people from industry. That gives us broad advice on overall approaches. We discuss other aspects with the Standing Committee on Agricultural Research, which Defra participates in. This is a co-ordination mechanism involving similar departments to Defra from across Europe all sitting round the table and discussing better ways of co-ordinating to ensure overall complementarity between the different types of agricultural research conducted. In addition, we have a number of technology platforms, which are industry-backed, which advise us on particular topics which they feel are appropriate at the time. We have another set of co-ordination mechanisms called ERA-NETs where policy managers of individual countries for particular sectors come together to facilitate co-ordination and even pool money for project funding. All these various elements are integrated and at the end of the day we have a set of topics that are then published as our work programme for that particular year. We also have input from other Directorate-Generals who have particular demands on us for policy support, i.e., research linked to policy. The whole package is then adopted by the Commission in its College form.[1] This is a political decision, each work programme being adopted annually by the College of the Commissioners, so all services are fully involved and responsible for the components that are in it. If I can move on quickly to Defra's links with us, or our links with Defra, first of all, as I think I said, Defra represents the UK both on the environment, and on the agri-food biotech themes in our programme committees, so has direct access to the decisions on the particular topics because we consult very closely with the Member States for each work programme. In fact, we need a positive opinion, as it is called, from the programme committee before the Commission gives its approval. Defra, from our point of view, has shown a very strong interest in working with other programme managers. It is very active in the Standing Committee on Agricultural Research and in various Standing Committee Working Groups. One of those is the Steering Committee but there are also a number of specific subject-oriented groups in which Defra is very active. In addition, as I mentioned, we have these ERA-NETs, which are basically groups of funding managers, people who manage the funds for research in particular countries around particular themes, and Defra has undertaken the co-ordination of one of these dealing with animal health, another one dealing with plant health, particularly the plant quarantine regimes, one dealing with fish, and another one dealing with flood risk management. Defra is also heavily involved in others, although not co-ordinating them, dealing with organic farming, marine pollution, biodiversity, climate change and a few others. Defra has also been very active in our Foresight activities, both in terms of bringing together and making sure we were fully aware of some of the activities in which the UK has been involved but also putting them into the European

[1] *Note by witness:* The whole package is discussed with the Programme Committee comprising representatives from Member States and then adopted by the Commission.

context. Also, and this is something that is about to start rolling now, Defra has been quite active in preparing for a new initiative called joint programming where on a much larger scale countries are going to come together and start pooling their research efforts. It is still at the embryonic stage so we cannot say much more about it, but during the year this will take shape and I think it will be part of the next big development in getting the different components in Europe working more closely together. I think the Defra agencies, the laboratory agencies, have worked quite extensively in projects as partners. They are involved in 30 at the moment and receive about €10 million as a result of their participation in projects totalling well over €100 million so for a relatively small amount of money going into the individual agencies there is access to quite a large amount of research. I think I will stop there, Chair, but if there are any questions on the detail, of course we can come back to that.

Q4 Chair: Thank you very much indeed. We are going to move on to some short and snappy appraisals of what we have heard. I was watching Steve Visscher from the BBSRC and when Dr Hall mentioned a seven-year funding programme, Steve Visscher's eyes lit up, and I think he is probably going to be coming to see you afterwards, Dr Hall, because the idea of seven years certainty of funding is something I am sure would appeal. BBSRC, what do you think about what we have heard so far?

Mr Visscher: Thank you for the opportunity to comment. First of all, I would like to say that the overall analysis that Bob Watson referred to on page 6, the three key areas and the interaction between those key areas, is a view that the BBSRC shares. The importance of multi-disciplinarity and partnership working which comes out in this document is important and we will continue to work closely with Defra on these areas. What I would like to do is put in context some of the particular big challenges we are facing at the moment and to draw out three areas in the short time that I have got available. This is from a BBSRC perspective of looking particularly at global food security and the challenges of producing more with reduced inputs and fewer environmental impacts. The three areas I would like to talk about a little are the capability in agri-food research, where we need clarity of responsibility and sustainable investment; secondly partnership; and finally coming back to funding, which is the enabler. Starting with capability, it was pleasing to see in the *Evidence Investment Strategy* that Defra will seek to protect the most important strategic capabilities, and I think this is welcome bearing in mind the undisputed needs that have been identified in many reports in recent months and over the past year in terms of research capabilities. The facts show that if one looks back in time, that investment in UK research capability has diminished substantially over the past 20 years while agricultural and food research has gone out of favour. I would submit that without the BBSRC maintaining investment when it was out of favour we would be in a weaker position than we are now. The question is who is responsible for sustaining national capability, and I think this is one of the key questions for the future. Over the years I think Defra as its priorities have changed, seems to have shifted to a position where it sees the responsibility for national capability resting with the Research Councils rather more than a shared partnership. Does the *Evidence Investment Strategy* signal a substantive change in this position? I am not sure. I would like to just refer back to the context of the sort of framework that we are working in. It goes right back to the Rothschild changes in the mid-1970s which introduced the customer/contractor principle. An essential feature of the Rothschild approach was that the departmental "customer" must work in partnership with the research and development "contractors". It was predicted that this arrangement would lead to clarity of responsibilities. I think experience shows that responsibilities are not necessarily clear and that maintaining national capability does need more focus. Perhaps some past decisions have been driven more by short-term changes in priority at the expense of sustaining long-term national capability. As part of recent efforts to tackle sustainability in research, there was a serious attempt to improve the situation. The Government's 2004 report—Research Council Institute and Public Sector Research Establishment Sustainability Study, known as the RIPSS report for short—sought to require strategic agreement between organisations, between the heads of organisations, permanent secretaries and chief executives of Research Councils, to address these issues of sustained capability, but I am afraid such agreements have not been reached. Looking forward, it seems perhaps we need either a single body responsibility or genuine partnerships and firm long-term budgetary commitments. Although we have full economic cost payments in research, paying full economic cost on short-term projects is not enough to sustain long-term infrastructure. These are vital issues that need resolution and if we are to ensure that we are well-placed to face the challenges of the next 20 to 30 years in terms of climate change and food security and so on, we need to make some step changes. In essence, we are talking about a kind of national insurance policy to safeguard national assets. The second area was partnership and, as Bob referred to, I think there has been very good partnership ---

Q5 Chair: Can I be very rude and interrupt you a second. Before you move on to that, you were talking about protecting capabilities and you were saying is this the same as Defra's current strategy. Could you give everybody an example of a capability which you feel needs to be defended and perhaps tell us if you feel that the *Evidence Investment Strategy* actually contributes to that objective?

Mr Visscher: Let me give you one. The area of exotic animal diseases requires high-cost containment facilities and expertise in terms of the staff, the technology, the bio-safety and so on to support that. This is an expensive capability. It is clear—and I think this document and other documents support the case—that climate change is leading to increases in the transfer of disease around the globe, increases in zoonotic diseases and an increasing proportion of these, so one can confidently say that the need for such facilities going forward is going to be there. Whatever the short term priority, whatever the particular disease is at any point in time you need to sustain these facilities. We are still grappling with how best to provide for that long-term sustainability, if you like, to keep the doors open so that you can then go in and carry out the research. That is an example of an area. There will be others but perhaps you have not got time for that.

Q6 Chair: That is very helpful. You were going on to the second part.

Mr Visscher: Bob referred to the partnership that was launched last week, the Global Food Security Partnership, which is joint between BBSRC, Defra, DFID, the Scottish Government, the Technology Strategy Board, other Research Councils and the Food Standards Agency. This is looking to address four key themes that have emerged from several of the reports on this area, including the Food 2030 strategy published in January, the UK cross-government Food Research and Innovation Strategy championed by Professor John Beddington and also the Royal Society report *Reaping the Benefits: Science and the sustainable intensification of global agriculture*. We are trying to address through the partnership some of the challenges in those reports. Picking up on the theme of partnership, I think there is a need for a step change. There is an opportunity coming up in the next couple of years when BBSRC will be committing around £250 million over a five-year programme, mostly at the research institutes starting in 2012. This provides a real opportunity for BBSRC and Defra to work together and to co-fund shared aims and national capability in a new and sustainable manner whilst jointly addressing the global challenges to which we have referred. It is a golden opportunity to put into practice the commitment in the evidence report and the original aims of Rothschild and the RIPSS sustainability principles. It also plays to Bob's comment about procurement, about focusing less on small pieces and more on a strategic approach. The third area I wanted to refer to was funding. Some of you will have seen that the Royal Society report highlighted the need for a substantial increase in investment in food security. The G8 summit in L'Aquila last year committed to a £20 billion investment in food security over three years and more recently the all-party parliamentary inquiry into global food security also highlighted the need for investment. Some of their comment was quite strident. To quote: "The continued neglect of agriculture and food security and the reluctance to significantly invest in UK expertise in these areas continues to fly in the face of all the evidence we have received during the nine months of this inquiry." I think what that is referring to, and part of the background to this, is that in real terms, if one goes back a number of years, the Defra investment alongside BBSRC has fallen from a real terms value of about £120 million in the mid-1980s to less than £20 million today. What that means is that leading organisations such as Rothamsted Research, the world's oldest agricultural research institute, which used to receive of the order of 40% of its funding from Defra, now gets about 10%, whereas the research needs have suddenly changed very much to require their capabilities. Whilst in practice the funding has shifted away from productivity and more towards environmental issues, I think it seems that the pendulum has perhaps swung a little too far and needs some correction. Picking up on the theme that Bob outlined at the beginning of the three areas, these new investments can tackle multiple targets at the same time. It is no longer a choice between improved productivity or protecting the environment but it is a combination of more productivity, improved quality and less environmental impact and we can meet these goals in research programmes. Reaping these benefits will need more stable and long-term funding and an increase, when this is affordable, but meanwhile with a strong focus on sustaining capability and on stronger partnerships to deliver the strategies.

Q7 Chair: That is very helpful indeed. I am sure we will come back to the subject of funding in our wider discussions but let me not tarry and move straight to Miranda Kavanagh. How does the Environment Agency respond to the brave new world that Bob Watson outlined in his remarks?

Ms Kavanagh: Thank you very much, Chairman, and thank you for inviting the Environment Agency. Might I start by just saying a few words about what evidence is at the Environment Agency?

Q8 Chair: You can put me right then.

Ms Kavanagh: It is the sum total really of everything we know about the natural environment and the areas in which we operate, so it is the information we get from our monitoring, it is what we spot through our modelling, it is various national data sets, it is some science that we commission, and it is the analysis and interpretation of information and its application for us to be able to do our job, so it is quite a broad subject. Moving on to the *Evidence Investment Strategy*, we have been quite involved in its production, as you might imagine, and Defra have been very consultative about this. We think they have consulted the right people. They have consulted widely in the network of Defra bodies and I think they have consulted with stakeholders as well. We fully support the emphasis on partnership

working, inter-disciplinary research and also multi-disciplinary research that was emphasised by Bob, and we support the selection of evidence challenges in climate change, ecosystem services and sustainable food supply. Indeed, this is reflected in our own research priorities. Climate change is becoming a central theme for us in our new corporate strategy, which I am sure you have seen, both in terms of mitigation and adaptation. We think it must be right to have a framework in the *Evidence Investment Strategy* document for trying to prioritise what it is you are going to focus on.

Q9 Chair: I am very sorry to interrupt you, but I am conscious that the acoustics in this room are not of the best and you, sitting here talking to me, may not realise a large number of people at the back I fear will be struggling to hear you. If you could shout at this piece of metal that comes out of the table, it may just help. It would help in trying to get your important words across.

Ms Kavanagh: Okay. Let me know if you cannot hear me in the back row by perhaps raising a hand. We have similar challenges in the Environment Agency in terms of having to prioritise our approach. As we all know, we are in the middle of quite a squeeze on public finances which means we have more of an acute need to do this. We are following a similar path, looking at partnerships, external funding, and also a certain amount of organisational change in order to adapt to the circumstances and deliver our remit. We are very supportive. There are a few pieces of feedback I would like to give. The first one would be I think the strategy needs to explain how evidence can be translated into action. I know that Defra are about to embark on their implementation plan, and Bob referred to that. That is a very important part of how all of this is going to be translated into action and how it will make a difference within Defra in terms of the choices that are made by the people who actually commission evidence and lead on different strands of policy. For me, the devil is in the implementation really. The second thing is Bob mentioned understanding behaviour and talked about the role of behaviour change which, again, I think is spot on, but an observation I have got—I am relatively new to the environmental field, I have come from a different background—is that we are not very good at communicating about the environment. There has recently been quite a kerfuffle, for want of a better word, about climate change science, for example, where one side seemed to have it all their own way for a very long time and we did not hear very much from the other side until somewhat belatedly. We all have to communicate clearly and explain this better to enable the public to try and navigate their way through this extremely complicated field. If we want to make our evidence compelling then the way we communicate it is key. In terms of working in collaboration and partnership, I absolutely agree with that and that is something we are doing more and more. We need to do so in a way that is responsive to fast moving policy agendas. We need to answer questions faster. Some of the work we are doing in the Environment Agency on our own evidence programme is concerned with making our people more responsive, streamlining our processes. I recognise what Bob was saying about improving procurement processes for one thing, working across disciplines and presenting what we know with a level of certainty. Yes, let us collaborate and partner but we also need to work at pace. The fourth bit of feedback I would give is I really do think it would be good if Defra, and I spoke to Bob about this earlier this week, brought in the rest of the network. There is a phenomenal amount of data, information, observation, facts, figures, expertise across the whole Defra network, including the Environment Agency, and it would be good for Defra to take the lead in marshalling that, pulling it together and making use of it for the benefit of the environment and people. We play a central role in delivering the environmental priorities of the Government both here in England and through Welsh Assembly Government and we have a number of roles as a regulator, operator and adviser and use our evidence and expertise to do all of those things. In my mind there has never been a more important time for prioritising what we do, getting best value for money, getting more for the environment for every pound we spend and, importantly, putting it across in a way that will convince people that something needs to be done. That was really all I wanted to say at this stage.

Q10 Chair: Thank you very much indeed. We have got two remaining contributions, one from Henry Robinson from the Country Land and Business Association, and David Gibbons from the RSPB. Both of you are, if you like, on the outside, you are not part of government, although you do rely on science for the benefit of your members, in the case of the CLA, and, indeed, for the RSPB in much of its work of commentary and conservation. Are you excited by what Bob Watson has said, or are you slightly jaundiced about it? How does it look from the CLA perspective?

Mr Robinson: Thank you, Chair. It is kind of you to invite us here. The CLA, as the representative body for those who own and actually manage the land, take a long-term and intergenerational view, something that we perhaps feel government could do more of. Clearly land managers have an interest in all three areas identified as the big evidence challenges: sustainable food supply, after all, our members are actually producing the food; climate change, adaptation and mitigation, we are right at the sharp end of this; and protecting ecosystem services, it is our members who own where they are. The CLA has been arguing for a food and environmental security policy for the last three years, a policy that promotes both food production and high quality environment, both—not one or the

other—but with food first. Food production is, and must remain, the absolute priority. If life gets tough we must be able to feed ourselves even if this means ploughing up permanent pastures. A sustainable system requires us to balance the two. The free market may ensure that we have sufficient food but will never unaided ensure that we have the sort of environment that society wants. For food and environmental security to be achieved we are quite clear that research and development must be prioritised. I would pick up Bob Watson's point about the knowledge transfer, which I think we have not been necessarily so good at, and particularly the point about encouraging the study in how we change behaviour because I thought that struck a lot of chords. Meeting the twin challenges of food and environmental security will require the best science and technology, the best research and development, the diffusion of innovation based on private incentive, farsighted and wise government and, of course, cooperation. Although palpably I am a farmer and not a scientist, I do offer an informed view from the perspective of the land manager. Defra needs to ensure that their *Evidence Investment Strategy* meets identified needs of land management and is not research for the sake of research. On the subject of food, increasing efficiency of water and soil is crucial to securing sustainable food production. We need to consider not where the soil is being lost but the rate at which the damage is being done. We are very keen on exploring biotechnology. Transgenics offer scope for yield improvement, disease and drought resistance, and where there are public concerns which need to be reduced. This too should be a priority for Government. On the subject of climate change, climate change increases the challenges of finding food and environmental security. The increased incidence of extreme weather evidence, which is predicted as part of climate change, will increase the volatility of crop production and provide challenges for all the market participants. We believe that agriculture is part of the solution and one of the ways in which we have been leading on that is the introduction of CALM, which is Carbon Accounts for Land Managers, a free and available to all, not just CLA members, method of assessing carbon emissions from land. Once assessed you can start to do something about it. Until they are assessed it is a great deal more difficult. Thank you.

Q11 Chair: Thank you very much indeed. Finally, Dr David Gibbons, RSPB.

Dr Gibbons: Thank you very much, Chair, for the chance to respond. I am not sure I would claim to be excited by everything I have heard Bob say, but I am heartened to find myself very much in broad agreement with what he has said. I do not doubt the need for a better understanding of how to adapt to climate change and to produce our food sustainably whilst also protecting the ecosystem services that benefit us all. I also agree with the assertion in the report that Defra is well regarded by stakeholders in the way it uses scientific evidence. This is certainly true in one area that I know well, the development of wildlife friendly farming schemes, specifically environmental stewardship. I congratulate Defra for that. I would, if I may, like to make a couple of pleas and ask one question. The first plea relates to ecosystem services. It is undeniably the case that we should attempt to put an economic value on the services that natural ecosystems provide us with, be that flood regulation, pollination, carbon storage or a host of other services that we currently take for granted. I am pleased that a national ecosystem assessment is underway and hope that it becomes a powerful advocacy tool to protect ecosystems and the biodiversity that underpins them. "Look", we will be able to say, "even if you see no reason to protect the natural world for its own sake, surely you can now see the benefits it brings you and that it must be protected". However, there are two possible unfortunate consequences of this line of thinking. The first is that it is only worth conserving biodiversity that is of utilitarian value to us, and surely this offers scant hope for much of the wild nature that enriches our world. The second is the belief that protection of ecosystem services will automatically deliver all biodiversity conservation. I think this is sloppy thinking and while protection of ecosystem services will contribute to the conservation of biodiversity, much, much more will remain to be done. In particular, we still need to develop practical solutions that can be implemented to conserve biodiversity. For example, how can farmers manage fields of winter wheat to boost numbers of the declining skylark? The solution, in fact, is to leave small uncropped patches in the field. Defra funded the science that developed this solution and it would not have been arrived had we focused solely on researching the services that the agricultural ecosystem delivers. My first plea to Defra is simple: please do not give up on funding applied research that solves biodiversity conservation problems in favour of funding the increasingly dominant ecosystem services agenda. We need both. My second plea might be seen as a subset of the first. In a foreword to the recent Royal Society report, *Reaping the Benefits*, which has already been mentioned, Lord Rees made it clear that we are already unduly dependent on farming techniques that have harmful environmental impacts and he further felt that to meet the needs of a growing population with changing consumption patterns productivity must be enhanced but it must be done sustainably, and we have heard much the same from the *Evidence Investment Strategy*. Given this, it is important that the science funded by Defra and the Research Councils ensures that the forthcoming second green revolution in agriculture does not have the same catastrophic effects on biodiversity as did the first. In fact, we should be more ambitious and ensure it reverses some of the effects of the first. In the current financial climate

there could be a temptation to constrain the definition of environmental sustainability and invest only in the science that underpins some elements of it, such as reducing emissions of greenhouse gases. While this is unquestionably important surely it cannot be beyond the wit of UK science plc to develop agricultural systems that are profitable and productive which mitigate the effects of a warming climate and yet still favour a rich biodiversity. My second plea to Defra is let us keep biodiversity conservation at the forefront of our minds when developing the science for sustainable agriculture. Finally, a simple question and perhaps a slightly contentious one. Given the increased pressures on the public purse, should Defra encourage the Research Councils to invest more heavily in applied research? Thank you very much.

Chair: Thank you for the clarity with which you have put forward your pleas. Ladies and gentlemen, you have heard from our three presenters who have outlined the policy from the UK and the European Union perspectives. We have had four informed, helpful and pithy observations on what our first three presenters said. In a moment I am going to invite all of you to have your opportunity to participate. When I do that, I said at the beginning that everything we were doing today was on the record, and to enable that record to be proper, true and accurate, when you get a roving microphone to make your point or put your question it would be much appreciated if you would identify yourself and if you are here from an organisation if you would be kind enough to identify which one it is. Everything that we do is protected by parliamentary privilege, but please do not insult the speakers unless you really feel so motivated! Before inviting you to comment, my colleague, Lynne Jones, has paid a particular interest in the subject of Defra's science position on behalf of the Committee and I know that she would like to pose one or two points of her own as her contribution to the discussion which we are then going to have.

