All-Party Parliamentary Group on Science and Technology in Agriculture

Notes of a Zoom Meeting held on Monday 22 February 2021

Hosted by NIAB, Cambridge

Drones in Precision Agriculture

In attendance:

Members:
Viscount Ridley
Lord Taylor of Holbeach
Earl of Devon
Owen Paterson MP
Ben Everitt MP
Lord Lucas
Lord Cameron of Dillington
Baroness Jones of Whitchurch
Earl of Lindsay
Robbie Moore MP
Lord Carrington

Guest speakers:
Hendrik zu Knyphausen, Vice-President of Operations, Hummingbird Technologies
Jonathan Gill, UAV Researcher, National Centre for Precision Farming, Harper Adams University
Dr Shamal Mohammed, Chief Technology Officer, AGRI-EPI Centre

Stakeholders:
Prof Malcolm Hawkesford, Rothamsted Research; Dr Julian Little, JLC; Milika Buurman, Elsoms; Liz Scott, NIAB; Richard Harrison, NIAB; Ian Cox, UKRI; Mark Buckingham, Bayer CropScience; Janet Williams, Bayer CropScience; Hazel Doonan, AIC; Ji Zhou, NIAB; John Kelley, AIC; Emma Green, British Sugar; Norman Coward, CFG; Dr Geoff Mackey, BASF; George Rothschild, Intl Dev consultant; Rosalind Martin, Bayer CropScience; Andrew Riche, Rothamsted Research; Prof Graham Jellis, ACFP; Nick Major, ForFarmers; Dr Julian South, MAGB; Tony Allan, UCL; Fiona Rust, AgriTech-E; Alastair Leake, GWCT; Catherine Barrett, AIC; Annabel James, NFU; Harry Fordham, Syngenta; Calum Murray, Innovate UK; Lisa Rivera, SFAM; Geoff McBride, STFC; Keith Geary, Harper Adams University; Leah Segal, Defra; Vicky Foster, BBRO; Bill Clark, NIAB; Daniel Pearsall, Group Co-ordinator.

1. Welcome & Introduction

Viscount (Matt) Ridley (MR) welcomed Members, stakeholders and guest speakers to the session. MR briefly introduced the topic for discussion, explaining his interest as a member of the Regulatory Horizons Council, which was established by BEIS to advise Ministers on the enabling regulatory reforms needed to support the safe and rapid uptake of promising new technologies and innovations across a range of areas. Drone technology was the subject of a current RHC inquiry on which he was leading.

MR suggested that regulation – rightly or wrongly - already appeared to be a deterrent to exploring some opportunities for innovation presented by drones, with also indications of a gap emerging between what is theoretically allowed and what is permitted in practice.

In considering how the regulations surrounding UAVs could or should be changed, MR noted that the issues fell into three broad categories: certification of aircraft; sharing of airspace; and operational issues, such as Beyond Visual Line of Sight (BVLOS).

MR indicated that in considering what Government should be doing in this space, the RHC was interested in the 'sandbox' experimental approach – ie enabling learning by doing, possibly by beginning with a less restrictive approach in more remote parts of the UK.

At the same time, MR suggested that having the social licence to operate – bringing along public awareness and acceptance of developments in the use of drones - was also important, and the RHC was interested to hear about the future development of UAV technology, including what agricultural drones might be doing in 10 years' time.

2. Guest speakers

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

Hendrik zu Knyphausen, Vice-President of Operations, Hummingbird Technologies

Hendrik zu Knyphausen (HK) introduced Hummingbird as an imagery and analytics business founded five years ago at Imperial College, London. The company works with farmers, agribusiness and the food chain to deliver more sustainable solutions, for example in relation to the use of chemical inputs, as well as decision support – monitoring, detecting and measuring things remotely to make life easier for the grower.

HK explained that Hummingbird either purchased imagery or used drones, and the resulting analysis could be translated into a map, eg showing optimum variable rate Nitrogen application across a field to be used by GPS guided machinery.

Hummingbird products using drone technology included variable rate Nitrogen, herbicide and PGR applications, using AI and machine learning to help optimise input use, so reducing run-off, leaching and selection pressure without adversely affecting yields. HK suggested that using drones in this way helped deliver average reductions of 24% for Nitrogen applications, more than 50% for pre-emergent herbicide applications, and 33% for PGR applications.

HK also used a lettuce growing case study to describe how the use of drone imagery can not only help growers apply the correct amount of inputs only where they are needed, but also enable yield forecasting to optimise harvestable yield, reducing time, wastage and other inputs.

