# 2024 Yearbook

ROTHAMSTED
RESEARCH

## From the Director

# Continuity & change

2024 was in many ways a "Year of Elections" and changes in governments. It is estimated that 2 billion people in 70 countries went to the polls over the last 12 months. If there was one emerging theme from all this voting it was "change" – electorates were keen to try something new.

For agriculture, new governments often present both new challenges and opportunities in terms of policy changes. Many farmers are now embracing change and innovation as a necessary path to more sustainable farming. But farming is equally about continuity. Building up healthy soils or replenishing biodiversity on farms takes time – sometimes generations.

For Rothamsted the themes of change and continuity could not be more apt. We are rightly proud of our 180-year-old long-term experiments (LTEs) and the huge contribution they have made to the development of modern farming. In 2024 we saw a flurry of papers based on the data from this record-breaking endeavour. Some looked back at how the experiments had been adjusted over time to maintain their relevance. In contrast, a study by the University of Lancaster based on LTE data looked at the very contemporary issue of microplastics in soil. Such studies exemplify the ongoing value of long-term data and the need to continue agricultural long-term experiments even whilst farming itself is changing.

Broadbalk is our longest running experiment. It has tracked changes in soil and winter wheat growth under different applications of NPK since 1843. Queen Victoria had been on the throne for a mere 6 years at that point and would continue as monarch for another 57. The founder of Rothamsted, John Bennett Lawes planted an oak tree to commemorate at Rothamsted Park in Harpenden, England, during her Golden Jubilee in 1887, where it still stands. Victoria's reign and longevity was not surpassed until the late Queen Elizbeth who was on the throne for 70 years. Much missed, she was a patron of Rothamsted from 1976, and I am delighted to say that her son, the current King Charles II, also conferred Royal Patronage on the institution this year.

It marks a continuing association with farming – and particularly more sustainable forms of agriculture, that the King has adhered to for much of his life. Such views might have seemed eccentric to some when, as the Prince of Wales, he espoused them decades ago, but they have rapidly become mainstream and are now driving change in the agricultural sector as never before.

This is informing government policies such as the Sustainable Farming Initiative and Environmental Land Management schemes which have been broadly welcomed by both farmers and environmentalists. However, it should never be forgotten that that the primary purpose of farming is to produce food. Global food security remained precarious during 2024, with continuing unrest in Ukraine and the Middle East keeping governments anxious. Extreme weather conditions continued to affect food production across the globe. Even in the UK, not usually as badly affected by flood and drought as some countries, excessively heavy autumn and spring rains delayed the planting of many staple crops and for many areas also meant harvesting was a real challenge. The final 2024 UK wheat harvest was 11.1 million tonnes, a decrease of 20% on 2023. This is the smallest wheat harvest since 2020 when wet weather last affected annual cropping cycles.

This turbulent backdrop points to the increasing importance of Rothamsted's science programme. We must deliver more food under ever shifting weather patterns. And at the same time farming must play its part in combatting climate change and restoring health to our natural systems. It's a tall order, even for the UK's tirelessly innovative farm community. We believe our science can help deliver the tools farmers will need – from better crops to fewer inputs.

New innovations in bioengineering, AI and high-speed DNA sequencing are transforming how we work, delivering robust solutions at an unprecedented pace. We need to stay focused, listen to our farming partners and deliver a more sustainable food system as fast as we can.

On a personal note, changes come to people too. At 68, I need to respect my life is catching up with me. I started in Rothamsted in October 1981, as a postdoctoral scientist after finishing my PhD, and have spent all of my career at the institute (including a spell of 10 years at our once sister site in Long Ashton). I am immensely proud of what Rothamsted has achieved in that time and what it continues to achieve. But I am also conscious that externalities impacting on research funding have changed significantly over the years, and especially recently. Challenging times lie ahead for all research institutions.

I will be standing down as Rothamsted's director in July 2025 to allow someone with fresh energy and drive to inspire and lead the institute successfully through the years ahead. I remain wholly confident in its future. After what will most certainly be a testing start to the year, I know that, with our brilliant scientific staff, expert technicians and dedicated support staff, Rothamsted's best days are yet to come.

Of course, one never really leaves a wonderful institute like Rothamsted. Even if I am no longer there physically, its presence will always remain with me.

