All-Party Parliamentary Group on Science and Technology in Agriculture

Farming Innovations to Deliver Net Zero

Notes of Meeting held on Wednesday 29 January 2025

Committee Room 17, Palace of Westminster

In attendance:
George Freeman MP (chair)
Charlie Dewhirst MP
Earl of Caithness
Lord Fuller
Lord Carrington
Earl of Leicester
Julia Buckley MP

Guest speakers:
Adrian Packington, DSM Firmenich
Carlos de Pommes, Remediiate
Robin Watchorn, Recycled Crop Nutrients
Johnny Mackey, MSD Animal Health UK
Phil McNaughton, British Sugar

Stakeholder attendees:
Professor Gideon Henderson, Defra; Sarah Evered, Defra; Katie Pettifer, FSA; Dr Janet Talling, Defra; Oli Watson, Defra; Louise Sutherland, Ceres Agri-Tech; Declan Weldon, Cambridge Enterprise; Dr Helen Ferrier, NFU; Martin Collison, Collison Assoc; Ian Mace, ABF; Nick Major, SSA; Professor Mario Caccamo, NIAB; Jon Williams, BASF; Ed Barker, AIC; Josh Woolliscroft, CropLife UK; Dr Penny Hundleby, JIC; Mimi Tanimoto, JIC, Jonathan Westlake, DSM Firmenich; Dennis Rijnders, DSM Firmenich; Saskia Hervey, Earlham Institute; Professor Ken Sloan, Harper Adams; Mark Buckingham, Bayer UK; Dr Phil Howell, NIAB; Dr Anthony Hopkins, BSPB; Dr Geoff Mackey, Chamerion; Helen Hu, BIEA; Daniel Pearsall, Group Co-ordinator.

1. Chair's welcome and introduction

George Freeman MP (GF) welcomed fellow officers, members, guest speakers and stakeholders, briefly introducing the topic for discussion, *Farming Innovations to Deliver Net Zero*. He noted that this was the ideal complement to the central theme of Agri-Science Week in Parliament exhibit in showcasing UK research aimed at reducing the climate footprint and improving the sustainability of productive agriculture. It also fitted with the APPG's 30:50:50 vision document just launched, setting out an ambitious Innovation Agenda for UK Agriculture, with a goal of increasing UK food production by 30% by 2050, while reducing agriculture's environmental footprint by 50% per unit of output, in terms of GHG emissions, land use, water use and soil health. He noted that Defra food security Minister Daniel Zeichner MP had complimented the All-Party Group on both the exhibit and the 30:50:50 initiative, and had expressed a keen interest in working closely with the Group on a cross-party basis to take that conversation forward.

2. Guest speakers

(NB Guest speakers' slide presentations are available to download via the Meetings section of the APPGSTA website - https://www.appg-agscience.org.uk/meetings)

Adrian Packington, DSM Firmenich

Adrian Packington (AP) opened by welcoming the APPG's 30:50:50 vision, which provided a much-needed sense of direction for the UK farming industry, and an agenda which his company's methane-reducing feed additive, Bovaer, would support perfectly.

AP introduced Bovaer as a feed additive product which significantly and consistently reduces methane emissions in cattle, with the potential to make a significant contribution to reducing GHG emissions in the livestock sector.

In November 2024, AP noted that the product was unexpectedly at the centre of a social media and media backlash, based on misinformation spread by online conspiracy theorists and climate change deniers. This followed the announcement, in partnership with the dairy co-operative Arla and food retailers Tesco, Morrisons and Aldi, of a 'trial' of Bovaer on 30 British dairy farms. AP indicated that the real science behind Bovaer strongly supports its safety and efficacy.

AP noted that agriculture accounts for 11% of GHG emissions in the UK, of which 58% are methane-derived. Significant progress has been made, through efficiency improvements, in reducing the intensity of GHG emissions from dairy farming per litre of milk produced. The next challenge lies in reducing the overall volume of methane emissions.

He explained that scientists had sought to find methane inhibitors for more than 50 years, but with limited success. A breakthrough came with the discovery of what is now known as Bovaer 15 years ago by a Swiss chemist working for DSM-Firmenich.

AP explained the process of methane synthesis by arca microbes in the rumen, which involves a chain of seven enzymatic reactions, of which Bovaer targets the last enzyme to interrupt the formation of methane, reducing its synthesis by around 30% and working in a similar way to statins which inhibit cholesterol.

