

Together we can develop agri-tech solutions for sustainable farming



Agri-EPI features several Innovation Farm Network members including Bowhill Farming Ltd, Selkirkshire which is trialling a number of products and systems including Nofence, the world's first virtual fence for grazing animals.

“We value being a Network member – while it’s helping to keep us on the frontline, we are pleased to provide a commercial platform for agri- tech companies to trial and validate new systems and products as part of the drive to ensure sustainable food production. The Network also provides an invaluable opportunity to share ideas and outcomes with other members.” Bowhill Farming Ltd farm manager, Sion Williams. Turn to p4 to find out more.

WELCOME

Welcome to Agri-EPI, the centre for agricultural engineering precision innovation. We help to develop robust and commercially viable solutions to empower more sustainable farms. From bespoke validation trials to system and product development, we are a collaborator of choice for agri-tech developers, start-ups through to established companies.

We are open to new projects and partnerships that use agri-tech in both funded and private research which are focused on the health and welfare of soil, crops and animals in order to

- increase efficiency
- enhance environmental sustainability
- ensure productivity and farm business sustainability

We provide a set of services to assist in the creation of agri-tech products through either commercial or grant funded projects. We assist in the development process through a strong technical team combining with a world class set of equipment and facilities.

Balancing productivity with environmental and business sustainability is a challenge at farm level, which will only become more scrutinised. We believe healthy soils provide a foundation for a resilient agri-food sector.

Relevant and affordable agri-tech has a part to play in supporting a sustainable farming system, whether its software to automate data capture, manage inputs and outputs for better decision making or hardware to optimise current processes, increase efficiencies, reduce emissions and provide precision application.

Agri-EPI is here to help with your tech development and offers the following resources.

R&D service

- Consortia building
- Bid writing support and scoping projects
- Research facilities
- Engineering space
- Data collection and ground truth assets
- Project management and delivery
- Specialist technical teams
- Life Cycle Assessment

Business support

- Membership ecosystem 260 members including farmers, industry networking and thought leadership events
- Office and research facilities under one roof
- International links
- Sustainability experts
- Investment advice

Commercial farms

- A diverse network of farm business and systems to trial technology
- End user and system requirements
- Measurement and validation
- Technical advice and support
- Market insight and analysis
- Data capture and dissemination

Agri-EPI Centre is open to new partnerships and projects, both funded and private research. To discuss potential opportunities please get in touch with team@agri-epicentre.com or 0131 239 7100.



Agri-EPI Centre Head of Agri-Tech
(Mixed)

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Introducing the Agri-EPI Innovation Farm Network with examples of deployed projects and technology

The Innovation Farm Network was developed by Agri-EPI from the desire to 'close the gap' between research and the end-user, by creating a platform to host research projects and evaluate developing technology in a commercial farm environment, rather than in a simulated or research environment.

The network is diverse, comprising different farming systems, sectors, sizes and business structures producing a range of agricultural commodities, all equipped with the latest precision sensor technologies that are purpose-built to measure your agricultural innovation.

Ground-breaking technology to monitor on-farm biodiversity 24/7

Organic dairy and arable farmer, Sophie Alexander is hosting an initiative to monitor biodiversity 24/7 on Hemsworth Farm, her Dorset mixed unit where soil rehabilitation and wildlife restoration have been priorities for 12 years. The joint collaborative project is funded through Innovate UK and Defra's Farming Innovation Programme: Research Starter Round 2 with Agri-EPI Centre, Dorset Wildlife Trust, AgriSound, Pollenize CIC, Chirrup AI.

This research project aims to test and demonstrate the effectiveness of digital technology as a means of remotely monitoring wildlife diversity in a farming context and address escalating ecological challenges through accurate quantification of nature in any one location. With biodiversity monitoring set to increase through the introduction of policies and schemes, it's important we support ecologists with access to scalable remote technologies to assist, especially when the number of ecologists are declining across the UK.