Angela Karp

**Professor Angela Karp**
Director and CEO

# Honoured in 2024

## Prof Lin Field

Professor Lin Field was appointed a Commander of the British Empire (CBE) in the 2025 New Year Honours List for services to protecting crops and the environment.

Lin is an insect molecular biologist, formerly head of Bio-interactions and Crop Protection at Rothamsted and currently a Professor Emerita. Her personal research interests are focused on understanding insecticide mode of action and resistance at the biochemical/ molecular level and her research team uses the latest genomic techniques to understand resistance and insecticide selectivity.

Lin has also developed a wide knowledge of alternative pest control strategies that minimise the effects on non-targets and the environment. Lin has been, and continues to be, an active participant in the debate on whether pesticides are needed and how they may affect bee populations. This has involved speaking to fellow scientists, farmers/growers, bee keepers, policy makers and the general public.

After a BA (First Class) from the Open University, Lin was awarded a PhD on the molecular basis of insecticide resistance at Rothamsted Research in 1989. She became leader of the Insect Molecular Biology Group at Rothamsted in 2002, and then Head of the Department of Biological Chemistry in 2010.

Since 2005, she has also been a Special Professor at the University of Nottingham. Lin is a Fellow of the Royal Society of Biology and a Fellow of the Royal Entomological Society. She was also President of the Royal Entomological Society from 2008 to 2010.

## Prof Steve McGrath

Professor Steve McGrath was elected a fellow of the Royal Society in 2024, the oldest and most prestigious scientific academy in the UK.

Steve is a discovery leader in the Sustainable Soils and Crops strategic area at Rothamsted Research. His research has significantly advanced our understanding of the bioavailability of trace elements, and their biological impacts in agriculture, the environment, food safety and human health. His work has bridged the fields of biogeochemistry, environmental science, soil science, soil microbiology, plant and crop science, resulting in groundbreaking discoveries and led to innovative solutions to some of the urgent problems facing farming and human nutrition.

His research on arsenic in paddy soils revealed the uptake and detoxification mechanisms in plants and provided valuable insights for breeding safer rice. He has also studied metal hyperaccumulation in plants which can be used to address contaminated soils and has explored micronutrient deficiencies in crops which has led to improved biofortification.

Steve was elected as a fellow of the International Society for Selenium Research, a fellow of the Institute of Soil Science, and he is an honorary member of the International Society of Trace Element Biogeochemistry. He is recognised as a Highly Cited Researcher by Clarivate.

# New biotracer

## sheds light on land-use response to extreme wet weather

Rothamsted scientists using a new tracer have shown that cereals-dominated arable land contributed over half of all sediments and associated organic matter dislodged by heavy winter rains in a watercourse in South-West England. The result confirms fears that, as the severity of wet periods increases under climate change, some current farm practices are accelerating soil erosion.

The study team used Carbon-13 isotopes of dicarboxylic fatty acids (diFAs) as tracers to identify which land uses were contributing to in-stream sediments at test sites along an 8km stretch of a catchment in Devon. These molecules are particularly useful as tracers because they are mostly produced by roots and their isotopic signature differs with vegetation. This means that the type of land use (grassland, arable land, woodland or stream banks) that sediment has been eroded from can be relatively easily identified using n-stream sediment and source area samples.

Taken over the record-breaking wet winter of 2019/20, the results showed that stream banks contributed most of the sampled sediment in the early winter (October–December) period. In contrast, the dominant sediment source shifted after a period of prolonged consecutive rainfall days in the late winter (January–March) to winter cereals-dominated arable land.

**"There is a high likelihood that winter rainfall in South-West England will be more prolonged and intense under climate change,"** said Rothamsted's Dr Hari Ram Upadhayay. **"So we need to better understand the differing levels of resistance different catchment sediment sources have to erosion driven by extreme wet weather. This new technique enables us to do that with more confidence."**

# Cell grazing study shows multiple positive impacts for both productivity and ecosystem health

A four-year investigation of cell grazing has shown that it has positive effects on soil carbon sequestration, pasture growth, and live weight production per hectare compared to set-stocking. The study compared cell grazing (CG), using TechnoGrazing infrastructure, where animals were moved every 1–2 days to new, and set stocking (SS), where animals remained in the same area for the grazing season.

The cell grazing method achieved substantially higher pasture growth, with dry matter production nearly 40% higher than set stocking. By the third year, CG areas supported double the livestock per hectare compared to SS – and produced 140% more liveweight per hectare.

