

**Notes of a meeting held on Monday 29 April 2019,
Committee Room 8, Palace of Westminster**

Defra chief scientist: the future for agricultural innovation

Present:

Members

Julian Sturdy MP
Earl of Lindsay
Owen Paterson MP
Antony Bennett (pp Jo Churchill MP)
Lawrence Abel (pp Gillian Keegan MP)

Guest speaker

Professor Ian Boyd, Defra

Stakeholders

Helen Munday, FDF; Susan Twining, CLA; Rosie Carne, Worshipful Company of Farmers; Steve McGrath, Rothamsted Research; Alessandro Coatti, Royal Society of Biology; Keith Norman, AICC; Penny Maplestone, BSPB; Tim Mordan, Defra; Carolina von der Weid, Brazilian Embassy; Brendon Noble, University of Westminster; Daniel Kindred, ADAS; Chris Brown, Society for Applied Microbiology; John Shropshire, G's; Alex Waugh, nabim; Steve Tones, AHDB; Paul Temple, AHDB; Paul Rooke, AIC; Sarah Blanford, Sainsburys; Helen Fox, BEIS; Sophie Bennett, Royal Society; Sara Brouillette, Royal Ecological Society; Richard Harrison, NIAB; Mario Caccamo, NIAB; Steve Knight, US Embassy; Martin Emmett, AHDB; Henry Blain, Tesco; Sir Peter Kendall, AHDB; Paul Smith, IRTL; Matthew Rose, Rothamsted Research; Jason Ainscough, Policy Connect; Ian Cox, Innovate UK; Andrew Marshall, British Sugar; Judith Batchelar, Sainsburys; Calum Murray, Innovate UK; Daniel Pearsall, Group Co-ordinator

1. Introduction

Julian Sturdy (JS) welcomed members and stakeholders to the meeting, and briefly introduced guest speaker Professor Ian Boyd, chief scientific adviser at Defra. JS noted that Professor Boyd had made a number of thought-provoking and controversial observations about the potential for disruptive innovation in the food and farming sector in recent months, adding that consideration of radical and challenging new ideas was important at such a crucial time for UK agriculture, with the sector facing the most significant policy overhaul for more than 40 years, and with productivity growth lagging behind other countries.

2. Guest speakers

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

Professor Ian Boyd, Chief Scientific Adviser, Defra

Professor Ian Boyd (IB) noted that at a recent meeting of G20 chief agricultural scientists in Tokyo, collectively representing 65% of global farm production, the UK was the only country in a position to think broadly and imaginatively about its future agricultural policy and farming

systems, partly because of the current political situation and the period of transition facing the UK.

In setting out the challenges facing our food and farming systems, and suggesting where some of the solutions might lie, IB indicated that it was his intention to be provocative and to stimulate discussion.

IB noted that fundamentally there were three challenges to be addressed – productivity, social and environmental, all inter-related and overlapping. He described the CAP as an amalgum of these three challenges, originally introduced to address productivity and social objectives, with environmental considerations introduced at a later stage.

IB observed that these three challenges would never disappear, but he suggested that the environmental challenge was becoming much greater and more appreciated than in the past.

Starting with the productivity challenge, IB presented Government statistics showing UK Total Factor Productivity (TFP) in agriculture since 1973. He noted that TFP has remained little changed since the early 2000s, while total outputs have remained static since 1984, indeed reduced input use was the only basis for increased TFP since the mid-1980s.

IB indicated that this performance was poor compared to other competitors, especially the US but also other EU countries operating under the same policy regime as the UK.

Turning to the spread of productivity performance by business size, IB noted that 7% of UK farms produce 55% of output on 30% of land, while 42% of farms produce just 2% of output on 8% of land.

Since 20% of farm businesses account for 80% of production on half the land, IB asked what could be done to transform the productivity of the remaining 80% of farms.

There was strong evidence, he suggested, that more intensive farming systems have greater efficiencies than extensive systems. He also noted that UK horticulture, one of the least supported sectors under the CAP, was one of the most efficient – was this because the sector is not heavily subsidised, he asked.