AP presented the following key facts about Bovaer:

1. Bovaer has been approved for use by the UK Food Standards Agency and European Food Safety Authority. It has been used by EU dairy farmers for over two years, and is already available in 68 countries worldwide.
2. UK dairy farmers supplying M&S have been using Bovaer for one year as part of the retailer's "Plan A" net zero programme.
3. Bovaer is metabolised in the rumen. It is not present in milk or meat. It does not affect milk yield, composition or processability. It has no adverse effects on cattle health, fertility or welfare.
4. Bovaer is proven to reduce methane emissions by about 30% in dairy cows, and by 45% in beef cattle.
5. The above statements are the result of more than 15 years of research, supported by 80 scientific papers in peer reviewed journals.

AP explained the prediction equation which allows on-farm methane reductions to be quantified precisely and consistently, by analysing the feed in the same way as published and used in carbon footprinting tools.

AP also presented the findings of a case study of Bovaer carried out at the Duke of Westminter's Lea Manor dairy herd, in partnership with Mueller and Tesco. This showed that feeding Bovaer at 60mg per kg of dry matter reduced methane emissions by 31%, equivalent to a per cow reduction

of 1.3 tonnes CO2e per year, or 3,417 tonnes of CO2e per year for the herd of 2,600 cows as a whole.

AP listed some of the companies and trusted brands already using Bovaer in their dairy supply chains, including Danone, Arla, M&S, Tesco, Mueller, Ben & Jerry's and Nestle.

AP underlined the net benefit of DSM's investment in Bovaer to the UK economy, with extensive trials commissioned from UK universities and research institutes, and the global manufacturing site for Bovaer under construction in Dalry, near Glasgow, representing a nine figure investment.

AP added that Bovaer was being supplied at no cost to the farmer, which was covered by retailers and processors as it helps reduce their Scope 3 emissions.

He concluded by reiterating that Bovaer is recognised as safe and effective by scientific experts and regulatory authorities worldwide, and offers a proven solution for low carbon dairy farming.

Carlos de Pommes, Remediiate

Carlos de Pommes (CdP) described how Remediiate's innovative approach to recycling industrial carbon dioxide emissions to grow protein-rich microalgae for animal feed addresses two fundamental business challenges: firstly providing a scalable alternative to soy protein to meet increasing demand from the animal feed industry; and secondly to provide a solution to the problem of hard-to-abate carbon emissions from industrial and power generation activities in the context of growing regulatory pressures.

CdP explained that Remediiate's vision was to become a world leader in carbon capture, usage and storage (CCUS) by turning industrial CO2 emissions into valuable products. Using its unique growing system, every 2 tonnes of CO2 emitted could be transformed into 1 tonne of microalgae for use in animal feed.

CdP noted that there are over 100,000 different species and sub-species of microalgae, each capable of producing a unique combination of oils, proteins, carbohydrates and other valuable nutritional components, and capable of being combined to meet desired specifications.

He explained that Remediiate's solution is based unique technology, complex systems and engineering know-how to deploy microalgae technology to convert CO2 into animal feed protein and high value chemicals.

Demonstrating the specially designed modular plastic tubs to grow the microalgae, which incorporate LED lighting to promote photosynthesis in the presence of CO2, CdP described the system as a rapacious consumer of CO2, making it an ideal partner for large power generating or chemical manufacturing facilities pumping out hundreds of tonnes of CO2 every day.

He described Remediiate's journey to date, from securing start-up funding from LightARC and the Department for Energy Security and NetZero to deploying and proving the technology at the Vale nickel refinery in Swansea, which emits 100 tonnes of CO2 per day.

In the context of the discussions taking place over the need to help farmers produced more from less, CdP pointed out that on an area roughly the size of 1.5 football pitches, and with CO2 throughput of 100 tonnes/day, the Remediiate system was capable of producing 18,000 tonnes of product per year.

CdP added that Remediiate had recently confirmed a 10-year, £1 billion offtake agreement with international animal feed company ForFarmers to use the microalgae as an alternative to soy protein in their formulations – on a one-for-one placement basis for soymeal. The microalgae also commanded a premium price over soymeal - £1400 per tonne vs £400 per tonne – to reflect the

additional beneficial micronutrients and vitamins already present within the microalgae which would otherwise need to be added to the compound feed.

