FARM TECH CIRCLE

# Newsletter

**Issue 3: 2023** | Keeping you up to date with the latest agri-tech developments

FARM TECH CIRCLE

powered by the AGRI EPI CENTRE

## Pioneering precision agri-tech

Throughout 2022, Agri-EPI have been pioneering precision agri-tech. We're fostering collaboration with our partners and farm networks with funding from Innovate UK to develop a smarter, more secure food supply chain.

To celebrate our success we have produced a special year in review video which includes our On Farm conference, self-driving tech, Smart Ear tags and much more.

**Watch the video**

If you know other members of the farming and growing community who you think would like to be kept up to date with the latest news and opportunities in agri-tech, please direct them to this publication.

If there's anything in here that you'd like to know more about, please get in touch.

**Thank you farmers of Britain!**

## FUNDING COMPETITION

The Farming Innovation Programme Research Starter Round 3 opens on January 30th.

**Click here for further information**

## Scalable Micro-AD for dairy farms

Agri-EPI Centre worked with BioFactory, who have developed Micro AD Farm™, funded by Defra via Innovate UK. An innovative, scalable micro-AD solution built into shipping containers, the system is aimed at smaller dairy farms and captures and turns methane emissions from cow slurry into biogas to provide on-farm energy, to reduce farm running costs.

The Micro AD Farm™ system also has a proven positive impact on greenhouse gas (GHG) emissions when compared to untreated slurry. Direct reductions in GHG emissions are achievable through the micro-AD process, supporting ecological goals and helping combat future legislative and regulative measures that may be introduced to tackle farming GHG emissions.

**Watch the video**

BIOFACTORY

## Hands free farm

Agri-EPI Centre joined Precision Decisions, Harper Adams University, and FarmScan AG to create the world's first fully automated farm.

The Hands Free Farm project launched in May 2019 following the end of the award-winning Hands Free Hectare feasibility study, which was the first in the world to plant, tend and harvest a crop without a driver in the seat or agronomists on the ground.

After receiving funding from Innovate UK, the Hands Free Farm, which is based at the university's campus in Shropshire, extended to 35 hectares and developed a fleet of autonomous small vehicles which can be operated from the farm office, ready for commercialisation.

**Watch the video**



## New data and robotics project essential for viticulture

New data and robotics projects could bring much needed time, cost and labour savings to UK vineyard producers.

Precision agriculture specialists, Agri-EPI Centre, AI-driven autonomous robotics company Antobot and vineyard owner, Ian Beecher-Jones, have embarked on two projects at JoJo's vineyard near Henley-on-Thames to create a vineyard digital map, and on-the-ground and aerial monitoring.

The shareable digital infrastructure project – funded by Innovate UK and Defra as part of their Farm Innovation Programme Research Starter Round 2- will create the digital infrastructure of the vineyard, including rows, posts and vines to an accuracy of two centimetres using real time kinetic (RTK) surveying tools. The shareable infrastructure model, based on the Australian Collabriculture project could save producers many hours of work and cost in setting their vineyards up ready to embrace viticultural technology.

On-the-ground and aerial monitoring will be gathered by robots and drones to add a layer of data to the digital map. The robots are being developed by agriculture robot technologists, Antobot, and drones are supplied by Agri-EPI Centre. This second strand is funded by the European Institute of Innovation and Technology (EIT).

**The resulting technology will be highly transferable to other row crop sectors, such as orchards and soft fruit.**

Duncan Ross, business development manager crops, Agri-EPI Centre said: "When wine growers want to survey a vineyard with a robot or drone they have to do a survey and plan beforehand, which can be highly time-consuming if they have to do it for each technology they want to use. Creating a shareable digital twin of the vineyard should cut down the amount of time that contractors spend out in the field, saving producers and technology companies time and money. If growers have their own shareable digital infrastructure built to a standardised format, it can be shared with any technology company the grower would like to work with, reducing duplication of unnecessary onboarding and set up time every time a new technology is to be tested and tried in the vineyard or orchard.

Marc Jones, Business Director, Antobot said: "This project is a vital step in the adoption and acceleration of sustainable robotics in viticulture. The grower-owned digital infrastructure will significantly reduce the time required for ag-tech providers to begin operations at the vineyard resulting in lower costs for the customer and faster development and deployment of robotic applications.