Lynne Jones: Thank you, Chair. Yes, I welcome this report. I have to say I am a bit disappointed that we are not going to get the implementation until October because it was promised in the spring, so why the delay in that? Obviously as Chief Scientific Adviser you have been working very hard in the Department and you have taken a really hard look at its performance, but it really is time that we should see some progress and direction of travel. One other area that I was a little disappointed that was not covered in the document was that we have seen in the past quite substantial cuts in the Defra science budget and really there is just a reference to the fact that the budget has been stable for the last couple of years, but should you not perhaps have taken a bit of a backwards look to see whether there have been capabilities lost through the short-term decisions which were mentioned by Steve Visscher? Are there any capabilities there that perhaps ought to be reconsidered and are there any implications for the future of that? The document is very much focused on collaboration and getting the best value by making sure that there are strong partnerships, which is obviously very important, and also your emphasis on dissemination of information and social science. I notice that you are proposing the creation of a social science group within the Department, so where is the money coming for that and what else is going to give to create that? Finally, I was interested in your advocating of greater risk in the future, and actually earmarking a proportion of the budget for more risk-taking. Is that wise when you will possibly be in a financially constrained situation? I accept the point that is made in the document about how it is important to move from incremental change to much more profound change and therefore risk-taking might have a role to play, but given the financial constraints and cuts in the budget already, is that necessarily a wise move? Could you say something about risk-taking?

Q12 Chair: I am going to ask you to hold your obvious desire to reply to those points just for a moment or two because the audience has been extremely patient and listened with great care to what has been said and I think it would be a good idea to let some of those who have come have their say. I am going to ask you to put your point or your question as succinctly as possible. If it is directed to an individual, please identify the person that you would like to respond to it, or in due course I will ask our panel, if I can put it that way, to pass their observations on what you have had to say. It may be that you do not need a reply, in which case I will exercise my right as Chairman to see whether we need to respond to it. The lady there and your name is?

Ms D'Silva: My name is Joyce D'Silva from Compassion in World Farming.

Q13 Chair: We have heard of the organisation and we have certainly heard of you so thank you very much for coming. Your point is?

Ms D'Silva: I would like to address this to Bob Watson and the question is: in view of the high level of greenhouse gas emissions from livestock production and the drain on the earth's resources of intensive farming of livestock should not the Government invest more in alternative agricultural production strategies and policies which address consumption of livestock products, in other words reducing consumption?

Q14 Chair: Thank you very much for putting that because I would like to raise an issue with you, Bob, about that because here we have a question from a well-informed source about a specific issue, and there will be a lot of people who will have their own particular area where they want to see some scientific work done in the future, but what I am interested to know is how do those kind of questions fit in with an approach which is highly geared to supplying

policymakers with evidence to deal with the policy challenges and decisions which they want to make, which may not necessarily be the area of thought that questioners like Joyce D'Silva have in terms of putting their point forward? How do you resolve what might be a bit of a paradox?

Professor Watson: That is a difficult issue. If you look at Food 2030 we talk about how we can have a sustainable agriculture. It argues for trying to be much more productive; it also argues for being more environmentally and socially sustainable; and it argues for looking fundamentally at diet as well, so the issue that has been brought up by Joyce is one that a lot of us have been thinking about before, and that is how can you have an economically viable and environmentally and socially sustainable agricultural sector and at the same time look at the whole issue of human health. As we know from the Foresight study on obesity, the UK is totally going in the wrong direction with respect to healthy diets and obesity. The role of Defra working with all the other Research Councils of course, including the Medical Research Council, and working with the other government departments including the Department of Health, is to understand the implications of diet on the environment and make sure we have an informed public, so when they do do something, whether it is drive a car, or eat meat or drink milk, they actually understand what the implications are for their health and understand what the environmental implications are. My view is that we need to understand this system and allow the consumer to be an informed consumer.

Q15 Chair: That is fine, but I am just concerned to go a little bit further. Joyce, do you think that answers your question? Do you feel the framework that has just been outlined will mean there will be a piece of science undertaken that will give you the answer you are seeking?

Ms D'Silva: I do not think there are easy answers to this obviously because we also need to take into account things like animal welfare. As you may know, there has been a recent report to the Welsh Assembly advocating that all the dairy cows in Wales go indoors for all their lives and are zero grazed, and half the beef cattle as well. That may be a partial solution to greenhouse gas emissions but it is a terrible solution in terms of animal welfare. That report does also mention that there could be changes in consumption. I think we have to find solutions, and I am sure there is research to be done here, where the environment and animal welfare is protected and the end result is that humans are eating a better diet as well.

Q16 Chair: I am going to take one more person from the audience and then I am going to bring in my colleague from the Committee, David Lepper.

Mr Gadian: My name is Alan Gadian. I work for the National Centre for Atmospheric Science and I am a senior research scientist. Obviously my speciality is in the atmosphere. My viewpoint is that I agree with David King that climate change is the biggest catastrophe that mankind has to face and I believe we will have to face it within 10 years, there is no question of that in my mind. My question is to Bob Watson, and I suspect he is expecting this. With its *Evidence Investment Strategy* we have a very limited amount of time, why is Defra not encouraging strongly the Research Councils to actually spend some of their money on understanding the climate we have? Before we can actually make a decision on what we do we need serious scientific evidence, discussion on geo-engineering, discussion on the science of climate change and there is just no investment for the Research Councils into this. It is a very long-term strategy. To me, it sounds like we are just rearranging the deckchairs, that is all we are doing at the moment, not addressing the serious problem that we need to do now.

Q17 Chair: Somebody is suggesting you might have a *Titanic* policy on your hands here, Bob. Do you recognise that as a valid criticism?

Professor Watson: As most people know this is one area that I have worked in for many years. I once chaired the Intergovernmental Panel on Climate Change before it got in trouble. This is an area where we truly need a global look at the issue. This is not just an issue for UK science, it is not even an issue just for European science, it is truly a global issue. In many respects it is relatively well co-ordinated through programmes such as the World Climate Research Programme and also other elements under the International Geosphere-Biosphere Programme (IGBP). Do we understand the earth's climate? I believe we have a fairly good understanding, but more knowledge is needed. There are 20 atmospheric ocean models around the world and probably about 12 really good ones, of which the UK has one of the best at the Hadley Centre. I would argue that climate change science on whether we affect the climate and whether we understand natural processes is pretty well-funded and co-ordinated around the world. Where I would say we have some big gaps is in exactly what the impacts of projected climate change are on agriculture, on water resources, on human health, on flooding, on coastal erosion, on biodiversity, so the area I would put much more effort in collaboration with the Research Councils and government departments, and I would tend to do it at a European level as well as a national level, is in a much better understanding of impact and adaptation. Also I would argue the world has to put far more effort into understanding how to do evolution and even revolution of energy technologies, and that is how do we go to a low carbon economy in both the production of energy, the use of energy, in waste, and therefore resource efficiency, which is my phrase for that. Also how do we reduce the emissions from the agricultural sector and deforestation. I recognise the importance of the modelling and the observations of the climate

system. My personal view is that the bigger weakness is in impacts and adaptation, and I am concerned that globally we are not putting enough effort into the technologies of a low carbon economy. With respect to geo-engineering I would argue we should look at it from a theoretical standpoint and whether you can change the radiation balance or change the uptake and release of carbon dioxide between the atmosphere and both the terrestrial land and the ocean and look at geo-engineering and understand its potential advantages and disadvantages. What I am worried about is if we have very large scale geo-engineering, with very limited budgets, money that should be spent on the technologies of a low carbon economy could be siphoned off into geo-engineering and we might find ourselves in a worse place than we are today, so geo-engineering needs evaluating. I would not go to large-scale programmes at this moment in time. I would largely follow what came out of the Royal Society report that John Shepherd chaired a few months ago.

Q18 Chair: Dr Hall, you will have heard Bob Watson's comments about the need to tackle this both at a European and global level. Does the kind of approach that he has outlined and the question that Mr Gadian raised have resonance in the Commission and do you feel that the approach that Bob Watson has outlined is the kind of approach Member States should adopt if they are going to meaningfully contribute to the type of research in this area that you are doing on a pan-European basis?
Dr Hall: I would largely agree with what Bob Watson just said. From our point of view, there is still a role for some local and national research, even regional research, because there are impacts at the regional and local level, but a lot of these changes and the impacts are at more than a country level so then you move into the continental scale where obviously Europe has a role, and of course, even beyond that to a global level. I am not an expert in this area but I agree from what I have read, and what I understand from colleagues, that there is an enormous amount of co-ordination across the globe in various bodies, so I am more of the view that, yes, it is the impacts we should be looking at more than the other aspects. Of course what can be done anywhere is very much dependent on the money that is allocated. As far as I am aware we have not yet been looking at geo-engineering apart from carbon capture, if you count that as geo-engineering. That is really all we have looked at. I think there might have been some speculative work on potential impacts and risks but as yet the current Framework Programme activities do not go much beyond the possibilities that carbon capture might have to offer.

Q19 David Lepper: In relation to Ms D'Silva's question, does Mr Robinson feel there is any scope for interaction between Compassion in World Farming and the CLA in view of the scheme he told us about, the CALM scheme? I was thinking in particular about Ms D'Silva's comment about livestock and carbon emissions.
Mr Robinson: Clearly there is a link. The difficulty of course is what you do having assessed your carbon emissions. If you then discover that 60% of your carbon emissions are coming from your dairy enterprise, it just may not be the sensible thing to close down the dairy enterprise and therefore let the same milk be produced by somebody else emitting the same emissions, either in this country or elsewhere. The danger of course is that you just export the problem. What CALM allows you to do is to address your particular problem and then see what you can do on your farm to reduce the greenhouse gas emissions. Actually a lot of it means do not plough up peat at any price.

Q20 Chair: The lady at the back please?
Ms Wheatley: I am Joanna Wheatley. I am just a livestock farmer.

Q21 Chair: Whereabouts do you farm and what do you do?
Ms Wheatley: I am a beef farmer and I farm near Maidenhead. For my sins when I left school I worked for a pesticide company developing an organophosphate pesticide.

Q22 Chair: Are you a very big beef farmer or a small beef farmer or somewhere in between?
Ms Wheatley: I am a small beef farmer.

Q23 Chair: A small beef farmer from Maidenhead. Fire away.
Ms Wheatley: I am really distressed by the science that is spouted, first about everything is an infection and I am thinking particularly about organophosphates because the first signs of poisoning are "flu-like symptoms" so when you get bird flu in chickens one should ask how often have they been treated with organophosphates. That is just one thing. Furthermore, if you take everything as an infection and it is a toxicological exhibition of ill-health, then you are never going to cure it because you are going to throw more chemicals at it and all you are going to do is make the system sicker. When it came to BSE, again perceived as an indestructible infection, I was just aghast that whilst the Meat Hygiene Service was banning beef on the bone from the abattoirs, it was allowing blood, pituitaries, brain material and spinal material out for pharmaceutical use and research work, which leads me on to the next thing about these research establishments: are they bio-secure? We are involved in so much bio-security it becomes ridiculous. As Joyce said, having to barn our cows up all the year round, that is welfare unfriendly and causes enhancement of disease. TB would be something that would proliferate in such conditions but then

you have got the TB reactor vaccine for which the vets come on the farm and they use the same needle across every animal.

Q24 Chair: I am going to ask Bob not so much to debate each one of those very important points that have been raised, but I think it would be quite interesting, Bob, to hear how in the world that you are identifying you would actually respond to an agenda like that? It has a number of challenging issues. There is a lot of science that is bubbling away in the background. There is an evidence assertion about for example the use of the same needle across a herd. In other words, it is what I call a concerned question with a scientific background to it. How is the new strategy going to respond to that kind of agenda?

Professor Watson: People like Steve Visscher can talk about bio-safety in research establishments, which is Pirbright, et cetera, which is clearly very important. The approach that Defra is taking now is working with the industry on the whole issue of responsibility and cost sharing and that is how do we work together with the farmer and the farming community to understand any one of these issues. So whether it is an economic disease like bovine tuberculosis or whether it is a more zoonotic disease, then the question is what is the role and responsibility of the government versus the role and responsibility of the farmer. There have been on-going discussions literally now for the last two years on the whole concept of responsibility and cost sharing. Along with the sector we do talk about what are the challenges, what are the concerns, to what degree do we have a joint vision of the research programme, and how do we make sure that the knowledge base gets to the farmer. This is the basis of what Hilary Benn has put in place with responsibility and cost sharing and so it is a question of joint responsibility, joint decision-making on animal movements, on research, but also it comes along with the whole concept of cost sharing between the government, which is of course the public's money through taxes, and the farming sector itself.

Q25 Chair: Is this approach going to be flexible enough that if issues like that arise, particularly if they are new issues, that you are going to be able to absorb them within the framework that you are identifying? I have a bit of concern. I wondered how rigid your approach was going to be geared towards policy requirements. You might be saying these are the things we are looking at so the rest of the issues like the ones that have been raised will have to take their place in the queue.

Professor Watson: What one has to do at the beginning of any year is come up with a strategy of how we will spend the money we have both between programmes—climate change versus animal health versus crop research—and then of course within each of those programmes. If an emergency or new issue comes up, there are two things. Firstly, one would hope that the research manager would be flexible. Let us say a real issue comes up that is outside the budget of the animal health part, we have something called a local approvals panel and a central approvals panel, so if a new issue comes up which really needs instant study that is not in the current budget for that research manager, they can first go to the local approvals panel, so that would be those in charge of the food and farming. If it cannot be absorbed within that budget, it would then go to the central approvals panel and they would say, "This is an emergency, this is a high priority, we cannot absorb it in our budget, we would argue it is a high priority," then it is literally at the director general level. If they agree with the case that is being made that more money is needed then more money will be given to that issue, but we have to realise that we are in a constant budget and it has to be taken from something else. There is a flexible approach in Defra, as I say, called the local and central approvals panel for things that come up. Of course, what we also have, if it is an animal emergency, a disease outbreak or floods, is a certain amount of money put aside each year so we can deal with emergencies.

Q26 Chair: A gentleman I identified there with the glasses and then a gentlemen here in the pink shirt and tie will be next. Sir?

Professor Battarbee: My name is Rick Battarbee. I am Professor of Environmental Change at University College London. I would like to ask a question about freshwater ecosystems in the UK. We know that our streams and lakes are threatened by many pollution pressures and especially in the future by climate change. Could I ask Defra, particularly Bob Watson, whether Defra recognises that our science capacity in the UK to tackle freshwater ecological issues has diminished and is diminishing at a time when demand is increasing, particularly in the context of the Water Framework Directive, the Habitats Directive and the interactions between these Directives and future climate change? In that context, does he support and does Defra support our attempts as a freshwater ecological research community to bring together stakeholders from the environment agencies and other organisations under a collaborative research partnership so that we can pool our resources and make sure the science we do is fit for the application that is needed by these stakeholders? If I could ask a supplementary more specifically, does Defra recognise the importance of long-term unbroken research—quality monitoring time series programmes that we need to understand long-term processes—that are needed to develop models and that are really needed to underpin policy and does Defra understand the difference between those kinds of research networks, long and unbroken time series, and the kind of monitoring that is done with respect to surveillance and compliance in relation to Directives?

Q27 Chair: Just before Bob responds to that I am going to ask Miranda Kavanagh to come in because obviously the Environment Agency has a great deal of involvement in a whole range of freshwater issues. You just heard an important question being asked in terms of science in this area. Are they issues that you recognise from the Environment Agency standpoint?

Ms Kavanagh: Yes, they are issues we recognise. I think we would be very interested to work with UCL and any others in partnership on these issues. They are areas where there is a diminishing capability.

Q28 Chair: When you say a diminishing capability, is that because there are not people going in? In fact, Mr Battarbee, you might like to elucidate on that. Is it because it is not an attractive area for people to go and work in or is it because the resources are not sufficient to create the opportunities? Why is it an area of diminishing resource?

Professor Battarbee: I think a lot of it is perhaps bad luck and historical accident that the community, a bit like biological populations, has become very fragmented, so we have pockets of excellence scattered throughout the country, people have retired and not been replaced, universities have perhaps not retained or recruited ecologists and have moved their positions into molecular biology or other life science subjects. There is good documentation on this and a paper was published about it a year or so ago which shows the evidence for that decline. The other concern is the link between the user community and the research community, that there is a kind of fault line, if you like, between what the research community and universities and research institutes want to be researching and the kind of knowledge and science that for example the Environment Agency and Countryside Council for Wales need. One of our proposals is to try to bring all these groups together. We have had a number of meetings where we can pool our resources and make sure the science that the scientists are doing is fit for the purpose of the other communities.

Q29 Chair: Thank you. Let me just ask Professor Hetherington, you have heard from a colleague scientist about an area of concern, but how in the world that has been identified in the new strategy, if somebody comes to you and says, "Look, you're the guys who are challenging Defra on the way that they are conducting their scientific policy", if you hear of a problem like that how do you deal with it? How do you respond? Do you say, "Yes, okay, it's an important point", but how do you take it forward under the new arrangements?

Professor Hetherington: There are two strands to the question. First of all, in the area of freshwater biological research, I think I am correct in saying in the UK this is still a major area of research for the Natural Environment Research Council. A lot of this work, and it is exceedingly good work, is carried out in research establishments referred to such as the Centre for Ecology and Hydrology. To return to the point, you were asking me about areas of research and what one would do as a member of SAC is I think what would happen is we would have a discussion within SAC about the priority area and if we felt this was something which was perhaps missing from the Defra portfolio, we would challenge Bob on the area and specifically be interested in finding out what they are doing and, very much in the vein of the way Defra science is developing, would be asking for information about the interfaces, so how Defra does it but also how it interacts with the other agencies which would be interested in that particular area.

Professor Watson: First, there is no question that freshwater ecosystems are critically important and, as stated, clearly under threat from both pollution and climate change. I am now co-chairing, along with Steve Albon from the Macaulay Institute, the National Ecosystem Assessment, which you heard about earlier from the other witnesses here. What we are doing is looking at all habitats in the UK, and that includes freshwater ecosystems, we are asking ourselves the question how have they changed over the last 50 years and are going to ask how could they plausibly change in the next 50 years. We are going to ask what the implications of those changes in the past 50 years have been on biodiversity, so species, as well as ecosystem services. We are going to ask what we know about those freshwater systems and all other systems and, therefore, where are the knowledge gaps. Through the National Ecosystem Assessment we will be looking at biodiversity, we will be looking at ecosystems, and freshwater systems is just one of them. Hopefully what will come out of that is what are the big knowledge gaps, what needs to be understood, and we will have to place it in a priority relative to the knowledge gaps in all of the other biomes and ecosystems that we are looking at. I strongly support collaborative research so, indeed, if a research group is getting together to do collaborative research with other stakeholders, I absolutely applaud that. As Alistair said, the Centre of Ecology and Hydrology, a Natural Environment Research Council (NERC) institution, is heavily involved in this. If one asks what would Defra do if there was a recognised weakness in a scientific discipline, we would have to work with Research Councils, with the Higher Education Funding Council for England (HEFCE), to say, "Is this one of the higher priority areas we have to fix?" For example, when Defra's Science Advisory Council (SAC) came to us and said, "You don't have enough social science in Defra", which I thoroughly agree with, we had three social researchers when I joined, maybe four, but we are now up to nine and have just hired a more senior deputy director who is going to head our social research and we are looking to hire a few more, which gets to the question that Lynne Jones asked. It will probably mean that we will have to do it at the expense of other expert areas, it is

going to be a relative priority in the hiring. When SAC came to us and said, "You don't have expertise in risk", we worked with NERC, the Engineering and Physical Sciences Research Council (EPSRC) and the Economic and Social Research Council (ESRC) and we now have a risk centre at Cranfield. When we were told we did not have quite enough on behaviour, we worked with ESRC and there is a joint programme between Surrey and Manchester Universities looking at behaviour. Obviously we take the advice of SAC into account and look to see where it fits in the priorities. Is it something Defra should take the lead on, is it something one of the Research Councils should take a lead on, or do we work on it jointly. Long-term monitoring is obviously important. I think we face a real challenge. This comes back a little bit to Steve's point about long-term commitment to capability and institutions. I am not saying we are doing it well, but I used to work in NASA, the Space Agency in the US, and the issue of long-term monitoring is a well-understood issue, that you have to monitor and you have to do process studies and you have to do theoretical modelling. You need all of them to be brought together at the same time. My answer on climate change is yes we need observations of changes in composition, changes in the earth's climate, yes we need to do process studies in that case, let us say, of clouds, but you have also got to put the monitoring with the process studies and with the modelling and you have to put the whole thing together. It is getting a balance in what we are doing, whether it is in climate change or ecosystems or food security. There are limited amounts of money, which is why we have to listen to people, work with the science community, work with the stakeholders and then set priorities. There is not enough money to do everything that we would like to do.

Q30 Lynne Jones: Just on the point about long-term monitoring programmes. That was one of the criticisms in the past, that Defra was not funding the maintenance of long-term datasets. This is not really a very sexy part of research, there are not lots of people trying to get A-rated research programmes in this area, but A-rated research programmes are dependent upon the maintenance of these more fundamental and perhaps more routine operations. Is this something that is of concern? Obviously Professor Battarbee has raised the issue of long-term ecosystem monitoring programmes. Are you just saying, "It is not of sufficient priority or those other areas are not of sufficient priority, we are not going to do it"?

