All-Party Parliamentary Group on Science & Technology in Agriculture

Notes of a meeting held on Wednesday 14 December 2016, Macmillan Room, Portcullis House

Cultivating the Future: How can 20 years of GM debate inform UK farm policy?

(Launch of a new Essay Collection marking 20 years of global GM crop cultivation)

Present:

Members
Julian Sturdy MP (Chair)
Lord Cameron of Dillington
Lord Taverne
Chris Green MP
Jo Churchill MP

Guest Speakers
Mark Buckingham, Chair, Agricultural Biotechnology Council (abc)
Professor Sir John Beddington, Senior Adviser, Oxford Martin School and former Government Chief Scientific Adviser
Dr Helen Ferrier, Chief Science and Regulatory Affairs Adviser, NFU
Graham Brookes, Agricultural Economist, PG Economics Ltd
Professor Huw Jones, Chair in Translational Genomics, Aberystwyth University

Stakeholders
Dr Jonathan Clarke, John Innes Centre, Abigail White, Lexington/abc; Matina Tsalavouta, Rothamsted Research, Alice Turnbull, Bayer; Joe Brennan, nabim; John Bingham, farmer, ret. wheat breeder; Matt Corby, Lexington/abc; Julian Little, Bayer; Lisa Timothy, Lexington/abc; Elizabeth Warham, DIT; Helen Munday, FDF; Jennifer Wilson, USDA; Adam Speed, CPA; Jonathan Baker, CLA; Sez Maxted, farmer; Paul Rooke, AIC; Neil Hipps, University of Kent; Prof Iain Fraser, University of Kent; Becky Purvis, Royal Society; Robin Upton, farmer; Dr Richard Summers, RAGT; Ella Adlen, Oxford Martin School; Prof Vivian Moses, CropGen; Soledad de Juan, Fundacion Antama; Daniel Pearsall, Group Co-ordinator

1. **Welcome & Introduction**
Julian Sturdy (JS) welcomed Members and stakeholders to the meeting and briefly introduced the topic for discussion, noting that through the 2011 UK Foresight Report on the Future of Food and Farming, the UK had led the way in highlighting the need to access the latest advances in agricultural technology and innovation to meet the food needs of a burgeoning world population in the face of climate change and declining natural resources.

Yet while GM technology had, since 1996, become the most rapidly adopted crop innovation on record, now grown on 180 million hectares by 18 million farmers worldwide, JS observed that no commercial GM crops were currently available to UK farmers and at EU level the technology remained log-jammed by political opposition. As the UK prepared to develop its post-Brexit arrangements for GMO regulation and future farm policy, JS welcomed the opportunity to reflect on the lessons learned from 20 years of global GM crop cultivation, and to consider the role of agricultural technology and innovation in addressing future challenges.

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

Mark Buckingham, Chair, Agricultural Biotechnology Council (abc)
On behalf of abc, Mark Buckingham (MB) thanked the All-Party Group for hosting and contributing essayists – four of whom were on the speaker panel - for their support in reviewing the development of GM crop technology over 20 years from a range of different perspectives. He also thanked Lexington Communications for their role in putting the essay collection together. Introducing the guest speakers, MB suggested that the potential of GM and other agricultural technologies was only just beginning to be realised, noting that the quality of expertise on hand promised exciting opportunities ahead for UK agri-science.

Professor Sir John Beddington, Senior Adviser, Oxford Martin School and former Government Chief Scientific Adviser
Professor Beddington (JB), who in his role as UK Government chief scientific adviser over six years under Prime Ministers Blair, Brown and Cameron had sought to underline the vital role of agricultural innovation in addressing the combined global challenges of food, water and energy security, said it was a tragedy that the pace of scientific advances in technologies such as GM had not been maintained following the extraordinary scientific achievements leading to the first GM crop, particularly in the UK which had been at the forefront of early developments.

Highlighting the scale of global demographic change taking place, JB noted that there would be 1 billion more mouths to feed by 2030, broadly 500 million each in Africa and Asia. Over the same period, the urban population was set increase to around 57% - in Africa alone that equated to adding 1000 cities the size of Edinburgh over the next 15 years, posing a major challenge for resource provision and allocation.

At the same time, decreasing poverty in the developing world would see a 160% increase in the global middle class by 2030, while the challenges and uncertainties surrounding the impact of climate change and political efforts to mitigate it were further complicated by the 20-year time-lag behind action taken to reduce greenhouse gas emissions.

As chair of an international panel on agriculture and malnutrition set up by DfID and the Gates Foundation, JB also underlined the stark statistics behind global malnutrition, which was causing more deaths and ill health than HIV AIDS, infectious diseases, tobacco use and alcoholism combined, and which also caused 25% of children born in developing countries to be stunted, with enormously damaging human and economic consequences.

JB insisted that these issues needed to be taken seriously by the global community, estimating that by 2030 the world would see increased demand for 55% more energy, 60% more water and a 40% increase in agricultural production.

In terms of the potential for agricultural technology and innovation to respond, JB suggested that the greatest obstacle, particularly in relation to GM, was political will. Brexit could open up opportunities for the UK to take more progressive stance on GM but this would depend on the terms of the exit deal reached with the rest of the EU.