He also stressed that geographically the spread of farm businesses was very different, with smaller farms tending to be more concentrated in the uplands.

In terms of profitability, most farm sectors would struggle without support, he suggested, with dairy remaining profitable and horticulture likely to be the most profitable of all.

Continuing to innovate at the current rate, spending £0.5bn a year on agricultural R&D but only managing to improve productivity by 1 or 2% pa, would fall way short of the objective of net zero carbon by mid-21st century, and underlined the need to stimulate alternative thinking, and to do something different in terms of agricultural innovation, he said.

Presenting a comparison of productivity by economic sector, IB noted that agriculture was at least three times less efficient than any other sector of the economy.

He suggested that the UK needed to be 10 times more efficient in terms of agricultural productivity, noting that for every calorie consumed as food the industry currently expends roughly 10 calories of fossil fuel energy.

He highlighted in particular the inefficiencies of the Haber Bosch process used to produce artificial fertiliser, as well as the inefficiencies of feeding livestock, adding that the negative social and environmental consequences of low productivity included high land use, air

pollution, high GHG emissions, chemical pollution of waterways and the sea, high food costs and low food self-sufficiency.

IB considered that the objectives of a future food policy should be:

- to make food production at least as resource efficient as other sectors (eg construction);
- to deliver parity in the energy input:energy output ratio (1:1) making food production carbon neutral;
- to free up land to cater for carbon storage, recreation (helping human health and welfare), and wildlife;
- to continue to make food cheaper and better quality.

IB suggested that future solutions lay in regarding food production as a manufacturing process rather than a farming process, and making use of technologies such as process engineering, robotics and synthetic biology to manufacture foods.

He depicted a food future of lab-produced milk and burgers without the cow, eggs without the chicken, and reduced waste using edible packaging.

The future of food production would also involve using renewable energy sources, mainly solar, and exploiting new, cheap and highly efficient energy harvesting technologies – according to IB it would be more efficient to pipe energy from solar panels in the field into LED lights and grow food indoors.

It would mean growing quality foods in smarter ways – IB suggested aiming for 20% of production by 2030 to be grown indoors in climatically ideal conditions, while such production could also be integrated directly into retail outlets.

Anticipating concerns about the impact on the traditional farming sector, IB suggested that exploring other ways to manufacture food could go hand in hand with continuing to farm, or alternatively farmland could be used economically in other ways.

But he added that other benefits of using new technologies to manufacture foodstuffs rather than farming them would include a move towards zero pesticides, more efficient use of water, semi-closed loop of recycling nutrients, greater food security, option to produce close to market, and new opportunities for UK-produced exotic foods.

Paul Temple, Farmer and Chair, AHDB Cereals & Oilseeds

Responding from a practical farming perspective, East Yorks mixed farmer Paul Temple (PT) suggested that one of the main reasons UK farmers had fallen behind in terms of productivity was being denied access to the same technologies and innovations, such as GM crops.

As a former GM crop triallist in the UK Government's Farm Scale Evaluation programme almost 20 years ago, he had seen first-hand the enormous potential of the technology to address both production and environmental objectives. However, while growing GM crops remained off limits to UK farmers, imported GM feed was flooding the British market on a daily basis.

He also questioned whether Professor Boyd's vision was realistically achievable, since developments in vertical farming would take 20 or 30 years to reach the scale and contribution to UK food production envisaged.

PT challenged the suggestion that British agriculture should target a 10-fold improvement in efficiency, which he said would not be possible in his lifetime and certainly not without

access to the technologies needed to deliver step-change improvements in genetic potential such as GM and gene editing.

He highlighted the growing frustration felt by UK farmers facing bans on pesticides which were still in routine use by competitors producing and exporting food to the British market, or when products such as metaldehyde were simply withdrawn without recognising alternative strategies, including the successful local initiatives developed by farmers and water companies working together.

PT added that serious problems with water supply would dramatically affect food production globally, and even in the UK, long before any impact from climate change.