Professor Watson: We have a group that all the Research Councils and most government departments belong to called ERFF—Environment Research Funders' Forum—where they try to look at what is going on in research, what are the priorities and what are the gaps. There is a particular sub-committee now set up under ERFF looking at Earth observations. It is looking at ground-based systems, ocean systems, land and ocean, and satellite systems. It is asking itself the question what are the big scientific and policy challenges in the whole of Earth systems and what are the datasets that we need long as well as short-term. Then we are going to come up with a protocol of how do we get these things funded, what are the highest priorities, how do we work with NERC, for example, on these datasets, whether they are oceanographic datasets, land datasets or satellite datasets. There is a big issue here of long-term datasets, there is no question. For example, on satellite datasets, which are very important and, of course, Europe takes the lead with the European Space Agency, NERC's view is that if it is the first or second instrument of its kind it is research, and NERC put a lot of money into satellite observations within a European context, but once you get to the third or fourth satellite system is that viewed as monitoring and no longer research and, therefore, it is not a high priority for NERC. We have got to get our head round these issues, whether it is ground-based or satellite observation systems. I do not have the answers. Through ERFF we are at least looking at these issues and hopefully working together across the Research Councils and the government departments we will at least understand where we are in good shape, where are the problems, how do we work with Europe in many cases and how do we work with the US on space observations, and other groups such as in Japan and even Brazil and India now. This is an issue of long-term monitoring. It has to be a combination of ground-based monitoring and satellite systems, not one or the other, because you ground truth satellites, as I know all too well from my time in NASA. This is an issue of the long-term datasets which we hope, through ERFF, will at least come up with some good analysis.

Q31 Chair: I am going to take the gentleman who has been very patient in the first row.

Professor Winkler: I am Jack Winkler, Professor of Nutrition Policy at London Metropolitan University. I would like to invite Bob Watson to link up two of the things to which he drew attention in his talk. One, our first food policy for 50 years, Food 2030, which was published in January, and, second, the emphasis he put many times on embedding evidence into policy and, in his phrase, establishing a clean line of sight between them. If you look at Food 2030 it is an extensive package of documents. The policy itself was only 80 pages long but it had a number of annexes and came together with several papers on indicators and a research strategy. The total package was over 800 pages, of which the policy itself accounted for about 10%. I would not claim to have read all those 700 other pages on research, but I looked at some of them and there seemed to me a disjuncture between all the research, some of which Defra produced itself, some of which it commissioned from expert outsiders, and the policy. That massive amount of research did not

seem to me to be adequately reflected in the policy. The optimistic way of looking at that is to say that Bob Watson's emphasis on the need to embed evidence in policy is absolutely right, but it does not look to me like it happened in 2010. I would ask him, and let us put it gently, is this a fair judgment? To put it the way Miranda Kavanagh did earlier, I too would like some more explanation of how you moved from evidence to policy in your new research strategy.

Q32 Chair: That is a question which we will have a response to in a moment but I want to move to the other gentleman I identified. The microphone is now with him.

Dr Atkinson: I am Chris Atkinson, Head of Science at East Malling Research, the UK's national fruit centre for research. I would like to come back to the question of capability and capacity. Lynne Jones brought the problem up initially and I want to focus particularly on delivering benefits through applied science and the fact that the implementation of this report is not going to happen until late into the autumn. We are currently in a situation where there is a lot of discussion about the further demise of horticultural research at Warwick University and those discussions are going on now. I am encouraged by the report with respect to the emphasis given on the partnerships, East Malling Research is very engaged in that and we do have financial backers that will part fund some of the research that we do as a charity, but clearly I need to go back to them with positive messages about the support that we would also get from Government. I believe this document suggests that that will happen, that Defra is keen on funding applied research to deliver better food systems, but we need rapid responses otherwise further institutes will close and decline.

Chair: And just to add topicality to this, Bob, I am going to give you a copy of a letter which Warwick HRI sent me. This is a good opportunity. You do not have to reply to it now but in due course.

Mr Drew: It is a long one.

Q33 Chair: It is interesting because they are obviously aware of what we are doing today and there was point that you have raised about the nature of applied science and Bill's other point that Lynn has raised and also one that the Committee raised in its own report on food security issues. We had seen what happens for example in Brazil with their Embrapa organisation which combines a lot of fundamental research with a great deal in terms of extension services. The points both of you make are very valid. Bob, two very strong food-related questions.

Professor Watson: I cannot answer the first one without asking the person who asked it where do they see the disjuncture between evidence and policy in the 2030 document? Can you be specific on where you see the policy is inconsistent with the evidence?

Q34 Chair: This is not on page 799 which you did not read?

Mr Winkler: I put it gently; let me be a bit more robust now. Reading the document there is a lot of space devoted to current government programmes that are alleged to be dealing with some of the issues of food security for 2030. There is much less on the indicators, virtually nothing on speculation, which was the subject of a major paper. They postponed all consideration of long-term food security until John Beddington's Foresight project comes through. There was a gross disjuncture in time between the five-year span of the indicators, the 20-year span of the food policy, the 40-year span of Beddington's group. Reading that together, particularly the emphasis on all those boxes on what a wonderful job the Government is doing, that document read to me more like a party political broadcast before a General Election rather than a food strategy for Britain for the next 20 years. That is a hard judgment but it seems to me it is one that is sympathetic to you, Bob Watson, as the one who is in charge of research in Defra. It seems to me that you did an awful lot of work, there is an awful lot of research backing there, 700 pages of it, and yet somehow the document itself, the policy itself, did not reflect that research. It seemed to me more designed to justify the current Government's policies than actually ensuring the food security of Britain in future.

Q35 Chair: Bob, have you got the disjuncture point?

Professor Watson: Partly. What we have to realise is it was a strategy document which now itself needs an implementation plan and we have to place that document in the context of several things. First we have to place it in the context of the world. You cannot look at the UK, in my opinion, in isolation from Europe or the world. Today the UK has about 65% of its food that we eat domestically grown, about 25% comes from Europe and 10% from the rest of the world. Food security is not just a production issue; it is an issue of production and trade, and it is an issue of access and affordability. You cannot look at the UK in isolation from the world, so we have to look at it in the context of the World Development Report, we have to look at it in the context of the report that I chaired called the *International Assessment of Agricultural Knowledge, Science and Technology for Development*, we have to look at it in the context of the Royal Society report *Reaping the Benefits*, and indeed John Beddington's report that will come out under Charles Godfray, which is unbelievably important, and that is how do we feed ourselves, the world, between now and 2050 when the population of the world will go up from 6.5 billion to 9-9.5 billion. It will be a wealthier world; it will be a world with climate change, a loss of biodiversity, a real challenge on water security, probably a change in the rural to urban migration, etcetera, so the 2030 document is an aspirational document that sets a strategy. We need to increase production, we need to make sure it is

environmentally and socially sustainable and we need to reduce greenhouse gas emissions from agriculture. That is really what the document is laying out, but it is basically a document that you have to place in the context of an evolving understanding, which is why the BBSRC-led document on what research is needed is absolutely critical. I do not see there is a problem with the 2030 strategy. It is an aspiration as to how we move forward, but I think it will be an continual document that we have to put forward based on evidence the whole way through. To me the question is whether we can significantly increase production and productivity per hectare and reduce greenhouse gas emissions and reduce nitrogen pollution all at the same time. That is what some of the challenges are and some of the research questions that are being asked in what I call this BBSRC-led initiative between government departments and Research Councils. I do not think there is any inconsistency between the evidence and the strategy itself but it does ask some very serious questions about how we actually implement this on the ground. The interesting point that has been made by many of us, including the agriculture assessment that I directed/co-chaired, was that we argued for intensification because every time you extensify you either convert grassland or you convert forest (especially in developing countries) which comes at a major penalty to greenhouse gas emissions and it leads to a loss of biodiversity and quite often land and water pollution. There is an interesting issue. If we are successful in intensification then it means the farmer will be more profitable and therefore there will be an incentive to extensify as well, so at first sight the solution to the world's hunger problem is intensification but on a country-by-country basis it will try and promote extensification because the farmer can make more money per hectare of land. There are going to be some interesting social issues, economic issues and trade issues as we look at this. My point would be no longer can we think of agriculture (and we do not in Europe) as production alone; we have to put it into a multi-functional system where we look at the economic issues, the trade issues, the marketing issues, the environmental issues, which we have talked about (climate change, biodiversity, land and water pollution, soils) and effectively the issue of production. The farmer needs to be paid—and that is what is starting to happen through Pillar 2 of CAP in Europe—both to produce a product that we eat or for bio-energy or for whatever else and at the same time have payments for ecosystems services. All of that is wrapped up in Food 2030 and it is consistent with the European policy going from Pillar 1 to Pillar 2, and there is lot of politics around it, but also the need for more understanding and more research which has come out of these efforts of the BBSRC and what is coming out of John Beddington's group. On the East Malling issue, as everyone knows, Defra withdraw its funding in essence for East Malling, except that it has been giving it money for about a 10-year period as it transitions, but I think the issue of horticulture and the way Warwick University deal with East Malling is an issue of priorities. That is one thing we have to say—there is not the money to do everything, even in the food area. Even with a very, very high priority on food and on food security, priorities will have to be applied. I think there is an issue of applied or translational research and under John Beddington's group he put together two sub-committees, one was looking effectively at skills mix and to what degree were we missing skills in the UK, and it was Celia from BBSRC that led that particular piece of work. I think there were some surprises. There are some skills gaps but not necessarily where we always saw them, so we are all looking very much at the report that Celia put together on the issue of skills. Then Chris Gaskell, who chairs the Defra SAC, has been put into another sub-committee, on which Celia is also working very closely, and that is what are the gaps in translational research. What we have to stand back from is looking at the whole research agenda from very pure research, say on genomics that BBSRC take the lead in, all the way to the policy relevant stuff we do in the public good of how could climate change affect agriculture, how do we have wise use of limited water, all the way through to the translational research and the role now that the Technology Strategies Board (TSB) is playing along with Defra and BBSRC which is right at the cutting edge of what information farmers and other stakeholders need in the field to make the farming sector economically viable. We are all trying to work together but, we have to be candid, there is a limited amount of money and priorities have to be set.

Q36 Chair: Steve Visscher, you indicated you wanted to make a brief comment but, Lynne and I were just wondering, who is Celia?
Mr Visscher: This is Dr Celia Caulcott.
Professor Watson: I could not remember her surname!

Q37 Chair: I feel much better already knowing that.
Mr Visscher: She is BBSRC's Director of Innovation and Skills. The brief comment I wanted to make was picking up on the Food 2030 document and whether it is being translated into practice. To some extent, the partnership that was launched last week, the UK Global Food Security Partnership, has four themes, one of which is economic resilience. This is tackling issues such as trade, risk, speculation and those sorts of issues which are important components. Another is tackling resource efficiency and the efficiency and uptake of nitrogen and so on, the emissions from agriculture, sustainable production; can we produce more with less, can we fix nitrogen, can we breed improved plants, can we have better systems of agriculture, and, importantly, the quality of the food and nutrition; within the food for the UK this includes addressing obesity. Indeed,

last week, DFID launched a nutrition strategy. All of these things are interacting together. Another important component is there has sometimes been a perception that the Research Councils are interested in basic science and let someone else worry about the translation. I would like to nail that one. We are very firmly interested in translation and are working with industry. The report which Bob referred to from Celia Caulcott's group has led to a £15 million commitment from BBSRC in an advanced training partnership looking at key skills. Last week there was a launch of the Crop Improvement Research Club, and this involves BBSRC working with 13 companies, asking what are the problems, "If you put a little money in, we will work with you on tackling these problems". There is more of this activity in the pipeline. We do want to get this balance and work with many organisations in the UK and, importantly, internationally as well. Let us just take an area such as wheat breeding where there is quite a lot of activity going on. By working internationally, sharing material and drawing in traits from crops around the world the UK can benefit and we can then share those benefits with other parts of the world by working collaboratively. I think there is a real movement between scientists and a desire to share to tackle these sorts of issues collaboratively. It is also a wonderful challenge for new scientists coming into the field who are turned on by the challenges of trying to address these problems. Clearly there is not enough money at the moment so we have to prioritise and maximise the use of the money we have by working effectively in partnership both with the private sector and other public sector bodies.

Q38 Lynne Jones: Could we have an answer about the delay in the implementation?

Professor Watson: There is not so much a delay, we have come up with solid implementation plans. All of our research co-ordinators, all of our policy specialists, have already absorbed what is in our strategy document. As we are looking at our budget for this year and getting ready for the next Comprehensive Spending Review they are already looking at what have we said here and we are already starting discussions with the Research Councils and government departments on how we work together. The food strategy that Steve has just talked about is a very major step in that right direction. As we were writing our *Evidence Investment Strategy* we were already working with BBSRC on the document that they released a couple of days ago. It is not that we are waiting to implement, we want to put it down on paper so everyone can see exactly what is there. We have already started to implement some of this. We have already brought in some more social research and are working closely with Andrew Watkinson, who is the Director of the LWEC programme, about what are the missing gaps and the opportunities to work with the other Research Councils on these issues of climate change, ecosystems, food security, et cetera. Yes, we need to write a solid document on exactly how we can have some indicators of success but the philosophy behind the *Evidence Investment Strategy* is already going on.

Q39 Chair: Time is rapidly closing down on us. There was a gentleman somewhere at the back who I saw waving his hand, and I see the gentleman with the white shirt. There is a lady here, a lady with dark hair and a gentleman on the end. I am going to ask if you would sequentially put your questions. First of all, they will be on the record and if there are particular points that come out of what you say we will try and get a brief comment before we have to close.

Dr Clarke: My name is Jonathan Clarke. I am from the John Innes Centre. I submitted three questions in advance and hopefully Bob will be kind enough to respond to those in writing. The general thrust of this is that we have seen a change in the nature of funding policy from Defra. Certain programmes have been removed, such as the LINK programmes, but what we have not seen, unlike BBSRC, is the implementation of new programmes. Can Bob please give us an indication of when we are likely to see calls for evidence collection programmes, what they are likely to be focused on and what is the timescale?

Q40 Chair: Thank you very much. The lady over here, please.

Dr Barsby: I am Tina Barsby from the National Institute of Agricultural Botany which was privatised in 1996 from MAFF and, with help, now thrives with diverse sources of funding. That is a positive note. I wanted to bring us back to something that was raised by the gentleman from the CLA and also indirectly by Steve Visscher. We talk about innovation and the need for innovation to drive answers to the challenges of the sustainable food supply, climate change and protecting ecosystem services, and we know from the reports that have been released recently that GM biotechnology is an important part of addressing those challenges and perhaps the major innovation that farmers are going to need access to in order to be able to do all those things that Bob has just told us they are going to need to do. We have a strong national capability in this technology but we are not using it. That capability and knowledge is not getting out on to farms. It is a question not just of having a national capability but of using it too, the classic "If you don't use it, you'll lose it".

Q41 Chair: Thank you very much indeed. The gentleman over there?

Professor Collier: Professor Chris Collier, National Centre for Atmospheric Science at the University of Leeds. Mr Visscher mentioned that he felt Defra believes the funding of national capability rests with the Research Councils and not Defra. This is unfortunate because in the case of NERC the

research institutes are being told that their national capability funding will be ramped down and will have to be compensated by gaining funds from other stakeholders, such as Defra. Clearly if we are going to embark on more applied research, as Dr Gibbons urged us to do, then there is going to be little money to do that. We will be hard pressed within research institutes to support what we have in terms of national capability. Without extra funding, and I accept that funding is in short supply, we are going to be hard pressed to really respond to some of the things we have heard about today.

Q42 Chair: Thank you very much. The young lady on my left, please.
Ms Ibrahim: Magda Ibrahim, *Horticulture Week* magazine. My question chimes with Chris Atkinson's question. Given Defra's call to UK horticulture producers to up production of fruit and vegetables, does it recognise the industry's special situation in requiring government funds for applied research because of the fragmented nature of small-scale producers? Hence, does it recognise the need for funding that goes beyond the Technology Strategy Board programme, which is not dedicated to horticulture and neither provides for ornamental horticulture? In addition, will Defra provide support for Warwick HRI to prevent further demolition of the research base post-2012 when Defra transitional funding ends?

Q43 Chair: There is an awful lot to digest within there and, Bob, I would not expect you to respond to every single point but if you would like to exercise some editorial control over that and there may be other of our responders who may want to have a quick word on that. If you would like to start, Bob.
Professor Watson: First, we will have no new LINK programmes, which is our private sector/Defra collaboration, but that is simply because the TSB has now offered to put £50 million on the table over the next five years and we will complement it with £30 million out of Defra, and BBSRC are also involved, although I cannot quite remember the number. The LINK programme is going to be replaced by this superb collaboration with the TSB on agri-foods which will have over £80 million and of course, by definition, there will be partnerships with the private sector. LINK goes away as a programme but it is replaced by something even more powerful. On the issue of GM biotech, you have to recognise of course that a big issue is European policy on genetically modified crops. At the moment there is only one GM crop that is even allowed in Europe which is not very much use for the UK. My view on GM crops is that we need to do the fundamental research. The first thing I would argue is that the basis is genomics. Genomics can then be used either for classical plant breeding, marker assisted breeding or it could be used for GM because we need crops that are temperature precipitation and salinity tolerant, with increased nitrogen use efficiency. The key point is solid work on genomics, followed by some research on GM with good, open, transparent and safe field trials. As far as whether or not any of it will be commercially grown, that is an issue for EU policy. The NERC Board understand that the whole issue of national capability is a very critical issue. I am on the NERC Board so I will not comment on it but we understand the issue of national capability. Our equivalents in Defra are things like the Hadley Centre, which we fund, CEFAS, VLA, et cetera. The whole issue of national capability is a key one. With respect to horticulture, we understand that it is a lot of small-scale producers. I cannot comment because I do not know the answer of whether Defra will or will not continue to fund this sort of research. It is one of the issues we are going to have to look to in the whole area of priorities, quite clearly, but I can come back to you because some other people in the Food and Farming Group might have a better answer than that.

Q44 Chair: Fine, that is very helpful indeed. I still have one or two people who want to comment.
Dr Gibbons: I just want to mention national capability. A few years ago some of you may recall NERC decided to close a number of ecology and hydrology stations, two in particular, one at Banchory and one at Monks Wood. For those who work in biodiversity and conservation research, which I do, those two centres were probably the two key centres with which we worked. We had research programmes with them and they delivered very valuable science to us. I understand some of the reasons why NERC did what they did but I felt that was a dramatic loss of national capability.

Q45 Chair: Dr Clarke, you just wanted to have a micro-second of further comment.
Dr Clarke: In a way you did not answer my question. You told me what TSB are going to fund, that is fine, but what are you going to fund?
Professor Watson: As I said, this will be a collaborative effort between TSB, ourselves and BBSRC. There will be more than £80 million over the next five years where we will jointly agree what the priorities are. Our money will be pooled with TSB and BBSRC and it will be a joint activity. Effectively, crop protection is the very first of the four areas of research that will be funded through the TSB but, again, I could give a written response on the four areas. That is in addition to the rest of the money that we spent on agriculture and on animal health and animal welfare, so it is one part.

Q46 Chair: Ladies and gentlemen, we have been going for a little bit over two hours and we have covered a great deal of information. I am going to draw strands together. Please do not think I am going to call it to an instant halt, and I do need one or two of you to stay behind because there is a little bit of homework I am going to ask you to do. I wanted to conclude because, Dr Hall, you have the

benefit, if you like, of seeing how lots of Member States approach the question of setting their scientific priorities both within the Member State and inevitably plugging into what the European Union is doing. It would be just perhaps helpful, as you have heard the debate unfold this afternoon, to have your closing observations as to whether you think the type of approach which the United Kingdom Government in the form of Defra have adopted is a sensible way forward. Clearly, all Member States are going to have to face the fact that national budgets for anything are going to come under enormous pressure, certainly for the foreseeable future, and by that I mean for at least the next five years, which in UK terms is two public spending rounds, and therefore how do you at a European level set your priorities but also make certain that you do not duplicate from within Europe what Member States are doing but you co-ordinate the outputs of all of these quite remarkable programmes?

