All-Party Parliamentary Group on Science and Technology in Agriculture

Notes of a Zoom Meeting held on Tuesday 19 May 2020

Hosted by NIAB, Cambridge

In attendance:

Members:
Julian Sturdy MP (Chair)
Sir Paul Beresford MP
Lord Cameron of Dillington
Lord Curry of Kirkharle
Katherine Fletcher MP
Baroness Jones of Whitchurch
Owen Paterson MP
Viscount Ridley
Lord Taylor of Holbeach

Stakeholders:
Dr Charlotte Allender, University of Warwick; Tom Allen-Stevens, farmer; Louise Ball, Defra; Catherine Barrett, AIC; Dr Tina Barsby, NIAB; Judith Batchelar, Sainsburys; Prod Sir David Baulcombe, University of Cambridge; Prof Mike Bevan, JIC; Paul Billings, Germinal; Susannah Bolton, AHDB; Tom Bradshaw, NFU; Neil Bragg, University of Essex; Graham Brookes, PG Economics; Hannah Brown, Defra; Connie Budge, Royal Society; Prof Mario Caccamo, NIAB EMR; Jaine Chisholm-Caunt, GAFTA; Bill Clark, NIAB; Dr Belinda Clarke, Agri-Tech E; Ian Cox, Innovate UK; Georgia Craig, NFU; Iain Donnison, IBERS; Jim Duncumb, Syngenta; Prof Jim Dunwell, University of Reading; Dr Helen Ferrier, NFU; Prof Dick Flavell, ex-JIC Director; Vicky Foster, BBRO; Monica Garcia, Estel Consult; Jim Godfrey, NIAB/IRRI; Paul Gosling, AHDB; Stephen Goward, Saaten Union; Ian Graham, York University; Martin Grantley-Smith, AHDB; Denis Griffin, TEAGASC; Catherine Harries, AHDB; Richard Harrison, NIAB; Adrian Hayler, Elsoms; Jonny Hazell, Royal Society; Saskia Hervey, Earlham Institute; Robert Hiles, Syngenta; David Hill, RW Hill Farms; Karen Holt, Holt Regulatory Solutions; Eric Holub, University of Warwick; Anthony Hopkins, NFU; Graham Jellis, AFCP; Dr Thomas Jolliffe, Limagrain; Prof Huw Jones, Aberystwyth University; Prof Jonathan Jones, TSL; Prof Angela Karp, RRes; Matt Kerton, DSV; Stuart Knight, NIAB; David Langton, Origin Enterprises; Dominic LeMare, FDF; Dr David Lloyd, IBERS; Ros Lloyd, NIAB; Dr Geoff Mackey, BASF; Nick Major, ForFarmers; Arthur Marshall, British Sugar; Sarah Middleton, BASF; Nigel Moore, KWS; Ian Munnery, SESVanderHave; Prof Johnathan Napier, RRes; Prof Richard Napier, University of Warwick; Prof Giles Oldroyd, CCC: Sarah-Jane Osborne, AHDB; Sarah Palmer, IBERS; Sam Pooke, abc; Steffen Reitz, NPZ Innovation; Jake Richards, NFU; Dr Helen Riordan, Defra; George Rothschild, Intl Dev Consultant; Prof Helen Sang, Roslin Institute; Liz Scott, NIAB; Dr Julian South, MAGB; Prof Mark Stevens, BBRO; Andrew Swift, Fera; Nick Talbot, TSL; Prof Chris Tapsell, KWS; Graham Teakle, University of Warwick; Craif Thomas, CN Seeds; Stephen Thomson, SGT Services; Susan Twining, CLA; Carolina von der Weid, Embassy of Brazil; Peter Watson, British Sugar; Dr Pete Wilkins, ex-IBERS; Marco Winters, AHDB; Robin Wood, Elsoms; James Wallace, IAR Agri; Mark Culloden, Strube; Paul Temple, Farmer/AHDB; Frances Gawthrop, Tozer Seeds; Nigel Kerby, NIAB Board; Chris Burt, RAGT; Emma Green, British Sugar; Sam Brooke, Syngenta; Prof Dale Sanders, JIC; Dr Richard Summers, RAGT; Richard Robinson, SESVanderHave; Daniel Pearsall, Group Co-ordinator.

1. Welcome & Introduction

Julian Sturdy (JS) welcomed Members and Stakeholders to the All-Party Group's first virtual session conducted via Zoom, apologising for the slightly delayed start.

He noted that attendees had received brief speaker biographies (attached at Appendix 1) and invited guest speakers to make their presentations.

