University of Nottingham
Food Systems Institute

Food Systems Institute Annual Report 2025

Cultivating solutions for a shared food future

Contents

Foreword

The food system is a wonder and a catastrophe. Today, globalised food systems feed more people than ever in human history and have largely addressed food borne diseases and nutritional deficiencies in economically advanced countries. Yet, we are exceeding our planetary boundaries, this is unsustainable and further marginalises those most vulnerable in society.

Now is the moment for concerted effort to address these impacts and we have the power to transform our food systems for a just and sustainable future.

At the University of Nottingham, the Food Systems Institute (FSI) community continues to build upon more than a century of research and teaching excellence in sustainable agri-food systems, to inform and implement change across this system. FSI's mission is to facilitate interdisciplinary research and innovation, translating research evidence for stakeholders to support food systems transformation and we are achieving this through leadership, partnership and engagement.

Dr Peter Noy, FSI Director

Research leadership

Leadership across FSI is driven through four Translational Centres. Each Centre was established to achieve the highest impact across our three pillars (Sustainability, Equity and Nutrition). They will drive a programme of new interdisciplinary research knowledge across communities, co-develop applied-research activities with key food systems stakeholders and undertake knowledge exchange activities to translate evidence-based research into practice. Our Centres are led by academic Directors, with teams built around them to support the delivery of their programmes.

1. **Centre for Food Policy and Foresight**

   Focused on evidence-based food policy, the Centre is the largest and most productive UK university Food Policy Centre with **80+ experts (6 in food policy advisory roles)** and 5 high-profile honorary affiliates, that has produced **>200 publications** in the last 3 years.

2. **Centre for Sustainable Agricultural Systems**

   The Centre is the largest UK university-based interdisciplinary research centre focused on sustainable agricultural production systems, with **over 50 experts** connected to our founding industry partners and delivering applied-research programmes.

3. **Centre for Equitable and Inclusive Food Systems**

   Launched in the last few months this **Centre aims to foreground Social Sciences, Humanities, and the Arts for People and the Economy (SHAPE) disciplines in equitable and inclusive food systems**, we are already locally embedded, this Centre will continue to grow our community and voluntary based sector engagement.

4. **Food Innovation Centre and Future Protein Hub**

   A focus for our food-tech research and innovation, our Centre has supported **more than 350 Food and Drink businesses**, developing over **25 new products** for market and advancing protein science and technology for future food.

Partnership & engagement

Partnerships and engagement are critical to the success of interdisciplinary research initiatives and FSI is open to collaboration with all food system stakeholders and knowledge producers. To date our activities have embraced diverse communities from local food system activists to sector working groups (farmers, manufacturers and innovators) and university academics. We will continue to bring these communities together to debate, co-create and problem solve food systems issues. We will continue to foster new networks and communities, whilst communicating our research through the lens of sustainable, equitable and nutritious food systems.

The future

Looking to the future, FSI will continue to evolve. Our food systems are complex and changing and so the knowledge and approach we take to tackle them will need to be agile. With these refined foundations in place, we can now go forward and deliver across our Centres, driving towards a more sustainable, equitable and nutritious food system.

FSI at a glance

Since the launch of FSI

300+
externally funded research projects
to drive forward food systems that work for everyone

>£51m
research funding
to co-create solutions with global and local networks

8,000+
social media followers
across FSI channels

94+
events
where FSI experts pushed forward the food agenda across national, local and global stages

600+
stakeholders
learnt about the critical state of our food systems, and the innovations, facilities and opportunities available for moving in the right direction at 10 FSI hosted events

11
policy papers
published to push for a more equitable food system

350+
Food and Drink SMEs
and businesses supported

28
food products
launched and scaled up for business growth

Image: FSI Core team members. Senior Administrator, Joanna Smuga-Lumatz; Communications and Engagement Manager, Maimuna Jeng and Director, Dr Peter Noy.

Sustainability

Equity

Nutrition

Food Systems Institute Network

Centre for Sustainable Agricultural Systems

Advancing sustainable and resilient agricultural systems

Centre for Food Policy and Foresight

Using evidence to transform the food system

Centre for Equitable and Inclusive Food Systems

Making food systems inclusive

Future Innovation Centre & Future Protein Hub

Driving innovation for healthier food and protein production

Our mission

Sowing ideas, creating solutions

Our mission is to facilitate a just transition to a more sustainable and nutritious food system, through trans- and inter-disciplinary research and innovation, translation of high-quality research knowledge to real-world scenarios, coordination of multi-stakeholder partnerships and stimulating sector change through thought-leadership and foresight.