Concluding, CdP indicated that next steps for Remediiate were to scale up production at the Vale site, and to seek out other CO2 emitters in optimal locations close to livestock production areas for future projects. He emphasised that such projects could be delivered at zero cost to emitters because of the premium value attached to the end product.

Robin Watchorn, Recycled Crop Nutrients

As the company's founder four years ago and following a 50+ year career in the fertiliser industry, Robin Watchorn (RW) introduced Recycled Crop Nutrients as a business working closely with agricultural businesses and universities to create a range of high-value pelletised fertiliser products from low-value residues sourced from agriculture, horticulture, aquaculture and the bio-energy sector.

With offices based on the Lincoln University campus at Riseholme, and as part of the Barclays Eagle Lab incubating new start-up businesses, RW explained that RCN's mission was to promote a circular economy and reduced carbon footprint approach to delivering more sustainable agriculture.

In four years, RCN has worked on 34 projects in the UK and overseas, involving a range of different residue streams derived from industry and agriculture, and increasingly partnering with researchers at the University of Lincoln, where 'practical meets academia'.

RW noted that a key project RCN has worked on over the past two years has been at a mine in Staffordshire disposing of material with very high levels of sulphur, a key soil nutrient of which 90% of UK agriculture's current requirements are imported. A granulation plant has now been built on this site following successful crop trials last year.

RW added that initial trials of a soil conditioner produced by RCN were also conducted at the walled vegetable garden at Riseholme with very positive results.

Other grant-funded projects undertaken by RCN include developing a fertiliser product for biofortification of faba bean, and establishing the evidence base behind recycled precision fertilisers (RPF) produced from agricultural wastes such as poultry litter. RPF fertiliser products are showing great potential but face barriers due to lack of information and inconsistent quality of currently available products.

RW indicated that RCN's activities contribute significantly towards a number of the United Nations' Sustainable Development Goals (SDGs), including: Zero Hunger (SDG 2), Responsible Production and Consumption (SDG 12), Climate Action (SDG 13) Protect Life on Land (SDG 15).

RW also outlined a number of other ongoing projects, including production of high-performance fertiliser products from food waste AD residues and sewage sludge, as well as conducting trials on a product new to the UK which 'speeds up nature' in breaking down ammonia. This could potentially be used to produce clean water for irrigation from slurry, or to help reduce harmful ammonia build up in large-scale poultry units.

Johnny Mackey, MSD Animal Health UK

Johnny Mackey (JM) introduced MSD Animal Health as a pharmaceutical company, part of the US Merck group, which also has interests in precision livestock technology.

Setting out how precision livestock technology can be used to increase protein production sustainably, JM noted that even Defra's own data indicate that there has been no increase in

output from UK farms in recent years. In some livestock sectors production is in decline despite available advances in science and technology.

Post-BSE and Food and Mouth in the UK, JM emphasised that a huge amount of livestock data is being recorded and collected on farm, but this information is not being properly integrated or exploited.

At the same time, he noted that technology continues to move on. Most people are familiar with devices such as smart watches capable of monitoring a range of health, activity and other factors, all connected to smart phones and with everything internet-linked via cloud-based systems.

So, with humans monitored using smart technology to the nth degree, it was a very logical step to extend that to livestock, JM suggested.

With 2.7 million breeding cows in the UK (1.5m dairy, 1.2m beef), JM indicated that accessing labour to look after them was becoming a huge challenge, and an area where health-monitoring technologies and devices could help.

From a sustainability standpoint, JM noted that healthier animals are more productive, consuming fewer resources and causing fewer emissions per unit of milk or meat output. Ultimately this will mean fewer animals needed to meet demand.

JM passed around a 25g ear tag capable of constantly monitoring and providing health and reproductive status updates for each individual animal, as well as holding its unique DNA fingerprint.

To provide an example of how this technology could be applied in cattle, JM showed two graphs tracking health and activity over a two-month period.

The first was healthy, with normal rumination function (c.10 hours/day) and with perfect 3-week intervals between heat spikes indicating the oestrus cycle. JM highlighted the significance of this since in the UK beef sector an estimated 80% of cows are not in calf each year (more than 200,000), yet still emit methane and consume valuable resources.

The second graph showed what happens when an animal falls ill, in this case a left displaced abomasum, similar to a twisted gut, with all health and activity indicators suddenly deteriorating and providing valuable, potentially life-saving early warning of the need for veterinary intervention.