The early-stage feasibility project brings together technology startups with end-users to explore emerging applications of remote sensing to inform the development of a commercially relevant solution. The findings are scheduled to catalyse a pipeline of further R&D across a much wider area and new research collaborations, and also accelerate research translation and development of new solutions.

Three separate remote sensing digital technologies will detect, identify, and quantify varieties of invertebrates and birds and the correlation to flowering plants they rely on. Insect conservation and pollination innovator,



Sophie Alexander, Hemsworth Farm

AgriSound which specialises in remote insect technology and environmental sensors to monitor pollinator populations, has installed three unique in-field sensor devices for automated insect monitoring. Called Polly™, the technology is optimised for attracting pollinators from a broad spectrum of local insects and detects 24/7 through the use of a specialised bioacoustics technology with data transmitted and securely stored, providing a comprehensive understanding of the farm pollinators.

Sophie Alexander said: ***"I believe it is important to establish our biodiversity baseline and to continue to monitor progress. There are too few experienced ecologists with sufficient time to manage it all. We are therefore pleased to be involved with testing the data collection capabilities of digital technologies to assist ecologists and in this case, Dorset Wildlife Trust to ground truth the information and demonstrate how an organic farming system can nurture wildlife as well as produce food."***

AgriSound founder and CEO, Casey Woodward said: "The collaboration not only underscores the importance of partnerships in driving forward sustainable agriculture but also showcases the immense value of innovative sensing technologies for biodiversity assessment which are being increasingly required as consumer expected produced sourced from sustainable agricultural practices."



The Agri-EPI Innovation Farm Network – meet two more members

Sion Williams is responsible for managing Bowhill Farming Ltd, Buccleuch's in-hand farming operations, on its Borders Estate in the Scottish Borders, which amount to 1,360ha of grassland and cropping and over 5,195ha of heather moorland and rough grazing carrying 8,200 ewes, 540 suckler cows, 32,000 layers and 300 breeding hinds together with a 200kW AD plant.

"Despite having economies of scale, we have adopted a similar strategy to smaller progressive units. We are attempting to farm efficiently to the best of our ability to achieve a sustainable and profitable unit," he explains. "We benchmark literally everything, we believe in regenerative practices and managing the soil is amongst our priorities; one of Buccleuch's guiding priorities is respect for the environment – we have to leave it in a better condition for future generations. Equally we are very open minded about using future technology to help stay ahead of the curve.

"We are trialling the Ritchie Beef Monitor which automatically weighs each individual animal several times a day and provides a continual performance report which is particularly useful if we adjust the diet. We have attached solar-powered Nofence collars to a portion of our suckler herd and the virtual fence technology is enabling more precision grazing in a rotational system on hill ground, as well as summer rotations without fences and forward creeping calves.

"Agri-EPI has also provided us with the opportunity to introduce drone technology for crop yield mapping purposes to accurately map weeds such as docks enabling accurate spot treatment, and as we move forward in GPS spraying technology this has the potential to make massive reductions in labour and chemical usage as well as saving clover in grass swards. We are also trialling satellite, drone, and sonar systems to increase accuracy, and speed up grass yield measurements for our rotational grazing systems."

"We try to be very progressive young farmers and act as a tech incubator to push forward ideas and concepts that may not be immediately financially viable but have the potential to be in future," say Rob and Jo Hodgkins, Kaiapoi Farm, Herts.

"We now run several projects with Agri-EPI including investigating novel crops and methane measurement."