Launched in 2023 at a time when the food system is confronted by pressures at local, national and global levels, we strive to develop long-term solutions that are environmentally positive, economically sustainable and societally beneficial.

In doing this, we recognise that there is no single tool that can solve the multifaceted challenges of the food system alone. The diversity of the food system is also its strength, and system-wide challenges require system-wide solutions.

This means that all of the elements and actors that are part of the food system - the environment, technology, industry, policy and people - have key interconnected roles to play in enabling sustainable food production that feeds the world population, preserves our natural resources and protects the delicate balance of our planet.

Pillars

Our pillars reflect the impact our research has on key priorities for action in the food system - Sustainability, Equity and Nutrition.

Sustainable and resilient food systems

Food supplies are threatened by extreme weather, global warming, diminishing water supplies and geopolitical instability, such as the war in Ukraine. Our research aims to investigate the various vulnerabilities that is facing our food system and how to adapt solutions that are environmentally friendly, and people focused.

Equitable and inclusive food systems

10 years ago, the world was making great progress towards eliminating hunger and malnutrition. Today that progress is receding, new conflicts, breakdown of international cooperation towards shared goals and isolationism are taking us away from these noble ambitions. Our research explores how we can ensure progress is equitable and inclusive for all in our communities.

Healthy and nutritious food systems

More than 800 million people on the planet are undernourished, while obesity rates are rocketing and poor diet is the highest risk factor for death among adults globally. With the global population predicted to hit nine and half billion people by 2050, our research is investigatin

Using shopping data to correct misconceptions about the environmental impact of everyday food

– Alexa Spence, Daniel Fletcher

Project overview

Food systems are a major driver of climate change and environmental degradation, contributing substantially to greenhouse gas emissions, biodiversity loss, and pressure on land and water resources. Encouraging more sustainable diets therefore requires not only better food options, but a clear understanding of how people perceive the environmental impact of the foods they buy every day.

Previous research has often focused on a narrow range of food products, typically primary or unprocessed ingredients, leaving a gap in understanding of the complex, processed foods that dominate modern supermarket shopping. Addressing this gap, an ESRC Smart Data UK–funded project has uncovered widespread public misperceptions about the environmental impact of commonly purchased grocery items.

Project highlights and lessons learned

- **Developed the Environmental Food Purchase Index (EFPI)** to measure and compare the environmental impact of grocery shopping decisions across households and over time
- **Combined survey responses with Tesco Clubcard data** to link perceptions, behaviour, and environmental impact
- **Revealed widespread public misconceptions** about the environmental impact of commonly purchased foods using real shopping data

Lead author Daniel Fletcher explains:

"People tend to think about food impact in terms of whether it is animal- or plant-based and how processed it is. This leads to systematic errors—people often overestimate the impact of highly processed foods and underestimate the impact of water-intensive products like nuts. Many are also surprised by just how much higher the impact of beef is compared to other meats, such as chicken."

Results and impact

Researchers in the School of Psychology, working in collaboration with N-Labs in the Business School developed interactive and visually engaging online tasks to assess public understanding of environmental impact across multiple food categories.

Crucially, this research programme moved beyond self-report measures by using data donation methods to capture real-world behaviour. A representative UK sample completed a survey on environmental food attitudes and donated their Tesco Clubcard shopping data, providing an objective record of actual purchasing decisions. When combined with scientific estimates of product-level environmental impacts, this created a unique dataset linking perceptions, behaviour, and environmental impact.

Building on existing life-cycle assessment research, the team developed the Environmental Food Purchase Index (EFPI), a normalised measure of the overall environmental impact of grocery shopping that allows meaningful comparison across individuals, households, and time. Linking EFPI scores with survey data revealed a significant but weak relationship between perceived and actual impact.

While participants recognised that meat-heavy shopping baskets tend to have higher environmental impact, they underestimated the importance of within-category choices—particularly meat type—which play a major role in determining overall impact.

Scaling impact

Together, these findings highlight important knowledge gaps in public understanding of food sustainability and point to the need for more effective eco-labelling and food communication strategies that reflect the true environmental drivers of everyday food choices.

Dr Alexa Spence works with colleagues across the university to drive research and understanding of public perception of the environmental impact of multiple, staple food items to address food production challenges on our planet.

