



All-Party Parliamentary Group on Science and Technology in Agriculture

Notes of a Zoom Meeting held on Monday 10 January 2022

Hosted by NIAB, Cambridge

Defra Chief Scientific Adviser – Professor Gideon Henderson

In attendance:

Members:

Julian Sturdy MP (Chair)
Lord Cameron of Dillington
Earl of Lindsay
Earl of Devon
Lord Taylor of Holbeach
Harriet Davenport (pp (Prof Lord Trees)
Lord Inglewood

Guest speaker:

Professor Gideon Henderson, Chief Scientific Adviser, Defra

Stakeholders:

Paul Billings, Germinal Seeds; Dr Julian South, MAGB; Keely Watson, Elsoms Seeds; Rob Hill, Rothamsted Research; Helen Riordan, Defra; Peter Watson, British Sugar; Prof Wayne Powell, SRUC; Prof Jonathan Jones, TSL; Dr Craig Lewis, Genus plc; Joanna Rufus, SW AgriTech; Vladimir Nekrasov, Rothamsted Research; Vicky Foster, BBRO; Oliver Doubleday, EMR Trust; Calum Murray, Innovate UK; Rob Hiles, Syngenta; Jenny Brunton, NFU; Dr Susan Twining, CLA; Fraser Black, CHAP; Tom Hart, Agility Ag; Lyndsey Chapman, CIEL; Prof Tina Barsby, Cambridge Univ; Jonathan Snape, James Hutton Institute; Prof Geoff Simm, Edinburgh Univ; Karen Holt, Regulatory consultant; Jane Smernicki, Agri-EPI Centre; Jon Williams, BASF; Joe Brennan, UK Flour Millers; Jim Orson, BCPC/NIAB; Prof Jim Dunwell, Reading Univ; Bill Parker, AHDB; Jim Duncumb, Syngenta; Sian Thomas, FPC; Adrian Hayler, Elsoms Seeds; Saskia Hervey, Earlham Institute; Olivia Byrne, Earlham Institute; Prof Huw Jones, Aberystwyth Univ; David Langton, Origin; Samantha Brooke, BSPB; Roger Vickers, PGRO; Dr Mark Fife, Aviagen; David Flanders, AgriMetrics; James Clarke, ADAS; Elizabeth Warham, DIT; Eva Sharpe, John Innes Centre; Nick Major, ForFarmers; Prof Paul Wilson, Nottingham Univ; Dr Richard Harrison, NIAB; Emma Green, British Sugar; Jonathan Carruthers, RSB; George Rothschild, Intl Dev consultant; Prof Sir David Baulcombe, Cambridge Univ; Alessandro Coatti, RSB; Dr Richard Summers, RAGT; Dr Daniel Kindred, ADAS; Prof Jane Langdale, Oxford Univ; Chris Jackson, UK TAG; Nicola Spence, Defra; Jim Godfrey, farmer/NIAB chair; Martin Collison, Collison Associates; Phil Stocker, National Sheep Assn; Sarah Blanford, Sainsburys; Prof Lin Field, Rothamsted Research; Pat Flynn, CHA; Erica Hawkins, AgriTech-e; Rob Gladwin, BASF; Judith Batchelar, FMI; Tim Mordan, Defra; Richard Tiffin, Agrimetrics; Brian Collins, Defra; Prof Johnathan Napier, Rothamsted Research; Robert Shepherd, Sumo Engineering; Danielle Golds, HoL; Suzannah Franks, Sainsburys; Prof Richard Napier, Warwick Univ; Eda Pogany, Syngenta; Lucy Foster, Defra; Tom Bradshaw, NFU; Mia Cerfonteyn, TSL; John Shropshire, G's; Sarah Evered, Defra; Dave Ross, Agri-EPI Centre; Kate Bannister, NFU; Dr Helen Ferrier, NFU; Julian

Smith, Rothamsted Research; Samantha Brooke, BSPB; Prof Helen Sang, Roslin Institute; Tom Allen-Stevens, Bofin; Simon Crawford, Burpee; Oscar Pepper, NFU; Joss Wallace, Defra; Jonny Hazell, Royal Society; Bethan Postle, NIAB; Daniel Pearsall, Group Co-ordinator.

1. Introduction

Welcoming members and stakeholders to the All-Party Group's second meeting of 2022, the chair extended a special welcome to guest speaker Professor Gideon Henderson, chief scientific adviser at Defra, noting that it was the first time Professor Henderson had addressed the All-Party Group since his appointment as Defra CSA in October 2019, and in doing so he followed in the footsteps of his two predecessors in the role, Professor Sir Bob Watson and Professor Sir Ian Boyd.

