

## DINNER/DISCUSSION SUMMARY

Achieving food security in the face of climate change – the CCAFS<sup>1</sup> Commission Report

Held at The Royal Society on 23<sup>rd</sup> May, 2012

The Foundation is grateful for the support for this meeting from  
The Department for Environment, Food and Rural Affairs, Lloyd's Register and The Michael John Trust

- Chair:** **The Earl of Selborne GBE FRS**  
Chairman, The Foundation for Science and Technology
- Speakers:** **Sir John Beddington CMG FRS FRSE**  
Government Chief Scientific Adviser, Government Office for Science  
**Dr Peter Holmgren**  
Director, Environment, Climate Change and Bioenergy Division,  
Food and Agriculture Organisation of the United Nations  
**Professor Tim Wheeler**  
Deputy Chief Scientific Adviser, Department for International Development
- Panellist:** **Sir Robert Watson CMG FRS**  
Chief Scientific Adviser, Department for Environment, Food and Rural Affairs

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SIR JOHN BEDDINGTON reminded the meeting of the five challenges set out in the 2011 Food and Farming Report of the Foresight Group at the Government Office for Science:

- Balancing future demand and supply sustainably;
- addressing the threat of future volatility in the food system;
- ending hunger;
- meeting the challenges of a low emissions world and;
- maintaining biodiversity and ecosystem services while feeding the world.

He gave examples of the positive impact achieved by this report and of the wide range of follow-up actions already in train. He saw the seven key recommendations made in the Commission's report as consistent with Foresight and welcomed the fact that food security would feature prominently in the agendas of the various international meetings scheduled for 2012 (G20, Rio+20 Earth Summit and COP18 in Qatar). The Commission argued that the global community needed to operate within three limits: the quantity of food which could be produced under a given climate, the quantity of food needed by a growing and changing population and the effect of food production on the climate. At present the planet was operating outside those limits and current estimates of population growth indicated

that it would still be doing so in 2050 with potentially catastrophic effects. There was no single "cunning plan" which would help. What was needed was a range of interventions all coherently contributing towards the objective of bringing the planet within a "safe" balance between these three limits.

DR PETER HOLMGREN said that agriculture had always succeeded in adapting to climate change but it was also potentially a major contributor to that change; 30 per cent of greenhouse gas emissions came from agricultural land use. Any discussion of agricultural sustainability needed also to take account of agriculture's role in non-food products and services (for example energy derived from agriculture was a major contributor to the world's energy needs) and also of the part played by social and economic factors in addition to environmental factors in achieving sustainability (one in seven people were undernourished and more than half of those depended on agriculture for their livelihoods). Although high level international and intergovernmental interventions had a part to play in dealing with the challenges identified in the Commission's report and the Foresight report, the biggest and most important contribution could be made by "climate-smart" agriculture (i.e. maximise the net beneficial impact of land-use on climate change – a mixture of mitigation and reduced adverse effects). The scale and success of that contribution depended on many factors outside the

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<sup>1</sup> CGIAR Research Programme on Climate Change, Agriculture and Food Security (CCAFS)

control of the farming community – factors such as the availability of fair and equitable finance, research, extension services to ensure the application of the output of that research, the buying and eating habits of consumers, infrastructure, and trade policies. Such a broad and heterogeneous canvas presented major challenges for ensuring effective implementation of the Commission's recommendations and for measuring and evaluating the success of interventions. He believed that there were three key metrics: (a) farm incomes, (b) the amount of biomass and organic matter in the landscape and (c) the amount of non-renewable energy per unit of output. He underlined the crucial role which a reduction of loss and waste could play both on the land and beyond the farm gates, pointing out that 80 per cent of energy consumed by the food production and distribution system resulted from activities beyond the farm gates. He said that the FAO message to the Rio+20 Earth Summit was the need for the elimination of hunger and the promotion of better nutrition, the need for sustainable production systems and the need for more inclusive and more effective governance of agriculture and food systems. He saw the Commission's report as consistent with that message.

