All-Party Parliamentary Group on Science and Technology in Agriculture

Notes of a Meeting held on Tuesday 24 October 2023

Meeting Room N, Portcullis House and via Zoom

Enabling genetic technologies for food security – Parliamentary launch of new Royal Society report on GM crops

In attendance:

Chair:
Julian Sturdy MP

Members:
Sir Robert Goodwill MP
Lord Carrington
Earl of Lindsay
Earl of Caithness
Lord Taylor of Holbeach

Guest speakers:
George Freeman MP, Minister of State, DSIT
Professor Jonathan Jones FRS, Group Leader, The Sainsbury Laboratory
Jonny Hazell, Senior Policy Adviser, The Royal Society

Stakeholders:
Jon Williams, BASF; Prof Johnathan Napier, RRes; Tim Mordan, Defra; Dr Helen Ferrier, NFU; Rosie Beevor, Defra; Steve Kelly, Univ of Oxford; Prof Eileen Wall, SRUC; Alessandro Coatti, RSB; Prof Cathie Martin, JIC; Prof Ian Graham, Univ of York; Dr Helen Riordan, Defra; Charlotte Surtees-Chapman, AB Foods; David Flanders, AgriMetrics; Simon Crawford, Burpee; Dr Julian South, MAGB; Stefano Brizzi, BASF; Dr Louise Ball, Defra; Kim Matthews, AHDB; Sir David Baulcombe, Univ of Cambridge; Jim Duncumb, Syngenta; Joe Brennan, UKFM; Ariane Derimay, UKFM; Benno van der Laan, Green Orange LLC; Dr Lydia Smith, NIAB; Martin Battersby, MKBioscience; Graham Teakle, Univ of Warwick; Dave Hughes, Syngenta; Martin Jenkins, Cambs farmer; Milika Buurman, Elsoms; Prof Andrew Balmford, Univ of Cambridge; Piet van der Meer; Prof Jane Langdale, Univ of Oxford; Karen Holt, regulatory consultant; Dr Frances Gawthrop, Tozer Seeds; Tom King, Eurofins; James Warner, United Oilseeds; Penny Hundleby, JIC; Prof Jim Dunwell, Univ of Reading; Nigel Bazeley, Biopotatoes; Jeff Hooper, Biopotatoes; Prof Joyce Tait, Innogen; Prof Brendon Noble, Univ of Westminster; Allan Wilkinson, HSBC; Julian Smith, RRES; Dr Petra Jorasch, Euroseeds; Leslie Sharp, Syngenta; Rachel Lambert, FCDO; Tom Richards, FSA; Prof Gideon Henderson, Defra; Nigel Padbury, Premium Crops; Graham Brookes, PG Economics; Prof Susan Jebb, FSA; Louise Manning, Univ of Lincoln; Anthony Keeling, Elsoms; Eleri Tudor, Elsoms; Perry Bateman, British Sugar; Kieran Woof, RSB; Phil Howell, NIAB; Rupert Lewis, Royal Society; Jim Godfrey, NIAB Trust; Mia Cerfonteyn, TSL; Helen Hague, RRes; Amrit Nanda, Plant ETP; Valerija Volcic, Plant ETP; Nathan Pumplin, Norfolk Plant Sciences; Dick Flavell, ex JIC; Mark Buckingham, Bayer; Liz Scott, NIAB; Ian Tollervey, FCDO; James Clarke, RRes; Mike Gooding, AHDB; Margaret Karembu; Peter

Hesketh, Gatsby Foundation; David Buckeridge, NIAB; Eva Gordon-Sharpe, JIC; Rory Blackbourn, Sakata; Nick Goodwin, JIC; Kirsty Culley, JIC; Odd-Arne Rognli, JIC; Robert Last, Michigan State University; Mike Summers; Kevin Folta, Univ of Florida;Esther van der Knaap; Prof Caroline Dean, JIC; Prof Dale Sanders, ex-JIC; Ikrah Ul Hassan, CropLife UK; Wayne Parrott, Univ of Georgia; Martin Emmett, NFU Hortic Chair; James Wallace, IAR Agri; Dr Geoff Mackey, Chamerion; Karen Holt, Holt Regulatory Solutions; Prof Angela Karp, RRes; Jonathan Clarke, JIC; Kamil Witek, TSL; Edwin van der Vossen, Solynta; Gotz Hensel, HHU; Luis Rafael Herrera Estrella, Cinvestav; Agnieszka Witek, TSL; Georgia Mitrousia, RRes; Daniel Pearsall, Group Co-ordinator.