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]

Karen Holt, Holt Regulatory Solutions

Karen Holt (KH) opened the session by presenting the key findings and recommendations of a report co-authored with Monica Garcia Alonso of Estel Consult Ltd and commissioned by the Agricultural Biotechnology Council (abc) entitled 'Fostering innovation in agriculture through enabling regulation'.

KH explained that the report reviewed global regulatory systems for advanced crop improvement techniques such as GM and gene editing, with a view to informing post-Brexit UK policy.

KH highlighted the need for enabling, risk-based regulatory frameworks to support innovation in agricultural biotechnology at a time of climate change and food security challenges.

By comparing and contrasting the regulatory oversight in Canada, Argentina, Australia/NZ and the EU, KH noted that enabling regimes are capable of supporting innovation through timely product approvals whereas non-functioning systems, such as the EU, stifle innovation and deter investment, with some products stalled in the system for over 20 years.

KH explained that the report put forward series of recommendations to support the pragmatic and proportionate implementation of a regulatory framework for products derived from genetic modification and gene editing.

Such a framework should be based on clear policy and protection goals. Risk assessments should be proportionate to the risks associated with each particular product, and performed by experienced risk assessors.

The risk assessment process itself should be flexible, transparent and underpinned by consultation.

In the case of gene edited products, KH suggested that the UK could follow a regulatory definition of GMO compatible with the Cartagena Protocol, as is the case in Argentina, for example.

In the case of genetically modified crops, the existing EU legislation could be implemented in a more flexible way, by means of the derogation clause (Article 5 of Regulation (EU) No 503/2013), in which only studies deemed necessary for a particular product, or those considered to be scientifically necessary for the risk assessment, would be required.

Professor Jonathan Jones, The Sainsbury Laboratory, Norwich

Jonathan Jones (JJ) spoke to the title "Agricultural Innovative Biotechnology (GE and GM) in the UK; an immense opportunity", arguing that the UK needs to establish a more science-based and proportionate regulatory framework for crops improved using gene editing and GM.

He pointed out that UK scientists play leading roles in visionary projects to increase crop yields and extend biological Nitrogen fixation. There are many UK-developed beneficial traits, such as nutritional enhancement in the purple tomato (which prolongs the life of cancer-prone mice) and in oilseeds to enable them to accumulate long-chain polyunsaturated fatty acids such as EPA and DHA that promote vascular health, and which currently derive from limited fish stocks.

JJ reported on using the GM method to achieve resistance to potato late blight, a devastating potato disease that led to the Irish famine in 1840s. Blight control requires £50-60million/year in crop protection in UK, with 11 - 15 sprays per season (in some cases up to >20).

With sustained BBSRC funding, JJ and colleagues have identified resistance genes from wild potatoes that enable the Maris Piper potato variety to resist all tested blight races. JJ noted that this resistance characteristic requires use of the GM method and is not achievable with gene editing.

These elite GM lines yield on a par with Maris Piper, and the tubers show reduced bruising damage, and lowered reducing sugars, using a trait ("Innate") that is already approved and commercially available in the US produced by Simplot. This tuber trait reduces the need to use the now-banned sprout suppressant CIPC.

Many other valuable discoveries deserve testing in the UK, for example to enable better weed control, or flea beetle resistance in oilseed rape.

JJ indicated that the UK could become a leader in Innovative Biotechnology in agriculture (AgIB), with scores of beneficial traits to evaluate and deploy. An exemption on use of IP for research (as in Belgium) would promote the establishment of start-up companies in the UK, as it has in Belgium.

JJ noted that access to advanced technologies was needed to meet the UN Sustainable Development Goals with only 10 years left to achieve them.

JJ acknowledged that GM was not a magic bullet and that addressing the sustainable intensification challenge would require the judicious use of all possible paths forward - the best crop improvement technologies would be needed alongside action in other areas, eg to reduce food waste. Let’s avoid false antitheses, he said.

JJ noted that the UK Government White Paper on Regulation for the Fourth Industrial Revolution (2019) mandates proportionate regulation of new technologies. The UK therefore needed to establish a science-based regulatory framework for crops improved using GM and gene editing methods. Current rules discourage using GM and GE to address sustainability and food security.

JJ added that the UK should declare that it is not bound by the ECJ ruling that gene editing should be regulated as GM. New plant varieties incorporating such events could be regulated as any other new plant variety.

However, many valuable traits required use of the GM method – and therefore more proportionate regulation of both gene editing and GM was needed. JJ suggested that the current EU rules on GM crops should be interpreted flexibly, to deliver well-defined goals, on a case-by-case basis, with dialogue between regulators and applicants.

