Agri-TechE 2024 REAP Report

Record attendance for the 11th REAP Agri-Tech Conference

When a moment is described as pivotal, it can be dismissed as hyperbole. Still, perhaps it underestimates the importance of the period in which the agriculture industry presently finds itself and what we came together to discuss at REAP 2024.

Changes in global leadership, huge commodity price fluctuations, and the increasing juxtaposition of food production and nature recovery compete for the biggest challenge to agriculture. This is all set against a challenging financial landscape as we try to navigate a way through.

However, nothing drives innovation like adversity.

For the first time, we can gain unprecedented insights into our crop and animal performance data, forecast the future more accurately, and make decisions differently. AI already enables this. As you will learn from this report, how it will transform our food production in 2025 is - as yet - almost unimaginable.

Agri-tech empowers farmers to do a lot. However, just because we *can*, does that mean we *should*? As an industry, we still struggle to calculate the ROI of new tech adoption effectively, which impacts decision-making across the supply chain.

REAP is the go-to forum to unite the agricultural ecosystem annually and debate the opportunities and challenges. In doing so, REAP and the Agri-TechE community are an engine for positive outcomes and delivery. We bring people together to fix things.

REAP 2024 will be remembered for its record attendance and captivating discussion of the application of AI in agriculture - and those at the networking reception may remember it for appearing in the background of a live ITV news broadcast from the exhibition hall!

The positivity and thought-provoking speakers brought the delegation together, stimulating much discussion about the industry's future direction and how AI will power this, led by REAP's keynote session.

Plus, in the Start-up Showcase, Nicole Sadd, CEO of Rothamsted Enterprises, asked Dr Boris Breiner what his organisation, Lambda Agri needed. His response - a shout-out to the crowd seeking chemical manufacturer for scale - elicited a successful, live match!

While Anna-Sophie Deetjen of Morrow, had us rethinking our daily caffeine fix with hard-hitting truths: coffee has some of the worst CO2 and water credentials. Their alternative solution uses local and upcycled ingredients.

The day closed with a lively Farmer Panel, giving farmers the opportunity to reflect on the presentations - with two also sharing their insights on the Farmers Weekly podcast recorded at REAP 2024.

Agri-TechE's REAP 2024 Report

Optimise one or manage many? Attendees of REAP 2024 learned that in the future, both might be possible with new technologies powered by artificial intelligence — from automating tasks to enabling data-driven breakthroughs in breeding, sustainability, and farming practices.

Will AI be the technology that unlocks a more effective method of managing the many while optimising the one? The theme for the latest – and biggest – REAP Conference was balancing those sometimes-competing management philosophies.

The keynote speech that set the tone for the day was given by Dr Elliott Grant, who spent the previous eight years leading Google's work on AI specifically for agriculture as CEO of Mineral.

AI is just getting started, he began: "We are on day one. AI today, whether it's a chatbot or image generator, is child's play compared with what we're going to be doing in the next few years.

"In 10 years, AI will be at least 1000 times more powerful than it is today."

Elliott pointed out that agriculture was ideally suited for AI as: “It’s extremely complex. Every farm, crop and season is different, and there are thousands of data points, human knowledge and experience that need to be integrated when making decisions. That process can be completely transformed by AI.”

The change would come in three stages, he predicted.

First, the substitution of tedious tasks; next, the augmentation of human capabilities, while the third phase is transformation – changing the way farming is done and how agricultural businesses operate.

Some of those, especially the first two, were already happening with initial technologies that used AI, he suggested.

“The robot can do what a human does, equally as well, and more cheaply and reliably,” Elliott said. “We’re able to substitute the human task. But very quickly you realise the AI is also augmenting what the human does.

The limitation of the human is you would only measure rust once or twice a season, but you can send out a robot every day.”

“It can transform the way we think about agriculture because one of the limitations for every farmer is they can’t be in every field every day, looking at every plant.”

“But what we are really aiming for is transformation, and in this case that will be from using the data it produces to transform the way breeding is done.”