The chair noted that at Defra Prof Henderson was responsible for overseeing the quality of evidence that the Department relies on for policy decisions. He also provides ministers with scientific advice and sets the priorities for scientific research and evidence-gathering. He has been Professor of Earth Sciences at the Department of Earth Sciences in the University of Oxford since 2006.

The chair added that Professor Henderson recently gave a lecture on the climate change impact of our food system, and how agricultural science and technology in particular might offer ways to reduce that impact, noting that many of the potential solutions he discussed – including new breeding technologies such as gene editing, novel production systems such as vertical farming, and realising the healthy eating and climate-proofing potential of Nitrogen-fixing crops such as pulses and legumes – are all very prominent themes for the All-Party Group.

The chair also noted that members of the Group have been particularly active - alongside scientists, breeders and farmers - in persuading the Government to adopt a more proportionate and enabling approach to the regulations governing new gene editing technologies such as CRISPR-Cas, welcoming the previous week's announcement that Ministers are pressing ahead with rule changes to free up gene edited crop research in England, as a small but important first step in that process.

In addition, the chair suggested that developing a consistent, meaningful and scientifically valid system of metrics to define and measure sustainable agriculture was absolutely critical to ensuring farmers, consumers and – importantly – policymakers, understand the impacts of their actions when it comes to food choices and farming systems and policies.

2. Guest speakers

[Please note that speakers' slide presentations are available to download via the meetings section of the All-Party Group website at www.appg-agscience.org.uk]

Professor Gideon Henderson, Defra Chief Scientific Adviser

Professor Henderson (GH) opened by thanking the APPG for the invitation and paying tribute to the Group's work the area of agricultural science and technology.

Setting out the challenges of net zero for the agricultural system, GH suggested that in many ways the framing of policy on net zero should be seen in terms of the flagship targets – clean air and water, thriving biodiversity, sustainable resource use and so on - set out in the Government's 25- year Environment Plan, published in 2018.

But GH noted that while the 25-year Environment Plan was relatively recent, action on climate change was not seen as one of the primary goals, but listed as a secondary goal. He suggested that climate change was still seen as lower down the priority list in many environmental sectors.

In 2019, a year after the Environment Plan, the UK Government signed into law the net zero by 2050 requirements, the first major industrial country to do so, now followed by many other countries with either similar legal requirements or statements of intent to get there.

GH added that the legal commitment to net zero by 2050 had underpinned a dramatic change in Government thinking about our interaction with the environment and across all sectors of society.

GH indicated that the UK Government was leading in the development of a Net Zero Strategy to deliver on its commitment, published in October 2021 shortly before the UK hosted the COP26 summit in Glasgow. Also published alongside the Net Zero Strategy, GH drew attention to the UK Net Zero Research and Innovation Framework document, laying out the Government's thinking about the research, science and innovation that will be needed to achieve the net zero target, including R&D requirements across the agriculture and land use sectors.

Presenting a series of graphs, GH set out the scale of the net zero challenge, which charting progress made between 2000 and 2018 had been on course to meet 20% of 1990 levels by 2050, but he emphasised that the revised target of net zero by 2050 will require even more radical reductions over the coming years. GH also noted that while significant reductions in GHG emissions had been achieved in the manufacturing, construction, fuel supply and electricity supply sectors, agriculture and land use remained little changed over the same period.

GH emphasised that the steepening of the rate of reduction in GHG emissions required to hit net zero - expressed in the carbon budgets to be set out over the next 10-15 years - represented a very significant challenge for all Government departments, and certainly for the sectors Defra is responsible for.

GH highlighted in particular the lack of progress made in reducing UK agricultural emissions over the past 20 years, a sector accounting for around 10% of total UK emissions. He described how the emissions attributed to agriculture are dominated by methane emissions from livestock production related to enteric fermentation and movement of livestock waste and manures. In addition, GH presented a breakdown of emissions from non-agricultural land use, which showed the very significant carbon emissions now associated with degraded peatland, and by contrast the very positive contribution of forestry in soaking up emissions.

In the agriculture sector, GH stressed the importance of focusing on reducing emissions from meat and dairy production if the UK was serious about its net zero target.

Turning to a graph from Henry Dimbleby's National Food Strategy report showing the GHG emissions associated with different dietary protein sources, GH acknowledged that consumption and production would not always correlate exactly, but he suggested that in general a switch from livestock-based red meat protein such as beef towards alternative, vegetable-based protein sources, or indeed alternative approaches to beef production, would help improve the emissions profile.

GH also highlighted the dominance of land use associated with beef and lamb production in the UK, not only for pastureland but also arable land to produce feed for beef and dairy cattle. GH considered that some of this land currently used to produce dietary protein with high emissions could be deployed to other uses to help reduce our overall emissions profile. Citing data from the Climate Change Committee (CCC), he suggested that around 2 million ha needed to be freed for other uses such as planting trees (30k ha per year), peat restoration, and biomass (eg miscanthus) production.