Ian Munnery, General Manager, SESVanderHave UK

Ian Munnery opened by highlighting the economic and agronomic significance of the sugar beet crop, grown on 4.5m ha globally, including 120,000 ha in the UK supporting 3000 farmers and 9500 jobs.

UK sugar beet production supplies around 50% of UK sugar demand from four factories (historically there were 18 factories and increased capacity could be established to meet 100% of UK demand – Eire and Scotland were both looking at restarting sugar processing from beet).

UK has highly efficient factories, processing beet for 208 days/year compared with 100-120 days operation in continental Europe.

However, IM explained that the UK sugar beet sector was exposed to the world sugar market, where costs of production are distorted by direct state aid and indirect aid unavailable to UK growers.

Sugar beet as a crop is important to maintain rotations otherwise it becomes more difficult to control pests, weeds and diseases in wheat, oilseed rape, potatoes etc.

Sugar beet is also the only UK crop to see a 1.5% yield increase year on year. Current average UK yield = 78t/ha, but the world record yield (California & Chile) ~ 170t/ha. With a relatively simple genome, the sugar beet crop offers huge potential for genetic improvement for yield, agronomic and quality traits.

Sugar beet is also a highly versatile crop with potential not only as a feedstock for food, but also for animal feed, pharmaceuticals, nutritional products and fuel (bioethanol).

Despite the development of innovative breeding solutions to Rhizomania and Beet Cyst Nematode, the sugar beet crop has seen fewer agchem products registered and more products banned, leading to a resurgent threat from pests, weeds and diseases.

A major challenge for UK sugar beet producers is Virus Yellows, a complex of five viruses and three aphid vectors which can cause yield losses of up to 50%. The UK is a greatest risk because of its relatively mild, maritime climate (last two years were the mildest on record) and the loss of systemic neonicotinoid insecticides which for several decades have protected the crop.

Access to fewer active ingredients also accelerates resistance, driving up costs and reducing yields here in the UK while growers elsewhere enjoy state aid, continued of neonics through emergency derogations or access to advanced breeding techniques such as GM. IM suggested that the combined effect was to render the UK uncompetitive relative to imports.

According to IM, the way forward lies in harnessing the potential of the sugar beet crop as a genetic resource. In sustainability terms, sugar beet requires just 20% of the water used by cane to produce sugar. It can also be improved and adapted genetically to cope with abiotic stresses (heat, drought, salinity) and biotic stresses (pests and disease).

IM described the results of an Innovate UK-funded study on Virus Yellows involving BBRO, ADAS, Maribo and SESVanderHave which has identified a number of promising QTLs that can reduce yellowing – the urgency now is to transfer these sources of genetic resistance into commercial solutions. Precision breeding techniques can accelerate the delivery of beneficial traits into elite germplasm, potentially producing market-ready varieties within 2-3 years rather than 10-12.

Access to gene editing techniques would therefore reduce the costs of production of both the crops and new varieties, protecting crops, jobs, investment, food security and the environment.

IM concluded by asking whether the Covid-19 crisis would awaken people from their complacency about food security, jobs and biosecurity.

He reminded the Group that 2020 was the 175th anniversary of the Great Irish Famine.

He also noted that sugar beet wasn't even considered as a commercial crop before 1811 when Napoleon decreed that an alternative should be developed to British exports of cane from the Caribbean. From nothing, France established 500 sugar beet factories by 1845, giving state funding to breeding and agronomy to develop an innovative new crop and a brand new industry.

Concluding, IM suggested that it was important for Britain to seize the opportunity and learn these lessons from history.

Dr Tina Barsby, Chief Executive, NIAB

Tina Barsby (TB) opened by thanking officers and members of the All-Party Group – on behalf of scientific and research institutions across the UK - for their active support on the gene editing issue.

She referred to the letter from Julian Sturdy as chair of the All-Party Group to Defra Secretary George Eustice seeking an enabling amendment to the Agriculture Bill, paving the way for the UK to set aside the European Court ruling of July 2018 classifying new gene editing techniques as GMOs.

TB explained that the proposed amendment offered a simple regulatory solution, by adopting a revised definition of GMO compatible with the definition applied in the internationally recognised Cartagena Protocol, so aligning the UK with the regulatory position of many countries around the world whose scientists, plant breeders, farmers and consumers were already benefiting from the advances made possible through these precise breeding techniques.

This revised definition meant that gene edited products whose DNA changes could have occurred naturally or through conventional breeding techniques would not be regulated as GMOs, an outcome successive Defra Ministers had already indicated that they would like to see post-Brexit.