“That’s the Holy Grail of breeding, and the only way to get there is to have orders of magnitude more data,” he said.

That could power a shift from the current episodic management model where heavy, costly machines drive through a field just a few times every season to one of continuous management where smaller, lighter machines continuously monitor and manage plants at the individual plant level, he explained.

“The economics of this are compelling, and the cost curve is being pushed down to make this readily available to farmers.”

“I can see that future, and it will be AI-enabled,” Elliott said.

Elliott stressed that collaboration would be needed for AI to truly transform agriculture. “There are some hard problems we need to solve together.”

Three problems are particularly challenging: business models that create, capture and share value, negotiating the inherent diversity of agriculture so new models are transferable to different situations, and data privacy.

Data privacy was a classic example of where there was a balance between the individual's interest and the collective benefits of the many. Elliott noted this at the invite-only farmer breakfast that preceded the conference.

Elliott Grant gave intimate insights at the REAP Farmer Breakfast

“Data is extremely valuable for farmers; it’s their differentiator, and you can’t just give it away for free. But if you don’t share, you never get the benefit of the common learning.

“I think the answer to the paradox is to find a way to share data that doesn’t disclose private information. There are technical ways of doing this, which already exist in healthcare, called confidential computing, which need bringing into agriculture.”

But in the meantime, he warned farmers to be careful about sharing data with private companies – only sharing with those they trusted, ensuring data was anonymised and used only to serve the farmer.

The REAP supply chain panel explores collaboration

Elliott alluded to how often the person buying technology isn't necessarily the person who gets the real benefit.

> ***"That's a supply chain problem," Elliott said. "I sell something to the farmer, but the benefit accrues to the retailer or the consumer, and unless the value flows back, it's never going to work."***

"So we do need to think more holistically about business models that make sure the value flows back to the farmer.

None of these things happen in isolation, so when we talk of business model innovation it could be a retailer buying differently, a wholesaler having a different contract, different financing of farm equipment, or a risk-sharing agreement. All these need to be considered because the way we do it today isn't going to work," he concluded.

The importance of collaboration and open innovation was the dominant theme for the supply chain panel featuring Dr Phil Taylor of Bayer, John Deere's Mark James and Unilever's Dr James Holmes.

The presentations and discussion highlighted that achieving a sustainable and efficient agricultural system required a multifaceted approach that balanced the needs of individual stakeholders with the overarching goal of a resilient and productive food system.

By working together, sharing data and aligning goals, stakeholders across the supply chain could leverage the power of technology to achieve both individual benefits and collective progress towards a more sustainable agricultural system.

For example, the Regen AgriFood Coalition in the Heartland (REaCH) was a consortium assembled by Bayer and BioSTL in St Louis to co-create and test solutions for regenerative agriculture. Phil explained:

"Last year, we selected 13 innovators to be part of the coalition, which the stakeholder group has worked with to help validate their technology, think about next steps and connect them to our network."

This collaborative approach ensured innovations were relevant and practical, delivering value across the entire supply chain.

Similarly, John Deere's Start-up Collaborator Program provided mentorship and access to dealer networks to test business cases, Mark said. "We started about five years ago working with six to eight small start-up businesses each year that have novel ideas, particularly around autonomy or doing more with data from the field.

"It helps them improve, develop business plans and commercialise ideas. Where appropriate, we invest in those collaborators all the way up to full buyout."

"This is about growing value for our customers, as well as being good business for us." Mark James, John Deere

Reducing the carbon footprint of its Colman's products was a key goal for a collaborative project involving Unilever's suppliers, academic partners and several businesses. It was just one of several projects using open innovation to drive forward Unilever's regenerative farming strategy, James explained.

"Within these projects, a key cornerstone is to grow farmer profits," James said. "It is not just something we are asking and expecting our growers to do. This creates value for their businesses."

Currently that involved either paying premiums for outputs or incentives to adopt certain practices, he said.