He concluded that a further barrier to productivity growth in UK agriculture was the lack of any cohesive plan to translate scientific developments at the highest levels of academia into applications at farm level, suggesting that this should be the primary focus of Defra's Chief Scientific Adviser to deliver real credibility in government.

Questions and discussion

The following key points arose during discussion:

The need for greater dialogue and cooperation between regulators and industry – eg to support the development of alternative (genetic) solutions to the withdrawal of neonics rather than presenting farmers with a cliff-edge which sets the industry back.

A recognition that the decision to ban neonics and other pesticides was not just about science but also about the social acceptability of using these products.

IB indicated that the original scientific approval of neonics did not envisage or take account of the extent or way the products have subsequently been used. He suggested that neonics had followed the same pattern as organochlorine and organophosphate products.

IB observed that the future challenge of getting high quality, nutritious food onto people's plates is a systems question – the solutions will not involve considering agriculture in isolation but bringing in process engineering, synthetic biology and robotics. The real innovators in the food industry will be engineers, not farmers, he said, but with the advantages of land and their understanding of supply chains and what makes good food, he suggested there would be significant opportunities for farmers to play a key role in this new revolution.

There is lack of reliable data and statistics on productivity in the horticulture sector, but the retail-facing nature of the fresh produce industry, and the demands of an aggressive retail market place, may explain the innovative nature of the sector, and the need to use new technologies to control every aspect of production very precisely. But in reality the UK horticulture sector exists on relatively shaky foundations and needs firm commitments from Government on issues such as access to labour (robotics not commercially available yet), loss of crop protection products, planning, investment in capital projects etc.

The need to develop and maintain a go-to resource where all research taking place in food and agriculture could be documented and accessed to ensure efficient sharing of knowledge and expertise, and to avoid duplication of research effort.

IB emphasised that the agri-food industry cannot expect Government to look after every sector of food production – much better led by the industry itself, as seen in other sectors such as automotive, oil and gas. As much a question of self-organisation as anything else.

There was a strong warning that the discussion on future food production ignores the social dimension at its peril, not only in terms of the potential impact on agriculture and the rural economy, but also in terms of the consumer acceptability of producing food in new and very different ways. How can the agri-food industry help consumers understand that the nostalgia and sentimentalism often associated with farming and food production is not representative of the reality?

There was also a need to address the productivity challenge by recognising that food production comprises a range of very different sectors - eg protected crops, livestock, broadacre crops – and the best approach to innovation in each may need different solutions. Also need to clearly define the productivity challenge and objective for each sector (set targets), and then use existing knowledge and technologies to improve efficiency and productivity across all producers.

IB suggested that there was no shortage of advice available to farmers (perhaps too much which makes it confusing), but he agreed on the need for clear targets to define the productivity challenge. He indicated that the Government's food strategy would hopefully provide some of those objectives.

Industry needs to help itself, not just blame regulatory barriers. Setting Key Performance Indicators (KPIs) by sector would also help target research to best effect and avoid the scattergun approach to R&D funding that currently prevails.

The only reason we have the luxury of this conversation is that the contribution of agri-tech around the world has allowed recent global harvests to keep pace with increasing demand – as soon as we revert to a food shortage situation the conversation will also change.

The complex nature of the agri-food industry with so many different sectors and individual micro-businesses may mean it is difficult to reach a universal consensus on a plan of action to drive improved productivity, but that is no excuse for doing nothing. Bringing together a coalition of the willing to do lots of small things quickly and at scale could deliver some quick and easy wins (the low hanging fruit).

Frustration that some of the data sets held by Defra which could be used to help with the development of decision support systems at farm level – eg soil, Met Office data – are not being made available.

Getting access to retailers' consumer data could also help in understanding consumer attitudes towards new food production systems and technologies.

A recognition that so long as farming remains supported by Government there is a potential lever to encourage/require farmers to collect and share productivity data.

Concluding the meeting, JS thanked Ian Boyd, members and stakeholders for their contribution to a lively and thought-provoking session highlighting some of the key issues at stake for future food production and the productivity and sustainability of UK agriculture.