Turning to the regulatory constraints on drone operations, HK suggested that agricultural drone data collection and analytics in the UK is associated with high cost, and as a result is not accessible to 80% of farmers. He highlighted the example of fragmented farms rather than ring-fenced farms, which under current BVLOS regulations meant much higher costs due to multiple take off and landing operations. HK indicated that the technology to enable safe autonomous flying, flying multiple drones at the same time, or BVLOS operation is already available. At the same time, further investment into safety technology is blocked or discouraged by over-precautionary regulation.

HK highlighted a cost comparison with other countries where Hummingbird operates, such as Brazil and Ukraine, where the costs of operating drones were up to five times lower than in the UK, and where 1500ha/day could be covered compared with 300ha/day in the UK using exactly the same equipment.

Concluding, HK indicated that unwarranted regulatory constraints in the UK are out of step with technological developments, holding back further investment and innovation, preventing uptake of more sustainable approaches to crop production and placing British farmers and growers at a competitive disadvantage.

Jonathan Gill, UAV Researcher, Harper Adams University
Working with drones since 2012 and a 2018 Nuffield Scholar, Jonathan Gill (JG) explained his particular interest and involvement in the development of spray drones allowing precise control and targeting of application onto crops only where required, without the soil compaction from tractor-based application and, being fully electric, reducing the carbon footprint associated with spraying operations, especially if charged by wind or solar power.

JG's current research involves the use of a quadrocopter with a 10 litre spray capacity, but he explained that the UK needs to prioritise getting spray drones authorised with safety testing and confirmation of efficacy to avoid being left behind.

JG suggested that the barriers to spray drone development were not related to the Civil Aviation Authority (CAA) but to the strict safety regulations and data requirements placed on their use by HSE and the Chemicals Regulation Division (CRD).

JG noted that just five years ago a number of spray drone manufacturers had been interested in investing in the UK, but because our regulations are so strict they had moved their research activities and investment to less risk-averse countries, damaging prospects for UK innovation in this area.

Concluding, JG show-cased another time and labour-saving application or drones, in this case related to livestock handling, by demonstrating how a flock of sheep had been trained to follow a drone to move from one location to another. One man, no dog, achieving in a very short space of time what would have taken four or five people several hours to complete.

Dr Shamal Mohammed, Chief Technology Officer, AGRI-EPI Centre
Shamal Mohsammed (SM) noted that a 2017 PwC report had identified agriculture as the second biggest market for drone technology, with a potential global value of US$32.4bn.

SM explained that current and prospective applications of drones as a diagnostic tool included soil and field analysis, crop growth and health monitoring, water stress and irrigation mapping, disease detection and yield/biomass forecasting.

But he added that most commercial drone applications would benefit from BVLOS operation to be cost-effective and realise their potential, while some operations would be impossible without BVLOS. He suggested that current developments in assistive technology, training and hardware could support a shift towards a more risk-based approach to BVLOS.

SM noted that the use of spray drones for input application was a growing area of interest, especially for the application of plant protection products – eg allowing more targeted application, reduced input loss and improved efficacy of crop protection.

But he suggested that more R&D would be required to support better regulation and standards for the application of different inputs.

In addition to the obvious challenges of low volume capacity of spray drones, BVLOS restrictions and cost of operation, SM indicated that more research was needed into the impact of height, speed and weight in terms of efficacy of the spray system. A key question was whether the use of spray drones could give rise to less chance of drifting as there was currently no proper assessment on the risk of spray drift from drones.

Looking to the future, SM suggested that the development of drones as a viable and cost-effective commercial service would require an integrated approach to a number of issues, including the development of automated/semi-automated operations; a modular approach to ensure compatibility across systems (akin to the 3-point tractor linkage system); improved farm connectivity (eg 5G); localised BVLOS aided by assistive technology; and research leading to bespoke rules and standards for input application by drones.

3. Questions and discussion

The following key points arose during questions and discussion:

Confirmation that the safety track record of drone application in countries with less restrictive regulations is compatible with the UK. No suggestion in Ukraine, for example, that more enabling regulation can be associated with any greater frequency of accidents.

Whether drone researchers and operators had encountered any resistance from farmers in terms of sharing data.

The need for more customised regulation of drone technology to help realise its potential, also to ensure an integrated approach to innovation – eg ensuring improvements are combined together to make the drone systems work as they should.

Noted that a current OECD project is looking to develop an ISO standard for drone spray application – this will need to be based on research trials investigating different operating height, speed, weight, droplet size etc.

Concluding the meeting, MR thanked guest speakers for their contribution to a stimulating and thought-provoking session, highlighting not only the very significant opportunities for more efficient and sustainable faring systems using drone technology, but also the regulatory barriers and options for more enabling regulations in future.