Dr Daniel Fletcher explaining to participants the environmental impact of meat products and the benefit of donating shopping data for climate action.

Estimating childhood obesity prevalence and socio-economic deprivation using machine learning

– Gavin Long, Georgiana Nica-Avram, John Harvey, Evgeniya Lukinova, Roberto Mansilla, Simon Welham, Gregor Engelmann, Elizabeth Dolan, Kuzivakwashe Makokoro, Michelle Thomas, Edward Powell, James Goulding

Project overview

Childhood obesity has become a critical public health challenge in the UK, with rates soaring to 23.4% by age 11, particularly affecting children in the most deprived areas. The links between deprivation, poor nutrition, and adverse health outcomes are well established, yet measuring nutritional insecurity at scale remains difficult.

Traditional deprivation metrics like the Index of Multiple Deprivation (IMD) are updated only every 4-5 years and do not incorporate dietary data, making it challenging to track changes over time or understand the effect of new policies.

Project highlights and lessons learned

- **Developed a cost-effective machine learning approach** to measure the nutritional deficiencies in populations at a large scale
- **Introduced a new metric** for measuring calories per pound (£) spent called Calorie-oriented purchasing (COP)
- **Demonstrated how research methods can be used to assess the impact of food insecurity policies** on already struggling and deprived communities

Results and impact

To address the gap in data generation and policy impact, researchers at N/LAB, University of Nottingham, partnered with The Co-operative Group UK to develop a machine learning approach using massive anonymised transactional data—covering 4 million members and 2.5 billion transactions over 30 months. The team matched over 10,000 food products to their nutritional content and engineered novel variables related to obesogenic diets.

Most notably, the researchers introduced a new metric called **Calorie-oriented purchasing (COP)**—measuring the total calories obtained per pound spent—which captures the behavioural tendency to maximise calories for money.

Lead researcher John Harvey explains:

"COP emerged as one of the most robust predictors of both deprivation and childhood obesity. Areas with high COP showed strong associations with extreme deprivation and elevated childhood obesity rates, suggesting that economic pressures drive households toward cheap, calorie-dense foods."

Through comparative assessment of machine learning approaches, tree-based models (Random Forest, XGBoost) achieved the best performance, with 88% accuracy for predicting the most deprived neighbourhoods and 79% accuracy for childhood obesity prevalence. The models also revealed that higher sales of soft drinks, cigarettes, and grains, alongside lower purchases of fish, fruit and vegetables, and ready-made meals, were strongly associated with deprivation and higher levels of childhood obesity.

Critically, this work demonstrates that grocery transaction data can provide near real-time insights into neighbourhood-level nutritional insecurity and health risks. Unlike traditional surveys, which are expensive and infrequent, transactional data offers a rapidly updatable alternative for monitoring deprivation and informing targeted interventions.

The findings have important policy implications: they could enable more efficient allocation of resources to struggling communities, support evaluation of local policy interventions, and inform retailer-led initiatives such as discounting healthy foods in at-risk areas.

Scaling impact

The research ultimately recommends that retailers adopt new measures like COP for national nutrition surveillance, helping ensure that funding support reaches those most in need.

Micronutrient Action Policy Support (MAPS)

– Louise Ander, Murray Lark, Kate Millar, Liz Bailey, Martin Broadley

Project overview

Micronutrient deficiencies (MNDs) are a widespread global problem, especially in sub-Saharan Africa (SSA), south and southeast Asia, generally impacting the poorest nations the most. The scale and impact of MNDs are, however, unequally distributed within nations due to geographic, socio-economic and dietary factors. Subnational-scale data are more rarely captured, quantified and used to inform action to redress MNDs than national-scale data. The consequences of MNDs include impaired growth, cognitive development and immune function, with women of reproductive age and young children at particular risk due to their greater micronutrient requirements. It is widely recognised that good nutrition underpins the successful achievement of many of the SDGs.

Project highlights and lessons learned

- **Co-created an open-access tool** to estimate micronutrient inadequacies and explore nutrition intervention pathways
- **Integrated agriculture, nutrition and health data** to support evidence-based policy and programme design
- **Built global capacity through training and collaboration,** including with national, regional and international partners, and UN agencies to support progress towards the SDG**s**

MAPS results and impact

MAPS co-created an open-access tool to estimate micronutrient inadequacies and explore pathways to improve nutrition. This project crossed disciplines around nutritious food systems, by blending datasets from Ag and Health, and delivered visualizations of micronutrient delivery scenarios within country contexts. The MAPS tool increases the usability of agriculture, nutrition, and health data to inform policies and programs across multiple sectors around the best ways to optimize resources to reduce MNDs in low- and middle-income country settings.