Despite more intensive grazing and higher stocking densities, soil carbon content increased in cell grazing enclosures while it decreased in set stocking, indicating higher levels of carbon sequestration.

In a perfect system, livestock would graze all parts of a field equally. In reality the animals tend to cluster around features like water troughs leading to uneven grazing and bare patches. Cell grazing reduces these problems; animals are evenly rotated around the paddock, grazing more intensively.

"These results give the best evidence yet that 'It's not the cow, it's the how'," said Rothamsted's Dr Jordana Rivero, who led the study. "Cell grazing benefits both the farm productivity and some aspects of the environment. Negative environmental impacts like increased nutrient runoff potential or soil compaction were similar between the two methods."

The study team found a range of other effects including changes in the botanical composition of the two systems. Cell grazing increased the abundance of perennial ryegrass within the sward and maintained levels of white clover, while set stocking led to an increasing abundance of weed species.

"Cell grazing benefits both the farm productivity and some aspects of the environment. Negative environmental impacts like increased nutrient run-off potential or soil compaction were similar between the two methods."
Dr Jordana Rivero

# Modern wheat has a diminished beneficial root microbiome

Modern wheat varieties grown with inorganic fertiliser show markedly fewer beneficial root bacteria compared to their unfertilised counterparts. In contrast, ancestral wheats show no such reduction, whether fertilised or not. This suggests modern cultivars have been bred to rely on nutritional inputs to maintain yields, a practice which reduces soil health.

The research team performed controlled experiments to compare growth-promoting root bacteria (plant growth-promoting rhizobacteria or PGPR) associated with ancient and modern wheats grown in both fertilised and unfertilised soil, resulting in the isolation of over 14,000 bacterial isolates.

“Modern wheat varieties have been bred to thrive in high-input systems”, said Dr Tessa Reid, the study’s lead researcher. “This appears to have greatly reduced the numbers of beneficial bacteria living on or around their root system.”

The team found that fertiliser application reduced the abundance of PGPR in modern wheats by 45%, making their levels no higher than in unplanted soil. This reduction was not observed in wild wheats, the ancestors of modern varieties.

“Microbiota of crop ancestors may offer a way to enhance sustainable food production,” said Dr Tim Mauchline, the team lead. “Future work could involve performing microbiome transplants, whereby, beneficial root microbes reduced through domestication will be supplemented to modern wheat varieties. Alternatively, reintroducing key genetic traits to modern wheat, from their ancestors, to boost root colonisation of beneficial soil microbiota is another promising strategy.”

# Protecting our crops

**Three important new studies have shed light on the growing threats to effective crop protection.**

## How black-grass survives waterlogging

Black-grass thrives on heavy land, particularly where drainage is poor. Now a new study has shown that this problematic weed uses specific adaptations to flourish even when soil is saturated for up to three weeks. The data show that when waterlogged, black-grass plants grow bigger than their well-drained counterparts while wheat growth under the same conditions, was significantly reduced.

The research also examined different populations of black-grass and showed that the more herbicide resistant the population was, the more waterlogging tolerant it was too.

"We knew that wheat plants alter their root structure in response to waterlogging, making drinking straw-like structures called aerenchyma that increase gas exchange from the unflooded tissues down into the flooded roots," said Rothamsted's Dr Dana MacGregor who led the research. "What we were surprised to see is that blackgrass always had these structures even in the well-drained conditions. In other words, black-grass is "ready to go" when fields are flooded, whilst wheat and other crops, must remake their roots to survive."

## First Phoma leaf spot resistance to azole fungicide found in Western Europe

The fungal species that cause Phoma leaf spot and stem canker in oilseed rape are showing decreased sensitivity to some chemical controls, sparking concerns for growers in Western Europe, according to a new study.

The diseases damage brassicas and are c aused by two fungal species *Plenodomus lingam (Leptosphaeria maculans)* and *P. biglobosus (L. biglobosa)*. In Europe, a range of fungicides are used for control, but azoles (known as DMIs) which act as inhibitors for a fungal enzyme, are fast becoming ineffective.

"Decreased DMI sensitivity has already emerged in Australian and eastern European *P. lingam* populations," says Dr Kevin King, who led the research. "However, we are now seeing it in Western Europe, which is very worrying."