1. Introduction

Julian Sturdy (JS) welcomed guest speakers and both in-person and online attendees to the meeting, noting that it was first APPG meeting since the Group launched its *'Farming Innovations to Deliver Net Zero'* report, which was available both electronically and in hard copy. JS briefly introduced the topic for discussion, observing that it is almost 30 years since GM crops were first grown commercially and that over that time, it has become the most rapidly adopted crop technology on record, now grown on more than 200 million hectares globally each year. Despite claims to the contrary from anti-GM activist groups, there are no substantiated reports of harm to human or animal health or the environment arising from the commercial cultivation and consumption of approved GM crops, and the technology has delivered significant benefits in terms of increased agricultural productivity, reduced pesticide use and lower greenhouse gas emissions. And while the UK Government, in response to calls first led by this APPG, has introduced new legislation to make the regulation of new precision breeding technologies more proportionate and science-based, the development and commercialisation of GM crops remain subject to time-consuming, costly and restrictive rules inherited from the EU. JS indicated that the Group was therefore pleased to help launch the Royal Society's excellent report exploring the case for also re-evaluating the UK's regulatory approach to GMOs in food and agriculture, to make them more proportionate to the scientific evidence of risk, to realise the potential benefits for the UK science base, and to help address the urgent global challenges of food security, climate change and sustainable development.

2. Guest speakers

(Copies of guest speakers' slides are available to download via the Meetings section of the All-Party Group web-site www.appg-agscience.org.uk)

George Freeman MP, Minister for Science, Research & Innovation, DSIT

George Freeman (GF) indicated that although he had not voted for Brexit, the passing of the Precision Breeding Act was a hugely positive signal of the opportunities for Britain to harness the incredible power of the genetics for global and UK good. He paid particular tribute to the members and stakeholders of the APPG for helping to make this happen, and to Britain's scientists for keeping the flame alive.

GF indicated that the Government was making a big commitment at a high level to shift the UK economy from a service economy to a much more strategic science, technology and innovation-driven economy, with a big increase in R&D funding and creation of the new Department for Science Innovation and Technology, as part of a 10-year plan.

He added that the Government had identified five critical technologies: AI, future of telecoms, semi-conductors, quantum and engineering biology, each with the potential to give the UK leadership and sovereign capability in transformational scientific disciplines. GM noted that engineering biology encompassed agricultural biotech, industrial materials and the healthcare life sciences, all of which were inter-connecting and intersecting.

In addition, GF noted that he and Mark Spencer at Defra were picking up the 10-year legacy work behind the Agri-Tech Strategy, looking to give it a shake-up, put some more money behind it, and turn the three Agri-Tech Centres into a catapult to provide the infrastructure for a scale-up of capabilities in this area. But he recognised that a key challenge would be for the sector to ensure it is not just about pure research, and that it will bring proper strategic partnering from major global companies.

In that context, GF indicated that the Royal Society report was perfectly timed. Ministers were well aware that one of the biggest barriers to activity and investment in this area was the need for regulatory certainty. One of the key pillars of the new science and technology framework was regulatory leadership, and he set out a vision of the UK as a leader in place-based regulatory sand-box testbeds, places where international and domestic innovators can come to get the data needed for rapid approval for their innovative products.

GF concluded by suggesting that in a global race, engineering biology was one area where Britain could move much more quickly than Europe, with a higher ethical and consumer confidence than the US, and catch up some of the ground we have lost.