Training provision to our key users in national nutrition or nutrition-sensitive agriculture settings; this training focused on using the tool functionality, and enabling more researchers in low-income settings to use the underlying models outside the tool environment, for instance a Learning Lab on the tool itself, and a Side Event on some of our analytical methods both at ANH Academy week in Lilongwe, June 2023. The MAPS team also hosted a Learning Centre and contributed to the Micronutrient Forum at The Hague, October 2023.

Training on the open-source modelling methods was provided to a cohort of data scientists/modellers from the UN World Food Program in Rome (Oct 2023), with a small number of attendees from UN Food and Agriculture Organization (FAO) also in attendance.

MAPS, a Gates Foundation funded programme, secured aligned co-funding (projects funded by FAO in 2022 and 2024) focused on open-source methods to develop global food composition tables. In keeping with the MAPS ethos of equity, equal success is seen by the input of aligned funding to any of the team, such as the USAID Advancing Nutrition program grants to both LUANAR (Malawi) and to LSHTM (UK) in 2023.

Scaling impact

Micronutrient deficiency risks need to be understood better at various scales and time-horizons, to support evidence gathering for programmatic and policy interventions. This is especially required in nations which have not yet conducted detailed or recent micronutrient surveys (MNS). Even where MNS data do exist, there is a need to communicate how MND risks will change over time and how different interventions could deliver health benefits as food systems evolve and respond to environmental change.

The MAPS open access tool can be found on the website **www.micronutrient.support**

FSI Translational Centres

Centre for Food Policy and Foresight

FSI team members Peter Noy and Paul Wilson with participants of the Food Environments in Transition Economies (FETE) Conference in Malaysia.

Developing evidence-based policy briefings, tools and advice for policymakers to act on

The Centre for Food Policy and Foresight (CFPF) brings together 80 colleagues from across UoN, spanning all Faculties, and recently including University of Nottingham Malaysia colleagues as we continue to build a Tri-Campus Centre. CFPF is focused on achieving impact from UoN research, particularly focused at local, national and international policy advisers, policy makers and politicians. The centre also delivers foresight and thought leadership, training for students and colleagues, and widely promotes UoN FSI externally.

Centre programmes and activities

In 2025 CFPF launched the flagship **Food Policy Internship** (CFPF:PI), training four taught students, who collectively worked with eight academics to produce two-page policy briefs and accompanying 10 slide powerpoint decks for academics to use in their engagement with policy influencers. The Interns were also supported with one-on-one mentoring by **Dr Ursula Davis** (CFPF Policy Translation Lead).

The CFPF:PI outcomes led to both interns and academics gaining new skills and perspectives, with a highly regarded summer showcase attended by external stakeholders.

We have included our high-profile **external Honorary Members** on the CFPF website, including Baroness Minette Batters and Sir Peter Kendall. Associate Honorary Professor Baroness Minette Batters was asked by the **Secretary of State for DEFRA** to produce a **Farm Profitability Review** focused on delivering practical outcomes to drive farm businesses forward; CFPF Director Paul Wilson contributed to the review and supported Baroness Batters in the production of summary outcomes.

Engagement activities included linking members of the Food Law Group with Prof Ramiro Alberio to discuss regulation around cultured meat. We have been working on **six foresight papers** (1 published (Public Health Nutrition), 1 minor corrections (Nature Foods), 1 under review (The Lancet Planetary Health), 3 in development across a range of policy and future-scoped research agendas.

In August Dr Peter Noy and Prof Paul Wilson visited **UNM** and engaged with colleagues who have interests in the Food System, gave keynote presentations internally and at the Food Environments in Transition Economies (FETE) conference, provided **training to ECRs and PhD students**, and engaged colleagues to host the first UNM policy brief on the CFPF website.

Dr Hannah Cooper presented evidence to a **House of Commons inquiry on Innovation and Global Food Security**. CFPF Director Prof Paul Wilson has been the **keynote or sole presenter at 12 conferences / meetings**, showcasing the CFPF and highlighting key topics of CFPF activity (e.g. Ag-CBAM). Professor Wilson has also been contributing to the Agricultural and Horticultural Development Board's (AHDB) Farm Resilience work.