Dr Hall: You have almost answered the question that you posed. I think the real secret is trying to get all these different funding arrangements that exist in a large Member State working in a cohesive way. If I could just use an example of this general area of food security in its broadest sense. Slightly more than one year ago BBSRC organised a meeting in London. It was just a one-day meeting and my impression and that of several other people who participated in that meeting was, yes, there was a lot of capacity in the UK but not a lot of co-ordination between the different bodies doing the work. From an outsider's view, in one year there seems to have been a complete change. There is now a much more co-ordinated approach across the UK. You have mentioned these various documents that have appeared. Obviously it does not mean it (better coordination) is actually happening but at least the spirit is there. The key to a whole set of problems now is really getting much more out of the different sources of funding that exist. You are not unique in the UK. In Germany it is even more complicated with different funders and different *länder* all having their own research budgets as well as some very substantial semi-privately funded institutions. All of these also have to try and work in a cohesive way. I am coming to the point that joint programming inside the country is the best way forward, on the assumption that you will not have one research funding body with all the funding going through one source. Obviously that is not very easy to arrange although it may be simpler in the long run. If you can do that at a national level and then we can do something similar on a European level, then I think we are going some way to at least contributing to resolving some of these funding problems. I mentioned European joint programming earlier on—BBSRC and Institut Natiional de Recherche Agronomique (INRA) in France, are co-ordinating a European joint programming initiative on agriculture, climate change and food security involving over 20 countries. Since at the moment it is embryonic, we do not know exactly what is going to happen but if those participating countries can agree there will be some genuine attempts to avoid unnecessary duplication and more usefully, to get some synergies out of the existing funds the countries have in their various different funding bodies. If that also stimulates countries to do the same thing, and I think the UK probably does not need the stimulus because it is already doing it, then some of these big societal issues which we all have to address may be resolved more easily. Believe me, I almost pitied you having to answer all these questions on priority setting, Bob, because it is the same problem every time. Even if you have twice as much money you will have the same difficulties of priority setting. You need to have the right process and right consultation mechanisms to minimise the problem, but you are never going to completely solve it.

Chair: Thank you very much indeed for that. The little bit of homework that I want to set those who have been kind enough to put their questions before us is on your seats attached to a piece of paper you will find a card that looks like the one I am holding. It is just to make certain that we have recorded accurately your name and the organisation that you come from. You do not have to write everything out about the question, but if you asked a question about animals perhaps you could just put "question about animals and emissions", or if it was horticulture, so that we can tie up the name of the person and the organisation with the question that was asked. The report that will be published will be there for posterity and I would hate you to show it to your grandchildren and say, "But they got my name wrong"! If you would be kind enough to help us avoid that pitfall by filling in a card if you asked a question, that would be extremely useful. Can I also say that I recognise not all of the questions that were sent in to us have been asked this afternoon but they will, however, be published with the transcript of this afternoon's proceedings. As I said at the outset, the aim of this operation was obviously not to have definitive answers to every single question you ever wanted to ask about publicly funded science, it was to put a marker down for the Committee that succeeds us about the way in which Defra is setting its priorities in terms of its approach to science. You have been kind enough to identify some important areas where questions still remain to be answered in some cases. It is quite evident from what Bob has been saying that he is sifting through this very complex matrix of objectives in terms of getting the necessary science to underpin policy, but at the same time recognising that there are a number of continuing pieces of work which have got to be integrated into the programme that he has outlined. As we have heard from our excellent challenge team from the CLA, the RSPB, the Environment Agency and BBSRC, there are plenty of informed clients, users, observers and others who will continue to probe and ask the difficult questions as the Defra

science policy evolves. I am sure that Alistair Hetherington and his team will also continue to probe Defra's activity. At least you know that if he asks for something 75% of what he asks gets granted, so his hit rate is very good indeed. May I thank you all very much indeed first of all for coming. I think the turnout shows there is a genuine interest in matters scientific in what is an evidence-based policy area. Can I specifically thank all those who kindly sent in questions, and some have asked their questions this afternoon. They have been a useful cross-section to identify to Bob and to others with the job of translating the strategy approach into reality the things that still concern you. It is that process of challenge which is what we are about as a Select Committee. We listen and we assimilate ideas, but we challenge Government in terms of our reports. Effectively this will be the last public evidence session that the present Committee will have, so I think it is very fitting that we have had such a splendid turnout this afternoon. May I thank the audience for their participation. May I thank all of those who have presented and challenged and, with that, wish you a very safe journey home. Thank you.

Written evidence

Note by Defra

Does Defra's new Evidence Investment Strategy 2010–2013 and beyond provide a robust basis for managing competing demands in tough economic times?

EFRA Select Committee, 17 March 2010

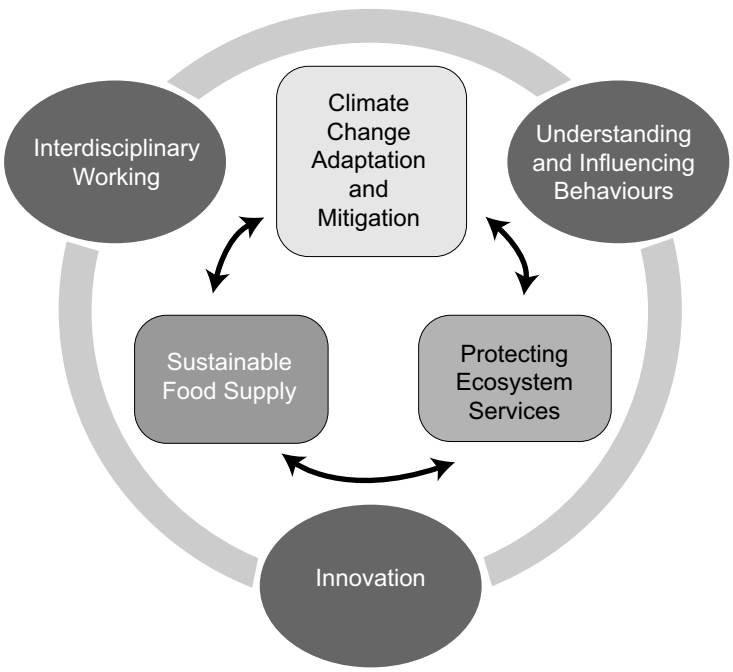
DEFRA'S EVIDENCE INVESTMENT STRATEGY 2010–2013 AND BEYOND

In Defra it is essential that all policies are formulated based on evidence. "Evidence" includes scientific research, monitoring and surveillance, natural science, social science, economics and technology. The *Evidence Investment Strategy 2010–2013 and beyond* (EIS) outlines Defra's plans and approaches to evidence gathering in a global environment where value for money is essential. The EIS was published on 26 January 2010 following 18 months of development.

Defra's Three Big Evidence Challenges

Figure 1

THE BIG CHALLENGES



The EIS recognises three big evidence challenges for Defra, government and society:

— *Sustainable food supply:* fair prices, choice, access to food and food security through open and competitive markets; continuous improvement in the safety of food; a transition to healthier diets; and a more environmentally sustainable food chain.

— *Climate change adaptation and mitigation:* climate change cuts across almost all of Defra's policy responsibilities, including farming and food, animal and plant diseases, ecosystems, water management, floods and conservation.

— *Protecting ecosystem services:* the Millennium Ecosystem Assessment not only recognised the multiple benefits that ecological systems provide but also highlighted that policy and planning decisions must take into account an ecosystems approach to be truly sustainable.

The big challenges are intertwined: food production affects and is affected by ecosystem services and climate change (both mitigation and adaptation). Climate change in particular underlines the need for a long-term, ecosystem-based approach. Not only will habitats and species be affected directly by climate change and sea level rise but they will also be affected by policy and behavioural shifts in sectors such as agriculture, water, transport and energy. A holistic, multidisciplinary and innovative approach is needed within Defra, the UK and on a global scale.

The CSA and his team have worked with policy and specialist teams across Defra to categorise programmes by their evidence needs, as well as external stakeholders across government and in the private sector. The EIS shows the clear priorities for Defra's evidence spend and provides the basis for managing competing demands in tough economic times.

The EIS' Objectives

Defra needs to change its approach to evidence and innovation in order to meet the Department's demanding policy objectives in the context of an increasingly difficult economic climate. The EIS identifies five strategic areas Defra needs to focus on to deliver such a significant change:

— prioritise investments between programmes;

— sharpen the Department's focus to deliver our evidence and innovation where we need it most;

— increase co-operation using partnership working with other government departments and research councils to share the investments, knowledge and expertise;

— develop and organise the right skills, expertise and capabilities; and

— refine our processes, eg, integration of evidence throughout the business cycle.

The EIS identifies a number of practical ways Defra can deliver each of these objectives. It also recognises that the big challenges will require a focus on interdisciplinary working, understanding and influencing behaviours, and innovation.

What next?

The next stage is implementation where working together with partners will be key. The recommendations will be delivered by the Evidence Programme, areas across Defra and organisations such as the Research Councils, other government departments and non-governmental organisations. Since the publication of the EIS the Evidence Programme has been working within Defra to develop detailed implementation plans including key milestones and performance indicators. Defra will provide regular updates on its website as the work progresses.

Professor Bob Watson, CSA
Defra

March 2010

Memorandum by the Department for Environment, Food and Rural Affairs

BACKGROUND

1. On 2 December 2009, in a letter to the Secretary of State, the Chairman of EFRA requested information about the management of Defra's science needs and the department's response to the report, *Survey of External Capabilities to meet Defra's Strategic requirements*, prepared by Arthur D Little. Please find responses to these questions below:

DEFRA'S STRATEGY FOR MANAGING SCIENCE NEEDS

2. Defra is responsible for policy issues, in the UK and internationally, which are not only often rapidly changing, complex and interlinked but are fundamentally dependent on a sound scientific understanding. Defra considers that it is essential to underpin policy with robust and well managed scientific and other (economic, social) evidence.

3. The Department has recently undertaken a detailed analysis of its evidence, led by Defra's independent Chief Scientific Adviser (CSA), as part of the updating of its Evidence Investment Strategy (EIS). The CSA's conclusions were that on the whole "Defra's evidence gathering is clear, well managed and well focused to deliver Defra's challenging policy goals". However, in order to meet its challenging policy objectives within the context of an increasingly difficult financial climate, Defra needs to build on its achievements and improve our performance in gathering and using evidence effectively.

4. The strategy therefore provides a clear vision and practical guidance to direct the future of evidence gathering and use. The approach identified in the strategy is to:

— Prioritise investments between programmes.

— Sharpen our focus to deliver evidence and innovation where we need it most in both the short and long term.

— Increase co-operation and communication within Defra across the big evidence challenges and with our external partners to share our evidence investment, knowledge and expertise.

— Develop and organise the right skills, expertise and capabilities to give us access to comprehensive, robust evidence and advice.

— Refine our processes to ensure we are lean and fit for purpose.

5. The strategy is due to be published at the end of January.

Department's Response to the Arthur D Little Report

6. The Department commissioned the *Survey of External Capabilities* to meet Defra's Strategic requirements from the Arthur D Little (ADL) consultancy as an important input to its strategic thinking. Defra relies on a broad range of different kinds of specialists, long-term datasets, specialist facilities and expertise from outside the department to support its work so it is important that we remain aware of their status and viability. This report provided a very useful, although incomplete, analysis of capabilities and presented some useful generic messages. The findings of the *Capability Report* were considered as part of the development of the EIS and many of its recommendations will be taken forward as the strategy is implemented.

7. In the meantime Defra is using the ADL report to identify and help protect key external capabilities as it scrutinises its evidence investments alongside all other expenditure as part of the Public Value Programme. Defra's CSA will be working closely with our evidence users, delivery agents and evidence partners to discuss and implement solutions, particularly around skills, partnership working and managing capabilities. (and the relations and impacts across similar capability studies undertaken by NERC, BBSRC, the Scottish Government and others).

8. We are now working on a detailed implementation plan for the EIS to deliver the envisaged culture change and the recommendations outlined above, which will be completed in late spring 2010.

January 2010

Questions from members of the public

Strategic and Investment Priorities

1. From: *Miss Gurpreet Padda, Policy Adviser, Common Fisheries Policy, Defra*

Given the forthcoming budgetary constraints is it prudent to be issuing a new science strategy when we aren't clear about where funding will be coming from? I'm unsure whether we can make evidence based decision making when the people collecting and compiling the evidence are dwindling as a result of the above.

2. From: *Professor Bill Reilly, President, British Veterinary Association*

It has been noted by the British Veterinary Association that whilst Defra's R&D budget has remained fairly constant over the last few years the proportion allocated to animal health and welfare has been substantially cut. With reduced investment into government research laboratories, how well prepared is the Defra for future disease outbreaks?

3. From: *Professor George Marshall, Assistant Principal, Scottish Agricultural College*

(a) How does Defra propose to work with the Research Councils and other major research funders in the UK to produce a strategically coherent approach to address the major challenges that face agriculture, food security and the environment?

(b) How does Defra propose to structure its research funding to introduce greater flexibility in contract arrangements to gain maximum advantage from EU funding opportunities?

(c) How will Defra make sure that the success of the LINK research programmes is at least maintained in the new arrangements through TSB across all sectors including livestock?

Food Science

4. From: *Magda Ibrahim, Deputy news editor, Horticulture Week*

Given Defra's call to UK horticulture producers to up production of fruit and vegetables, does it recognise the industry's special situation in requiring Government monies for applied research because of the fragmented nature of its small-scale producers? Hence, does it recognise a need for funding that goes beyond the Technology Strategy Board programme, which is not dedicated to horticulture, and neither provides for ornamental horticulture? In addition, will Defra provide support for Warwick HRI, to prevent further demolition of the research base post-2012 when Defra transitional funding ends?

5. From: *The John Innes Centre (BBSRC)*

(a) Given the importance of elite plant varieties to highly-productive, sustainable arable farming, will Genetic Improvement Networks (GINs) continue to form part of DEFRA's strategy for evidence collection in relation to food security in the UK, and will there be an uplift in funding to reflect the increasing UK[sic]?

(b) Given the need to ameliorate GHG emissions from the production and use of nitrogen fertilisers, does DEFRA require further evidence to support the improvement and expansion of the UK legume crop as part of its strategy for reducing the impact of agriculture on climate change, and if so, by which programmes will it support the collection of this evidence?

(c) Given the demand for fuel produced from crops (biofuel) and the controversy surrounding certain forms of biofuel production, what programmes of research will DEFRA employ to gather evidence to support sustainable biofuel within the context of UK agricultural practice and its environmental impact?

6. From: *Mr Wyndham Rogers-Coltman, OBE*

In the same way that science has a major role to play in alleviating the effects of climate change so it has a major role to play in assuring the sustainability and affordability of food supplies. Would Defra agree with me that the development of new husbandry techniques and food producing plants and animals which require less water, are more resistant to disease and are more productive, whilst requiring less inputs of chemicals and fertilisers, is essential to the survival of the human race and the environment in which we live? If they do agree with me, will they ensure that increased freedom is given to scientists in their work in developing such scientific advances and that, where the work is to the national benefit, financial support is made available to ensure that the work can be carried out?

7. From: *Jill Sanders*

I would like to ask the Committee if it would be prepared to conduct an assessment of the value of the contribution gardeners make to the food supply? This could be conducted through both individuals and allotment societies, where those participating could engage plot holders and review crops and methods. It would be valuable to have some idea of how much this kind of local production might meet the need for supplying food to families.

8. From: *Joyce D'Silva, Compassion in World Farming*

(a) In view of the high level of greenhouse gas emissions from livestock production and the drain on the earth's resources of intensive farming of livestock, should not the Government invest in alternative agricultural production strategies and policies which address consumption of livestock products?

(b) In view of the fact that Defra-funded research at Bristol University showed that over 27% of broiler (meat) chickens suffer from signficant lameness,[1] should not Defra take urgent steps to address this widespread problem affecting over 150 million broiler chickens each year in the UK alone?

(c) In view of the fact that farm animals are recognised in the Lisbon Treaty as sentient beings, should the Government not adopt a policy that any climate change mitigation research and strategies which affect farm animals be subjected to an animal health and welfare screen?

9. From: *Molly Conisbee, Campaigns and Communications Director, Soil Association*

In the light of the findings of the IAASTD report, published in 2008, and chaired by Professor Watson, what plans do DEFRA have for funding research into agro-ecological farming systems, which have historically fared rather badly in comparison to biotech funding?

Freshwater Ecosystems

10. From: *Professor R W Battarbee FRS, University College London (UCL), and Professor Alan Hildrew, Queen Mary University of London (QMUL) on behalf of colleagues in Universities, NERC Research Institutes, the Environment Agency, Natural England and Countryside Council for Wales*

UK freshwaters are severely threatened by many pressures, including climate change. Does Defra:

(a) recognise the extent to which the UK's capacity to provide research-based evidence to support the management of freshwater ecosystems has diminished?

(b) support efforts by freshwater ecologists to bring together freshwater scientists, managers and policy makers under a new Cooperative Research Partnership?

(c) appreciate the importance of long-term, unbroken freshwater ecosystem monitoring programmes, as conducted by Universities and Research Institutes, in underpinning science and providing the evidence base for policy, and

(d) recognise that such monitoring programmes differ fundamentally from compliance-based monitoring led by environmental agencies?

[1] Knowles *et al* (2008), Leg Disorders in Broiler Chickens: Prevalence, Risk Factors and Prevention. PlosONE 3(2): e1545. doi:10.1371/journal.pone.0001545.

Non-native Species

11. From: *Dr Neil McRoberts, Reader in Systems Ecology, Systems Analysis Team Leader, Land Economy & Environment Research Group, SAC*

Why is an error-ridden UK non-native species risk assessment scheme still being used as the basis of UK non-native risk assessment, and still publicly available for downloading from the non-native species risk assessment panel web pages, when both Defra and the scientists responsible for developing the methodology have been informed of its serious technical faults and that it cannot provide transparent, meaningful evidence of invasive risk or potential economic impact?

Funghi

12. From: *Dr David W Minter, President, European Mycological Association*

Fungi are not animals or plants, but belong in their own totally separate biological kingdom. Their importance in providing ecosystem services is enormous, and therefore they are major factors impacting on climate change, food security and other environmental issues. A recent House of Lords select committee identified mycology, the scientific discipline for fungi, as being the most endangered area of taxonomy (50% of the very few remaining British systematic mycologists reach retirement age within the next two years). Defra's *Evidence Investment Strategy 2010–2013* contains no reference to fungi.

Has Defra's *Evidence Investment Strategy 2010–2013* overlooked the fungi?

Flooding

13. From: *Professor Chris G Collier, Professor of Atmospheric Science and NERC National Centre for Atmospheric Science (NCAS) Head of Strategic Partnerships, School of Earth & Environment, University of Leeds*

(a) Following the severe floods of 2007, and in response to the subsequent Pitt Review, the Met Office and the Environment Agency established the National Flood Forecasting Centre building upon the Environment Agency National Flood Forecasting System (NFFS) and the Met Office high resolution Numerical Weather Prediction (NWP) system. Currently the Centre is introducing the CEH G2G (Grid 2 Grid) hydrological forecast model. These initiatives will underpin part of Defra's new Strategy. However, what new initiatives does Defra envisage for using the considerable meteorological and hydrological academic research output to improve flood forecasting lead times and accuracy particularly for extreme events?

(b) Defra has supported considerable research over many years into the statistical analysis of the occurrence of heavy rainfall and severe flood events. This work has led recently to new engineering design guidance for extreme rainfalls. However, do Defra intend to continue to support this work through investigations of the impact of climate change on the analysis of extreme rainfall, fluvial and coastal flood events, in order to provide improved guidance for the future development of hard defences against fluvial and coastal flooding, and for reservoir safety applications?

(c) The introduction of high resolution NWP ensemble forecasts of rainfall by the Met Office has provided a foundation for the further development of improved fluvial, pluvial and coastal storm surge flood forecasts. However, much further work remains to be undertaken to interpret and use operationally ensemble forecasts from coupled meteorological, hydrological and coastal storm surge models. How does Defra intend to facilitate and harness academic research in this area to establish a balance between the need for soft and hard flood defences?

Geo-engineering Research

14. From: *Alan Gadian, Leeds University*

Sir David King stated that global warming is a bigger threat than international terrorism. I believe that it is the biggest threat to civilisation that mankind has ever had to face.

We need to procure funding to further research into our cloud whitening geoengineering scheme; one of only two Solar Radiation Management schemes recommended for research in the Royal Society's recent geoengineering assessment. The influential Copenhagen Consensus Centre rated it the most promising of all geoengineering schemes. This UK-initiated scheme has been supported by many leading international scientists, and offers the possibility of holding the Earth's average temperature and polar sea-ice cover constant for perhaps 50 years ie this technology could provide a substantial grace-period within which to reduce CO_2 emissions drastically and/or replace fossil fuel burning by a clean form of energy.

Currently, EPSRC through its rules, has not allowed us to apply for blue sky research funds, and has refused to let us bid for funding from a recently convened sandpit.

Why has Defra, with its science investment strategy, effectively not allowed even an application for funding for the most advanced of the UK geoengineering research efforts, in a crucially important area of science?

General

14. From: *Mark Yoxon, Liaison Officer, Environment, Communications & Systems Department, MCT Faculty, Open University*

(a) How can we make research outcomes relevant and accessible to groups whose modus operandi puts them in direct contact with citizens so they can be effective agents of change?

Context: Building from our own partnership working, we feel wider communication issues are paramount. For example, making research accessible to groups who might not have the capacity to assimilate direct research outcomes into their day to day working but do have requirements to absorb research outcomes into their *modus operandi*. Often such groups are at the sharp end of implementation, in direct contact with citizens and so are important agents of change.