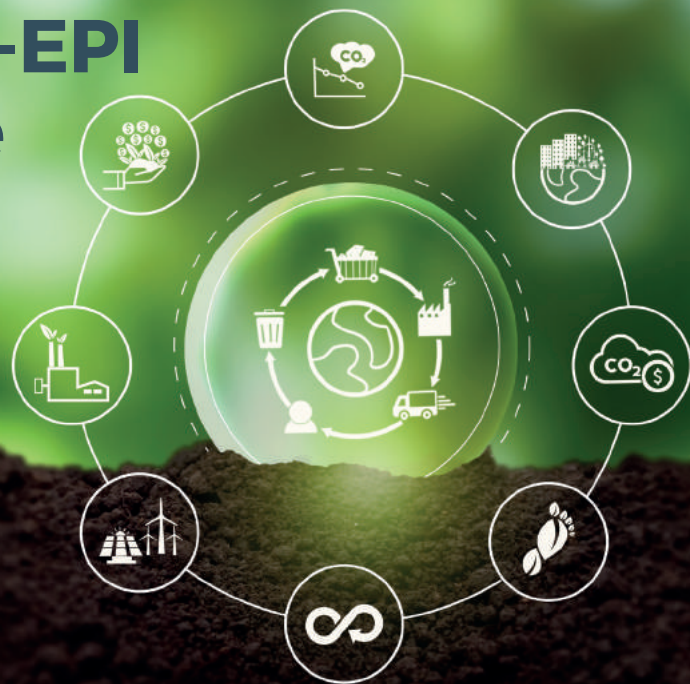
One of Hodgkins projects in collaboration with Trimble and Agri-EPI used the Garford Inter-row hoe, controlled by the Trimble RTK autosteering system, to regeneratively control black grass, utilise nonchemical control and cut down pesticide use. The couple have also collaborated on a project with Affinity Water and SoilEssentials to mitigate nitrogen leaching and to use satellite imaging of the farm to estimate the biomass of their crops.



Rob and Jo Hodgkins

Embracing future farming with Agri-EPI Centre's Life Cycle Assessment

– a vital step towards a sustainable, thriving agricultural landscape



The term sustainability is hard to define and often poorly used as a marketing tool, however Agri-EPI Centre recognises the role that agri-tech can play in enhancing sustainable farming systems.

Regenerative agriculture has recently received significant attention from livestock producers and growers and we are aware that Agri-EPI's Innovation Farm Network members are taking different approaches to achieve more regenerative farming systems. A recent questionnaire found carbon sampling is one approach, however the uptake within the network was only 56% of the participating farmers. While they were generally looking at the value of their soils and how this can be measured in their businesses, the most frequent complaint referred to the non-compatible services and having to rely on too many different platforms to reference crops, livestock, yields and soil samples.



Agri-EPI Centre Agri-Tech Sustainability Analyst in Life Cycle Assessment,
Emily Laskin

We believe some of these new challenges farmers are currently facing can be addressed through intelligent technological solutions. One of our new tools is Life Cycle Assessment (LCA), an internationally standardised scientific method that provides agricultural technology developers with a credible way to assess the environmental sustainability of their product, process or service.

Life Cycle Assessment quantifies an array of impacts at each life stage of the subject including fossil fuel extraction, greenhouse gas emissions, water eutrophication, soil acidification and land usage, and then goes on to sum them up to create a comprehensive picture of the affects the subject has on the environment. We believe this methodology is crucial for the end-user – the farmer.

Agri-EPI Centre wants to ensure that the technology we are recommending to farmers is proven to decrease their environmental impact through scientifically founded means. Applying quantifiable methods of sustainability will prove to farmers that they are not being taken advantage of and instead are actively contributing to the country's climate change mitigation strategy.

This also may become useful when farms are completing carbon audits. Having LCA-certified equipment on farm will increase the accuracy of the carbon audit and may enable access to carbon-related government grants.

Life Cycle Assessment is just the beginning of Agri-EPI's sustainability offering. Our vision is to offer a full package of assessments, analysing all three pillars of sustainability: environmental, social, and financial. We believe a product must be interrogated in each of these categories before being labelled as 'sustainable' – in other words, it must be cost effective, have minimal to no negative environmental impact, and it must support the health and well-being of the communities it affects.