GH identified degraded peatland as a sector responsible for around 20 million tonnes of CO₂ emissions to the atmosphere every year, something now accounted for in the Government's national metric and requiring an urgent plan of action to re-wet peatland and use it in more innovative ways.

Again drawing on a figure from the Dimbleby report, GH discussed three different strategies proposed to reduce GHG emissions associated with agriculture and land use, from the CCC's 'balanced pathway', which with significant tree and biomass planting projected a carbon negative outcome by 2035, to the NFU's net zero plan which projected less tree planting but nevertheless reduced overall emissions from agriculture by around 16.5m tonnes over the same period, and finally the IDDR/FFCC regenerative farming model, which projected a similar outcome to the NFU scenario but which in GH's view included heroic assumptions about dietary change.

And while there were different pathways proposed to tackle the net zero challenge, GH suggested that there were also multiple ways in which science and technology could be deployed to improve the emissions profile. Possible options included:

- making greater use of non-food biomass, eg to burn for electricity generation to displace coal and gas, but also through greater use of timber as a construction material to reduce use of cement, a major source of carbon emissions;
- using new genetic technologies, such as gene editing in plants, to help improve crop production efficiency, reduce pesticide and fertiliser use;
- moving crop production indoors through vertical farming systems, freeing up land for other uses, enabling re-wetting of peat, and potentially allowing greater control over gas emissions, and using renewable energy rather than fossil fuels to grow food crops;
- exploring opportunities for wetland agriculture after degraded peatlands have been restored, eg for biomass production or specialist food crops such as cranberries or water cress;
- understanding better (eg through social science) how to influence behavioural change to reduce the embedded carbon in the food choices people make in future, including by making sure consistent and meaningful labelling enables and encourages people to reduce the carbon footprint of their purchasing decisions – although GH noted that this whole area of sustainability metrics was fraught with complexity and required attention inside and outside Government.

GH concluded by highlighting the existential risks associated with a failure to take effective action to reduce GHG emissions in agriculture, illustrating this with an image of central London protected from flooding by the Thames barrier, and noting that London will be underwater if sea levels continue to rise as a result of climate change.

GH observed that our agricultural system is only as resilient as it is to climate change, and that means not only adapting to and being ready for change, but also ensuring that it does not contribute to or cause the change.

3. Questions & discussion

The following key points arose during discussion:

- (i) The importance of taking account of wider global considerations, for example by ensuring future agricultural policies do not simply result in offshoring emissions and environmental

degradation by reducing domestic production and increasing dependence on imported food supplies.

GH stressed that this is above all a global challenge and many countries share the UK's ambition to deliver net zero by 2050. He insisted that the UK must seek to reduce emissions within the context of a vibrant farming industry which produces at least as much food as it does at the moment. GH reiterated that the scale of the changes needed to deliver on climate commitments were often not fully comprehended, even within Government, as exemplified by the fact that at the 25-year Environment Plan did not list climate change action as a priority issue.

GH suggested that the agriculture sector itself did not fully grasp the nature or extent of the changes required. Compared to the UK transport sector, with its stated aim to phase out production of new petrol cars by 2030, agriculture needed to match that level of ambition.

(ii) The need to ensure metrics and data are relevant to their contribution to climate change, eg measurement of global warming potential in livestock rather than just CO₂ equivalent, as advocated by climate expert Myles Allen at Oxford University.

GH indicated that this was a complex area, but that it was important to understand the impact of the methane we are currently emitting via livestock, which accounts for around a fifth of the warming we are experiencing at the moment. It is seen by many as the 'low-hanging fruit' in terms of how we can reduce the warming impact of human activity because it decays in the atmosphere more quickly and therefore reducing methane emissions quickly will see a shorter-term reduction in warming effect equivalent to the 0.2°C currently attributable to methane.

GH indicated that he was aware of calls for alternative metrics to be using in reporting methane emissions to take account of breakdown in the atmosphere, but these were not the metrics used by the UK for international reporting of GHG emissions. He added that there was currently no desire to renegotiate those metrics, either from the UK or elsewhere, and this was the basis on which progress towards net zero would be accounted for.

(iii) Given the urgent and overriding need to reduce GHG emissions from the livestock sector, what solutions are available, for example to UK beef, sheep and dairy producers, and if reducing livestock grazing on pastureland is one such solution, are there not other important environmental outputs from grassland which are equally important as climate change reduction?