Forward look

We have secured funding through the Policy Support Fund (PSF) and the Campden BRI / University of Nottingham led Food Consortium Collaborative Training Partnership to support eight UK campus based students to join on our 2025/26 CFPF:PI, and we are also engaging four students who are working with our Malaysia campus food experts. The PSF funding allows us to extend the 2025/26 programme to also include stakeholder mapping and engagement. We have already received considerable interest from colleagues wanting to work with the CFPF:PI programme. We will continue to progress our **on-going foresight papers**, collate evidence from the wider CFPF Associates on their policy engagement activities, and have several keynote / sole **presentation engagements** booked for early 2026. We will also develop interactions with **UNM** colleagues and look ahead to engagement with **UNNC** colleagues.

Centre highlights and case studies

Food Policy Internship Programme

FSI CFPF food policy interns at the Internship Summer Showcase held at the University Park Campus in Nottingham in July 2025

Offering young people a seat at the table

The Centre for Food Policy and Foresight launched its first Food Policy Internship offering four students hands-on experience in shaping food systems policy. Interns collaborated with University of Nottingham researchers to develop policy recommendations addressing complex food system challenges. The programme concluded with a summer showcase celebrating their achievements.

The programme equips students with the skills and confidence necessary to tackle food system challenges under the mentorship of our UK leading food and agricultural researchers. The interns applied system-wide thinking to unique food system challenges, producing evidenced-based policy outputs to support policy makers in tackling these issues.

Connecting academic research with student-led actions

Over six months, interns worked alongside academic supervisors, bringing fresh ideas to explore poverty, school nutrition, media framing of farmers and public engagement strategies. Through interdisciplinary projects and mentorship, they saw how research informs policy while contributing to healthier, fairer, and more sustainable food systems.

Students demonstrated a deep understanding of the connection between research and real-world policy.

Voices of our interns

Eunice Lamptey “I am hopeful about the future of food, particularly regarding what students and young people can accomplish by tackling ongoing issues.”

“Working with Prof. Rachel Gomes gave me a clear understanding of how this work connects to real-world issues, and how it links to the job I’m about to start,” said Kirsten Bailey.

Sarah Cletheroe described: “The internship exceeded my expectations in the knowledge I would gain, due to the research opportunities that occurred when exploring the multidimensional nature of the food system.”

Growing the Food Policy Internship Programme

Policy briefs from our first cohort are available on the FSI website. Intern reflections’ show the value of hands-on experience in bridging the gap between policy and research, and the critical role such opportunities play in shaping future food policy leaders.

Prof. Paul Wilson, Centre Director said:

“Looking ahead, sustaining and expanding this internship requires continued investment and support from the food community. Supporting future cohorts will ensure more students can develop the skills needed to drive innovative, equitable, and sustainable food policies.”

Professor Paul Wilson,
FSI Centre for Food Policy and Foresight Director

Centre for Sustainable Agricultural Systems

CSAS Co-Director Dr Nicholas Girkin facilitating a session with industry partners at the CASAS launch in November 2024.

Transforming sustainability challenges in agriculture through strategic industry partnerships

The Centre for Sustainable Agricultural Systems (CSAS) at the University of Nottingham is a cross-faculty hub that brings together one of the UK's largest clusters of agricultural expertise to address the urgent sustainability challenges facing global food systems. With more than 50 affiliated researchers across Biosciences, Geography, Engineering, Computer Science, and Business, the Centre delivers interdisciplinary solutions spanning agronomy, soil health, crop genetics, digital agriculture, environmental monitoring, supply-chain sustainability, and farmer behaviour. CSAS benefits from Nottingham's unique research infrastructure, including a 445-ha commercial research farm, the Centre for Dairy Science Innovation, large-scale glasshouse and field trial facilities (10,000 plots over 15 ha), the Hounsfield X-ray Computed Tomography Facility, and the Nottingham Advanced Data Centre, enabling rapid, translational research from lab to field to industry deployment.

Research focus and activities

CSAS is built around four thematic expertise hubs, Regenerative Agriculture & Soil Health, Climate-Smart Crops, Digital Agriculture & AI, and Sustainable Tropical Commodities (with a focus on cocoa), supported by global research links through the University's campuses in the UK, Malaysia, and China. The Centre co-creates research with agribusinesses and farmers, supported by an advisory board of founding partners including Anglo American, Pelagia, Diageo, G's Growers, and Premium Crops. In its first six months, CSAS has already generated more than £450k in research income, established a growing portfolio of externally funded projects, expanded sector engagement through workshops and industry events, and developed a pipeline of student and postgraduate research collaborations. Its mission is to position Nottingham as a global leader in net-zero, climate-resilient and sustainable agricultural systems.