## Glyphosate ban could lead to difficult trade-offs

A ban on glyphosate could lead to an increase in weed abundance and a decrease in the yields of some crops, according to a new modelling study. Although the environmental risks associated with this herbicide would be eased, alternative approaches to weed control had mixed outcomes for the environment, food production and profitability, although some show potential benefits.

"Our findings emphasize the need for careful consideration of trade-offs if a ban were to be enacted," said Rothamsted's Dr Helen Metcalfe who led the study. "Glyphosate, the most widely used herbicide, is linked with environmental harm and possible human health issues, but its use is central to no-till farming approaches. Public pressure is now building for it to be replaced in agricultural systems. We wanted to find out what the implications of a ban might be."

The study team modelled the impacts of discontinuing glyphosate use and replacing it with alternative control methods for controlling weeds based on winter wheat arable systems typical in northwest Europe.

"Integrated Weed Management offers the potential to reduce chemical use but can also have some negative environmental and economic impacts," said Dr Metcalfe. "The uncertainty associated with the non-chemical approaches we tested supports the view that adoption of IWM should be adapted to the local environment."

# The long-term view

## Our long-term experiments continue to make important contributions to crop science.

Rothamsted is rightly famous for its long running experiments. These established the first principles of plant nutrition in the 1840s and formed the bedrock of modern approaches to farming.

The oldest, Broadbalk, has been sown with winter wheat since 1843. It still produces a modest crop, but given its high use of inputs, is it still relevant to increasingly regenerative practices?

"Long-term experiments (LTEs) are a vital source of information for assessing the sustainability of agricultural systems," said Paul Poulton, who has worked with Rothamsted's long-term data for most of his career. "In 2024 we published a review suggesting that that headlines warning of only a limited number of harvests left are not true in a general sense and that even modest inputs of fertiliser and agrochemicals can maintain crop yields."

The Broadbalk Wheat Experiment is the oldest continuing LTE in the world. The site is divided into 20 strips. Several of these have had differing treatments of nitrogen (N), phosphorus (P) and potassium (K) applied. One strip has had nothing applied since the experiment began and acts as a control. Adjacent to it is a strip that has had cattle-based farmyard manure added to it since the start. This was originally done as a comparison with chemical applications and predated the organic movement by nearly a century.

On a soil that had probably been in arable cropping for centuries before the experiment began, soil organic carbon (SOC) is relatively low at around 1%. Adding manures for many years to some plots increased stocks of carbon by about threefold.

> **"The experiment and the data from it, together with the archive of crop and soil samples, continue to provide scientists with a valuable resource to increase our fundamental understanding of agricultural systems as well as providing a sound basis for practical management strategies for improving sustainability."**
> Paul Poulton

# Change-makers

Whilst the meticulous record keeping and attention to scientific detail have remained constant, the experiments themselves have undergone changes. This may seem counter-intuitive: a great part of the scientific value of long-term experiments (LTEs) has been their unchanging nature. This consistency yields valuable insights into the complexity of farming systems, since by holding so many factors (like location and overall land use) constant, other variables can be more easily investigated.

Nevertheless, some changes are required over time. Sometimes these are necessary to ensure that the experiment is not threatened by factors like acidification or weeds. But often changes are needed so that the experiment remains relevant to current agricultural practice.