TB suggested that this would send a clear signal that the UK is serious about supporting genetic research and innovation, and would mark an important step, in the Prime Minister's words, to liberating the UK's extraordinary bioscience sector.

TB noted that significant momentum was building behind this simple change, which could have very far-reaching and beneficial consequences for scientific research and innovation in this country, particularly as the UK begins to chart its recovery from the devastating Covid-19 crisis.

The scientific community in particular was united in supporting this initiative, and actively advocating their right to apply excellent science in the public interest and for the public good using the same research tools and technologies as colleagues around the world.

TB also noted that support for the amendment proposal extended across the farming, plant breeding and seed sectors, and was shared among like-minded cross-party politicians. This was an opportunity for positive change, after decades of stagnation within the EU system, after years of watching the debate over genetic innovation hijacked by unelected and unaccountable interest groups.

TB urged politicians of all political parties to seize this opportunity, particularly at a point in time when science would play such a vital role in our recovery from Covid-19, to demonstrate that science is also critically important in our ability to mitigate and adapt to the effects of climate change, in our ability to ensure our future agricultural systems are genuinely sustainable, and in our ability to support the demands of global food and nutrition security.

TB continued her presentation with a brief look how gene editing was already being used around the world – which crops and traits were already being tackled.

She explained that gene editing offered a suite of new breeding techniques, of which CRISPR-Cas was by far the most widely used, which allowed plant scientists and plant breeders to make very precise, desired changes to the genome. By far the most compelling advantages of these new techniques were speed and precision – 2 or 3 years instead of 10 to 12 years to develop an elite plant variety. This was because gene-editing minimised unwanted (not harmful, but inconvenient) characteristics introduced along with the desired change, removing the need for several generations of back-crossing to disconnect them.

In the race to keep pace with a growing world population, in the context of climate change, rapidly evolving new pest and disease profiles, and demands for future farming systems to be less dependent on chemical inputs, speed was of the essence, and access to precision breeding tools such as these would be vital.

TB presented data taken from a recent global review of gene editing applications conducted by the Julius Kuhn Institute in Germany.

The Julius Kuhn Institute review identified gene editing applications in 46 different crop species, with rice, tobacco, tomato, maize, wheat and soybean among the most cited.

There was also a very broad range of market-oriented traits already developed using gene editing techniques – not only agronomic traits such as yield and disease resistance but also consumer-facing traits such as food quality, and climate resilience traits such as drought and salt tolerance.

Examples cited by TB included:

Wheat with bigger grains and increased grain weight
Pod shatter resistant oilseed rape
Powdery mildew resistance in rice, wheat and tomato
Citrus canker resistance in orange and grapefuit
Reduced gluten content in wheat
Healthier oil profile and quality in soybean
Drought tolerance in maize and wheat
Salt tolerance in rice

TB explained that behind each example lay a positive story of how these precision breeding techniques are being applied to address genuine challenges for the sustainability of global agriculture.

TB also highlighted the diverse range of players in the gene editing space. A recent peer-reviewed study of the situation in Argentina, which was at the forefront of developing a fit-for-purpose, enabling regulatory approach to gene editing, found that – in comparison to the first wave of GM products - gene edited products have been able to follow a must faster development rate from lab to market, and that this development has been driven by a more diverse group of research-based organisations, led mostly by SMEs and public sector research organisations.

This was because the techniques themselves are relatively low-cost and accessible – it was only when the time and costs of wholly disproportionate GM regulatory test and data requirements were factored in that these techniques became unviable for public sector research organisations, as well as small independent plant breeding companies or university spinouts.

Turning to the regulatory landscape for conventionally bred plant varieties in the UK, TB acknowledged that some people believe the regulatory future lies in a completely new, trait- or product-based approach to regulation, in which all new varieties, irrespective of breeding method and including GM varieties, would be entered through the same regulatory funnel.

But TB argued that the UK already has excellent, functioning, trait and product-based regulations which have delivered safe and fit-for-purpose plant varieties over the years. These regulations could easily embrace varieties produced with new breeding techniques.

TB noted that the existing UK variety testing and registration system had served the industry well for more than 50 years, and was widely mirrored internationally. It provided the foundation not only to assess the quality and performance of new varieties to ensure they match up to market and consumer requirements, but also to support the award of Plant Variety Rights, the unique Intellectual Property system which underpins investment and innovation in the plant breeding industry.

TB added that plant breeders operate under the overarching requirements of UK food safety and environmental protection legislation, with an impeccable track record of safety stretching back decades.