Forward look

CSAS is poised for substantial growth over the next 18 months, expanding its research portfolio, industry partnerships and international reach. A major strategic priority is the creation of multi-partner research consortia in areas such as Net Zero Agriculture and Digital Twins for Cocoa, enabling large-scale, pre-competitive research aligned with industry sustainability targets. These consortia will be supported by a Technologist role, providing agronomy, soil carbon, field trials, and life-cycle assessment expertise, to accelerate project delivery and unlock new commercial funding models.

The Centre will widen engagement through a programme of thematic external workshops (e.g., Net Zero Agriculture; Climate Resilience in UK Supply Chains; Future Fertilisers) and by strengthening its presence at major agri-tech events including REAP, Cereals, Groundswell and LAMMA.

Internationally, CSAS aims to deepen partnerships in tropical agriculture, regenerative farming, and climate adaptation across Africa, Latin America, and Southeast Asia, leveraging Nottingham's global campuses to operate across geographies and supply chains. The Centre will also increase visibility through enhanced online presence, sector-facing case studies, and coordinated policy engagement via the CFPF. Over the medium term, CSAS intends to establish itself as the UK's leading university-based hub for sustainable agricultural systems, characterised by integrated field-to-satellite data capabilities, a strong industry advisory network, and a track record of shaping practice and policy.

Dr Hannah Cooper,
Co-Director Centre for Sustainable Agricultural Systems

Dr Nicholas Girkin,
Co-Director Centre for Sustainable Agricultural Systems

Highlights and impact stories

BIO-PHAGE-UK: Applying biological and Phage biostimulants for greenhouse gas emissions mitigation in UK agriculture

University of Nottingham team:

Dr Nicholas Girkin lead;
Prof Jon McKechnie;
Dr Hannah Cooper

Project partners:
Terrafarmer (overall lead);
Citadel Environmental Solutions; Fera

Project summary

Interest is increasing in the use of soil biological amendments and biostimulants to support emissions reductions. These encompass a wide range of products that can benefit soil health, enhance carbon sequestration, and support crop performance, often with a lower emissions footprint than mineral nitrogen fertilisers. While previous research has generally focused on single-product evaluations, combining amendments may offer synergistic benefits by broadening nutrient supply, enhancing microbial activity and soil functionality, and amplifying positive soil-plant interactions. However, these combinations require optimisation and on-farm validation, particularly within intensive dairy production systems, and from the perspective of emissions mitigation. This project will investigate the impact of biological soil amendments on three representative forage systems: ryegrass (the primary crop in UK dairy systems), herbal leys (common in regenerative practices), and whole crops (used widely in mixed forage strategies).