Suggesting that Rachel Carson's 'Silent Spring' had been followed by a 'Suspicious Summer', JB warned that careful attention should be paid to the regulation of new breeding techniques such as gene editing, which had not yet encountered the same level of resistance as GM.

Accepting the rationale for individual GM products to be assessed in terms of their safety for health and the environment, JB rejected the fundamental prejudice of pressure groups and

individuals such as Prince Charles in their opposition to the very existence of GM as a technology.

While GM and new gene-editing technologies could not offer a universal panacea for all the global challenges outlined, JB emphasised that they had a critical role to play and the political context for their development and application, including the response to the concerns surrounding them, needed to be considered very carefully.

Dr Helen Ferrier, Chief Science and Regulatory Affairs Adviser, NFU
Offering a perspective from the farming industry, Helen Ferrier (HF) noted that farmers were instinctive innovators, keen to learn about and adopt the latest scientific and technological advances, and to see what competitors were doing to improve their businesses.

In relation to GM there was a sense of frustration among UK farmers. The technology was seen to be working on a commercial scale around the world, and offered enormous potential not only to improve productivity, but also to cope with a diminishing crop protection toolbox, respond to climate change, enhance resource use efficiency, and provide safer and more sustainable nutrition. Yet access to the technology was denied to UK producers.

HF explained that the focus of NFU policy on GM was to support choice for farmers and consumers – recognising that biotechnology was not a silver bullet but could be part of an integrated approach to addressing the major challenges facing farmers and food production.

NFU activity in this area ranged from monitoring developments, providing information and listening to members' views to working with partners in the supply chain and explaining the practicalities of co-existence. HF noted that farmers and the supply chain routinely practised co-existence to maintain the integrity and value of conventional crops, and the same would apply to GM crops.

But while UK farmers were currently unable to grow GM crops, HF noted that imported GM feed ingredients were an integral part of domestic livestock production. Given the significance of feed costs for pig and poultry producers in particular, access to GM products was a key factor in maintaining the sector's viability and competitiveness, highlighting concerns over the EU's dysfunctional GMO approvals system and its implications for consistency and security of high quality feed imports.

Emphasising the volatile and uncertain conditions currently facing UK farm businesses, HF stressed the importance of securing access to agri-science advances such as GM and gene-editing to provide the confidence and resilience to tackle future production challenges.

She expressed the hope that the UK would not be left on the sidelines for another 20 years, and that Brexit might open up new opportunities in this area to support innovation in UK agriculture.

Graham Brookes, Agricultural Economist, PG Economics Ltd
Presenting the headline economic and environmental benefits attributed to GM crop adoption over the period 1996-2014, Graham Brookes (GB) noted that the technology had supported a 581 million kg reduction in pesticide use and 18.5% cut in associated environmental impact, delivered a $150 billion increase in global farm income, and saved 22.4 billion kg of CO_2 release, equivalent to taking 10 million cars off the road for a year.

In terms of farm income, GB estimated that every $1 invested in GM seed returned on average $3.59 in added value across all farm types. Record adoption rates for the technology seen over the past 20 years were therefore not surprising. For farmers in developing countries the return was even higher at $4.42 per $1 invested.

Of these farm-level benefits, GB observed that 65% were derived from higher yields, eg insect resistant GM cotton had increased yields by 17.3% on a global basis from 1996-2014. Yield gains were greatest in developing countries, eg India +32.0%, Myanmar +30.4%, Argentina +30.0%, Pakistan +21.0%.

Over the period 1996-2014, GM technology had supported production of an additional 158.4 million tonnes of soybeans and 321.8 million tonnes of corn. Across all crops, the additional area of conventional production required to maintain these increased levels of output totalled 151 million hectares. In 2014 alone, the additional area required (20.64 million ha) equated to roughly one third of Brazil's total arable cropping area.

GB noted that the 581 million kg reduction pesticide use associated with GM crop adoption was equivalent to the total use of pesticides by China for more than a year. Insect resistant GM cotton had delivered the largest pesticide savings: a reduction of 249 million kg in insecticide use and 28% cut in associated environmental impact.

In terms of carbon emissions, GB suggested that the most significant benefit came from the contribution of GM crops in allowing no and low-till farming systems and therefore preventing release of CO_2 into the atmosphere. In 2014, this accounted for 20 billion kg of CO_2 savings in addition to 2.4 billion kg less CO_2 associated with reduced fuel use.

GB concluded that there was now a significant body of peer-reviewed literature quantifying the largely positive impacts of GM crop adoption over the past 20 years for farmers and citizens in both developed and developing countries. UK farmers had been denied these opportunities due to poorly functioning and non-science-based EU regulations, with most biotech R&D activity now taking place outside the EU.

GB suggested that Brexit could pave the way to more science-based regulation and investment in R&D of relevance to UK agriculture, but the time-lag to bring products to market meant such developments were still a number of years away.