PROFESSOR TIM WHEELER focussed on the appropriate response of decision makers to imperfect knowledge and uncertainty, the need to be clear about what worked and what did not and the need for good information systems and data. On the first of these he instanced the world map in the Commission report (figure 6 on page 12) showing the projected changes in agricultural production in 2080 due to climate change. The data depicted in that map in fact were arguably hugely uncertain. Yet they still conveyed some robust messages which could reasonably be used as a basis for valuable policy decisions; inaction should be justified only by smallness of risk and not by uncertainty. On the second point, he underlined the importance of good monitoring and evaluation of interventions. On the third point, he advised caution about data collection systems and provided as an illustration a case where the subjective perception of a group of farmers in a part of Africa about climate change differed markedly from the objective evidence about the climate in that part of Africa. It was important to remember that the behaviour of farmers was likely to be more influenced by their perception than by objective data. As a concluding thought he suggested that, although setting the right priorities was important for decision makers, a bigger issue was a proper assessment of the trade-offs between conflicting objectives. He congratulated the Commission for having produced a report which provided a good bridge between assessment and analysis of evidence on the one hand and delivery and implementation on the other.

In the subsequent discussion periods before and after dinner the three speakers were joined by SIR ROBERT WATSON. His key messages were first, food security for all is attainable but not with current farming practices and, secondly, that more capacity building in rural areas in developing countries was vital.

In the discussion periods there was no disagreement with the essential thrust of the Commission report. Points raised by speakers tended to focus on how to ensure positive results in the pursuit of the seven key recommendations, given the wide scope of those recommendations and the huge variety of organisations and individuals with a role to play. Members of the panel of speakers made it plain that the urgency of dealing with the issues identified was such that reliance could not be placed on technological advances as the sole solution. It would be at least 20 years before new research conducted now would be able to make any real impact. And new research would be needed to provide solutions to the challenges created by a world affected by the level of climate change currently predicted for the future (for example plants able to tolerate high temperatures and water shortage). However the panel saw great scope for positive and speedier benefits derived from the application of current scientific knowledge to increase food production, from investment in rural development and infrastructure, from the reduction of loss and waste and from innovations in the financial sector to increase the flow of funds to support agriculture and the food system.

Several speakers commented on the political obstacles to progress, especially in relation to the wider acceptance by EU member states of Genetic Modification (GM) of crops and to the elimination of subsidies and other barriers to efficient agricultural trade. It was suggested that the scientific community could do more to help educate the wider public to the benefits for consumers from greater use of GM; the present public perception tended to see GM as providing benefits only for big business at the expense of the general public. A particular problem which many identified was the readiness of some Governments (especially in France and Germany) to base decisions on the need to achieve zero risk rather than on a rational assessment of risk and benefit.

A topic raised by a number of speakers was the perceived competition for land use between those seeking an increase in food production, those seeking to preserve forests as a means of dealing with the problem of carbon emissions and those seeking non-fossil fuel sources of energy. All members of the panel believed these perceptions to be largely misplaced and that the trade-offs between different objectives could be resolved

satisfactorily, especially if adequate steps were taken to increase food availability and not just food production. In any event food was always likely to be the economically most attractive product for farmers unless, as in the USA, national security considerations intervened with large subsidies to encourage such crops as maize for the production of ethanol.

One speaker wondered whether the promotion of migration should form part of the answer to achieving food security in the face of climate change. This prompted others to point to the problems likely to arise from the massive migration already occurring from rural to urban areas in many countries (possibly one thousand new cities the size of Edinburgh in the next 15 years would be needed in Africa) and also to a number of other disadvantages of such a course of action (see the 2011 Foresight Group report on Migration).

There was some discussion about the contribution which social scientists could make to the issues under debate. It was pointed out that social scientists had contributed to the work of the Foresight Group Food and Farming report and that behavioural patterns were an important element in achieving the outcomes sought in the Commission report, especially in connection with demand side matters. But the fact that the public was wary about being manipulated meant that the contribution of social science needed to be carefully handled.

A question was asked about aquaculture and fisheries. The increasing acidification of the oceans was seen a real problem for the future of "wild" fish and that there would be a switch from "hunting" to "husbandry" in the sourcing of fish as a food stuff. In addition present systems of aquaculture and the reliance of aquaculture on animal based feeding needed to be changed in the interests of reducing the adverse effects of aquaculture on the environment.