(b) What wider UK mechanisms can Defra encourage to foster linkages across research agencies to extend the reach of applied research carried out by higher education research institutions?

Context: Although encouraged, by for example Defra, communication across research agencies is not always adequate. For example we know of waste managers in local authorities who had telephone calls across a week or so from different research agencies, all of whom wanted their time and input into several separate but linked projects. Other than those projects with direct relevance to the funded research it is often challenging and beyond the scope for a single research group to coordinate a wider and often diverse set of research activities.

15. From: *Richard Bruce*

As stated recently by a wise scientist specialising in physics and the universe there are no absolutely proven laws of physics because science is always evolving. I would add that in chemistry science is still discovering new properties even for water, the most abundant material on the planet. I would therefore suggest that there is no such thing as "Sound Science" because science is continuously evolving and it is positively dangerous to suggest that current scientists know all that there is to know, or that their opinions are wholly reliable in the decision making process. "Scientists prove that scientists disprove what scientists prove". Worse than this, too many scientists depend on theory and wrongly dismiss evidence that fails to fit that theory. They are often well rewarded for such attitudes by industry. This I would suggest is extremely dangerous. Some of our greatest inventions, and much of the scientific knowledge base, has been provided by people outside of the scientific community with no formal scientific training. Sadly, despite the value of their knowledge to mankind, they were often destroyed by the scientific establishment.

Statement

From: Joanna Wheatley of Long Lane Farm, Long Lane, Maidenhead

Defra should not be involved in the production of pharmaceuticals. This is commercial enterprise driven by demand and satisfaction for the end product, and can be financially rewarding. DEFRA should only be involved in monitoring efficacy and purity of said products, furthermore in the case of Genetic Engineering eg BBSRC and other research commercial or otherwise they should be monitoring bio-security, eg Experimental animals going to abattoirs when they should be incinerated on site. Incidents where I believe this has happened are briefly listed below.

BSE; the indestructible agent that is in feed but not in bovine based injectables, for which farmers are still footing the bill.

Foot and Mouth Disease the last episode escaped from one of their institutions but farmers had to deal with the consequences and trauma both physical and financial.

TB which is still raging through the country with Animal Health officials with the law behind them going on to farms using the same needle throughout the whole herd. Then blaming the farmer for poor husbandry.

The involvement of Defra in both pharmaceutical and chemical industries leaves open to question its impartiality and integrity to advise and inform both Ministers and the public.

Memorandum submitted by Rothamsted Research

1. Rothamsted Research (RRes) is a BBSRC-sponsored public sector research establishment (PSRE), a company limited by guarantee and a registered charity. It is the largest institute in the UK conducting scientific research of relevance to crop-based agriculture and the environment as well as being the longest-established such organisation in the world. The institute employs approximately 280 scientists supplemented by over 100 PhD students and visiting scientists (mostly from overseas). RRes is the one UK-based organisation that uniquely places emphasis on the interdisciplinary integration of chemistry, mathematics, ecology and crop sciences (including: genetics, pathology, entomology and soil science) to contribute predictive understanding and scientifically-sound options for the sustainable management for crop-based agricultural systems.

2. RRes is a major research contractor to Defra and during 2008–09 expects to conduct work to the value of approximately £3 million. This represents about 10% of the institute's research activity but reflects a substantial decline in funding year-on-year compared to 2002–03 when the value of research funded at the Institute by the Department was over £7 million and represented about 25% of its activity.

3. In considering the scope of the forthcoming inquiry, RRes considers the following areas to be particularly worthy of investigation:

- The adequacy of the existing scientific infrastructure within Defra, and the systems by which the Department prioritises research, appraises impact and ensures it has access to appropriate specialist scientific advice.
- The impact of the decision to change the role of the Defra Chief Scientist's Group by placing the contracting and management of research projects within policy groups.
- The extent to which Defra has an appropriate critical mass and continuity of high quality scientific expertise to enable it to act as an intelligent customer for research.
- The adequacy of project management arrangements including the morale, motivation and continuity of staff involved.
- Mechanisms for accessing scientific advice and maintaining contact with contractor organisations.
- The duration and size of research projects in relation to cost effectiveness and impact.
- The impact of reductions in Defra research funding on the ability or contractors to sustain national capability and expertise.
- The differences between periods of notice required for implementation of research staff redundancy procedures by contractor organisations and that provided by Defra relating to alterations in research requirements.
- The extent to which Defra engages with the land-based industries in determining its research priorities and the importance of LINK as a vehicle for ensuring industry relevance of research.
- Defra's approach to collaboration with other research funders including Government Departments, Research Councils and Levy Bodies.
- The extent to which Defra considers it has a responsibility to sustain scientific facilities and expertise outside its Agencies.
- The extent to which it is appropriate for Defra Agencies to act as research providers and also play a role in regulation.
- Mechanisms by which Defra allocates research funding to its Agencies and the extent to which the Department's responsibility and liability as an employer may influence decisions or impact on maintaining national capability.
- The extent to which Defra is appropriately responsive to changes in national and international research priorities or alert to opportunities for positive impact from scientific advances.

March 2008

Memorandum submitted by Martin Hancox

Your February Report on the ISG's 2007 final report on badgers and bovine TB (2) shows that Defra science infrastructure and collaborative subcontracting is "fit for purpose", but unfortunately had too narrow a remit to achieve the desired results. The best science is an art form in that asking the right questions gets results. What should have been asked was why is there a cattle TB crisis, how does it fit in with schemes elsewhere (13) or indeed why GB nearly eradicated TB without any badger culls (15), and why is everyone so certain badgers are the problem.

The ISG team started with the preconceived notion that badgers are the main reservoir of bovine TB, and hence concluded that the rises and falls in cattle TB were due to the badger culls. In particular that perturbed badger populations had more contact with cattle hence the "edge effect" and a rise in TB. The compromise between this ISG view that partial culls would make things worse contrasted with Professor King's view that culls work, led to the idea that any cull would need to be over some 300 km^2, be sustained for many years, and preferably be within impermeable boundary areas. This accidentally renders any cull policy unworkable and uneconomic: a perfect political fudge.

It is very sad that neither the ISG nor the EFRA Committee reports were able to recognise that like the Emperor with no clothes, they have in fact at long last proven badgers to be completely irrelevant to solving cattle TB. They have failed to note two key facts:

1. Too few badgers with TB. Out of nearly 11,000 badgers culled over seven years from 2,000 km^2 there were only 1,515 with TB (1,204 proactive, 311 reactive ISG p 50, 74, 75, 205–9) and ONLY 166 with severe lesions which might have been a risk to cattle (p 77). In nearly half of the 51 proactive culls there were 15 or

fewer TB badgers per 100 km^2… hardly a major reservoir or cause of anything. And since the cull removed c 70% of badgers, there would have been some 500 left and perturbed, so 50 per 100 km^2 area which supposedly rushed across the boundary to cause the rise in cattle TB there (about 1 per km!).

2. It seems almost beyond belief, but the ISG have completely ignored the fact from cattle TB schemes worldwide, that removing TB cattle by test annually and slaughter reduces cattle TB, any relaxation of such measures allows cattle TB to explode out of control via cattle-to-cattle spread (1, 3, 5–11, 13). Lack of testing due to 2001 foot and mouth and a huge backlog of tests meant from 2000 to 2002 a doubling of herds and a 3–4 fold rise in reactors. The number of herds with over six reactors doubled from 23% to 42%, but had dropped back to 17% by 2005 as intensive testing began to bite. Zero tolerance on overdue tests led to a peak of 30,000 TB cattle in 2005 (twice as bad as 1960) but these measures dropped TB by 30% in 2006 whereas the apparent rise last year is simply because more herds and cattle are being tested: cattle controls are working!

The drop of 23% in proactive areas is due to this, especially "by the fourth badger cull", and is most marked where annual tests have been in place longest (Cornwall) nothing to do with impermeable boundaries. The rise in reactive areas happened BEFORE the cull (p 109) so it's daft to claim it was due to perturbed badgers. Only three areas ran long enough for any "effect" to appear, and only 32 TB badgers culled (ABC). Doubts as to any reactive perturbation factor elsewhere (King and 12). A decisive rebuttal of reactive perturbation effects is hidden in Defra Project Report SE 3108 which found too few TB badgers, too few badger movements and only to next door clan, and the cattle TB DNA spoligotypes were NOT the same as local badgers *ie* from brought in cattle! As to proactive perturbation… in fact there were transient cattle rises both inside and outside these AND the survey only (no cull) areas (p 88, 94, 97, 100).

The two key misunderstandings underpinning the entire badger TB debate are that annual testing removes cases before they reach the more infectious stage (not recognised by ISG 17), (1, 5, 6–11, 13). And when such measures have been in place some years most cattle are caught very early so it is not possible to confirm TB via lesions or M bovis culture. These NVL or non visible lesion cases comprise a HUGE undetected reservoir of TB and are the real source of new or repeat herd breakdowns hence the Australian NGSP National Granuloma Submission program (4, 6, 14, 16).

Rather ironically the ISG also accidentally showed that doubling cattle TB meant twice the spillover TO badgers more widely or with less clustering: Victim not Villain.

March 2008

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Supplementary memorandum submitted by Martin Hancox

One very simple, BUT ABSOLUTELY CRITICAL QUERY to raise as regards the Defra Science and your recent bovine TB report. Professor King and the ISG disagree on whether the effect of badger culls and perturbation is transient or not (Ev 120). It states that although culls ended in 2005, Prof C Donnelly and the ex-ISG are continuing to monitor cattle TB both inside and outside the proactive cull areas.

Since all areas were prioritised for intensive annual testing when dealing with the backlog of herd tests in 2002 after foot and mouth, it would be very surprising if there has not been a dramatic drop in TB in ALL 30 triplet areas (including the no cull ones). Cattle measures "work", exactly as they did in nearly eradicating TB in GB by the early 1970s, without any badger culling. It is hard to see why any cull is needed now. Incidentally Ulster nearly eradicated cattle TB likewise with a low of 174 reactors in 1971. But a premature switch to three yearly testing let it explode back out of control. Badgers have always been regarded as an irrelevant spillover host for TB caught from cattle, and not culled.

Producers of greentop unpasteurised milk were also prioritised for annual testing in 2002. It is madness to propose a new fashion for greentop milk, since in some areas 1 in 4 herds have TB and sooner or later TB will slip past public health safeguards.
April 2008

April 2008

Memorandum submitted by FARM

Thank you for the opportunity to help frame the scope of the forthcoming inquiry into the science capability of Defra and its agencies. We particularly welcome this inquiry since we recognise the importance of an effective science, research and technology base as one of the principal foundations upon which our food and farming industry must be based.

This is a brief summary, which builds on previous submissions that we have made to the Office of Science and Technology and the review of Agricultural Levy Bodies, both of which were conducted in 2005 and a proposal for a Sustainable Food and Farming Commission, which we presented to the SDC in the same year.

Our overall concern with the science commissioned by Defra is the apparent lack of a clear, coherent policy that can be demonstrated to deliver the objectives set out in their science and innovation strategy. Whilst recognising that a proportion of Defra's work is intended to help inform policy decisions, we feel that it is important to be able to place all of their work within the context of how it will be applied in practice.

With limited resources, a process of prioritisation must be applied when deciding which projects should be funded, but it is unclear what these priorities are, and whose interests they serve. This is particularly true of funding that is directed through the Research Councils, where much of the science leaves us with the impression that it is science itself rather than the interests of farming (including the wider role of environmental stewardship) that are being served.

We would therefore like the Committee to consider how clearly Defra have defined the objectives to which their science program is addressed and the extent to which these meet the objectives stated in their science and innovation strategy (which encompasses Sustainable Farming).

In commissioning scientific work, where funding is passed through the Research Councils, we are left with the impression that it is the Research Councils themselves rather than Defra who set out the detail of the projects. If this is indeed the case, then it is unclear how well the objectives of the Research Councils (both individually and collectively) are aligned to those of Defra's overall strategy.

We consider that the use of public funding for scientific work within the area of food and science should be justified by the fact that the public benefit; either directly or because the science is used to address areas that are otherwise unlikely to be supported by the private sector through lack of clear commercial markets. Examples of these could include:

- The provision of independent testing or assessment of commercial products.
- Enabling farmers to develop management practices that allow environmental objectives to be integrated with commercial production.
- Methods of management that allow a reduction in agricultural inputs such a sprays or fertilizers.

Whilst there are example of projects within Defra's science portfolio that are clearly intended to address such areas, we have found it far more difficult to identify examples where research has been effectively disseminated and applied at farm level.

We would therefore like the Commission to consider the extent to which the scope of the work that Defra undertakes reflects a reasonable balance between the interests of science and the wider expectations of the general public.

FARM was involved in some of the work undertaken by the Agriculture and Environment Biotechnology Commission (AEBC) as part of the debate on the application of GM plant breeding to agricultural crops. Although much of the debate was highly polarised, we did feel the AEBC succeeded in providing a forum

where social and ethical issues could be debated alongside the purely scientific arguments. We consider science, the refinement of technology and finally, its application at a practical level to be three distinctly separate phases in the development of new technology. However, we are concerned that in the current absence of a similar forum within food and farming, the predominance of "sound science" as an argument in determining policy is leading to an exclusion of the ethical and social considerations. There are a number of contemporary issues, including the control of TB, intensive farming practice, the effects of pesticides and GM crops, which we feel cannot be resolved by science alone.

We would therefore like to Commission to consider to what extent DEFRA science succeeds in integrating social and ethical issues within technological development.

The final area that we would like the commission to consider is whether examples exist elsewhere within Europe that can be used to develop models within the UK whereby science is more closely integrated with practical farming. We have looked at examples of work being undertaken elsewhere within Europe by research facilities such as Wageningen in Holland, where farmers are engaged in the process of identifying areas where new research is needed and working farms are used as a test bed to ensure that the research has a direct relevance and benefit to working farmers. Such facilities appear to be an effective means of disseminating scientific understanding to those for whom its use is intended.

We would therefore like the Commission to consider is whether examples exist elsewhere within Europe that can be used to develop models here in the UK whereby science can be more closely integrated with practical farming and environmental stewardship.

Thank you once again for the opportunity to help frame this inquiry.

March 2008

Memorandum submitted by "The Commercial Farmers Group"[2]

The Commercial Farmers Group is concerned that Defra Science policy is not in tune with the major issue of the growing imbalance of global food supply and demand. This is due to population growth, increased demand for animal products in emerging economies, increased use of crops for biofuels and compounded by the damaging impacts of climate change. Against this global background we consider that food security should be seen alongside energy security, water security and environmental security as being of prime importance to the UK, and a competitive UK agriculture can make a significant contribution to all.

One of Defra's principal objectives is "to promote a competitive and efficient farming and food sector….",[3] but Defra Science does little to satisfy this objective. Whilst it is claimed that the current Sustainable Farming and Food Science Programme is "based around Defra's strategic priorities", there is no mention of the competitiveness and efficiency of UK agriculture in any of its "five broad scientific areas".

We consider that the lack of support by Defra Science for the need to increase competitiveness and efficiency has not only contributed to the UK agricultural industry falling behind other countries in competitiveness, but also to the demise of the agricultural R&D infrastructure and applied science expertise in the UK. Whilst the infrastructure can be reinstated with appropriate investment, re-establishing the lost expertise of those involved with "science into practice" will take much longer. We are now down to only a handful of scientists in many applied agricultural science areas (soil science, weed science etc), and there is a lack of career structure in universities and research institutes to attract new blood.

The Defra LINK Programme is a successful example of collaborative research between government and the agricultural industry. We are therefore concerned that it is currently under review, and the indications that if it does continue it will no longer be under the control of Defra. This appears to be a further indication of the lack of enthusiasm of Defra to be involved in the competitive development of the agricultural industry.

Reductions and withdrawals from funding by Defra for a number of internationally-recognised research institutes continues to undermine their capability and sustainability. It also results in those remaining placing even more emphasis on basic science at the expense of applied science. The loss of applied R&D capability as a result of Defra reductions in funding has damaged the ability to innovate at the applied agricultural science level and this is probably one of the main factors explaining the poor growth of competitiveness by the industry.

We consider EFRA should examine:

— Defra Science policy in relation to its support for a competitive agriculture.

— The lack of a joined-up approach between Defra and DIUS on R&D policy and funding for this key industry.

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[2] The Commercial Farmers Group is a group of farmers and academics supporting the competitive development of the UK agricultural industry.

[3] The Strategy for Sustainable Farming and Food. Facing the future. (2002). http://www.defra.gov.uk

— The role of Defra Science policy in overcoming the dysfunctional state of the agricultural R&D chain.

March 2008

Memorandum submitted by SAC (Scottish Agricultural College)

The Scottish Agricultural College (SAC) is one of Europe's leading specialist institutions in science and technology—covering education, training, research and development, advice and consultancy in agriculture and its associated industries, rural development, food production and the management of land and natural resources. It is also one of the major suppliers of research to Defra.

We suggest that the EFRA Committee inquiry considers:

1. Defra mechanisms for forecasting, and planning to meet, research needs—especially important in the light of a dramatic reduction in funding of food-related research by Defra over the last 10 years. We are unclear of the funding position for food-related research in 2008–09—the late agreement of budgets is itself a problem in planning research—but expansion is justified, given Professor John Beddington's recent call, in his role as UK government's chief scientific adviser, for more agricultural research to help tackle a potential food crisis.
2. The role of Defra science funding in maintaining the continuum from basic to applied, policy-relevant research. If we are serious about the importance of a "knowledge economy" in the UK, it is vital that we properly resource translational research, to ensure that the knowledge generated from research really does benefit the economy. Having a very strong and/or narrow focus on only one of two issues—such as climate change—has meant a loss of linkage with industry objectives, which also threatens effective linkage of research.
3. The role of Defra science funding, and the wider UK government role, in meeting, the EU target of investing approaching 3% of GDP in R&D by 2010. Also, what should the role be of encouraging industry to play a greater part—industry investment in R&D in the agri-food sector is especially low.
4. The role of Defra in supporting the training and development of young scientists through postgraduate scholarships and other means
5. Cohesion between Defra science and research activities supported through other agencies, perhaps especially RCUK

March 2008

Memorandum submitted by the National Farmers' Union (NFU)

The NFU represents farmers and growers in England and Wales. We believe science and technology have an essential role in agricultural systems in the 21st Century. As the industry's main government department and competent authority, both Defra's funding of agricultural research and its use of science in policy making is of significant interest to us, and impact on our industry.

The NFU agrees with the two areas listed in the invitation to help devise the scope of the inquiry. We would also like to see the following areas form part of the proposed EFRA Committee inquiry, in no particular order:

— Defra's focus on only funding science to deliver its strategic policy objectives, and that these are very largely related to environmental mitigation. There must be recognition that productive agriculture is one of the ways Defra's policy objectives will be delivered. Translational science and application of technology is needed to enable agriculture to deliver Defra's objectives and stay in business.

— There is no point in producing scientific studies if the results do not lead to behaviour change or have impact on the ground. Translational research and knowledge transfer are essential, and currently a major gap in the pipeline. The funding and the experts are not there to deliver this essential link. This must be addressed by Defra to enable delivery of policy and to avoid wasting the decreasing amount of money available. A knowledge-based (bio)economy, with agriculture at the heart, needs a robust and well-resourced pipeline from basic research right through to translation/knowledge transfer and practical impact.

— The LINK programmes are valuable but there is concern that a project's industry-relevant aims can be diluted by having to fulfil Defra's environmental policy requirements.

— Defra claims evidence-based policy making. However, the process to achieve this must be examined for all policy decisions. We suspect that in many areas, particularly environmental regulation, the policy comes first and then Defra looks for the evidence to support that policy.

— The impact and sustainability of continued cuts in research funding across the land-based sector must be assessed. With no push from Defra as a key user, BBSRC risks interpreting a lack of need for agricultural research. Capacity is falling below a critical level in many key areas of science for agriculture—soil science, genetic improvement/public good plant breeding, pest and disease resistance etc.

— Uncertainty of budgets and strategic direction of funding means that contracts cannot be made, projects cannot be finished, and scientists cannot tolerate the uncertainty. The number of scientists in some areas, especially in the more applied subjects, is falling below a critical mass and young scientists are leaving the land-based sector, or academia altogether.

— The UK has long been a leader in many of the science disciplines Defra uses and funds. However, as other countries both in Europe and elsewhere strengthen both research and application to agricultural production, the UK is at real risk of slipping behind and losing both its ability to make use of science and the scientists themselves.

— It is essential that Defra is clear about its strategic direction in science funding and can provide some certainty and stability to the land-based sector. Repeatedly producing large scale reviews of Defra science, evidence, innovation or priorities will continually delay decisions about funding and compound problems of uncertainty in the science community.

— Science capability cannot be switched on and off, to be invested in again and expected to deliver when the Government decides that production from the land is important ie to deal with impacts of climate change, global population increase, poverty reduction and pressures on resources. What will be required from farming in 10 years time? The science and research for this is needed now!