In response to a question from the audience about what businesses would do differently to ensure value would flow through the supply chain to farmers producing commodity products, there was general agreement about the need for new business models.

Mark provided a vision of what that might look like within his company, explaining farmers might only pay part of the cost of a machine or system upfront, instead paying an ongoing licence.

"That means you can get a machine that is cheaper to start with," he explained. "You can gather some savings from that, potentially unlocking some economic headroom. The ongoing subscription then allows you to enhance that machine to get more features."

He added that he could see a model where growers paid by operation rather than for a machine in the long term.








Farmers respond to the day's discussion in the Farmer Panel

Not surprisingly, the Farmer Panel was concerned about obtaining value from their data and the dangers of sharing it.

The REAP 2024 Farmer Panel, chaired by AHDB's Farming Systems Director, Mike Gooding, featured arable farmers Jimmy Goodley, Richard Ling, pedigree cattle farmer Helen Reeve, plus root crop grower Nick Sheppard.

“Making our data available to the supply chain is quite a dangerous place to be,” Richard suggested. “Our data has clear value which needs to be realised back for the farmer.”

But he was broadly supportive of Elliott’s concept of confidential computing. “I think the only way we can learn is by making mistakes. We need to make more mistakes to move forward.”

Sharing data where you were supplying supermarkets or defined end customers was risky, Nick stressed. “It can affect negotiations around contract pricing for the forthcoming season, for example.

“But for broadacre arable crops, it’s not so critical as there are so many different suppliers, and the world market affects the wheat or barley price, whereas potato price is dictated by the multiples or processors,” he said.

The panel also concentrated on what AI and other tech discussed in the Research in Practice and Start-up Showcase meant for their businesses.

They were primarily interested in technology that solved problems and delivered tangible benefits to their businesses.

For example, Helen wanted tools that would alert her to problems with the herd at home while away from the farm. She rears and breeds Dexter for beef sold directly to consumers through farmers’ markets or direct sales, as well as relief milking 200 head of Jersey cows.

“I would dearly love to be with my cattle 24/7, but I can’t do that,” she said.

Nick had used see and spray technology for the first time this year to control volunteer potatoes in onion crops, cutting 85% of the needed herbicide. “With the cost of a contractor, it was about cost neutral with an overall spray,” he noted.

Farming using regenerative practices, Jimmy was keen to use technology, whether it was AI-based or otherwise that helped him filter out the “noise” when measuring how the farm was performing.

“Farming is particularly noisy. We do a lot of soil testing and have explored sap testing, but we found the results from both unhelpful because of the noise.

I want tech that can be used to reduce that noise and give me more accurate, usable data,” concluded Jimmy.

Six key farming challenges research is helping to solve

One of the standout sessions at REAP 2024 was the Emerging Agri-Tech panel, which bridges the gap between cutting-edge scientific research and its practical application on farms.

During this session, researchers shared the latest progress from their farmer-focussed projects, which often become the seeds for the most exciting future innovations in agriculture and horticulture.

The best thing since sliced bread?

Earlham Institute's Ashley Lister research aims to boost wheat yields by addressing sterility in the basal spikelets of wheat ears.

She hopes to provide breeders with reliable genetic markers to overcome this sterility to develop varieties that consistently produce grain throughout the entire ear.

What's cookin' in agri-tech?

Marcello Calisti from the University of Lincoln is developing modular agri-robotic designs that are effective and adaptable to the diverse range of conditions on farm.

Modularity helps farmers customise robots with various sensors and tools tailored to specific tasks.

A GPU to grow yields, not top scores

Harper Adam's Marcelo Precoppe is leveraging computer simulation to make the design of agricultural equipment more efficient, affordable and responsive to farmer needs.

By creating virtual prototypes, engineers can test designs before physical construction, reducing costs, speeding up design and providing earlier farmer input.




The beef with methane

SRUC's GreenShed project addresses the challenge of reducing the environmental impact of livestock production, particularly methane emissions, while simultaneously enhancing farm profitability and resource efficiency, Louise McNicol explained.