In summary, TB suggested that the current variety registration system offers a proven vehicle to deliver the outcomes society expects from agriculture in the future. The system is not set in stone and has evolved over the years to reflect changing market, agronomic and policy requirements. In future this would include ensuring the system reflects increased demands for reduced input use, climate change mitigation and climate resilience.

In conclusion, TB acknowledged that the existing plant variety testing system was largely hidden from the eyes of most consumers and scientists, whereas plant breeders, farmers, regulators and seed suppliers took it for granted. There was therefore an obligation on all those sectors to explain to how system matches up to future objectives and expectations for food, agriculture, and the environment.

3. Questions and discussion

During the discussion, Members, Stakeholders and guest speakers considered a range of questions, including the potential damaging implications for genetic innovation of the recent French government decree classifying a number of traits derived from mutation breeding as GMO, the reduced scope for “off target effects” within a genome using gene editing compared to established “conventional breeding” techniques, the relative safety for consumers and the environment of gene editing as a breeding technique compared to classical crossing or mutation breeding, and the risks of not taking a scientific approach to gene editing.

Concluding the meeting, JS thanked Officers and Members for their attendance and contribution to an extremely well-attended and productive session.

APPENDIX

SPEAKER BIOGS – Zoom Meeting – 19 May 2020

Karen Holt, Holt Regulatory Solutions Ltd

Karen graduated in Biochemistry from Canterbury and started work at Syngenta, Bracknell in 1987 as a Protein Biochemist in Plant Growth Regulator and Herbicide Research before joining the research team that developed the delayed ripening tomato which became the first genetically modified product to be launched in the UK.

She moved to Biotechnology Regulatory Affairs in 1996 and since then has led Global and EU projects helping to shape regulatory frameworks as well as being active in OECD and on the Convention on Biological Diversity. As a Senior Regulatory Affairs Manager in Syngenta she led a team responsible for gaining regulatory approval for genetically modified plants destined for both research and commercial purposes in the EU. She recently left Syngenta to set up her own company "Holt Regulatory Solutions Ltd" which offers advice and regulatory guidance on matters relating to genetically modified and gene edited crops. She is also a Fellow of the Royal Society of Biology.

Professor Jonathan DG Jones (JJ), The Sainsbury Laboratory, Norwich

JJ completed his PhD at the PBI in Cambridge in 1980, was a postdoc in Boston, and worked 1983-8 at an early US agbiotech company, AGS. At the Sainsbury Lab (TSL) since 1988, he isolated some of the first resistance genes. His lab works on (i) isolating, understanding and deploying new genes for potato late blight resistance from wild potato relatives (ii) understanding the mechanisms of an Arabidopsis immune receptor.

JJ served as head of TSL 1994-1997 and 2003–2009. He is an outspoken advocate of GM solutions to crop disease problems, working with the 2Blades foundation (www.2blades.org), and on the board of ISAAA (www.isaaa.org). He was co-author of UK Royal Society's "Reaping the Benefits" 2009 review of the science required for sustainable food security (https://royalsociety.org/topics-policy/publications/2009/reaping-benefits/). He was elected EMBO member in 1998, Fellow of the Royal Society (London) in 2003 and a foreign member of the US National Academy of Sciences in 2015.

Ian Munnery, General Manager, SESVanderHave UK

Ian started his career at Sharpes Seeds in the early 90's, before time at Fishers Seeds & Grain, United Oilseeds and for the last decade for Sugar Beet breeder SESVANDERHAVE; establishing the UK subsidiary in 2012, increasing the R&D capacity and investments within the UK.

A 5-year research collaboration on Pre-breeding for Virus Yellows with Maribo-Hileshog, ADAS & British Beet Research Organisation with part funding from Innovate UK has just concluded.

Dr Tina Barsby OBE, Chief Executive Officer, NIAB

Tina is a plant geneticist with significant experience in the agricultural crop sector. With a PhD from the University of Nottingham, she spent several years

working in North America, including 5 years with the Canadian technology company Allelix, before returning to the UK.

After almost 20 years working on biotechnology applications in crop breeding for the seed companies of the Limagrain Group, she spent 2 years co-ordinating cereal and grass genetics and genomics for the UK research council, the BBSRC. She became CEO of NIAB (previously the National Institute of Agricultural Botany) in 2008.

NIAB celebrated its Centenary in 2019. Today it is an internationally recognised and innovative organisation, operating under the strapline ‘Plant Science into Practice’. NIAB provides information and practical advice to improve the yield, sustainability and resilience of crop production across the arable, forage and horticulture sectors. Tina is committed to the translation of plant science into products and services of value to industry and to society at large. She was awarded an OBE in the 2018 New Year’s Honours List for services to Agricultural Sciences and Biotechnology.