March 2008

Memorandum submitted by NABIM

nabim represents the milling sector in the UK. As a technologically based sector of the food processing industry we depend on wheat as our raw ingredient and are involved in many of the scientific issues surrounding its production. We have regular contact with both Defra and the Food Standards Agency.

As a sector that is dependent on the production of quality wheat for milling we believe that key areas for the committee to examine are:

(1) The significant reduction in Defra funding of R & D for production agriculture.

(2) The manner in which R & D is prioritised between production and other areas such as environmental matters.

(3) The method by which the department consults with the various industry sectors in establishing R & D priorities.

(4) The consideration that the department gives to scientific research on the growing of agricultural crops safely.

March 2008

Memorandum submitted by British Society of Animal Science

The British Society of Animal Science is a learned society and educational charity concerned with advancing science related to animals, and encouraging uptake of new knowledge for the benefit of animals, producers, food processors, consumers and the environment. Animal science has a vital role in delivering national benefits and in meeting global challenges, including: living with climate change; meeting rising global demand for livestock products in an environmentally and socially responsible way; translating scientific discovery into economic, environmental, animal welfare or social benefit; and integrating information from the "biological revolution" into practical applications.

We offer the following points:

— *Defra's role in building and protecting capacity in areas of science likely to be relevant to future needs.* Defra funding of animal science research has declined by ~20% over the last decade, adjusted for inflation. The decline is even greater in areas directly related to food production. Also, it appears that Defra has been forced to cut research funding to meet recent EU fines, and costs of recent climatic and animal health crises—contingency costs that we believe should not affect a research budget. The future of several internationally-recognised UK animal science research groups depends on Defra funding. It takes decades to build such groups, and just a couple of years of underinvestment to destroy them.

— *The Defra/wider UK government/industry strategy for this sector, should meet the EU target of investment of 3% of GDP in R&D by 2010.*

— *The key role of Defra R&D funding—either directly or via co-funding through schemes like LINK—in maintaining a vital link in the continuum from more basic R&D to application.* British science fails to make the economic impact that it should, given its published output and international standing. A key issue here is the underfunding of strategic/translational animal science—exacerbated by the cuts mentioned above, and the decline in levy board funding of animal science. The LINK Sustainable Livestock Production Programme has been judged by external reviewers to be very successful, producing high quality industry-relevant science that makes a difference in practice. Yet this scheme is under threat because of a lack of convergence of Defra and industry priorities. As well as the impact on economic performance, this also means the loss of important contact/leverage with industry to help enact policy.

— *How to make Defra's horizon scanning/research priority setting more flexible, responsive and "joined up".* Recently Professor John Beddington, the UK government's chief scientific adviser, warned of a future food crisis and called for more agricultural research to tackle the problem. This follows substantial cuts in Defra's food and farming R&D. We need a joined up, balanced, longer term approach to agricultural research that embraces sustainable food production as well as environmental impact, and disease threats which have been overriding Defra priorities in the past.

March 2008

Memorandum submitted by Institute of Grassland and Environmental Research

Thank you for the invitation to help frame the inquiry into the science capability of Defra and its agencies.

This submission is from the Institute of Grassland and Environmental Research (IGER) which receives a significant proportion of its research income from Defra through both commissions and competitive awards and will continue to depend on Defra for more than 25% of its income in the coming years.

We consider that the scope of the Inquiry should include consideration of:

— the extent to which Defra has the appropriate "in house" scientific expertise to define, develop and implement policy objectives in the wider context of the needs of UK land use; and to assess scientific project proposals against those objectives;

— the balance between competitively funded research. commissioned research and industry supported "LINK" research; and whether this is appropriate in terms of maintaining overall science quality; the capability and capacity of the UK science base in the medium to long term; investment in longer-term strategic research; and the promotion of economic and social impacts from research outcomes;

— how the Defra Assessment of Strategic Knowledge Capabilities and BBSRC/HEFCE Study of Land-Based Facilities and Resources will inform future policy;

— the extent of the integration needed between Defra, research councils, levy boards and other industry partners and the extent to which current mechanisms promote this;

— the extent to which Defra should expect research providers to conduct strategic management of consortium projects and its willingness to build this requirement into funding awards; and

— the long-term relationship of Defra with its main contractors and sub contractors including research sustainability risk management and the need to maintain physical infrastructure and staff capacity against an agreed science strategy.

The Institute looks forward to the opportunity to submit evidence to the inquiry.

March 2008

Memorandum submitted by Institute of Rural Sciences

Support for interdisciplinary research

We believe that challenges facing UK agriculture and land use will increasingly require the formation of inter-disciplinary teams linking not only applied with basic science (*eg* genomics to applied animal and plant breeding), but also disciplinary cross over's between the life and the physical, mathematical and social sciences. Clearly to capture these emerging opportunities Defra will need to work in partnership with other funding agencies to support and catalyse mission focussed long term projects of sufficient breadth and scale to successfully tackle the major global challenges of the 21st century. In this context we are concerned that the apparent tendency of Defra to fund short term desk based studies is detrimental to the long-term competitiveness of the UK's science base.

Maintenance of capacity

Clearly Defra like all Government departments has to function within a controlled budget. However, there is an impression that at times the Defra research budget has been adversely affected by the need for Defra to fund its statutory work, resulting in short falls in R&D support. Several internationally-recognised UK research groups depend on Defra funding, including our own. It takes decades to build such groups, and just a couple of years of underinvestment to deplete and in some cases loose key facilities and competencies. In particular, we would draw attention to the limited facilities available within the UK for integrated large scale grassland, crop and animal research and the need to sustain a "fit for purpose" resource that is vital to the pastoral based agriculture of the British landscape. Indeed, we believe that anthropogenic land use changes coupled with climate change are likely to have a major impact on the ecology and biodiversity of natural, semi-natural and managed agricultural ecosystems. Understanding the basic mechanisms responsible for organismal adaptation to changing environmental pressures represents a major scientific objective that requires interdisciplinary solutions and "fit for purpose" facilities and infrastructure.

Maintaining the linkage between fundamental biological research and its practical application

There has been a welcome (if relatively small) increase in funding for fundamental research available through the Research Councils; however, if this is to lead to sustainable changes in land use management and agricultural practise it needs to be matched by a substantial increase in funding for more applied research. Current EU targets suggest that the UK should be investing 3% of GDP in R&D by 2010. We believe that the agriculture and land use sector falls far short of this, particularly in the more applied work required to drive changes in current practise. Harnessing the science and technology base that exists in the UK and ensuring that innovation is fostered at all points along the chain from discovery to delivery is vital to the UK's long-term prosperity and socio-economic welfare. Both industry and academia have welcomed the LINK funding program as a useful (if somewhat limited) model for translating research into practise. We would therefore encourage a far greater degree of integration and synchronisation of the strategic and applied science that Defra funds with the more fundamental research funded by the Research Councils and others, to embrace the needs of the relevant industries and stakeholders.

March 2008

Memorandum submitted by Natural England

Natural England welcomes, and would like to respond to, the invitation to help frame the EFRA Committee's inquiry into the science capability of Defra and its agencies.

Natural England is a new organisation which has been established under the Natural Environment and Rural Communities Act 2006. It is a non-departmental public body. Natural England's purpose is to ensure that the natural environment is conserved, enhanced, and managed for the benefit of present and future generations, thereby contributing to sustainable development.

In terms of the scope of the committee's work, we would recommend that the inquiry considers:

(a) The full range of social, economic and physical/natural science relevant to Defra's remit.

(b) The full scope of activity from "operational" science (required to support the short-to-medium term delivery of Defra's objectives) through to strategic science (focused on understanding underlying complex processes in order to assist the development of long-term integrated solutions).

In terms of specific questions, we would suggest that the committee could usefully consider:

(a) The overall levels of Defra funding/support for science and the adequacy of this support to meet current and future needs.

(b) The clarity of the rationale by which Defra distributes resources for science—across the key topics for which it is responsible (*eg* environment, food/farming, rural affairs), across its departments and agencies and across work focused on short and longer term needs.

(c) The extent to which Defra is effective in working in partnership with others to gain maximum value from public (and other) investment in science.

(d) The extent to which Defra and its agencies are effective in informing and influencing the science work and investment decisions of others—for example the research councils and other government departments (*eg* CLG).

(e) The extent to which Defra and its agencies effectively use research to develop integrated solutions for the complex challenges facing our environment.

We would, of course, be happy to work with the Committee as they progress their inquiry further.

March 2008

Memorandum submitted by the Open University Integrated Waste Systems Research Group

With 12 academics and researchers, Integrated Waste Systems (IWS) is one of the UK's principle academic research groups specialising in sustainable waste management research. At the time of writing we have several "live" Government funded research projects underway. Applied research is fundamental in the development of our distance learning and many of the staff in IWS are actively engaged in course development.

There are four points we would like to make to the committee relating to the scope of its work:

1. Developing a "Research Protocol"

If research is to be robust and inspire public confidence in its outcomes, particularly as a key contributor to policy development and implementation then it must be neutral, objective and transparent. We would urge the committee to consider developing a protocol for Government funded research which addresses the issues noted.

2. Encouraging Wider Partnership Working

We believe that partnerships which link academic and non academic agencies are an essential way of working. Creative partnerships, which encourage cross disciplinary working, enrich the research process, widen communication and dissemination and, by helping to avoid duplication of effort, amplify research funding. We feel the committee could usefully consider how partnerships can be encouraged in the research process.

3. Research Communication Issues

Building from partnership working, we feel wider communication issues are paramount. For example, making research accessible to groups who might not have capacity to assimilate direct research outcomes into their day to day working but do have requirements to absorb research outcomes into their *modus operandi*. Often such groups are at the sharp end of implementation, in direct contact with citizens and so are important agents of change. How to make research outcomes relevant and accessible to such groups could usefully be considered by the committee.

4. Linking Research Activities

Although encouraged by, for example Defra, communication across research agencies is not always adequate. For example we know of waste managers in local authorities who had several telephone calls across a week or so from different research agencies, all of whom wanted their input to separate but linked projects. Other than those projects with direct relevance to the funded research it is challenging and beyond scope for a single research group to coordinated a wider and often diverse set of research activities. The committee could usefully consider how to better link and coordinate across research groups.

Finally, these four points clearly do not exist in isolation and form part of a wider systemic research framework.

We would be pleased to elaborate on the points above should the committee wish.

March 2008

Memorandum submitted by Department for Environment, Food and Rural Affairs, Science Advisory Council

Defra's Science Advisory Council (SAC) has been providing advice and challenge to the Department through its Chief Scientific Adviser (CSA), on Defra's use of science since 2004.[4] The Council has, particularly through its Sub-Groups, looked at a number of areas including: the use of science in policy, the acquisition of external science advice, the quality assurance of science in the Department, and the use of social research.[5] The Council also receives reports and advises accordingly on the Science Audits of the major research laboratories of Defra,[6] particularly in regard to cross-cutting issues.

[4] http://www.defra.gov.uk/science/how/advisory.htm
[5] http://www.defra.gov.uk/science/how/advisory05.htm
[6] Audits have recently been completed for the Centre for Environment, Fisheries and Aquaculture science (CEFAS), the Central Science Laboratory (CSL) and the Veterinary Laboratory Agency (VLA). http://defraweb/science/how/agencyScienceAudits.htm

There was strong support for the role of the SAC providing an overall view of Defra science from the 2006 Office of Science and Innovation (OSI) Science Review of the Department:[7]

> "Defra's SAC fulfils an important role in providing a challenge function; supporting and advising the CSA; using Sub-Groups to look at specific issues in-depth; engaging with the wider community; and interacting between the natural and social science communities."

The OSI review went on to endorse the Royal Society's view that:

> "To be effective SAC must be involved in all major policy issues involving scientific evidence and include a sufficient number of internationally recognised scientists (covering an appropriate range of disciplines) in addition to other stakeholders."

There was further support, specifically for Defra's SAC from the House of Commons Science and Technology Committee report on Scientific Advice, Risk and Evidence-Based Policy Making:

> "Defra's decision to introduce an independent Scientific Advisory Council to support the work of the departmental CSA is sensible and should be emulated by other departments. It is critical that these Advisory Councils are independent and are seen to be so".[8]

SAC has purposely defined science in a broad way, to include the evidence that the Department needs and uses in its formulation and support of policy, and has specifically taken it to include the social as well as natural sciences. We feel the Committee should take a similar approach.

SAC is currently advising, via a Sub-Group,[9] the Defra CSA on the Department's own internal review of its science capability,[10] now being carried out in part in collaboration with the Biotechnology and Biological Sciences Research Council (BBSRC). Several issues have been discussed, and are recorded in the minutes of recent SAC meetings.[11] These include the scope of the review and the definition of capability that is to be used.

In any review of Defra science capability, a limited review of physical facilities is of some value; an audit of intellectual resources and skills, in both the Department and its Agencies, is also necessary; a measure of the Department's access to wider capability in research institutes, universities and other research organisations (including the private sector, and overseas organisations), provides a more complete picture. An audit of future needs, which would include a consideration of the development of the necessary skill base, is more difficult but should form part of a full-scale review of capability. A clear definition of capability will be important to the Committee.

The Science Advisory Council would wish to contribute to the Committee's review, and will be happy to provide its particular perspective and experience. Access to the reports, recommendations and meeting minutes of the Council is available via the SAC website.[12] In the first instance please contact the SAC Secretariat if you require further information.

March 2008

Memorandum submitted by the Food Ethics Council

We welcome the Select Committee's decision to examine the science capability of Defra and its agencies. While Defra seems to have responded positively to the results of its own past consultations into Defra science, evidence and innovation, we support the need for an external review by EFRA.

Three areas which we would be pleased to see form part of EFRA's inquiry are as follows:

— *Public engagement*—Defra appears to be aware of the need for greater public engagement in its science and science policy, a need which we identified in our response to DEFRA's 2004 consultation on its *Evidence and innovation* report (http://www.foodethicscouncil.org/files/DEFRAevidenceandinnovation10-04.pdf) and which we further outlined in our report *Just Knowledge?* (http://www.foodethicscouncil.org/files/justknowledge.pdf). We are now curious how effectively Defra is engaging the public and stakeholders in practice, whatever the department aspires to do on paper.

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7 http://www.berr.gov.uk/dius/science/science-reviews/Completed%20Reviews/page42387.html [See page 14, section 11; page 53, section 130 and Recommendation 12]
8 http://www.publications.parliament.uk/pa/cm200506/cmselect/cmsctech/900/900-i.pdf [Recommendation 22]
9 http://www.defra.gov.uk/science/how/advisory05g.htm
10 http://www.defra.gov.uk/science/documents/papers/2007/SAC(07)28.pdf
11 http://www.defra.gov.uk/science/how/advisory06b.htm [See Section 11 of Minutes of SAC meeting on 29 January 2008 (SAC(08)11) ; Section 7 of Minutes of SAC meeting on 17 October 2007 (SAC(07)34)] [Papers of Sub-Group to be published on completion of the Defra capability review]
12 http://www.defra.gov.uk/science/how/advisory.htm

— *Sustainable food and farming*—The April 2005 report of the Agriculture and Biotechnology Commission (*What shapes the research agenda?* http://www.aebc.gov.uk/aebc/subgroups/ra_analysis_of_responses.pdf) argues that sustainability should be a stronger driver of agricultural research. Has Defra acted on this sound advice, which is more important than ever in the face of current concerns over food security?

— *Scientific advice*—Defra's efforts to improve its use of scientific advice and the operation of its advisory committees are, in many respects, examples of good practice to other government departments (see Demos's report *The received wisdom* http://www.demos.co.uk/files/receivedwisdom.pdf). However, Defra's executive agencies, notably the Veterinary Medicines Directorate, do not appear to be keeping pace (eg http://www.foodethicscouncil.org/files/VPChormones.pdf). Is the use of science in such agencies overdue for an overhaul?

March 2008

Memorandum submitted by the Royal Society of Chemistry

The RSC welcomes the opportunity to comment on the scope of the Defra Science inquiry by the Environment, Food and Rural Affairs Committee.

The RSC is the UK Professional Body for chemical scientists and an international Learned Society for advancing the chemical sciences. Supported by a network of over 44,000 members worldwide and an internationally acclaimed publishing business, our activities span education and training, conferences and science policy, and the promotion of the chemical sciences to the public.

This document represents the views of the RSC. The RSC's Royal Charter obliges it to serve the public interest by acting in an independent advisory capacity, and we would therefore be very happy for this submission to be put into the public domain.

The document has been written from the perspective of the Royal Society of Chemistry.

The RSC believes that some or all of the areas highlighted below should be considered for inclusion in the committee's inquiry:

1. In order to prioritise research and to formulate an effective strategy, a roadmap of future research, development and deployment needs in the UK is critical. Key areas for funding include the adaptation and mitigation of climate change, sustainable water and food supply and the development of novel agrichemicals. The chemical sciences will have a crucial role to play in training scientists, carrying out fundamental research and promoting interactions with scientists from other disciplines.
2. The RSC believes that the Select Committee should inquire about the way it seeks scientific advice and how it incorporates it into legislation. Learned and professional organisations with access to a large number of experts, such as the RSC, should play a pivotal role in giving balanced scientific advice to Defra. This is particularly important before new legislation is devised that will impact significantly on industrial and research capabilities. Decision making processes need to be made more transparent. Confidence in the process by which scientific advice is incorporated into policy development would be enhanced by providing a publicly available record detailing how scientific advice was used or not.
3. The RSC believes that the Select Committee should inquire about the nature and adequacy of the in-house expertise in Government Departments. Even if most advice is to be gathered from outside it is necessary to have sufficient expertise to identify who is technically knowledgeable and to act as "intelligent customer" for the external advice. In many cases departments lack the competency to frame the question, recruit the appropriate expert or understand the answer when it has been provided.
4. The RSC strongly supports Defra's use of a Chief Scientific Adviser and a Science Advisory Council (SAC). The RSC believes that the operation of the SAC is an area the Select Committee should examine in its inquiry.
5. The RSC believes that the Select Committee should inquire about ways to support multidisciplinary research. Publicly funded science is essential to the future prosperity of the UK. Responsive mode funding is crucial to the long term success of the UK's scientific research. It is essential to fund multidisciplinary projects, as research grows more and more interdisciplinary. Consortia such as Supergen are essential to improve communication between different research groups and across disciplines.
6. It is particularly important that funding mechanisms are transparent and that the remit of the funding programmes is clear. There still remains confusion amongst scientists—especially at the interface between traditional disciplines—on where to best apply for funding. Funding opportunities need to be publicised widely and openly to improve recognition of their remit. The different funding bodies need to interact closely with each other to ensure that they are systematic

in deciding which projects are funded by which funding body. The RSC believes that it is important that the Select Committee inquires about how application processes for funding schemes of all funding bodies can be harmonised to reduce the administrative burden on researchers.

7. In light of long-term challenges such as climate change and sustainability of food and fuel production, funding opportunities should reflect the need for long-term and multidisciplinary projects. The Select Committee should inquire about how finding can be provided for expensive equipment and what mechanisms need to be in place for long-term measurements. The RSC believes that commitment of funding agencies and grant holders need to remain continuous and reliable over a period of time to sustain research groups successfully and to produce reliable data.

March 2008

Memorandum submitted by the Biotechnology and Biological Sciences Research Council

Thank you for the opportunity to help devise the scope of the above inquiry. The following is the response from the Biotechnology and Biological Sciences Research Council (BBSRC).

Suggestions for the Scope of the Inquiry

BBSRC broadly endorses the issues raised in responses from our sponsored institutes, such as Rothamsted Research and the Institute for Animal Health. The following are important issues from the perspective of the BBSRC Executive:

— *Defra's responsibility to help maintain the research base upon which it depends:* The "RIPSS" report[13] sets out Government policy that fitness for purpose and sustainability of the research base is the joint responsibility of the principal public funders (Research Councils, government departments). Defra funds a significant amount of research in BBSRC institutes, but is reluctant to recognise its shared responsibility for their long-term sustainability.[14] The nature of research is such that it can not be switched on and off as short-term policy and budget needs dictate. Unless the RIPSS principles are adopted, Defra's science capability will be damaged by loss of continuity, key expertise and facilities.

— *The funding of Defra science:* Defra funds science mostly as short-term 1–3 year contracts. This may be appropriate in some cases, but sustainability (above) and Defra's science capability would be greatly improved by a longer-term planning horizon offered by five-year (or longer) programmes of research, particularly in the area of sustainable agriculture and land use. Defra considers that it is unable to fund beyond each three-year spending review, while other departments do not take this view. The committee might consider why this is.

— *The prioritisation of Defra science:* The committee may also wish to explore how Defra science is prioritised and its current balance. Although Defra is responding to budget cuts we question the scale of its shift from Sustainable Food and Farming research to the area of Environment & Climate Change. Whilst the latter is important, and attractive to Ministers, the Government's own Chief Scientist has warned that the UK faces an enormous challenge to maintain agricultural productivity as climate change bites and the population grows. Good long-term agricultural science is essential to underpin food security, yet it is exactly this area from which Defra is now withdrawing.