GreenShed captures methane released by cattle and, along with biogas from anaerobic digestion of manure and bedding, fuels electricity production to power the shed, with excess powering a vertical farm.

No clowning around!

University of Essex's Adrian Clark is using machine learning to unlock valuable insights about the biological activity and overall condition of soils, in combination with PES Technologies.

The machine learning model analyses the relationships between the gases released when soil is heated to a higher level of accuracy than traditional lab analysis, making it more affordable and accessible for farmers.

Is this the sweetest solution yet?

Drones equipped with high-res imagery together with machine learning algorithms are being used by Niab's Robert Jackson to count individual blossoms in apple orchards.

The result enables growers to make more informed decisions about targeted chemical applications, leading to more efficient use of resources, reduced environmental impact and improved crop quality.

REAP 2024's eight picks for the future of farming

Each year, the Start-up Showcase at REAP celebrates exciting new technology companies in the sector, and each company is allowed ten minutes to showcase itself at the conference.

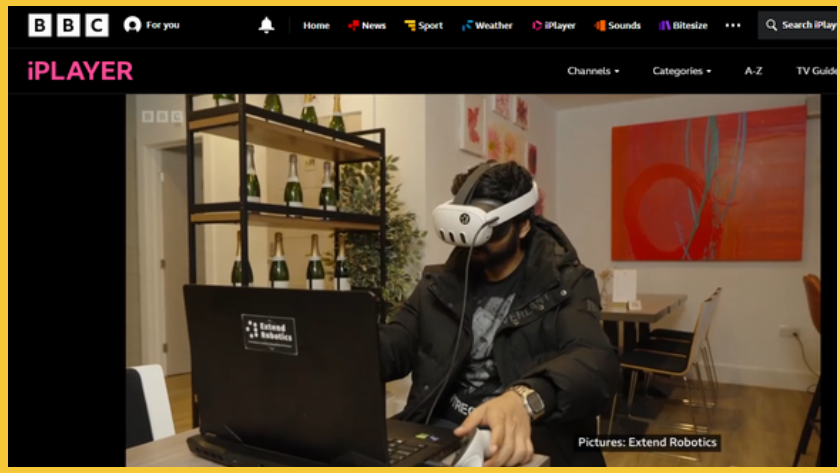
Successful innovation solves intractable problems, and so the 2024 cohort provides **solutions to four of the industry's challenges**.

1. Solving labour shortages

Versatile RobotX creates innovative and adaptable robotic platforms for fruit harvesting.

Its two flagship products include a mobile autonomous strawberry harvesting platform, successfully trialled in traditional polytunnels and at the UK's first vertical growing system for soft fruit at Wilkin and Son's Tiptree.

With £4m in DEFRA funding over the last four years, they are now developing a second-generation, low-cost prototype that would be accessible to smaller farms.



Xtend Robotics has developed immersive augmented reality (AR) software that allows operators to remotely supervise, control, and train robots to work semi-autonomously on farms.

Its scalable digital solution enables skilled workers from across the globe to log in and operate robots on farms remotely.

2. Minimising food waste and creating additional marketing opportunities

Morrow is developing sustainable, locally sourced coffee alternatives while proactively combating what they foresee as a looming "coffee deficit."

By partnering with maltsters, growers, and distributors, Morrow is crafting coffee without coffee beans by utilising unwanted ingredients like fruit pips, peels and seeds and using locally grown crops and plants sourced from regenerative farms.

UPP has developed a two-fold solution to tackle inefficiencies in the broccoli supply chain.

First is their patent-protected, machine learning-powered, automated harvester. Rather than teams of up to 20 casual workers, one automated harvester moves up the tramlines quickly and efficiently to minimise harvest losses.

UPP then takes what would typically be discarded, the broccoli stems and turns them into a high-protein, hypoallergenic food ingredient.