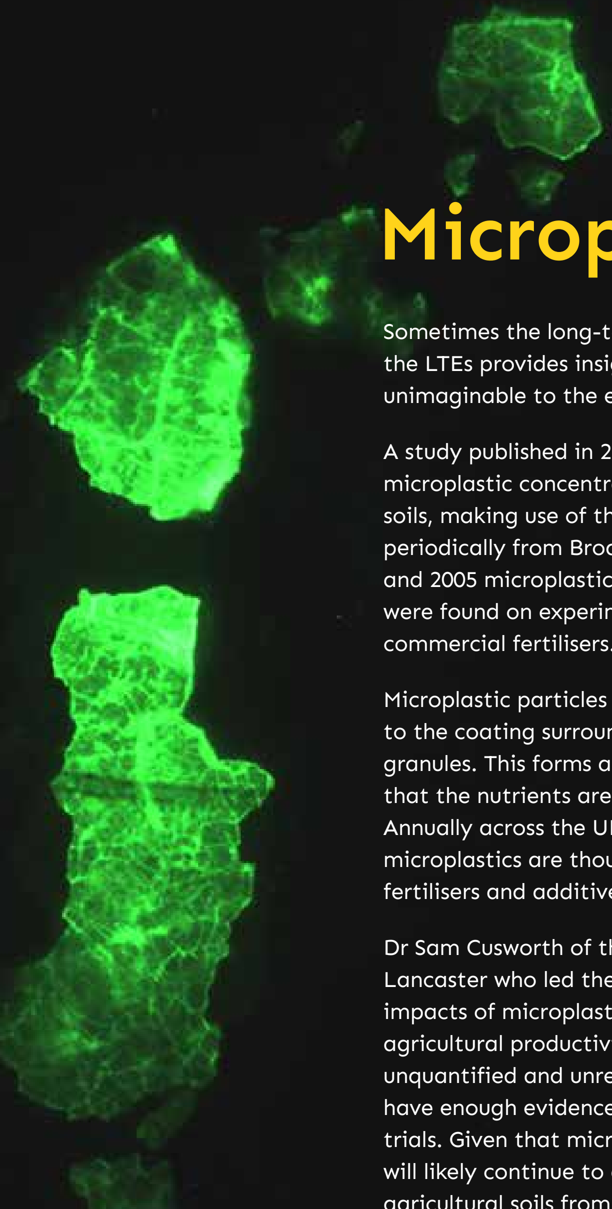
“Changes to the long-term experiments (LTEs) should not be made just for the sake of change or to investigate aspects of management that could be better resolved in a short-term experiment,” says Poulton, the lead author of the paper. “Rather, modifications should only be made after carefully considered discussion, involving scientists from different disciplines.”

This balanced approach can be seen in the Broadbalk experiment. Ploughing, drilling and harvesting techniques have all been updated, chalk has been added, and pesticides used, rotations have been included and up-to-date cultivars have been regularly introduced.

“Despite all of these changes the experiment is still recognizably the same and still serving its original purpose,” says Poulton. “Carefully thought-out changes can be extremely beneficial. We have learned that LTEs should not be regarded as static museum exhibits that should never be altered.”

However, sometimes the only solution to new challenges is to set up brand new LTEs. As interest in agro-ecological approaches has grown, for instance, Rothamsted set up a new set of rotational experiments seven years ago incorporating variable treatments such as no-till and cover crops.

Dr Sam Cusworth,
University of Lancaster



A collection of stained microplastic fragments under a fluorescence microscope found in an agricultural soil sample from a UK farm with a history of plastic mulch film use.

# Microplastics

Sometimes the long-term data provided by the LTEs provides insights into challenges unimaginable to the experiments’ originators.

A study published in 2024 looked at microplastic concentrations in agricultural soils, making use of the soil samples collected periodically from Broadbalk. Between 1997 and 2005 microplastic increases of up to 350% were found on experimental plots treated with commercial fertilisers.

Microplastic particles are intentionally added to the coating surrounding the fertiliser granules. This forms a barrier that ensures that the nutrients are released more slowly. Annually across the UK, 22,500 tonnes of microplastics are thought to be released from fertilisers and additives.

Dr Sam Cusworth of the University of Lancaster who led the study, said, “The impacts of microplastic pollution on agricultural productivity are largely unquantified and unreliable – we simply don’t have enough evidence from longer-term field trials. Given that microplastic concentrations will likely continue to accumulate in agricultural soils from both agricultural and other sources, the effects of microplastics in farming systems should be better understood.”

# Oil Seed Rape
# – time for a comeback?

**With oilseed prices sky high, many farmers are reconsidering OSR despite pesticide bans that make management challenging. New insights from Rothamsted may help plot a path forward...**

## Companion cropping and mulches

Presence of cereal volunteers in oilseed rape (OSR) fields and direct drilling could lead to a marked reduction in damage caused by cabbage stem flea beetle (CSFB), according to a 2024 Rothamsted study. The results suggest that relatively simple changes in crop management could help control this ubiquitous pest which, in recent years, has led to many farmers abandoning the crop altogether.

The field trials, conducted as part of the EU-funded EcoStack project over four seasons in Harpenden (Hertfordshire) and with collaborators from the University of Kassel (Hesse) in Germany, assessed OSR crop damage caused by adult CSFB feeding and larval infestation when sown with different companion plants and mulches.