Professor Jonathan Jones FRS, Group Leader, The Sainsbury Laboratory

Jonathan Jones (JJ) opened by welcoming the Precision Breeding Act as a significant step forward for crop improvement using gene editing, and paid tribute to the Government and hard-working civil servants for getting the legislation in place. Like gene editing, GM also offers opportunities to increase and protect crop yields, and to replace chemistry with genetics. 40 years of evidence and experience with the GM method have shown that it is no more risky than other breeding methods. Nevertheless, implementation of GM rules in the EU is dysfunctional and adds excessive costs and delay. However, the rules themselves do allow some scope for discretion by regulators to allow for derogation from some requirements. JJ indicated that, outside the EU, the UK has the opportunity to implement the GM rules we have inherited from the EU in a more proportionate and risk-based manner.

JJ highlighted the continuing need for crop genetic improvement. Without higher-yielding varieties, food prices would be higher and we would need more land for agriculture with adverse impacts on nature and biodiversity. Today we are using the same area for farming as in the 1960s, but producing more than twice as much food. To continue this progress we need to use every tool in the toolbox, he said.

Pointing to the ‘natural’ or ‘wild’ ancestors of our major food crops, JJ noted that we have been ‘genetically modifying’ crops for a very long time. It is equally ‘unnatural’ to have moved crops such as maize, tomatoes, potatoes, sunflowers etc from South America to Europe, and Sir Walter Raleigh may have been put off bringing such crops to our shores if he had had to contend with some of the plant health and biodiversity regulations now in place.

Providing examples of what is possible using the GM method but not though gene editing, JJ pointed to:

- Virus resistance in papaya which saved the Hawaiain papaya industry, a public sector project with ringspot resistant genetics provided free of charge to growers;

- Bt eggplant in Bangladesh providing effective resistance against the devastating fruit and shoot borer and greatly reducing insecticide use by poor farmers in Bangladesh while increasing their crop yields;

- Bt corn and cotton have also greatly reduced the need for insecticide use, and as a result they account for 85-95% of US plantings;

- Vitamin A-enriched Golden Rice as a solution to Vit A deficiency, which affects 250 million children in the developing world. Each year 500,000 children go blind as a result of Vit A deficiency, most die;

- Engineering phosphorus metabolism in crops to produce a dual fertilisation and weed control system by enabling crops to use phosphite rather than phosphate, so they out-compete the weeds;

JJ highlighted the enormous genetic diversity in crop plants, and explained that the GM method borrows a nature-based solution to add desired genes into a plant chromosome, indeed in 2015 sweet potato was found to be a naturally transgenic crop.

He also noted that GM is a method, not a thing. Like adding an app to an I-Phone, after adding a gene to a potato with 60,000 other genes, it is still a potato, but with added function.

JJ illustrated the huge genetic diversity within any crop species by showing the scale and extent of chromosomal variation within the potato crop, pointing out that the natural structural and allelic variation in any plant genome is enormous compared with the tiny changes introduced using GM and gene editing.

JJ noted that GM foods had not always been controversial, and that in the early days GM tomato puree available in UK supermarkets had outsold its non-GM counterpart. Today, GM purple tomatoes have been developed at the John Innes Centre with nutritional benefits including potential cancer-fighting properties. The purple tomatoes were approved for marketing in July 2023 by the US Food & Drug Administration, and supply cannot keep up with demand.

Omega-3 enriched Camelina, developed at Rothamsted Research in the UK led by Professor Johnathan Napier, is another example of using the GM method to improve nutritional properties in crop plants, in the case to provide a plant-derived feedstock for use in aquaculture as a more sustainable alternative to depleted marine sources.

Explaining his research interest in using the GM method to activate disease resistance mechanisms in plants, JJ pointed to a pepper gene which confers bacterial resistance in tomato, and an Arabidopsis gene which can save tomato plants from bacterial wilt – noting that there are dozens of other potentially useful GM traits that could solve crop problems through genetics rather than chemistry, but they are currently blocked in the UK by excessive regulation.

JJ's own research relates to delivering late blight resistant potatoes using three separate resistance genes, shown in UK field trials to confer complete resistance to all blight races without yield penalty, and already commercialised on a small scale in the US by Simplot.

In the face of food security and climate challenges, JJ said all solutions would be needed. Given the track record of safe use and the potential to drive increased crop production, it was time to move on from the pre-cautionary regulatory principle on GM based on completely hypothetical hazards to a post-cautionary era when uncertainty is replaced by certainty and facts. Also time to move on from the gene editing 'good', GM 'bad' narrative.