3. Enhanced plant and animal health diagnostics

Plant Metrics develops ionic-specific sensors to provide precise macro and micro nutrient insights, potentially replacing costly, time-consuming tissue testing.

By monitoring iron concentrations, these ionic-specific sensors will also be used to explore early onset Huanglongbing disease detection in citrus trees in the USA.

Plant Metrics uses SAP sensor technology, which translates ionic flow measurements within plants into voltage readings. Current research includes trials in the USA, Israel, Canada, and the UK, with irrigation trials helping determine voltage levels that indicate drought. In internal trials, the technology detected signs of water stress before any phenotypes appeared on the plants.

Vet Vision AI has developed AI-powered cameras for continuous, detailed monitoring to improve animal husbandry and welfare.

They require just one week of data collection to deliver insights and track behaviours like feed access, lying times, and comfort levels.

Data is analysed and linked to a dashboard, offering key performance indicators. Reports created are designed to help vets and farmers improve areas such as equal access to food, comfort and space usage.

4. Improving production efficiency

Lambda Agri is developing greenhouse solutions to optimise crop yields by enhancing sunlight with coating on the glass.

The technology alters the spectral composition of sunlight by converting high-energy UV light into lower-energy red light, a process known as ‘luminescent downshifting’. This is highly effective for photosynthetic turnover as it boosts plant productivity, aiding crops in harnessing sunlight better.

Fruit Cast predicts fruit yields to allow growers to confidently forecast when and how much fruit will be ready for harvest by analysing millions of images using advanced AI and camera technology.

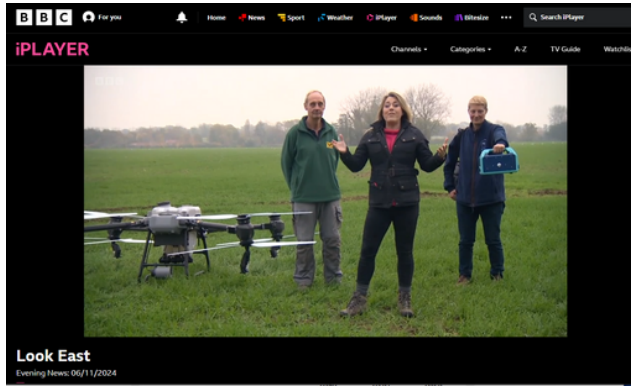
The delivery-agnostic cameras are designed to attach to various farm vehicles, collecting critical data that is transformed into clear, actionable strategies through refined software architecture for reporting to supply chains and labour planning.

REAP 2024 made waves!

In addition to presenting their products and services to delegates from the farming, scientific, and commercial agri-tech communities, exhibitors at REAP had the exceptional opportunity to be interviewed by the press as they browsed the stands.

Jim Bailey from PES Technologies had the opportunity to demonstrate their technology in a pre-recorded session for the BBC on another Agri-TechE member's field. Farmer Chris Eglington was also able to benefit by explaining his drone spraying technology.

On the day, Living Optics, Extend Robotics and Versatile Robotics were all interviewed for BBC News and an ITV News live broadcast. Other companies had their branding on camera as they panned the exhibition. The coverage was truly multimedia, with a Farmers Weekly podcast dedicated to REAP airing shortly before Christmas.



REAP Technology Exhibition

Agri-TechE's Director of Communities, Becky Dodds, explored the exhibition with her camera to get feedback from people manning the stands. You can hear what they had to say about **exhibiting at REAP in this video**.

The Farmers Weekly Podcast @ REAP 24

The Farmers Weekly Podcast dedicated its final episode of 2024 to REAP: From artificial insemination to artificial intelligence ~ how agri-tech is shaping the future of farming.

Listen here

Recorded at the event, the episode features key highlights from the conference and interviews with world-class speakers, innovative start-ups, and forward-thinking farmers to explore how technologies such as artificial intelligence and advanced data science are reshaping agriculture.

Thank you to our REAP 2024 sponsors

Looking forward to seeing you at REAP 2025!

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