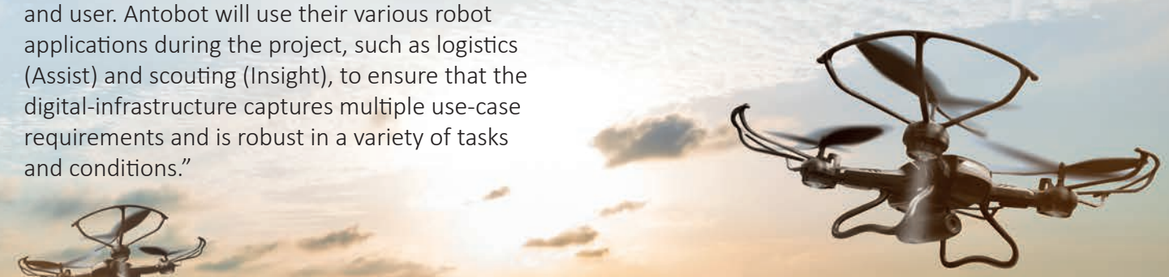
"The digital-infrastructure map will provide a common understanding and 'language' for both growers and ag-tech providers ensuring that precision can be matched to reality and reducing the friction between the data outputs and user. Antobot will use their various robot applications during the project, such as logistics (Assist) and scouting (Insight), to ensure that the digital-infrastructure captures multiple use-case requirements and is robust in a variety of tasks and conditions."

Ian Beecher-Jones of JoJo's Vineyard said: "I expect the viticulture sector to act favourably to these exciting and essential projects. We need technology to find a way to replace the labour shortages the industry is facing by allowing a more accessible way for vineyards to embrace robotics and AI technology. It will hopefully allow us to find a new way of marketing vineyards to our customers through a potentially new revenue stream with consumer facing technological products and innovations. We cannot lose traditional wine-making skills, but any vineyard that can blend traditional with modern ways of production will be at the forefront of the industry.

"From my own 20 years of working in agri-tech, I know that there are growing pains for agri-tech companies; by working together, JoJo's and Agri-EPI Centre can give a platform to companies to test their technologies and roll them out not only to the wider viticulture sector, but potentially other food growers.

"It is the shareability of the digital infrastructure that is key to establishing a reliable and trustworthy data platform we can all work from. Once established we can share it with and partner alongside a range of ag-tech companies who see the benefits and opportunities of working with one of fastest growing crops sectors in the country."

**Watch the video**



# Successful agri-tech solutions come straight from the farm

**By: Claire Hodge**
Head of Agri-Tech (Crops) at Agri-EPI Centre

At Agri-EPI Centre, we work closely with farmers through our innovation farm network, running workshops to foster new ideas for on-farm innovation that take into consideration farmers' core challenges and needs on farm. These aren't always big picture challenges but rather are often day-to-day issues such as looking after crops, getting nutrition right for their stock, and managing their business. Our job is to introduce tech and innovation on farm that strikes a balance, addressing challenges both big and small.

Some new technological systems adopt a whole-system approach, while others introduce integrating robotics into an existing system at strategic points so that farmers can work out exactly what they want. Most of us who work in agriculture do so because we enjoy working directly with the land, soil, plants, and livestock. The best technologies won't take that synergy away but will rather make tasks easier, such as tech that allows scouting in stores to measure the quality of crops or removing stones on grading lines. Many of the tools I am interested in are co-bots which work with and alongside people so that people can concentrate on what they enjoy doing. An example is tech that removes the heavy lifting and repetitive movements in some manual tasks. Another interesting development involves mapping to help create an easily accessible intelligent blueprint of a farm and enable the transfer of knowledge from one generation to another.

Industry nervousness is understandable and individual businesses will undoubtedly be focused on picking the right approach without taking on too high a cost and without fear of becoming redundant. Technology will not take farmers' roles away, but rather will complement existing systems and knowledge. The tractor is here to stay, but could still be complemented further by robotics, drones and satellite data. It's about how we use the assistance these tools provide.

Farmers have to balance an extraordinary number of risks relating to the market, weather, climate, and politics, and the hope is that a toolbox of tech can be developed to help in making calculated decisions while taking these risks into account. Farming will always be a volatile industry, but increased knowledge can help farmers make better decisions. I believe we will become more and more comfortable with making AI-informed decisions and working around more robotic systems.