R&D for sustainable agri-tech

Agri-EPI offers a wide-ranging set of facilities, equipment, and services including those at the Soil and Crop Technology Hub at Cranfield University – base for our engineering team who can be used as part of research and development projects to support sustainability on farm.

Key resources include:

- Multi-modal agricultural data
- Spectral imaging and sensing
- Agricultural data analysis
- System simulation
- Development / robotic platforms
- Data and robotics in agriculture consulting

We provide high quality sensing across a broad range of technologies, including hyperspectral, SIF imaging, multi-spectral, ground penetrating radar and LiDAR. These sensors are useful for creating data sets used in machine learning training, agronomy, simulations, and system validation. The sensor data is backed up by a range of operational and IoT data sources which are centralised in our geospatial data platform to create a high-density layered data repository.

Service provision is available from creation of the initial testing plans right through to delivery of analysed data. Operations planning is conducted in-house, especially in the case of our UAV mounted systems, and we also undertake post-processing of sensor data using the spectral imaging expertise of the team and a suite of industry leading software. Our team of platform and spectral imaging experts uses our fleet of sensors and specialist software to deliver a range of sensing products such as ground truthing for AI model generation, or the creation of digital twins.

We also offer UAV and UGV platforms as a means to test novel sensors and end-effectors without the need for a bespoke vehicle. And through working closely with our Innovation Farm Network, we are creating a heavily layered source of evidence for developers to design and test their innovations.

Robotriks RTU v4. Light Agricultural Robot



Mirico's Orion®



Multi-sensor VTOL UAV

Cutting-edge technology deployed on farm

Providing collaborative R&D and enhancing farm sustainability

We implement a variety of technologies on the commercial farms within our Innovation Farm Network which have been created by external providers. This cutting-edge equipment can be used in collaborative R&D projects while also enhancing both farm sustainability and productivity. Our range includes the following.



Data management systems to aid farmers in tracking and managing dairy operation metrics. This data informs decisions around resource use and herd health, while also monitoring environmental indicators to support sustainable farming.



Pollinator conservation tools using IoT sensors. These aim to increase and track bee populations, supporting biodiversity and crop pollination, which in turn boosts productivity.



Soil sampling technologies. These tools help farmers understand their soil's nutrient content and detect potential contaminants, which in turn guides decision making around fertilizer use leading to better crop yields and reduced environmental impact.



Drone technology is used for crop monitoring. Equipped with advanced imaging, drones allow for quick detection and response to crop health issues and areas of water stress.



Weight monitoring systems connected to cattle ear tags. They provide continuous, non-invasive livestock growth tracking, ensuring optimal animal weights and promoting animal welfare.



GPS-enabled livestock collars for boundary and pasture management. These tools offer flexible, virtual fencing options, giving farmers better control over grazing areas which can subsequently improve soil health and vegetation regrowth, leading to sustainable land use.



Soil Flux 360, helping to understand GHG soil emissions

Measuring and monitoring positive and negative soil flux can help balance greater productivity, sustainability, and improved soil health for the entire supply chain - from growers and ag-chemical companies to processors and food retailers.



Agri-EPI's automated field-based chambers capture topsoil and above ground plant gases, offering rapid and accurate data of soil respiration and sequestration. Soil Flux 360 offers a two-pronged approach. Measuring and understanding the different variations in respiration (positive flux) and sequestration (negative flux) of carbon from soil and crops at different times of day, month, season, and year which will help us better understand soil emission during seed drilling, fertiliser application and harvest. The tracking tool will also inform where in the UK's geography are the best carbon sinks and research into what organic materials can be added to improve soil organic matter.

8 Empowering world leading precision agricultural technology






Collaboration is key to agri-tech development. In addition to our facilities, we host on-farm events and networking meetings. We also have an industry and farmer network of over 250 members. Together we can develop agri-tech solutions for sustainable dairy production.

Get in touch with our dairy innovation team to find out more and discuss opportunities; team@agri-epicentre.com

www.agri-epicentre.com

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