Highlighting the range of ways in which these monitoring technologies could be used, JM singled out the improved link between control systems and databases, providing improved farm to fork traceability for government authorities and supply chains, as well as early detection of health conditions leading to reduced morbidity and mortality, increased productivity, and improved animal welfare and sustainability outcomes.

JM pointed to a recent report produced by MSD Animal Health, entitled ‘Time for Tech’, highlighting case studies from five farms covering five species using livestock technology to deliver positive outcomes for production and sustainability. This includes the finding from Prof Jude Capper of Harper Adams University that improving dairy cow fertility can reduce emissions by up to 16% on the worst performing farms.

JM also flagged a forthcoming AI(LIVE) conference taking place at the Science Museum in London on 23 September 2025, focused on innovating livestock agriculture – technology, sensors, data and AI – for a sustainable future.

Phil McNaughton, British Sugar

Providing a perspective from an agri-based food processor, Phil McNaughton (PM) outlined British Sugar's approach to circularity and sustainability in its operations.

BS works with around 2,300 growers based on the eastern side of the UK, and processes the sugar beet crop through four manufacturing facilities based in Norfolk, Suffolk and Nottinghamshire.

Through collective activity with plant breeders and researchers at the British Beet Research Organisation (BBRO), PM noted that the industry has achieved a 22% increase in sugar yields over the past 20 years, a key metric for improved farming efficiency.

British Sugar produces around 1.2 million tonnes of sugar from 8 million tonnes of sugar beet harvested each year, nearly all sold into the domestic market and providing over 50% of the UK's sugar requirements.

As part of its commitment to circularity, British Sugar has invested more than £360 million over the past seven years to support carbon and energy reduction at its four sites, and to develop a range of co-products and complementary activities alongside sugar production, ranging from stones, topsoil and soil improvers for agriculture, bioethanol and renewable energy generation, animal feed, CO2 and horticulture production.

Since sugar beet is 75% water, PM noted that sugar production is a heat intensive process, and high energy demands and usage are also driven by the company's activities in animal feed drying, lime kiln operation, production of bioethanol and other co-products. Through investment in combined heat and power (CHP) technology and other efficiency savings, British Sugar has reduced Scope 1 and 2 emissions by 21% since 2017/18, and has also reduced energy consumption by 8% and reduced water usage by 11% over the same period.

PM outlined some of the other areas British Sugar is working in to improve its sustainability performance still further:

- at farm-level to reduce N use and improve soil health, as well as to identify potential solutions such as gene editing to help reduce losses from virus yellows in sugar beet;
- explore alternative transport fuels for inbound and outbound supply chains, including electricity and compressed natural gas (CNG);
- seek continued energy reduction and decarbonisation in the factories, including identifying alternatives to natural gas;
- explore new co-product opportunities.

PM concluded by emphasising that British Sugar is on a journey to meet its 2030 science-based targets and its longer term net zero ambition. This will require continued strong collaboration with growers and supply chain partners.

3. Questions & discussion

The following points were raised during Q&A:

Recognition of the significance of the threat posed by Virus Yellows disease to the future viability of sugar beet production in the UK following the complete withdrawal of neonic seed treatments.

Recently appointed Food Standards Agency CEO Katie Pettifer introduced herself to the Group, emphasising that while the FSA's overriding priority was to protect consumers, the Agency was also acutely aware of the need to ensure its activities did not unnecessarily block or impede prospects for innovation and economic growth. She invited suggestions of actions the FSA could take to support wealth creation and investment in innovation.

One suggestion from DSM was for FSA to speed up approval processes, noting that Bovaer was originally approved by EFSA for use in the EU in April 2022, but was not approved in the UK until December 2023, preventing earlier adoption of a beneficial technology.

Remediiate added that there were a lot of beneficial micro-organisms associated with microalgae which could also help reduce methane emissions in cattle, which could also be brought to market sooner with more efficient FSA regulatory approval processes in place.

The meeting also briefly discussed the extent to which a change in terminology from ‘waste’ to ‘resource’ might help encourage greater innovation, investment and uptake of the kind of recycling initiatives presented, eg by RCN, Remediiate and British Sugar?

Concluding the meeting, APPG vice-chair Charlie Dewhirst MP thanked guest speakers, members and stakeholder attendees for their contribution to an informative and interactive session focused on some of the groundbreaking innovations taking place to support reduced carbon emissions and improved sustainability in UK agriculture.