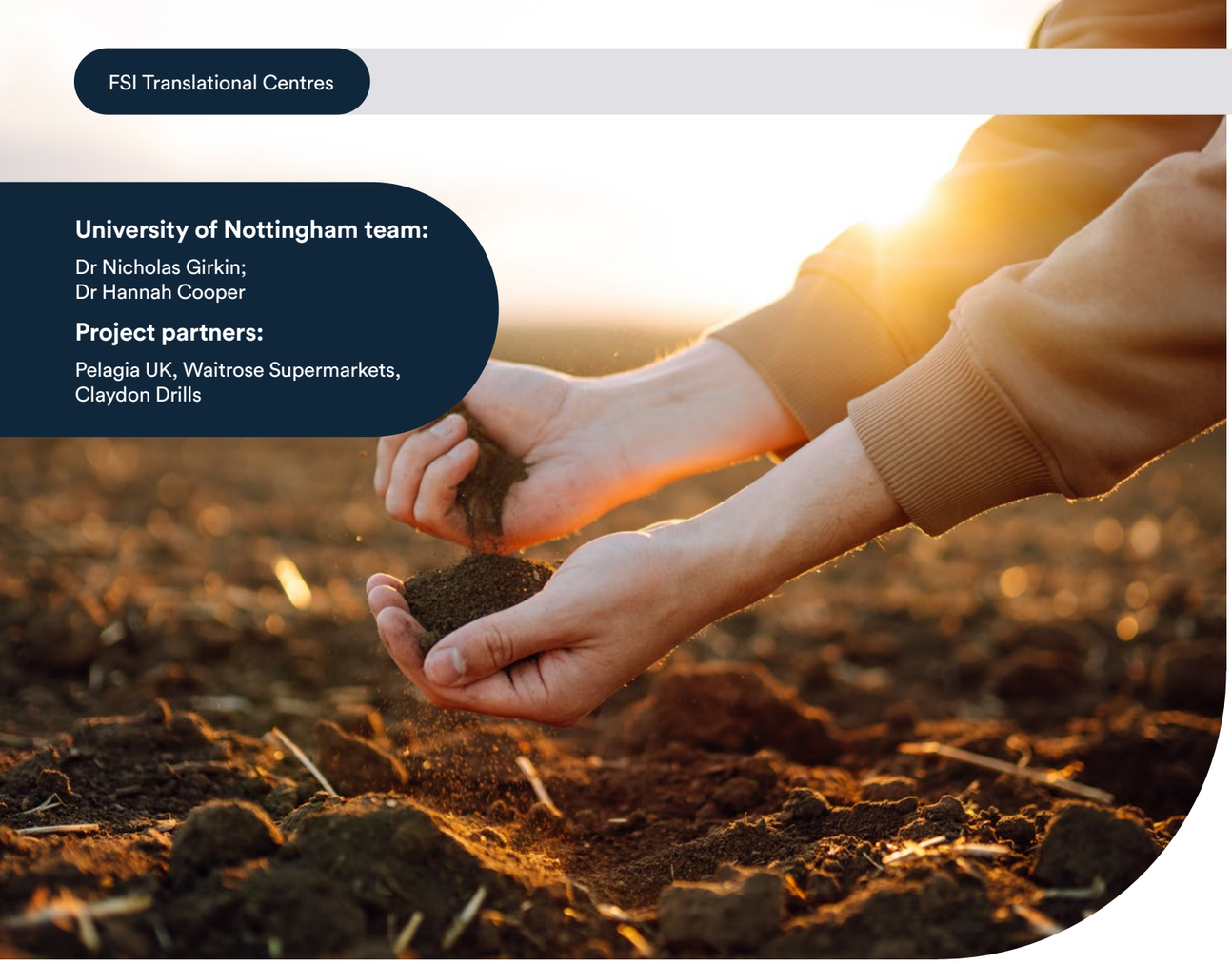
Large-scale field trials will be conducted over two years on three farms representing a range of soil types, with four applications of treatments per site. This will be coupled with the assessment of in-field performance of BIOCAT+, a novel soil phage (virus) that directly targets soil denitrifying bacteria, resulting in a reduction in nitrous oxide emissions, and increasing available soil nitrate, affecting root and subsequent cop development.

Impact of BIOCAT on root structure; green shows an increase in root size, and broad shifts in development in wheat treated with BIOCAT

To understand the broader environmental implications, GHG data from the field will feed into a life cycle assessment (LCA), enabling comparison of production, transport, and in-field emissions across treatments. The LCA results will be expressed in functional units (e.g. per unit of yield or applied nitrogen) and integrated into a simple Excel-based calculator to support practical decision-making by farmers. This tool will also ensure compatibility with widely used carbon assessment platforms such as the Cool Farm Tool.

Expected outcomes

This project will generate robust evidence on the role of integrated biological amendments, including phage-based technologies like BIOCAT+, in reducing GHG emissions in dairy systems, contributing to the UK's pathway to net zero while supporting productive and sustainable agriculture. We expect at least two academic publications to arise from this work, including the first publication on the efficacy of BIOCAT+ as a novel soil phage delivery pathway.



University of Nottingham team:

Dr Nicholas Girkin;
Dr Hannah Cooper

Project partners:

Pelagia UK, Waitrose Supermarkets, Claydon Drills

Sea2Soil: validation of a novel fish hydrolysate soil conditioner

Project summary

Sea2Soil, is a novel fish hydrolysate fertiliser, with high amino acid content, and is being tested for its impacts on soil carbon, biology, chemistry, and agronomy in the context of a wider-shift to regenerative practices in UK agriculture. Working in partnership with Claydon Drills and Waitrose, our project combines farmer-led experimentation with rigorous measurement to understand how Sea2Soil influences soil function, crop performance, and long-term sustainability.