The adult beetles damage the OSR plants by feeding on cotyledons and young leaves early in the autumn, which can threaten crop establishment. The larval stages also feed in the stem causing reduced yield. Neonicotinoid seed treatments were an effective method of control but with an EU-wide ban, farmers are left without efficient options to manage this pest.

The team found that OSR with cereal companion plants or with straw mulch showed the strongest reduction in adult feeding damage.

**"This study shows that companion planting can protect OSR crops from both CSFB adult feeding damage and larval infestation,"** said Gaëtan Seimandi-Corda who managed the experiments. **"These results suggest that farmers could relatively easily adopt new control techniques, but there is a need for more research to define the best agronomical practices."**

## Seeing the light

Hi-tech optical sensors in fields could provide an effective means of monitoring beetle numbers arriving in oilseed rape (OSR) fields. Results from an optically sensed field were compared to those baited with standard water traps and in-field counting by hand. The optical sensors recorded an increase in pollen beetles 2 days ahead of water traps and 4 days ahead of plant counts. In terms of early detection and numbers of beetles recorded, this was clearly the most efficient pollen beetle monitoring method.

Automated near-infrared optical sensors recorded the signal of light backscattered by insects flying through a detector beam. Researchers were able to record insects actually in flight and detect each insect's wing beat frequency, which often differs from species to species.

"Our study suggests potential for precision agriculture to reduce insecticide use through targeting of pollen beetle aggregations – in other words treating only areas of the crop where pollen beetle density is high," said Rothamsted's Dr Sam Cook who is the senior author of the study. "Optical sensing of pollen beetles gives us more efficient monitoring in both time and space, so it is a promising tool for early warning of insect pest immigration."

"Sensors might even be useful for tracking natural enemies to determine if an insecticide application is necessary considering biocontrol potential. Alternatively, pollinators may be identified in the field to avoid non-target insecticide effects on these beneficials, thereby contributing to both pesticide reduction and biodiversity protection goals for sustainable agriculture."

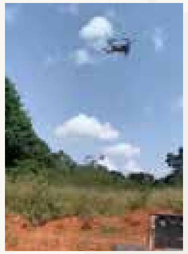
# Around the World

## USA

We provided the University of Oklahoma Health Sciences Center with synthetic molecular standards for gas chromatography analyses as part of a study looking at using ultra-long polyunsaturated fatty acids (PUFAs) for treatment of retinopathies.

## Ghana

Partnering with local agencies, Rothamsted scientists have carried out the first drone-based aerial fungal spore survey in Ghana.



## Brazil

Working with local universities, Rothamsted's forensic expertise was used to investigate river sediments. The study concluded that soil loss from sugar cane plantations was the main culprit and that retaining natural vegetation on riverbanks would be the best way to reduce soil erosion from farmland.

## France

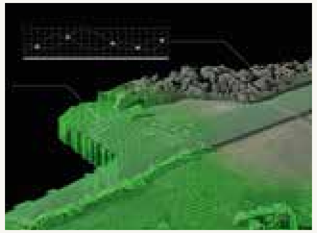
We provided a *Zymoseptoria* genome re-annotation to INRAE in Paris as part of a study to intercompare numerous gene set predictions.

## Zimbabwe

In partnership with CIMMYT, a comprehensive study of household eating patterns shows adoption of biofortified enhanced crops could improve nutrition for local families.

## China

Rothamsted is collaborating with the Chinese Academy of Agricultural Sciences on the impact of soil structure on soil carbon and nitrogen dynamics, building on our research and findings on the importance of soil physical processes in regulating the response of soil respiration to warming.



## Australia

We are partnering with the University of Southern Queensland on remote sensing research as part of APSIM: the leading software framework for agricultural systems modelling and simulation.

# Shake

## Climate Change secures new investment

The Shake Climate Change entrepreneurship programme has secured £845K to invest in new projects that will help deliver the next generation of climate-friendly farming.

Based on a unique funding model, Shake helps entrepreneurs and start-ups who are combatting climate change with science or tech-based ideas in the areas of agriculture and food production.

Now in its fourth year, the programme is hosted and led by Rothamsted Research as part of a consortium with three leading universities – Cranfield University, the University of Hertfordshire and University College London.

Original funding for the initial 4 cohorts came from the Societe Generale UK Foundation, who are now joined by three more investors to enable Shake 2024 – Climate Change Cohort 5: Beeches Capital, the Lawes Agricultural Trust, and The Novo Nordisk Foundation.