Agri-EPI Centre works with a great diversity of pioneering farmers and start-up companies with the goal of developing accessible options for all farms. Products will only work if they solve real problems. Every farm is unique and complex, dealing with different markets, situations, and business models, and we know that farmers have to be not only CEOs, but COOs, vets, scientists and labourers all in one. It is up to us to help make their working lives better while achieving increased profitability and positive environmental impact.

**Get in touch at team@agri-epicentre.com if you have an agri-tech solution you would like to discuss.**




# Farm walk brings together agri-tech community at Upper Nisbet Farm

Agri-EPI hosted another successful on-farm day in Scotland at one of their innovation farms, Upper Nisbet Farm, in collaboration with farmers Robert, Jac and Andrew Neill.

Agri-EPI members and representatives from across the agri-tech sector met up for a farm tour and day of networking, discussions, and precision tech demonstrations.

Autonomous grain storage monitoring company, Crover, showed a live demo of their grain swimming robot.

Lorenzo Conti, Founder and Manging Director, explained: "The main aim is to help farmers like Rob, but also grain storage operators and grain merchants, to store large quantities of grain to maintain the quality of their stock, to better plan their businesses, and also to improve the health and safety of their operations".

KEENAN, a respected leader in sustainable and profitable farming solutions focused on maximising feed efficiency, demonstrated their mixer wagon in action. Datamars, who enable the harnessing of data to measurably improve productivity and quality of life for livestock farmers, demonstrated their Tru-Test range. And John Deere, leading manufacturers in agricultural machinery, discussed their GPS and data collection tractor technology.

Farmer Robert Neill rounded out the day by leading a trailer ride to view the arable fields and cows and calves.

Ross Robertson, Head of Mixed Farms at Agri-EPI Centre, said:

"This kind of in-person networking and collaboration is invaluable to us as an organization, as it allows us to engage with our members and farmers alike to get genuine feedback on the products we are involved with. As we all know it has been a difficult past couple of years for all businesses in the sector, and getting back on farm and meeting face-to-face at events like this will help everyone progress in what they are trying to do in benefitting the Agricultural sector".

As a key, government-backed player in the agricultural sector, Agri-EPI Centre has been able to enlist a network of farms spread throughout the UK to participate in the Agri-EPI Farm Network.

They equipped these farms with a suite of precision sensor technologies to measure variances across every dimension of food production – quality, productivity, wastage, and more. From there, they are able to begin implementing the technologies and innovations that will change the future of farming, and assess the ways in which they can work together to bring these ideas to full commercial viability.

## Multi-sensor VTOL UAV

Agri-tech has undergone tremendous improvements with the introduction of remote sensing technologies, making many agricultural properties that were difficult to achieve before now accessible.

Multi-Spectral imaging has been widely used on satellites (e.g. Landsat) for earth observation science at a global scale. In the agricultural domain, UAVs as a platform have played a major role utilising various payload sensors including multi-spectral imaging.

The advantage of multi-spectral imaging is that it extends human sight sensitivity beyond the visible spectrum. Some wavelengths that are widely recognised for applications, such as the normalised difference vegetative index (NDVI), can be deployed into multi-spectral imaging. Nonetheless, it has been proved to be very useful in many other fields, greatly empowering the advancement of agriculture. The adoption of UAVs has made it possible to achieve large-scale mapping and thus better agricultural management.

Agri-EPI Centre has invested in the Multi-spectral VTOL UAV which has a potential use as ground truth technology for other technologies and/or systems.

**For information on renting out our technical assets please contact team@agri-epicentre.com.**

**This UAV and sensing payload system can also be used for a variety of fruit orchard use-cases which include:**

- > Estimation of leaf area index
- > Estimation of canopy volume
- > Estimation of water stress
- > Fruit biomass estimation
- > Temperature variation across the orchard
- > Temperature variation of specific plants over time
- > Fruit count estimation

**It can also be used in other agricultural areas which include:**

- > Pest infestation detection
- > Quantity moisture levels
- > Analyse wildlife damage
- > Vegetation index creation like NDVI
- > Crop counting
- > Create 3D photogrammetry maps



## Agri-EPI network explores data needs for farmers online

Agri-EPI Centre hosted a member community online special interest group titled What has data ever done for you, that brought farmers and tech developers from across the agri-tech sector together online to discuss data needs, successes and challengers for farmers.