Jonny Hazell, Senior Policy Adviser, The Royal Society
Jonny Hazell (JH) opened by emphasising that what the Royal Society is advocating from a policy perspective is not new, and fits in to a strategy of pro-innovation, smarter regulation as set out in the Government's 2023 *UK Science & Technology Framework* document, and as reflected in the Department for Business and Trade's observation that *'some of the current regulatory standards inherited from the EU are based on an overly restrictive and often disproportionate interpretation of the precautionary principle.'*

Since GM has been shown over recent decades to be no riskier than other breeding technologies, as evidenced for example by statements from ACRE in the UK and a 2016 meta-analysis of 900 research publications by the National Academies of Sciences, Engineering and medicine in the US, the current approach to GM regulation is disproportionate to known risks.

This disproportionate, over-precautionary approach to regulation has resulted in a requirement for GM application dossiers to contain huge amounts of data, compiled at great cost, and in practice affordable only for the largest multinational companies. Indeed, for some time these files have been for import and marketing only, since applications for GM crop cultivation in the EU effectively stopped in the 2000s because they were blocked politically.

JH noted that ACRE observed in 2013 that current GM regulations do provide the flexibility for applicants to submit evidence to address risk hypotheses on a case-by-case basis, taking into account crop type, trait, scale of activity and experience of growing the GMO elsewhere, and that risk assessments should also be based on defined hypotheses of potential adverse effects.

JH pointed to an analogy highlighted by the Chancellor of the Exchequer in the last Budget speech in relation to plans for regulation of medicines and healthcare products from 2024, which will assume approval for products already approved by a trusted regulator in a third country.

JH explained that the RS has taken this information to develop a proposed mechanism for interaction between regulator and applicant to determine regulatory experience elsewhere of the crop/trait combination, as well as any plausible, science-based hypotheses of risk requiring case-by-case assessment or which might justify derogation from such risk assessment.

In developing this proposed approach, JH highlighted the USDA's recently reformed regulatory review process, which determines whether a GM plant requires regulatory oversight based on the characteristics of the plant itself (ie whether there is a plausible pathway to increased plant pest risk), rather than assuming that all GM crops are inherently risky. This determination process takes 180 days and supports positive interaction between applicant and regulator.

JH noted that the first GM product in the US to be submitted through this process was the purple tomato developed at the John Innes Centre in the UK, on a budget in the tens of thousands rather than millions. A more proportionate approach to regulation, based on plausible hypothesis of risk related to the product rather than any particular technology, could pave the way to enabling public benefit innovations from public sector research organisations as well as encouraging greater access and commercial activity among start-ups and SMEs.

3. Questions and discussion

The following key points arose during questions and discussion.

The Food Standards Agency's medium-term plans for reform of its regulated products categories, which include novel foods, GMOs and irradiated foods, possibly building on the two-tier system proposed for precision bred food and feed products.

Need to factor in the dimension of consumer trust and confidence when considering plans for reciprocal recognition of approvals granted by other authorities.

Despite the scientific evidence showing GMOs are no more risky than conventional breeding, market surveys suggest that GMOs are still perceived as risky by around a third of the UK population, with a further third considering the benefits outweigh the risks, and a final third with no firm view either way. However, consumer research also indicates that attitudes can be influenced significantly by the trait or application involved, eg delivering health or environmental benefits rather than cosmetic changes.

Notable that while members of the public may express concerns in surveys of this kind, this does not extend to their consumption habits when holidaying abroad, eg to the US, where GM products and food ingredients are ubiquitous.

Pros and cons of herbicide tolerance traits in UK crops such as wheat and sugar beet, offering significant benefits for farmers but posing a communication challenge for consumer acceptance.

Scale of the regulatory burden collapses the case for most applications of GM, and has meant that its use has effectively been restricted to two major traits – herbicide tolerance and insect resistance – in very large-scale commodity crops. If the costs of registration were reduced from $100m to $100k, it would open up all kinds of new opportunities for beneficial new products and innovations.