The programme focuses on closing the gap in business development between the early start-up stage and investable ventures, through provision of expert care and advice, sourced through the high-profile consortium and its associated network of mentors.

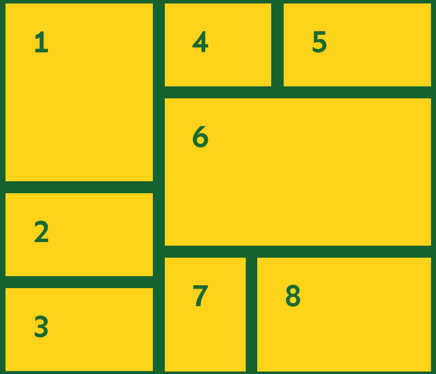
The first four cohorts, from 2019–2022 involved a total of 64 entrepreneurs with 11 successful ventures ultimately selected by Shake for investment.

Many of these early ventures have already notched up some impressive successes. Seven of the original eleven have each raised over £1m in further investment after Shake nurtured their early growth. Bristol-based **Glaia**, for instance, which is transforming how plants grow, benefitted from Shake funding and mentoring in 2019 and secured a further £1.3m in investment funds. **Economad**, which specialises in small on-farm biogas generators, has also broken the £1m investment mark.

# Public
## and stakeholder engagement

Our engagement programme has had its busiest year ever exhibiting at events with a combined attendance of over 200,000 people.

Notable firsts included an invitation to present science activities at the popular Latitude Festival in Suffolk and a busy evening showcasing our soils research at the Science Museum Lates in South Kensington.




**1–3** Latitude Festival
**4** Hertfordshire Show
**5** Groundswell
**6** Cereals
**7–8** Science Museum Lates

# Resistance 2024

**Resistance 2024 was the 9th in a series of conferences organised by Rothamsted Research and took place at Rothamsted on 23/25 Sept. The event was co-organised by the Insecticide, Fungicide and Herbicide Resistance Action Committees. A new Pesticide Resistance Monitoring Platform is currently under development at Rothamsted as a partnership with industry, government and academia with the aim of furthering pesticide stewardship through the better management of pesticide resistance.**

The conference covered the extraordinary variety of successful of new technologies that are addressing growing pest resistance, such as gene editing and the development of novel biocides. None of these, however, consign pest resistance to history. Whatever the pest or disease, when exposed to the threat of a new pesticide, Darwin's theory of evolution will prevail. Add the fact that many pest species reproduce in vast numbers and extremely quickly, makes resistance a very real and dynamic risk to crop production, both in the UK and globally.

The recent conference at Rothamsted brought together industry, government and academics from around the world to address this question to consider the role of research in mitigating future risks. The recent conference at Rothamsted brought together industry, government and academics from around the world to address this question and to consider the role of research in mitigating future risks.

## Dr Jules Smith, Science Director for Growing Health and Chair of the Conference Committee

"Flawed policymaking, based on scant evidence, can often lead to unintended consequences in crop protection. Take the withdrawal of neonicotinoids in 2018. Based on the decline of pollinators and a possible link to neonic pesticides, a ban on use was imposed in the UK. To be controversial, coincident with the ban, no plan – by government industry or as a partnership – was put in place to evidence that the 'new neonic-free' was better for pollinators and biodiversity in general. With forethought we could have predicted that the alternative pesticide choices would be less effective, requiring more applications. Resistance to pyrethroids was already a problem, and greater use was only ever going to go one way. We could have predicted the crops that would be most heavily impacted such as oilseed rape by cabbage stem flea beetle. What transpired has been a vast decline in OSR cultivation, approaching 50%, without awareness of what crop(s) would take over and to what extent these impact on the environment."

By measuring cropping systems outcomes against 'economies' of productivity, environment and societal values, Rothamsted's research is better evidencing how new technologies, regulations and other externalities that impact farmer choices are as intended."

# 2024 in numbers

**169*** farm trials

Scientific publications **285**

**15** Datasets published

**545** members of staff, from

(369 permanent and fixed term staff)

**58** countries

Website traffic

**161k** page views from 84k users*

**2,439** Media mentions

**4.56bn*** Social impressions

**42,691** Total social media followers

up **7%**

**53** awards & recognition for **25** people across **41** BBSRC projects

*Denotes FY figure Apr 2024 – Mar 2025

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