The final messages from the panel were that farming practices had to change if food security for the world population was to be achieved, that "smart agriculture" was the answer, that the evidence to support the need for urgent action was now available so implementation and delivery should now proceed and that, even if we did not yet have all the right answers (continued scepticism and criticism were crucial), the right questions had now been posed.

Sir John Caines KCB

#### Useful web links:

Arts and Humanities Research Council  
[www.ahrc.ac.uk](http://www.ahrc.ac.uk)

Biotechnology and Biological Sciences Research Council  
[www.bbsrc.ac.uk](http://www.bbsrc.ac.uk)

Economic and Social Research Council  
[www.esrc.ac.uk](http://www.esrc.ac.uk)

Engineering and Physical Sciences Research Council  
[www.epsrc.ac.uk](http://www.epsrc.ac.uk)

The Future of Food and Farming Foresight Report  
[www.bis.gov.uk/assets/foresight/docs/food-and-farming/11-546-future-of-food-and-farming-report.pdf](http://www.bis.gov.uk/assets/foresight/docs/food-and-farming/11-546-future-of-food-and-farming-report.pdf)

[www.bis.gov.uk/assets/goscience/docs/u/11-975-uk-cross-government-strategy-for-food-research-and-innovation-progress-report-2011](http://www.bis.gov.uk/assets/goscience/docs/u/11-975-uk-cross-government-strategy-for-food-research-and-innovation-progress-report-2011)

The Commission on Sustainable Agriculture and Climate Change  
<http://ccafs.cgiar.org/commission/>

Department for Environment, Food and Rural Affairs  
[www.defra.gov.uk](http://www.defra.gov.uk)

Department for International Development  
[www.dfid.gov.uk](http://www.dfid.gov.uk)

Food and Agriculture Organisation of the United Nations  
[www.fao.org](http://www.fao.org)

Foreign and Commonwealth Office  
[www.fco.gov.uk](http://www.fco.gov.uk)

The Foundation for Science and Technology  
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Government Office for Science  
[www.bis.gov.uk/go-science](http://www.bis.gov.uk/go-science)

Medical Research Council  
[www.mrc.ac.uk](http://www.mrc.ac.uk)

National Farmers Union  
[www.nfuonline.com](http://www.nfuonline.com)

Natural Environment Research Council  
[www.nerc.ac.uk](http://www.nerc.ac.uk)

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## ROUND-TABLE DISCUSSION

Achieving food security in the face of climate change – the CCAFS<sup>2</sup> Commission Report

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**Dr Peter Holmgren**  
Director, Environment, Climate Change and Bioenergy Division,  
Food and Agriculture Organisation of the United Nations

SIR JOHN BEDDINGTON set the context for the Commission's report. By 2050 world population would have risen to 9 billion. Food prices had risen sharply in recent years and continued price volatility was likely in the future. Migration from the land to the cities would continue apace; one thousand new cities the size of Edinburgh would be needed within the next 15 years in Africa. There were significant risks of failed states and social upheaval if urgent steps were not taken to increase food supply, reduce poverty and eliminate hunger - Africa was a major problem area. But, at the same time those steps needed to ensure that agriculture not only did not increase the risks of adverse climate change but actually contributed to the reduction of those risks. Agricultural practices needed to change so that it became "climate-smart". Research and application of that research into genetically modified (GM) crops needed to be pressed forward. There would be increased pressure on supplies of water but fortunately recent research indicated that there was greater availability of ground water in Africa than had previously been thought.