Professor Huw Jones, Chair in Translational Genomics, Aberystwyth University
UK research scientist and EFSA GMO Panel Vice-Chairman Professor Huw Jones (HJ) stressed that while GM crop technology had seen rapid development and adoption in other parts of the world, the EU regulatory framework for GMOs was not functioning effectively and this was hampering access to innovation for UK farmers and researchers.

HJ highlighted the emerging opportunities for crop improvement presented by gene editing techniques, which allowed small changes to be made to a plant's genetic make-up in a targeted way. He emphasised the need to regulate gene edited crops with a light touch, indicating that the precise nature of the techniques involved did not warrant the 10 years of testing and regulatory data requirements currently required for GM crop applications.

In the longer term he stressed the need to overhaul current regulations applied to GMOs to ensure they were more risk-based and proportionate, but the immediate challenge was to prevent UK science and farming from falling even further behind in terms of research and innovation involving these new breeding techniques.

As with GM, the rest of the world was moving rapidly to develop and adopt gene-edited crops, with Canadian farmers already cultivating the first gene edited canola crops and the US set to introduce them in 2017.

In conclusion, HJ called for a proportionate, evidence-based approach to the regulation of gene-editing techniques, focused on the characteristics of the end product rather than the breeding process itself, to avoid a repeat of the current EU impasse on GM crops.

3. Questions and discussion

The following key points were highlighted during discussion:

The challenge of overcoming a political agenda by certain NGOs to campaign against an entire technology rather than its application on a case-by-case basis.

Prof Beddington suggested that these campaigns had culminated in the 'disgraceful' correspondence against Professor Anne Glover calling for her dismissal as EU chief scientist for suggesting that there was no evidence to show GMOs were harmful.

By 2050 the world must increase food production by 70%, some 20% higher than the productivity gains achieved during the Green Revolution. This would simply not be achieved without access to yield-enhancing technologies such as GM.

In addition, global agriculture will require a major increase in pesticide use to maintain production without GM.

Why had GM not had more of an impact on horticultural crops: most GM crops currently grown were for processing and animal feed use, not direct consumption; also horticultural crops were often developed by smaller breeding companies not able to afford the regulatory approval costs.

In addition to evaluating the contribution of GM crops to global farm incomes and greenhouse gas emissions, the importance of communicating beneficial impacts which meant something to individual consumers, eg a reduction in the cost of food, was highlighted.

It was suggested that millennial consumers in particular were strongly motivated by environmental arguments, but struggled to distinguish easily between risk and hazard and needed to hear from trusted, neutral sources.

A failure to exploit fully the potential benefits of advanced farming technologies such as GM for global food security would not cause an overnight shock, but would result in a gradual decline in food and nutrition availability, with a corresponding increase in global food prices, poverty, malnutrition and child mortality. John Beddington - *"The world will just be a sadder place to live".*

It was noted that adoption and development of GM were highly regionalised – with North and South America leading the way and Africa, Russia and Europe lagging behind. The same pattern was also emerging with new gene editing techniques, with the likelihood that farmers in the UK and Europe would not be in a position to access and integrate the best breeding technologies into practice.

The challenge of communicating with a consuming public not familiar with everyday farming realities was highlighted: eg the benefits of reducing pesticide use on potatoes through a GM blight resistant potato were unlikely to gain traction (or improve perceptions of farming) among consumers who were not currently aware that conventional potato crops were routinely sprayed eight times during the growing season to control blight.

There was an acknowledged need to improve the provision of public information more broadly about the role and benefits of science and technology in agriculture. In this respect encouraging retailers to promote agri-tech more positively was seen as critical to consumer acceptance.

The importance of challenging fatuous, unscientific claims and arguments, even those published in peer-reviewed publications, was also emphasised.

Efforts by Rothamsted Research to promote public and media engagement and provide transparent information about their GM wheat trial were highlighted as a positive example of focusing in the scientific issues involved and defusing potential opposition.

The complexity of extrapolating the contribution of GM technology to reduced food prices was recognised, although the importance of differentiating between public and private benefits, and providing examples of direct relevance to individual consumers – eg price, taste, shelf-life, nutrition etc – was highlighted.

It was suggested that new metrics could help to demonstrate the value and benefits of GM technology, with information delivered by independent, professional communicators.

The importance of focusing on UK productivity gains was highlighted, with a population set to increase to 80 million by 2050 yet with half the agricultural area of Germany. Future GM innovations could help deliver a step change increase in crop yields through improvements in photosynthetic efficiency and Nitrogen fixation. Continued Government investment in GM-related research was viewed as essential to support such advances in a UK context.

Mark Buckingham again thanked the All-Party Group for hosting the report launch, observing that the discussion had highlighted three key issues – trust, communication and choice – and the need to identify the right spokesmen and narratives for the right audiences to promote improved public awareness and acceptance of the demonstrable benefits of GM technology.

Concluding the meeting, Julian Sturdy MP thanked speakers and attendees for their contribution to a stimulating and informative session, suggesting that the impressive scale of positive environmental benefits now attributable to GM crops on a global basis – particularly in terms of reduced pesticide use and greenhouse gas emissions – was not yet widely appreciated or understood. Given the increased prominence of global concerns over sustainability and climate change, there was a major challenge to communicate the critical role of agricultural science and innovation to a wider public.