GH suggested three potential actions: produce less by keeping fewer cows and fewer sheep; make livestock systems more intensive – often UK red meat emissions compare favourably to countries such as Australia and Argentina, but they tend to be higher than other European countries which rear livestock more intensively; and change livestock diets or use feed supplements designed to reduce methane emissions, an active area of research.

GH suggested that freeing up grassland in this way offered multiple benefits from alternative land use, such as tree planting, biomass production or rewilding for biodiversity gain.

(iv) Referring to the lowland peat issue and the apparent emphasis within Defra on land-sharing as part of the peat restoration process, whether the supply chains are in place to respond to this anticipated growth in wetland agriculture, and which crops might be suitable for production in this way? Also whether more of a mosaic approach to policy development might be feasible, allowing some food crop production to continue – otherwise UK production would simply be exported overseas.

GH accepted that peat was very much a research frontier with no particular Defra policy steer and knowledge still being developed to reach the same level of understanding as existed for tree planting, for example. Although the simplest answer to peat restoration would be to wet the lot, he agreed that a mosaic approach would almost certainly prevail, not least because a uniform

approach to wetting all peatland would not be possible because it is not perfectly flat. A lower level of food production in some parts would need to be balanced with rewilded or restored peatland, with perhaps in the boundary between some wetland agriculture producing crops such as cranberries and water cress, and with the potential through research to develop other cropping opportunities, possibly using gene editing.

(v) How Defra regulatory policy on genetic technologies might develop over a five-year time horizon from enabling gene editing for research purposes to bringing gene edited products to market, as well as freeing up the commercial use of GM applications to deliver outcomes which could not be achieved through gene editing?

GH indicated that following the public consultation last year the Government intends to move forward beyond the relatively small but important step of freeing up gene edited crop trial research, leading to new primary legislation for gene edited plants to relax the definition of GMO, although he could not confirm a timetable for this as yet. Defra also plans to look carefully at the use of gene editing in livestock, bearing in mind the public unease expressed in responses to the consultation regarding possible negative consequences for welfare.

GH added that the Government intends to take a step-by-step approach to regulatory change in this area, not only to ensure risks are properly assessed, but also to make the sure the public are aware and on-side. The desire is to see how the planned legislation is received and what its implications are for food production and the environment, and any future regulatory developments in relation to GM technologies will depend on the success or otherwise of steps being taken now and in the near future. He indicated that he would expect it to take at least five years for any new gene edited crops to appear on supermarket shelves.

(vi) Building on GH's comments about using sustainability metrics to support behavioural change among consumers, concern was expressed about Defra's apparent support for the Global Farm Metric, which while light on detail but appeared to favour a whole farm, area-based approach to measuring resource use and environmental impact, rather than relating those impacts to the amount of food produced – a critical difference. How does Defra plan to help consumers choose foods produced with lower impact?

GH indicated that this was not an area on which Defra has anything resembling a mature policy on as yet, and that its approach will need to be developed in collaboration with scientists, food producers, retailers and agriculturalists. He agreed that the functional unit of the chosen metric is critical, it is a complicated area with a lot of work needed, and also a lot of teamwork to get people together to agree on those metrics. There was certainly a recognition of the need to act in this area, but not yet an agreed Government position on the direction of travel.

(vii) Need to recognise the natural variation which exists between ruminants in relation to methane emissions, and how combining that with various methods of measuring and predicting performance can also provide tools to mitigate methane emissions. This should not be overlooked in both research and policy development towards 2050 targets.

GH agreed that taking steps to ensure we are breeding and rearing the most productive per carbon emissions livestock is another key route to reduce the GHG contribution of meat and dairy.

(viii) Given that pulses are an important protein crop requiring no N-fertiliser input, where do they fit in relation to the Government's plans for net zero?

GH agreed there was huge potential in this area – indicating that pulses and legumes are protein-rich, nitrogen fixing crops which we should be making more use of, harnessing their genetic richness to create alternative proteins and other useful products, and again with opportunities to apply promising genetic improvement technologies such as gene editing.

(ix) GH invited to comment on concerns raised at a previous meeting of the Group entitled 'Whatever happened to Sustainable Intensification?' that the term Sustainable Intensification – optimising the balance between food production, resource use and environmental impact – appears to have dropped off the Government's radar, and that the outputs from research projects such as Defra's 2014-18 Sustainable Intensification Research Platform, including on sustainability metrics, were not feeding into the policy development process going forward.

GH indicated that this was more about terminology, and the term 'sustainable intensification' having fallen out of fashion, although he personally considered that it expressed precisely what was needed, and he insisted that the principles and objectives conveyed through the term remained central to the Government's policy development focus.

Concluding the session, Julian Sturdy MP thanked Professor Henderson, members and stakeholders for their contribution to a highly informative session.