DR PETER HOLMGREN urged that, contrary to the impression given by the Commission report, the focus for action and for international policy coordination in such gatherings as the Rio+20 Earth Summit, should be agriculture as a whole and not just food security. He noted that there was considerable convergence internationally on needs but that the translation of that convergence into sufficiently speedy, effective and coherent action was sadly distant. In addition to the development of good action programmes there needed to be some

agreed measures for judging the effectiveness of such interventions. In his opinion there were three key metrics – (a) farm incomes, (b) the amount of biomass and organic matter in the landscape and (c) the amount of non-renewable energy per unit of output. He agreed with the Commission report's identification of the importance of reducing loss and waste in the food system but he also placed great weight on the need to channel large scale finance into small scale agriculture. His discussions with fund managers had convinced him that finance would be available (small scale as well as large scale) if projects were seen to be profitable. That meant that ways had to be found by bankers of reducing the burden of transaction costs and by governments of reducing risks (e.g. exchange rate risk).

The following points were made in the ensuing minutes of discussion:

- crop genetics was a key area of research if agriculture was to cope with the challenges presented by expected climate change but there was a serious shortage of young scientists being attracted into that area;
- there could also be shortages of experience in the important areas of agricultural engineering and soil science;
- it was in the UK's own interests to think globally because of the potentially adverse effects on those interests of problems in other parts of the world. But at the same time it would be wrong to believe that global remedies would be

<sup>2</sup> CGIAR Research Programme on Climate Change, Agriculture and Food Security (CAAFS)

sufficient to meet the expected challenges. The required remedies would vary from country to country;

- although Africa was seen as a major problem area it should not be forgotten that there were several African countries with impressive records of economic growth and some of that growth stemmed from agriculture. But there were significant obstacles to the necessary scaling-up of successful small initiatives. A favourable enabling environment was needed. The components of that environment were physical (infrastructure such as rural roads) and institutional, as well as education and governance;
- it was easier to identify the problems than to find ways of solving them especially when the complexities and interactions of those problems involved a large number of different stakeholders, many of whom would be resistant to change, such as the pressure groups actively opposing GM;
- Government could do more to raise the public awareness of the key issues about food security so that the population at large was able to understand them. Public support could be enlisted if the central message was properly articulated and the method of communicating it carefully devised. In addition it would be desirable to build food security considerations into existing initiatives in other fields. The UK Research Councils could play a part, for example, in ensuring that increased understanding of nitrogen science was translated into effective and beneficial initiatives, especially on a collaborative basis;
- it was a lamentable fact that the main fertiliser companies were doing little basic research and that some products and practices were based on science no more recent than 1907;
- the importance of extension services could not be overstated as part of a wider need to build better bridges between the farm and the laboratory. Farmers needed to know what science could offer to improve their businesses and scientists needed to understand what farmers saw as obstacles to the improvement of their businesses. It was unfortunate that the Rural Land Use Programme was about to end;
- the Department for International Development (DfID) and the Consultative Group on International Agricultural Research (CGIAR) had done and were doing excellent work to support research into "orphan" and tropical crops. The benefits could now be seen in farmers' fields from research of 30 years ago – a potent

reminder of the time and effort involved in turning science into profits;

- on finance mention was made of an interesting development in Nigeria whereby big banks provided guarantees to small banks and thereby helped to reduce transaction costs. Another way in which banks could assist producers was through lending to large end users;
- achieving food security was not merely a matter of improving production and yields; storage, regulation, distribution and purchasing power of communities all had a contribution to make;
- much better use could be made of agricultural waste;
- although biofuel was judged to have benefits as a means of reducing dependence on fossil fuels and as a possible use for less fertile land, it could have detrimental consequences for carbon retention and for water usage. The Foresight Group's 2011 Food and Farming report did not consider in detail biofuel issues but a supplement would shortly be published covering these issues.

In their closing comments the two speakers stressed the difficulties of coping with multiple and interconnected challenges (poverty reduction, food security and climate change), the dangers of the unintended consequences of interventions and the need for any interventions to contribute coherently and effectively to a set of agreed overall objectives.

Sir John Caines KCB

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The Future of Food and Farming Foresight Report  
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[www.bis.gov.uk/assets/goscience/docs/u/11-975-uk-cross-government-strategy-for-food-research-and-innovation-progress-report-2011](http://www.bis.gov.uk/assets/goscience/docs/u/11-975-uk-cross-government-strategy-for-food-research-and-innovation-progress-report-2011)

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Medical Research Council  
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National Farmers Union  
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Natural Environment Research Council  
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