  Also, Defra's current consultation on responsibility and cost sharing in Animal Health and Welfare[15] proposed that the farming industry could provide research funding (through levies) to continue support of areas that Defra is withdrawing from. How viable is this?

— *Defra's internal structures are opaque:* Defra's science capability largely depends on interaction with the research base and other funders such as BBSRC. However, this is inhibited by the devolved nature of Defra's science, where research budgets are held by disparate policy groups. Researchers and funders find Defra difficult to penetrate. How might this be improved to benefit Defra's science?

March 2008

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[13] Research Council Institute and PSRE Sustainability Study ('RIPSS') (DTI, 2004): http://www.dti.gov.uk/science/science-funding/ripss/page22675.html

[14] See oral evidence from Hon Lord Rooker and Professor Howard Dalton to House of Commons Science and Technology Select Committee Inquiry into "Research Council Institutes" http://www.publications.parliament.uk/pa/cm200607/cmselect/cmsctech/68/6110108.htm.

[15] See http://www.defra.gov.uk/corporate/consult/ahw-nextsteps/index.htm

Memorandum submitted by the Institute for Animal Health

Funding Timescales

Most programmes of research operate over lengthy time frames, with development and maintenance of scientific expertise and technical skills. Manipulating pathogens in experimental animals, dissecting disease mechanisms and providing effective solutions cannot occur rapidly from a standing start. Laboratories supplying research to Defra cannot plan adequately with short funding cycles, for example Defra funding to the Institute for Animal Health (IAH) for statutory surveillance and diagnostics for foot-and-mouth disease and Bluetongue is negotiated currently on an annual basis.

Funding Levels and Sustainability

Funds must be found by government to sustain the research environment needed to manage risks from livestock and zoonotic infectious diseases. High capital and recurrent costs of facilities for working with pathogens of livestock at high bio-containment must be recognised and met fully and Defra must ensure the UK has capacity to respond to current and future disease threats.

Funding a Spectrum of Research to Address Long Term Disease Control

High quality diagnostics and surveillance do not exist in isolation and are frequently updated by applying new developments from basic and applied research. Having research and statutory activities within a single institute, such as IAH, promotes synergy and rapid translation of research, provides in-depth expertise when outbreaks occur and allows unfettered access to resources generated by reference laboratories. During the 2007 FMD outbreak crucial tests developed from IAH research were applied, including a lateral flow device for rapid detection of viral particles, whole genome sequencing to promptly and definitively identify the order in which farms were infected, and PCR tests to detect infection prior to onset of clinical symptoms. It is crucial that Defra recognises the importance of this spectrum and funds it sustainably.

Funding Work on all Major Classes of Livestock Infectious Diseases

Recent outbreaks have focused immediate attention on "exotic" animal viruses but it is crucial to remember that facilities and expertise are essential also for parasitic, bacterial and rickettsial diseases and for arthropod vectors. Emergence of pathogens is not restricted to viruses. A recent high-profile study (Jones *et al*, 2008, Nature 451 990–994) concludes that in the past 60 years over 50% of emerging infectious disease (EID) events were due to bacteria or rickettsia, over 10% to protozoa, 6% to fungi and 3% to helminths. EIDs were dominated by newly emerging zoonoses (60.3% of total), highlighting the need to deal with zoonotic pathogens in multiple host species. Vector-borne EIDs (23% of total) increased dramatically in the last decade supporting the hypothesis that climate change drives disease emergence where vectors are sensitive to environmental changes. Funding work on a range of diseases maintains a broad skill-base and facilitates technical breakthroughs and solutions that cannot be achieved solely by working on exotic viruses.

Government Partnering Awards to BBSRC Response Mode Grants

GPAs provide an opportunity for Defra to access BBSRC research but the Committee may consider that better use of this link would be for Defra to provide additional funding to exploit "Translational gaps" between BBSRC-funded research and downstream practical outputs.

Fit-for-purpose Funding Forums

Greater transparency regarding how Defra arrives at its funding priorities is required, including greater use of funding forums of stakeholders and co-funders to review progress and help determine future priorities

March 2008

Memorandum submitted by the Government Chemist

I broadly agree with the areas identified in the invitation, and would like to suggest that particular consideration could be given to the following topics.

- Awareness and utilisation of the whole UK scientific advisory system.
- Optimising interactions with BERR, DIUS and their scientific advisers.
- In particular, enriching communications to ensure that information relating to the safety and sound management of chemicals is shared effectively.[16]

[16] Defra has the policy brief for wider chemical issues such as REACH (Regulation EC No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals). This extends into areas such as consumer safety, in which other government departments retain expertise. For example, Defra represents the UK in European debate on the marketing and use restrictions which apply to consumer articles, making use of advice on chemical safety that is prepared on behalf of BERR.

— Synergies between funding streams which at present may be working in isolation. It may be possible to identify: experience that could be more widely shared; procedural efficiencies; methods of presenting funding opportunities more transparently for applicants, perhaps as a "one-stop shop"; and ways of scoping calls for research proposals more strategically.

— For scientific agencies, review of good practice and benchmarking in relation to competitive tendering, collaboration and knowledge transfer.

March 2008

Memorandum submitted by the Royal Society

The Royal Society welcomes this opportunity to contribute to the initial stages of the inquiry into Defra's scientific infrastructure. This submission has been prepared from previous policy work, listed below. We welcome the opportunity to engage with the Committee as it develops this inquiry further.

Issues to Investigate

We think that the suggestions made by the Committee of areas to investigate are sensible. Within these, we make the following suggestions for specific areas to consider:

— Whether the Defra family of agencies and NDPB's is adequately used, including the level of understanding within Defra of the different roles and responsibilities of the individual organisations.

— Whether the quality-assurance mechanisms that Defra has in place for the science undertaken by its executive agencies are effective.

— Whether Defra's financial support for its own research institutes, and research within Research Council Institutes, enables them to make long-term strategic decisions and maintain capacity for research expertise.

— How non-specialist perceptions of scientific issues are included in the policy-making process.

— Whether demand for basic science as well as innovation and other technological development is stimulated by appropriate policy drivers.

Suggested Approach

We suggest that the Committee considers the use of case-studies to look at these issues, and does not try to examine every area within Defra's remit. We believe this will be more effective in identifying areas for commendation or concern, rather than generalised statements of principle. Good examples of case-study subjects include:

— infectious diseases in livestock;

— antimicrobial resistance;

— genetically modified crops;

— biodiversity;

— fisheries and marine environment management; and

— avian influenza.

March 2008

Memorandum submitted by the Biosciences Federation

About Us

The Biosciences Federation (BSF) is a single authority representing the UK's biological expertise, providing independent opinion to inform public policy and promoting the advancement of the biosciences. The Federation brings together the strengths of 44 member organisations (plus seven associate members), including the Institute of Biology and the British Ecological Society.

The Institute of Biology (IOB) is an independent and charitable body charged by Royal Charter to further the study and application of the UK's biology and allied biosciences. IOB has 14,000 individual members and many specialist learned Affiliated Societies.

Together, BSF and IOB represent a cumulative membership of over 65,000 individuals, covering the full spectrum of biosciences from physiology and neuroscience, biochemistry and microbiology, to ecology, taxonomy and environmental science.

The British Ecological Society (BES) is the learned society for ecology in the UK. Founded in 1913 and with over 4,000 members, the BES supports ecologists and promotes ecology; the study of living things and their relationship with the environment in which they live. The Society's mission is to advance ecology and make it count.

Authors of this Response

This response was developed through the IOB/BSF Environment, Agriculture and Sustainability committee and the Public and Policy Committee of the British Ecological Society.

Openness

The IOB, BSF and the BES welcome the opportunity to respond to this call for information and are happy for this submission to be made publicly available. Should the Committee have any questions about this submission, please direct them to the British Ecological Society (www.BritishEcologicalSociety.org, telephone 020 7877 0740).

Topics to Consider

The IOB, BSF and the BES would like to see the EFRA Committee examine the following issues as part of its inquiry, in addition to those named in the Committee's initial call for information. We are strongly supportive of the Committee's decision to include Defra's agencies within the scope of the inquiry. Throughout we take "Defra" to mean both the Department and organisations in the Defra "family".

Commissioning Research

1. Is Defra an intelligent customer for procuring research from internal and external contractors?

2. Does Defra support the right strategic science to inform policy, including long-term research (5–10 years in duration)?

3. The tension between research freedom, for scientists wishing to pursue interesting lines of enquiry, and the provision of funding by Defra for target-oriented projects.

4. Does Defra feel its approach to its work gives it access to the best scientific minds and appropriate access to scientific networks? If it does not, what plans does it have to gain access to such resources—including support for national infrastructure and the development of a skilled workforce?

5. Does Defra make adequate use of Horizon-scanning to identify novel threats and opportunities for which environmental science will be needed in the future?[17] *For example; extreme events, outbreaks of disease, food security and agricultural productivity. How can opportunities be created for the UK research community and Defra work together to tackle these?*

6. When commissioning reviews of evidence, how does Defra ensure a repeatable and critical assessment that uses methodology designed to minimise error and bias, such as that used routinely in health care?

Using Research

7. Who are Defra's main research partners and what do such partnerships bring to the work of Defra? What does Defra bring to the partnerships in terms of knowledge, policy context and financial investment?

8. How does Defra strike a balance between science inputs to the evidence base and inputs from other forms of evidence (such as opinion)?

Structure and Governance

9. Is Defra's structure too complex; does it allow for the best possible co-ordination and use of science within the Department? *The silo-based organisation of Defra has the potential to stymie the initiation and development of cross-cutting projects.*

10. How open is Defra currently to the use of peer-review for grant funding and contracts? *Mechanisms for engaging the scientific community with peer-review in this context could be explored.*

11. The role of the Defra Chief Scientific Adviser (CSA) in the Department's decision-making and policy-making, the degree of the post-holder's access to Ministers and the level of the research budget at their disposal.

12. The relationship between Defra and the devolved administrations including: the relationship between the Defra CSA and scientific advisors in devolved government; the relationship between Defra and environmental research institutes in the devolved nations (ie Institute of Grassland and Environmental Research and the Scottish Government Rural and Environment Research and Analysis Directorate (RERAD) research providers).

[17] Sutherland, W J *et al* (2008) Future novel threats and opportunities facing UK biodiversity identified by horizon scanning. Journal of Applied Ecology. http://www.blackwell-synergy.com/doi/pdf/10.1111/j.1365-2664.2008.01474.x

Policy-making

13. The relationship between the policy-making process in Defra and Government and overall UK science policy. *At which points in the policy making process is scientific advice sought? How and to what degree are Ministers able take account of scientific evidence? Is Defra's science framework sufficiently detached from political pressure and "spin"?*

14. How will the new Committee on Climate Change be supported by science and research and to what extent will Defra's Ministers be obliged to accept advice from the Committee?

Funding

15. Budget cuts and frequent re-organisation within Defra. *Nationally significant science projects and skilled teams of experts must be protected long-term, from the negative impacts of organisational change on national capacity and capability.*

16. Does Defra have an adequate science budget to fund the policy-relevant research that it needs, for example within its priority areas of climate change and the ecosystem approach?

March 2008

Memorandum submitted by Campaign for Science and Engineering

DEFRA'S SCIENCE CAPABILITIES

1. The Campaign for Science & Engineering (CaSE) is a pressure group aiming to improve the scientific and engineering health of the UK. Our objective is to communicate to Parliament and the nation as a whole the economic and cultural importance of science and engineering, and the vital need for its funding by government and industry. CaSE is supported by its members, which includes individuals, corporations, universities, research charities and learned and professional societies.

2. One of CaSE's five tests for the Government's science and engineering policies is the "proper funding of science in government ministries, and no political interference in handling scientific advice on contentious issues." CaSE welcomes parliamentary scrutiny of departmental science capabilities.

R&D Budget

3. Departmental R&D budgets are a good headline indicator of its science capability. The Sainsbury Review recommended that all government departments should invest and protect their R&D budgets (rec 8.4). The Committee should investigate Defra's R&D budget and if it has ring-fenced it. The Committee may also wish to investigate Defra's progress on implementing its evidence and innovation strategy. Defra agencies, such as the Central Science Laboratory and CEFAS, are critical to its science capabilities and should be included within the scope of the inquiry.

Independent Scientific Advice

4. The Committee may wish to investigate how well Defra's scientific advisory system is operating. Defra has been a leader in this area and now has a well established Chief Scientific Adviser position, a Scientific Advisory Council, and various specialist advisory committees. However, there has been concern over how Defra has dealt with scientific advice on controversial issues, such as badgers and bovine TB.

Support for Scientists and Engineers

5. The Committee may wish to investigate Defra's support for scientists and engineers within Defra and its links with the wider science and engineering community. This could include investigating Defra's support for secondments to bring external scientists and engineers into departments and get to civil servants into research organisations.

NDPBs

6. It is critical that the inquiry investigates the science capabilities of Defra's NDPBs (eg Natural England, Environment Agency). Defra's NDPBs should have sufficient R&D budgets, specialists and appropriate scientific advisory systems.

March 2008

Memorandum submitted by the Agricultural Industries Confederation

DEFRA SCIENCE: INVITATION TO HELP FRAME EFRA COMMITTEE INQUIRY

INTRODUCTION

This submission is made on behalf of the Agricultural Industries Confederation, representing approximately 300 companies involved in fertiliser manufacture and distribution; animal feed manufacture & distribution; arable crop marketing; seed and agrochemical distribution. The combined annual turnover of the membership is in the order of £6.5 billion.

SCIENCE INFRASTRUCTURE

We believe the Committee should investigate the science infrastructure, in particular the long term planning for that infrastructure and how different parts of the Department co-ordinate their work and scientific input.

We would ask that the Committee examines how co-ordination of a cohesive structure has been impacted through the splitting of functions, previously centrally managed, into executive agencies and the effectiveness of operational control being at arms' length from policy making. We would also ask that the effectiveness of stakeholder communication through this revised structure is also examined.

FUNDING

We would support a review of how funding priorities are determined and how they link back into the long term infrastructure planning.

The Committee may wish to examine the balance of funding in relation to environmental and production issues whilst at the next level down the balance between, for example, animal health and animal production.

OBJECTIVES

We would ask that the Committee considers Defra's core science objectives and investigates the feasibility and desirability of these objectives being met by all core research funding applications. For example not all core research into agronomic efficiency can be directly related to Defra's core objectives—we would argue there should be greater flexibility

With more than an eye to issues of food security the Committee might investigate how Defra's approach to science and R&D particularly, balances the demands for reduction of inputs such as fertilisers against continuing research into optimisation on application timing and their efficiency of use.

SCIENCE CAPABILITY

The ability/knowledge to make decisions regarding R&D funding is one area. But recent national cataclysms have also highlighted that Defra may not have the "science capability" to make the necessary decisions. Effective control or eradication of national epidemics within the livestock population being a case in point. The Committee could therefore consider how Defra might make best use of available expertise, not necessarily on a full-time basis, but through a system of expert contact points. The Committee might investigate whether such an approach delivers a consistency by utilising expertise from a wider science base which has been gathered over a longer period of time.

March 2008

Memorandum submitted by the British Trust for Ornithology

The British Trust for Ornithology (BTO) is the UK's leading independent ornithological research organisation and provides impartial independent scientific information to government and a range of commercial and non-government organisations. We use evidence-based knowledge to inform government about the impacts of environmental and land-use change on biodiversity.

The BTO has worked closely with Defra, particularly with respect to understanding bird populations declines (including the PSA farmland bird target) and the impacts of agricultural practices, climate change and avian influenza, and welcomes the opportunity to suggest areas that EFRA Committee might want to consider as part of its inquiry into Defra's science capability. Here we suggest two key areas.

(a) Defra's funding strategy for the maintenance of important nationwide long-term monitoring and surveillance of the natural enviroment; and

(b) the process by which it is possible to contribute urgently needed scientific advice to Defra.

(a) Funding of long-term monitoring and surveillance. Many of the key issues facing the sustainable use of the environment are being affected by large-scale, long-term changes due to population growth, climate change and associated socio-economic factors. The analyses of a number of key long-term monitoring programmes has proved of pivotal importance in understanding the impact of such changes and in

distinguishing them from short-term, random fluctuations (or noise). There have been a number of initiatives to collate information on these datasets and organisations such as the Ecological Continuity Trust has been set up to promote the value of and support for such datasets. This is an area of utmost importance to Defra, especially within the context of the Living With Environmental Change Programme, and it would be important to explore how Defra plans to identify key environmental monitoring and surveillance programmes, to assess the security with which such data are collated, maintained and made available, and, most importantly, to ensure funding security for key programmes should existing funding streams cease.

(b) Rapid advice delivery. In cases of urgent national environmental emergency, Defra often needs the extremely rapid provision of advice from a range of experts. Examples include the recent cases of Avian Influenza where, at Defra's request, ornithological experts from the BTO undertook surveys and analyses of existing data within hours of an outbreak being confirmed. As Defra requires extremely rapid emergency advice provision to inform its response, a review of how Defra can ensure that such foreseeable advice is readily available is important. The current system in place for Avian Influenza works well, but places extreme pressure on the resources of the organsations Defra works with, and at short notice. A more planned approach to the provision of such advice would benefit Defra and would secure the provision of this advice in the long-term.

March 2008

Memorandum submitted by the Agricultural Biotechnology Council

abc welcomes the opportunity to comment on the scope of the Environment, Food, and Rural Affairs Committee inquiry into the science capability of DEFRA and its agencies.

Introduction

1.0 abc is the umbrella group for the agricultural biotechnology industry in the UK. Our goal is to provide factual information about the agricultural use of genetically modified (GM) technology in the UK, based on respect for public interest, opinions and concerns. Our members are drawn from the six leading agribusiness companies in the world—BASF, Bayer CropScience, Dow AgroSciences, DuPont (Pioneer), Monsanto and Syngenta.

Background

2.0 With the lowest grain stocks for decades and food prices steadily increasing around the world, and UN predictions for steady increases for at least the next two years, many commentators believe we are on the cusp of a new era of basic foodstuff price inflation and volatility.

2.1 The drivers for this situation—global population growth, high oil prices and a push for biofuels, increasing wealth and demand for resources in the emerging economies of China and India will not diminish.

2.2 The increasing number of mouths to feed—200,000 new mouths a day—is also putting pressure on remaining land and water resources, but in addition, further pressure on the environment is coming from climate change.

2.3 To help tackle the projected demand for food and fuel basic grain production will have to increase by an estimated 2.5% per year for the next 40 years. Agricultural R&D will have to provide the impetus for this increase, as it has in the past. However, UK government funding of appropriate agronomy focused R&D in agriculture has been heavily cut back.

Suggested Areas to Examine

3.1 Against this background abc believe the Committee should examine DEFRA research in the following areas:

— *Academic research in the plant sciences.* Plant science research that has an impact on driving forward crop yields, improving crops ability to tolerate stress such as drought, salinity and aluminium toxicity. What applied research is being conducted in developing innovative agronomic advances in crop production?

— *The environmental footprint of agriculture and its impact on the food chain.* Biotechnology offers many advantages in reducing the carbon footprint of modern agriculture—this should be actively being investigated within the UK. Biotechnology driven agronomic practice offers huge advantages into reducing the environmental impact of agriculture.

— *First and second generation biofuel generation in the UK.* Biotechnology can offer many advantages in the production of biofuels, particularly second generation biofuel production. How actively is this being researched in the UK?

March 2008

Memorandum submitted by the Economic and Social Research Council (ESRC)

1. The ESRC welcomes the Committee's new inquiry and the opportunity to comment on its scope.

2. The Council hopes that the Committee will consider, as a central part of its inquiry, Defra's engagement with, and use of social science research, given the central importance of bringing together economic, social and environmental concerns to Defra's mission. Strengthening Defra's social science capabilities and use of social science evidence was a key recommendation (rec 2) in the Office of Science and Innovation's 2005–06 Science Review of Defra. The ESRC also welcomes the recent report (November 2007) and recommendations of the Defra Science Advisory Council on Social Research in Defra. The Committee may wish to consider how Defra might build upon recent progress to further develop its strategy for strengthening its capabilities in the social sciences.

3. The ESRC welcomes the steps taken by Defra to enhance the number and range of social scientists within the Department and also to enhance knowledge exchange with the social science research community through, for example, collaboration in ESRC's Placement Fellowships, collaborative studentships schemes and public policy seminars. The Committee may wish to consider the potential to learn lessons from this and to further develop such activities in the future. A recent report by the Environmental Research Funders Forum (2007) on Using Research to Inform Policy: the Role of Interpretation makes a number of recommendations which could be considered in enhancing the potential for research to inform Defra's policy-making processes (http://www.erff.org.uk).

4. The Committee may wish to consider how Defra could strengthen its links with existing and new Research Council initiatives in areas central to its mission, such as the recently announced ESRC Centre on Climate Change Economics and Policy at the LSE and University of Leeds and ESRC Climate Change leadership fellowships, to ensure optimum arrangements are in place for knowledge exchange and utilisation of research outcomes.