The event was chaired by Eliot Dixon, Head of Agri-Tech (Engineering) at Agri-EPI Centre, and discussions were led by David Smurthwaite, Head of Dairy at Mackie's of Scotland, and Jose Chitty, COO of Smartbell.

Jose Chitty began the conversation with an overview of his Smartbell project, an animal health monitoring and management system that provides unique data insights, focused on detecting health issues in calves. Smartbell makes it easy to gather data and present insights directly on a phone, and allows for farmers to spot problems faster and more easily, and create benchmarks for tracking changes and improvements on farm. This kind of data gathering can help to improve profitability, improve animal health, justify spending, and help to access funding.

David Smurthwaite, one of Agri-EPI's innovation farmers, then took over the discussion to comment on the farmer perspective for using data and tech on farm. He uses Smartbell on his farm, and though he was cynical and had a hard time believing in the data at first, the app has improved and the system is working well for his team. For David, data needs to be user friendly, as implementing changes and getting an older team on board to use tech can be a challenge. He would like for the information to be more accessible but has very much started to rely on tech to aid him and his team in improving the welfare of their animals.


Discussion followed, where a number of questions were posed to the audience, and an array of thought-provoking answers were shared:

**Q: What is the ultimate destination for this technology in the future?**

**A:** Data transfer across the industry for benefit and joined up decision making, data that drives actions to help business, and a hand holder for farmers improving sustainability and profitability.

**Q: What data sources are already vital for farmers?**

**A:** Data associated with productivity, data that mitigates known risks, data that enables yield to be optimised, and data that provides efficiency on farm.

**Q: What are specific challenges on farm that could be solved with data and information now?**

**A:** Yield forecasting, connecting environment with individual animal performance, prediction rather than just alerting, investment, storing data, and statistical analysis for data.

**Q: What is stopping farmers from getting the most information out of the data they have?**

**A:** The data isn't always the farmers but rather the equipment manufacturers, the data is too complex, farmers may lack certain skills or digital knowledge needed to understand the data adequately, farmers may not have enough time or have inoperable systems on their farm, and a lack on interoperability.

**Q: What are disadvantages of using information and data?**

**A:** Becoming over-reliant on certain companies and pieces of tech, the lack of accuracy of some data, or getting landed with the wrong application. Trust in the system needs to be ensured.

**Q: Who should own the rights to the data from farms?**

**A:** Farmers should own the data and be able to have a say on what is done with it, but secondary information could be owned by third party. Both parties should understand contractual laws and come to their own agreements, since data sharing is extremely important for the agriculture sector.

CASE STUDY

# Cold Harbour Farm:

## Aiming to improve the efficiency of harvesters through the use of technology

**Background**

Harbour Farm is a satellite farm for the Agri-EPI Centre in Edinburgh, working in partnership to identify and develop innovative solutions to some of the issues facing arable farmers today.

The farm, near Beverley in East Yorkshire, has been in the same family since 1889 and 430 hectares are now farmed all on the chalk based soils of the Yorkshire Wolds.

It is a largely arable farm, producing wheat, barley, oilseed rape, and grass to feed the Belgian Blue cross beef herd. The farm is also part of The Green Pea Company, a co-operative of 250 farms growing vining peas for the Birds Eye factory in nearby Hull.

Farmer Paul Hayward said the famous boast that the peas go from field to freezer in under two and a half hours was not just a marketing slogan. He said: "It is true! If the peas don't get into the freezer in 150 minutes, they are rejected. The crop goes off the field, through the freezers and is packed into the bags, and we do have to meet those timescales."

He said that although he had not suffered the shortage of skilled workers that other farming sectors had as yet, he was always looking for ways to help his workers be more productive. He said: "Our business uses skilled people, locals, and so far, so good. They are tech literate but there is no doubt we're not getting younger people through so increasingly we will face staffing challenges. We are fortunate Adam is now in the business bringing his experience of working in Agricultural Machinery Industry.



"The reason we've been able to grow without growing our team is thanks to the technology we supply them with to do their jobs, we are more productive, but our people still have a sensible working schedule."

