

Nick's IAgRE Speech

Introduction

- Nick Starkey, Director of Policy at the Royal Academy of Engineering
- Also lead the National Engineering Policy Centre, of which IAgRE is a part, and which I shall say a bit more about shortly.
- When I left the NFU, where I led their policy on non-food crops, a good 15 years ago, I probably expected that I'd left the fascinating world of agriculture policy behind.
- I certainly didn't think that my introduction to it would be by way of engineering.
- But what I now know, and you always knew, is that the worlds of engineering and food are sufficiently intertwined that you can't fully understand the one in isolation from the other.
- For the Academy, and particularly for our policy team, the area where this link is most apparent is data.

Food and data

- Digital technologies in the food and drink sector are enablers of efficiency and productivity, but more broadly can play a role in combatting other major challenges such as sustainability and reaching net zero, food traceability and food security.
- At the heart of many of these challenges is obtaining value from data – how can data best be used to inform decision-making to improve productivity or reduce resource use in food production, or to improve transparency, for individual factories and across the supply chain?
- For example:
 - o companies might use operational data from their factories to benchmark their resource efficiency against other companies with similar factories;
 - o data might be used to drive down variability in productivity in the factory;
 - o data could be used to track raw materials as they travel from where they are grown to the factory, to ensure their provenance and also to predict when raw materials might enter factories at a particular time
 - o data could underpin emerging 'farm to fork to farm' circular-economy type models
- Some of the plenaries at this conference pick these issues up in greater depth.
- Data is useful for both for the industries and their supply chains that generate it, but also for policy makers faced with the challenge of designing and delivering policy. To make good policy in an area, you need a good map of how that area actually functions in real life.
- And data isn't just what's going on in computers and fibre optic cables. It very much intrudes into the physical and the human world.
- The so-called internet of things is an important part of this conversation. The IoT connects devices through the internet, enabling data about the nature and location of goods to be shared across many different organisations in the supply chain.

- Work by the Academy on [data sharing](#), and by the '[Internet of Food Things' Network Plus](#) to which we contributed, identify trust as a central challenge
- The Academy's data sharing report says 'when one organisation's data is accessed and used by others, strong oversight and appropriate frameworks are vital in order to ensure that data sharing meets commercial, regulatory, legal or ethical requirements and promotes trust'.
- The Internet of Food Things' *Network Plus* report also makes a central point that IoT/data are enablers of 'digital collaboration', requiring sharing of information and data, which is a necessary part of the industry responding to complex challenges.
- Factors that influence trust in data sharing drawn from the Academy report include
 - o ensuring that costs and benefits of collecting, storing and using data are fairly distributed
 - o defining and agreeing how data is used, with enforcement mechanisms if an agreement is breached, and
 - o providing assurance about data quality, provenance and timeliness.

Engineering and Policy

- These are profound changes in how our food system works. They are already well advanced, and they have major implications for policy makers too.
- It is a familiar refrain in digital policy that innovation is happening at a rate which makes it hard for policy and regulation to catch up, with twin risks:
 - o Either regulation may hold back beneficial innovation, perhaps sacrificing competitive advantage and improvements for producers and consumers alike.
 - o Or it may fail to protect us, leaving the door open to mistake, malpractice, or in extreme cases terrorism and deliberate harm.
- Engineers are at the forefront of these changes.
- And so the need for engineering expertise to inform policy making – in digital, and in a myriad of other issues - has never been more acute.
- Almost all of the issues facing policy makers today - from climate change to housing, cyber security to health care - are complex systems problems often with a technical edge.
- Engineers are natural systems thinkers, with an ability to define a problem, marshal evidence, trial solutions and make connections, and they have a huge amount to contribute to the design and delivery of policy for the public good.
- It is for this reason that the Royal Academy of Engineering has collaborated with the other 38 major professional engineering institutes to form the National Engineering Policy Centre, launched earlier this year.
- The Centre is a vehicle through which we can reach across organisational and professional silos to take a systems approach to policy issues with an engineering element.