5. In terms of collaborative research, Defra has made an important contribution to the Research Councils' inter-disciplinary Rural Economy and Land Use (RELU) Programme and the Committee may wish to consider the potential lessons and good practice which can be learnt from RELU for future collaborative research activities. The ESRC also welcomes the recently announced partnership between Defra, the ESRC, the Environment Agency and the three UK Devolved Administrations to commission a new joint independent Research Centre on Sustainable Behaviours and also the joint commissioning by Defra, EPSRC, ESRC and NERC of a centre of excellence on natural and environmental risks, both of which might provide useful models for future collaboration.

6. The new Living with Environmental Change (LWEC) Programme (http://www.nerc.ac.uk/research/programmes/lwec/) provides an important new opportunity for Defra and its agencies to engage in collaborative research with the Research Councils and other funders of environmental research to adress the new inter-disciplinary research challenges which are raised by Defra's mission and strategy. We would encourage the Committee to consider how Defra might exploit the new opportunities offered by LWEC, alongside existing collaborative fora including the Environmental Research Funders Forum (ERFF), to further develop its research strategy in co-ordination with other research funders.

March 2008

Memorandum submitted by Hilary Burrage MSC, BSc (Hons) PGCE

From my perspective as an Independent Consultant in strategic policy, I would like to suggest that the EFRA Review include in its remit a consideration of the issues of STAKEHOLDING, ENGAGEMENT and SOCIAL CONTEXT. These notions are in my view critical to obtaining maximum value from the work of Defra, as an arm of Government taking forward scientific and political understandings as the basis of (ideally, and where possible, evidence-based) policy.

I would also suggest that there be a focus in the review on the connection/s between different aspects of the Defra operation, such as Communications, Policy, Science and, more recently, Social Enterprise; but I understand that these inter-connections may already have been discussed elsewhere and so I will not elaborate on this theme.

Stakeholding, Engagement and Social Context are however terms which are widely used, but with such variation in intended meaning that they often currently add only a little value to discussion and effective policy development.

The most limited view of Stakeholding (etc) is that it involves only those who are directly linked in a scientific programme; the direct financial arrangements are the defining limits of the exercise. This position is, when it occurs, both a very serious constraint on the scientific insights to be gained from research, and also quite possibly a potential loss in respect of the value of the programme for policy development.

Politics and the art of Government can of course only be conducted within the parameters of the possible. It follows that a view, right at the beginning of any research or programme development, on who ultimately has a Stakehold, Engagement or other interest in given matters of intended action or concern, is crucial. (The SAC Social Research document gives some illuminating examples of where a limited initial perspective did not help Defra to add ultimate value.)

The time when Government policy could be "done unto" people is past (if it ever existed), and senior policy makers are very conscious that wide ownership and publicly evident good reasoning is critical to decisions about where to focus and what to do. This perspective has not in my experience always as yet been at the forefront of thinking about priorities and feasible ways forward in Defra.

There is much very excellent scientific research and other endeavour being conducted by Defra and its partners. It is possible that even more value would derive in policy and delivery terms from this excellent work, if there were a more embedded understanding across the Department (and also between Government Departments) of the implications in their widest senses of Stakeholding and Engagement.

The issues which face Defra are universal; and so as we all recognise must be the contexts in which it places its policy development and delivery.

I would be happy to elaborate on any aspect of this commentary which you might wish to develop further.

March 2008

Memorandum submitted by the Environment Agency

INTRODUCTION

The Environment Agency welcomes this opportunity to input into the framing of the EFRA Committee inquiry on Defra Science. We recommend the following areas for investigation:

1. Success of delivery of Defra's Evidence and Innovation Strategy.
2. Ways of working with other UK science funders.
3. Success of collaboration on science within the Defra Network.
4. Integration of policy and reviews into science objectives and plans.
5. Implementation of Defra Capability Review.

1. *Delivery of Evidence and Innovation Strategy 2005–08*

The Committee should consider the extent that the evidence element of the strategy has delivered on its ambitions for the environmental evidence base. For example, has it delivered requirements to support UK and international policy?

With regard to the innovation element, the Committee should address the extent that it is driving the "innovation for the environment" agenda. In particular, how well does it work with other innovation drivers such as the Technology Strategy Board?

2. *Ways of working with other UK Science Funders*

The Committee should consider how Defra ensures efficient delivery and coordinates its work with other funders of environmental science. For example, how well does Defra work with Research Councils in the UK as main contributors to the research funding base?

Defra, the EA and other members of the Defra Network contribute to the Environmental Research Funders Forum and to various projects and programmes. However there is no overall strategy. What steps Defra is taking to drive cohesion?

The Committee should also consider how Defra connects with the third sector in the delivery of sound science with high public interest, for example on climate change.

3. *Collaboration within the Defra Network*

The Committee should examine how Defra operates as a parenting body to deliver a joined up science agenda, covering successes and areas for development.

Areas to consider:

— How Defra operates as a parent body in working with agencies on specific projects.

— Defra and its agencies have different approaches to peer review and evidence based decision-making. What are the implications for how the quality of science is assessed?

— How can communications across the Defra network work better to meet the expectations of operating authorities?

— How can the outcomes and wider benefits of science be realised across the Defra network?

4. *Integration of policy and reviews into science objectives and plans*

The Committee should examine how changes in policy and the outputs of reviews are integrated into the planning and implementation of science within Defra teams and agencies.

5. *Implementation of Defra Capability Review*

The successful implementation of the current Defra Capability review is key to facing the challenges of the future. The Committee should investigate how Defra intends to apply the recommendations of this review and what the future map of environmental science capability in the UK will look like.

How the Review will improve lines of communication across the Defra Network and other funders of science is also key.

CONCLUSION

Clarity of delivery and the implications of the Defra Capability Review are key issues of interest. We recommend that the inquiry has a strong forward looking element, considering how robust Defra and its agencies will be in working together to meet the science challenges of the future.

March 2008

Letter from the Chief Scientific Adviser, Professor Robert T Watson, to Rt Hon Michael Jack, Chair, EFRA Select Committee

Thank you for the session on 17 March which discussed Defra's Evidence Investment Strategy. I found the seminar-style approach a useful format for exploring the range of issues raised by the Committee, the panel and the audience.

As agreed, I attach responses to those questions which we did not have time to answer at the session. As we are now in the election period I have kept the language as neutral as possible.

Professor Robert Watson

12 April 2010

DEFRA'S RESPONSES TO QUESTIONS OUTSTANDING FROM THE SEMINAR ON DEFRA SCIENCE, 17 MARCH 2010

STRATEGIC AND INVESTMENT PRIORITIES

From: *Miss Gurpreet Padda, Policy Adviser, Common Fisheries Policy, Defra*

Given the forthcoming budgetary constraints is it prudent to be issuing a new science strategy when we aren't clear about where funding will be coming from? I'm unsure whether we can make evidence based decision making when the people collecting and compiling the evidence are dwindling as a result of the above.

It is always important to review the Department's policy needs and decide on what our priorities are (page 28 of the strategy). This prioritisation can be adapted to changing circumstances and budgets. The strategy includes consideration of developing and organising the right skills, expertise and capabilities and identifying external expertise we can draw on. Defra also works with other departments and the Research Councils to identify and fund the research required for evidence-based policy-making.

From: *Professor Bill Reilly, President, British Veterinary Association*

It has been noted by the British Veterinary Association that whilst Defra's R&D budget has remained fairly constant over the last few years the proportion allocated to animal health and welfare has been substantially cut. With reduced investment into government research laboratories, how well prepared is the Defra for future disease outbreaks?

It is the case that there has been a decline in the overall annual investment expenditure on research and development on animal health and welfare topics. This has been a consequence of the re-ordering of priorities across the wide range of business undertaken by Defra and the rationale for doing so has been set out in some detail in the Evidence Investment Strategy which was published earlier this year www.defra.gov.uk/evidence/science/how/strategy.htm

From: *Professor George Marshall, Assistant Principal, Scottish Agricultural College*

(a) *How does Defra propose to work with the Research Councils and other major research funders in the UK to produce a strategically coherent approach to address the major challenges that face agriculture, food security and the environment?*

Defra works with the major UK research funders, including the Research Councils at a strategic level to produce an approach to address these challenges through its membership of and participation in the Environmental Research Funders Forum, the Living with Environmental Change Programme and more specifically in the development of the new BBSRC-led joint Research Council and government department programme on Global Food Security.

(b) *How does Defra propose to structure its research funding to introduce greater flexibility in contract arrangements to gain maximum advantage from EU funding opportunities?*

Defra can maximise the benefits from EU research funding through influencing the development of the annual work programmes in FP7 and benefit from the added-value of projects funded by the Community. EU funding also provides benefits by supporting the coordination of national research programmes through mechanisms such as the ERA-NETs. Defra is active in such networks.

(c) *How will Defra make sure that the success of the LINK research programmes is at least maintained in the new arrangements through TSB across all sectors including livestock?*

LINK Programmes were run under the auspices of the former DTI. The Technology Strategy Board (TSB) is the successor to DTI in the role of supporting collaborative research and development and exploitation of technology and innovation for the benefit of UK businesses. The TSB's collaborative funding is designed, as was LINK to be "business support", with proposals responding to requirements or challenges identified by the industry. Industry can submit proposals to the competitions announced, with an appropriate business case and research contractors, and may be able to build on previous LINK successes. The first call, on crop protection, is in progress and will provide experience on how future calls, including those relevant to livestock, will operate.

Food Science

From: *Mr Wyndham Rogers-Coltman, OBE*

In the same way that science has a major role to play in alleviating the effects of climate change so it has a major role to play in assuring the sustainability and affordability of food supplies. Would Defra agree with me that the development of new husbandry techniques and food producing plants and animals which require less water, are more resistant to disease and are more productive, whilst requiring less inputs of chemicals and fertilisers, is essential to the survival of the human race and the environment in which we live? If they do agree with me, will they ensure that increased freedom is given to scientists in their work in developing such scientific advances and that, where the work is to the national benefit, financial support is made available to ensure that the work can be carried out?

New husbandry techniques and food producing plants and animals which require less water, are more resistant to disease and are more productive, whilst requiring less inputs of chemicals and fertilisers, are essential for long-term environmental, social and economic sustainability. A significant amount of research is already being conducted in these areas, and the recently released UK Cross-Government Food Research and Innovation Strategy addresses these issues. The academic community has the freedom to follow whatever lines of research are interesting and likely to succeed—subject to availability of funds and success in the peer-review of their proposals.

From: *Jill Sanders*

I would like to ask the Committee if it would be prepared to conduct an assessment of the value of the contribution gardeners make to the food supply? This could be conducted through both individuals and allotment societies, where those participating could engage plot holders and review crops and methods. It would be valuable to have some idea of how much this kind of local production might meet the need for supplying food to families.

The question of a further assessment is for the Committee to respond to however, Defra has done some work in this area as described below.

Defra's Family Food report[18] provides an estimate of the contribution gardeners make to the food supply. According to this report average amounts of fresh fruit and fresh vegetables entering the household per week in 2008 were estimated at 790 and 1,294 grams per person per week. In further analysing the data it is possible to determine that 2.4% of fruit and 3.3% of vegetables were home grown either in a garden or allotment.

[18] Defra's Family Food report is based on the Family Food Module of the Living Costs and Food Survey which was previously called the Expenditure and Food Survey. It is an annual voluntary sample survey of private households. Each individual aged over 7 in the household keeps a diary of daily expenditure for two weeks. Free food entering the household is also recorded on the diaries. Information gathered on food purchase includes food brought home, takeaway meals eaten at home and food consumed away from home with a very detailed breakdown of food expenditure.

Food security has various dimensions, including global availability / markets and global resources sustainability (see the UK Food Security Assessment: http://defraweb/foodfarm/food/pdf/food-assess100105.pdf). The EFRA committee report "Securing food supplies up to 2050: the challenges faced by the UK" stated that iIn terms of overall production, the trends of increasing enthusiasm among consumers for buying food that is local to a particular area of the UK, and also for growing their own food "are a small contribution to a huge challenge, but they are a way of reconnecting people with food production and have an important part to play in encouraging the sort of changes in consumer behaviour that will be necessary for a sustainable system of food production."

From: *Molly Conisbee, Campaigns and Communications Director, Soil Association*

In the light of the findings of the IAASTD report, published in 2008, and chaired by Professor Watson, what plans do DEFRA have for funding research into agro-ecological farming systems, which have historically fared rather badly in comparison to biotech funding?

The need to produce food whilst responding to the challenge of maintaining ecosystem services and biodiversity and the need for research to support this was recognised in the UK Cross-Government Food Research and Innovation strategy,[19] published in January 2010.

Agro-ecological systems research is funded through Defra's Sustainable Farming Systems and Biodiversity programme and currently focuses on developing solutions to trade-offs and conflicts, within the farming system as a whole and provides evidence to reduce the negative environmental footprint of agriculture and enhance the environment and biodiversity associated with farmland, within a sustainable farming context. This includes the development of improved varieties or breeds with better characteristics which are important to developing farming systems in tackling environmental and climate change concerns.

Defra's remit encompasses applied strategic and applied specific research. The Biotechnology and Biological Sciences Research Council (BBSRC) leads on basic biotechnology research in relation to the food system.

Non-native Species

11. *From: Dr Neil McRoberts, Reader in Systems Ecology, Systems Analysis Team Leader, Land Economy & Environment Research Group, SAC*

Why is an error-ridden UK non-native species risk assessment scheme still being used as the basis of UK non-native risk assessment, and still publicly available for downloading from the non-native species risk assessment panel web pages, when both Defra and the scientists responsible for developing the methodology have been informed of its serious technical faults and that it cannot provide transparent, meaningful evidence of invasive risk or potential economic impact?

The GB (formerly UK) Non-native Species Risk Assessment Scheme has been under development since 2004. In its original version (dated 2005) several approaches were proposed to demonstrate the overall risk posed by a species. These included an approach described as 'conditional probability'. We believe that this is the part of the scheme that Dr McRoberts is referring to in his question.

To ensure the scheme was robust it was peer reviewed through a research project in 2006 and the recommendations from this project were implemented in a second project that concluded in 2008. This latter project resulted in an upgrading of the scheme in conjunction with EPPO[20] and the conditional probability calculation was completely removed from the new scheme. It is this new scheme that is now being used by all risk assessors completing risk assessments as part of the GB Non-native Species Risk Analysis Mechanism. The scheme closely follows the EPPO plant health scheme, which is recognised throughout Europe.

It must be stressed that the conditional probability approach was a minor component of the scheme which has not been used in practice and was in no way the basis on which risk was presented. It should also be noted that each risk assessment is peer reviewed by an independent expert and then scrutinised by a panel of risk assessment experts until the panel deems it fit-for-purpose. All risk assessments are then published on the website of the GB Non-native Species Secretariat[21] for public comment for a three-month period and all relevant comments are sent to the risk assessor to address.

The out of date manual has now been removed from the internet pages to avoid confusion. Defra is developing new guidance for risk assessors to replace this manual.

[19] http://www.bis.gov.uk/assets/biscore/goscience/c/cross-government-food-research-strategy.pdf

[20] EPPO is the European and Mediterranean Plant Protection Organisation, whose risk assessment methodology provides the basis of the GB Scheme. EPPO risk assessments are internationally recognised documents and are, for example, accepted by the World Trade Organisation as a valid basis for imposing restrictions on imports. www.eppo.org

[21] www.nonnativespecies.org

FUNGHI

From: *Dr David W. Minter, President, European Mycological Association*

Fungi are not animals or plants, but belong in their own totally separate biological kingdom. Their importance in providing ecosystem services is enormous, and therefore they are major factors impacting on climate change, food security and other environmental issues. A recent House of Lords select committee identified mycology, the scientific discipline for fungi, as being the most endangered area of taxonomy (50% of the very few remaining British systematic mycologists reach retirement age within the next two years). Defra's Evidence Investment Strategy 2010-2013 contains no reference to fungi.

Has Defra's Evidence Investment Strategy 2010-2013 overlooked the fungi?

We recognise that fungi are important for ecosystems services, climate change and food security and although Defra does not have an individual programme on fungi (which is why it is not considered specifically in the Strategy) programmes such as the Rural Development Programme for England include work on the association of mycorrhizal fungi with key plants in species-rich grassland.

GENERAL

From: *Mark Yoxon, Liaison Officer, Environment, Communications & Systems Department, MCT Faculty, Open University*

(A) *How can we make research outcomes relevant and accessible to groups whose modus operandi puts them in direct contact with citizens so they can be effective agents of change?*

Context: Building from our own partnership working, we feel wider communication issues are paramount. For example, making research accessible to groups who might not have the capacity to assimilate direct research outcomes into their day to day working but do have requirements to absorb research outcomes into their modus operandi. Often such groups are at the sharp end of implementation, in direct contact with citizens and so are important agents of change.

Defra agrees that making research outcomes accessible to intermediaries who work directly with those the Department is trying to reach is important and Defra does this in a number of ways ranging from involvement on research steering groups through to development of tools which help organisations work with aspects of our evidence base. For example intermediaries are very important in working with farmers. In terms of climate change key people are involved in the research as it progresses (so they can help steer the research). One Defra project looking at climate change mitigation for agriculture has groups such as DairyCo and the umbrella body for farm advisors on the steering group. Linked to this research the Department is reviewing / mapping advice provision.

Developing an evidence base that is accessible to other organisations is key to the work of the Sustainable Behaviours Unit (SBU) in Defra. The programme of work provides a broad understanding of current behaviours, how to influence behaviour to more pro-environmental actions, the motivations and barriers to change and what will best achieve change at a household level. Research also includes piloting and testing innovative approaches to encourage pro-environmental behaviour through a programme of Action Based Research, small-scale piloting and through the Greener Living Fund (a third sector grant funding programme). Developing an evidence base that is accessible to other organisations is key to the work, for example, external stakeholders are often part of project steering groups or invited to dissemination events. SBU has developed tools to help other organisations work with aspects of the evidence base, for example toolkits for both qualitative and quantitative research to recruit to the Defra segmentation models.

(B) *What wider UK mechanisms can Defra encourage to foster linkages across research agencies to extend the reach of applied research carried out by higher education research institutions?*

Context: Although encouraged, by for example Defra, communication across research agencies is not always adequate. For example we know of waste managers in local authorities who had telephone calls across a week or so from different research agencies, all of whom wanted their time and input into several separate but linked projects. Other than those projects with direct relevance to the funded research it is often challenging and beyond the scope for a single research group to coordinate a wider and often diverse set of research activities.

Defra is a member of and works in partnership with programmes such as Environmental Research Funders Forum (ERFF) and Living with Environmental Change (LWEC), as well as working with the research councils. These partnerships promote co-operative working and knowledge sharing including across research agencies.

From: *Richard Bruce*

As stated recently by a wise scientist specialising in physics and the universe there are no absolutely proven laws of physics because science is always evolving. I would add that in chemistry science is still discovering new properties even for water, the most abundant material on the planet. I would therefore suggest that there is no such thing as "Sound Science" because science is continuously evolving and it is positively dangerous to suggest that current scientists know all that there is to know, or that their opinions are wholly reliable in the decision making process. "Scientists prove that scientists disprove what scientists prove". Worse than this, too many

scientists depend on theory and wrongly dismiss evidence that fails to fit that theory. They are often well rewarded for such attitudes by industry. This I would suggest is extremely dangerous. Some of our greatest inventions, and much of the scientific knowledge base, has been provided by people outside of the scientific community with no formal scientific training. Sadly, despite the value of their knowledge to mankind, they were often destroyed by the scientific establishment.

Scientific knowledge is always evolving—that is the nature of scientific inquiry. "Sound Science" does not mean that scientists know all that there is to know. It includes informing policymakers what is known, what is not known, what the key uncertainties are, and what the implications of uncertainty are for policy formulation and implementation. Many scientists depend on theory and wrongly dismiss evidence that fails to fit that theory. A good scientist will examine both the evidence, which can be wrong, and the theory, which can be wrong.

From: *Lynne Jones MP*

(1) *Should you have taken a backwards look to see whether there have been capabilities lost through the short-term decisions?*

Previous decisions on investment in research and development were made with the best information at the time, recognizing budgetary limitations. A decline in one budget does not necessarily mean a fall in research funding overall: whilst the Defra evidence budget declined, the budget for agricultural research in BBSRC increased significantly. Therefore, close coordination and collaboration among Government Departments and Research Councils is essential when making decisions that impact on an overall UK capability.

(2) *Are there any capabilities that ought to be reconsidered and what are the implications for the future?*

As part of the department's prioritisation exercises, individual programmes have been assessed (see page 28, Table 2*).

(3) *Is Advocating greater risk wise when you will possibly be in a financially constrained situation?*

The strategy does not advocate taking greater risks.

* Defra's Evidence Investment Strategy: 2010–13 and beyond.

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