Since 1993, Cold Harbour Farm has been a LEAF – Linking Environment and Agriculture – demonstration farm, aiming to show that intensive agriculture is consistent with caring for the environment, particularly to non-farming public.

Under the countryside stewardship scheme, the farm has a long-term programme of hedge planting and restoration, areas of woodland have been planted and fields now have grass strips at the edges planted with native grasses and wildflowers.

Away from crops, some of the older brick buildings at Cold Harbour Farm have been converted into Calf House Studios, a collection of affordable studio and workshop spaces for local artists and craftspeople.

There are several Neolithic sites of historic interest on the farm.

**How Agri-EPI has made a difference**

Farmer Paul Hayward said the farm's relationship with Agri-EPI was a result of its LEAF status. He said: "We are a LEAF demonstration farm and have been for some time. The advantage of our role is that LEAF make introductions, and they brought the idea of working with Agri-EPI to us. It's brought some real advantages to our wider business, Agri-EPI can make introductions to key stakeholders in our network.

"We had some deficiencies in the way we use technology. We are always trying to improve and develop but using innovative tech was the one field where we could do more. We had spent money and got some benefit, but we thought there was a lot more potential that could be achieved. A link with Agri-EPI offered a way of doing so.

**"A network like Agri-EPI which brings together that knowledge, expertise, innovation, and funding know-how is not just a mutually beneficial arrangement for our business, it's necessary to make progress.**

"Individuals just cannot do what Agri-EPI do, you just can't. You must realise your limitations. We are happy to put work in and support and add a little bit of our expertise, but it's got to be a team approach.

Paul said that initially the farm would suggest projects and staff from the Agri-EPI Centre would provide support and assist with funding bids. Now, he said, the projects were being developed more collaboratively from an earlier stage.

**"It's all about learning, evolving and progressing."**

Expert support from Agri-EPI was particularly helpful, he said. “Agri-EPI do the funding bids really. Bids take considerable resources, and know-how, and contacts. It’s the glue, and the mentoring, knowing where to go.”

He also believed that Agri-EPI’s mission to drive innovation and cutting-edge technology in agriculture complemented the environmental aims of LEAF. He said: “What we do as a [LEAF] demonstration farm broadens the field – LEAF is a progressive organisation rather than “We must turn the wheel back or maintain the status quo”. They are for responsible improvement.”

As well as Cold Harbour Farm benefiting from Agri-EPI’s expertise and resources, Agri-EPI in turn is able to tap into the network of farmers Paul works with through the Birds Eye cooperative, helping to capture the needs of the industry and develop ideas for solutions.

A current project the farm is working on with Agri-EPI involves making better use of drone technology by extending the use and application of it – and Paul said the training supplied by Agri-EPI would be particularly beneficial. He said:

“There’s the drone itself and there is training to go with it. “We can fly it and take images, but it is all about making best use of those images quickly and translating them onto a piece of kit that will go onto the field and do the job.

“At the moment I or Adam, my son, can fly it, take a picture and get a different perspective than when we’re on foot across the field, but if you could feed that information into the controller for the fertiliser spreader, or something like that, it would be a great help.

“It’s out there, but it’s not out there for the everyday farmer like myself. Drone technology could ultimately help with timeliness, precision application and, not replacing people, but making people’s time more effective.”

Agri-EPI is also working together with Cold Harbour Farm to find funding, which was led by the farm’s need for innovative technology. Paul said: “It is a big operation for the co-operativewe grow about 80 hectares out of a total of 10,000 hectares. It was an attraction for Agri-EPI that we had connections with other growers and there was an opportunity to make a difference in that size business.”

Paul said: “We had a project that would potentially improve efficiency and quality. We needed help with the technology to progress it, and Agri-EPI supplied that.

“Agri-EPI supported us getting the project, and with the hardware. The problem we found was interpretation of the data. That was a project that would have delivered, and it might do in the future.

“It was using a technique called near infra-red, replacing people physically going and grabbing peas and taking them to the factory to sample with real time information. With the coordination of 15 harvesters, when you’re working 24/7, small margins make big differences. “That was a good example of where Agri-EPI highlighted things that we could try to improve things, and we gave it a good go.”

The next steps in Agri-EPI’s collaboration with Cold Harbour Farm are to enable systems to improve data handling on the farm and supporting the farm to find future funding.