- IAgRE is an important and influential part of that alliance.
- Through the Policy Centre we are together informing the consultation on a National Food Strategy, of which I shall say a little more in a moment.
- We have a digital topic group which keeps abreast of the developments in data and digital – which we consider to be itself a branch of engineering - and their implications for other parts of engineering.
- And we are currently undertaking a major project on the Safety and Ethics of Autonomous Systems, learning specifically from the different early experiences of autonomy in agriculture, air and marine contexts and in other applications such as social media and healthcare.

The National Engineering Policy Centre and Food

- Food is one of the issues which is very much on the radar of the National Engineering Policy Centre
- Just last week we submitted a response to Defra consultation on a forthcoming National Food Strategy.
- In keeping with how the Policy Centre works, the response drew on contributions from across the engineering profession, in particular, the Institution of Chemical Engineers (IChemE), the Institution of Agricultural Engineers (IAgRE), the Institution of Mechanical Engineers (IMechE) and the Institute of Physics (IoP), and was led by the Academy's policy team.
- I was hugely grateful for IAgRE's input, and Jane your president and Ed your CEO joined us for the workshop where we designed the structure of our response.
- Reading the response, what strikes me about the engineering take on the food strategy is an emphasis on data, and on data as the interconnecting tissue which links food to a range of other issues including decarbonization, innovation, and safety.
- The response finds that engineering, the chemical and the physical sciences play a vital role in realising opportunities and innovations across the whole food system.
- The response highlights significant the contributions of engineering and technology in the production, processing, safe storage and supply of food, as well as in the utilisation and minimisation of co- and by-products.
- The food system is inseparable from hydrological and water systems, ecological systems, and from waste, energy and human health.
- As such, a systems approach is required to provide an integrated understanding of the benefits and risks associated with new innovations and practices.
- There is a pressing need to move away from extractive toward regenerative systems.
- This requires circular economies across the food system with a much greater level of recovery, reuse and recycling throughout the production, processing, packaging, storage, distribution, retail, consumption, waste and disposal stages of the food system.

- The use of life cycle sustainability assessment must be central to building the evidence base on the sustainability of such innovations.
- Food and drink manufacturing is the single largest manufacturing process industry in the UK and the Office for National Statistics recently identified it as one of four major contributors of growth in the decade between 2008-2018.
- It is a diverse sector, encompassing a variety of enterprises from farms to high-tech manufacturers.
- And it involves smaller companies as well as global giants – 96% of the 6,600 or so businesses in the sector range from micro- to medium-sized.
- Much of the sector is potentially amenable to automation and it is crucial that this is introduced with due attention to the critical need for cybersecurity principles.
- With regard specifically to on-farm production, there is currently a confluence between greater capabilities and application in monitoring and data-analytics, smarter machinery, robotics and automation, and improving capability for precision agriculture and systems optimisation.
- Both Ron who follows me and Mark Rutter in the session parallel to Ron's will discuss the use of so called 'big data' in more detail, and I am hoping to catch Simon Parson's talk on automation and agri-robots, in part with a view to our work on the safety and ethics of autonomous systems.
- We have found at the Academy that for technologies as diverse as infrastructure and Engineering Biology, that developing technology and really delivering its advantages are two different things, however.
- There are many examples of technologies that have been developed and are available on the market, for which there is evidence of both economic and environmental benefits or savings, but of which there has been limited uptake.
- This suggests a greater policy focus on support for uptake and deployment where innovations need to be examined in combination with other developments with which they can be combined in parallel, rather than on an individual basis.
- Successful knowledge and best practice dissemination schemes might be successfully replicated across much of the food system, especially when encouraging the uptake of innovations throughout SMEs.
- These are the lessons of the Policy Centre's response. Initial engagement with the Defra team suggests they are keen to engage further with the Policy Centre, possibly through workshops to delve into detail on particular areas of innovation.

Close

- I hope you will engage with the National Engineering Policy Centre, perhaps through the Institute of Agricultural Engineers.
- If we are to encourage government to take a systems approach to policy, engineers need to be better joined up amongst themselves, and our partnership with IAgRE has been one important vehicle for doing so.