Across participating farms, barley and wheat plots treated with Sea2Soil are monitored using consistent protocols to assess changes in soil carbon, soil structure, and biological activity. Particular attention is given to soil biological composition (fungal to bacterial ratios), and function (through soil respiration), as key indicators of soil health that respond quickly to shifts in organic matter and habitat quality.

By operating across diverse soils and farming systems, the trial network provides a realistic picture of on-farm performance for both 'conventional practice' versus new 'regenerative' practices.

The longer-term aim is to build a mini-consortia to fund continued research in this area into validating product performance and benefits across a broad range of crop and soil types.

Impact

Thus far, our work has indicated that Sea2Soil can substantially increase soil amino acid concentration, and provide benefits to crop production under drought conditions. Ongoing trials are likely to provide vital information to support increased uptake by farmers in the medium term.

Harnessing microbial ecology to transform cocoa fermentation and chocolate flavour quality

The quality and flavour of chocolate begin with the cocoa bean, shaped by both pre- and post-harvest factors. Among these, fermentation is the first, and one of the most critical steps after harvest, laying the foundation for aroma development and flavour complexity in the final product. Fermentation is a microbe-driven process that typically occurs directly on farms, where harvested beans are placed in wooden boxes, heaps, or baskets. Here, naturally occurring bacteria and fungi break down the beans, generating the key chemical compounds that underpin chocolate's flavour and aroma.

However, this spontaneous process is largely uncontrolled. Farmers have limited influence over which microbes dominate or how the fermentation unfolds. As a result, bean quality and flavour vary widely between farms, seasons, and regions, posing major challenges for producers aiming for flavour consistency.

Researchers at the University of Nottingham are working with cocoa farmers, industry partners, and other stakeholders across the global cocoa community to bring scientific precision to this traditionally step. By combining multi-omics analyses with both on-farm and controlled laboratory fermentations, the team is revealing how microbial communities drive the development of chocolate flavour. Their goal is to empower producers with tools to reliably create high-quality, flavour-rich chocolate in a sustainable and scalable way.

University of Nottingham team:

Dr Gabriel Castrillo;
Dr David Gopaulchan

Overview of findings

Through multi-year collaborative studies, the team has mapped the succession of key organisms, including yeasts and bacteria, across different geographical regions and linked their metabolic activities to specific flavour outcomes. They found that distinct microbial consortia and their dynamics consistently drive unique flavour profiles in finished cocoa beans. In addition to the microbial communities themselves, abiotic factors such as changes in bean temperature and pH, both driven by microbial activity, are strong predictors of flavour development.

In controlled in vitro fermentations, synthetically designed microbial communities were able to reliably reproduce the chemical and sensory outcomes observed in traditional on-farm fermentations. By modulating the composition of these defined starter cultures, researchers can precisely shift flavour profiles, enhancing fruity, nutty, and other desirable chocolate flavour notes. Moreover, encouraging specific microbial communities can reduce fermentation losses, shorten processing times, and improve quality and flavour uniformity.

Next steps

Building on this work, the Nottingham team is now:

- developing region-specific microbial starter cultures tailored for reliable flavour outcomes.
- creating a microbiome-informed decision-support tool to help farmers monitor fermentation in real time.

Partnering with stakeholders to test scalable fermentation technologies that enhance flavour consistency without increasing labour or environmental burden.

Just as starter cultures transformed beer, wine, and cheese production, these advances signal a shift toward a standardised, data-driven approach to cocoa fermentation. By domesticating this process, the programme lays the foundation for a new era in chocolate production, one in which defined microbial communities unlock new flavour possibilities, improve sustainability, and support farmers and chocolate makers worldwide.

Food Innovation Centre & Future Protein Hub

The Future Protein Hub and Food Innovation Centre provide a focus for the University of Nottingham's Food-tech research and innovation.

The Future Protein Hub supports **discovery alternative protein research programmes** across cultivated meat, underutilised plant-based protein, insects and single-cell protein sources, including fungal, algae and bacterial production systems. Our cross-cutting technology platforms include food structure, nutrition, flavour and sensory science, supporting **novel Food-tech integration into products** with expertise from production to consumption. The hub brings together over 30 academics across the university focused on the advancement of knowledge and technologies for protein production, processing, scalability and consumption.

The Food Innovation Centre, established in 2016, has now supported more than 350 Food and Drink businesses, from start-up to multi-national enterprises. Our industry expert food technologists have brought more than 25 new food products to market, including 4 in the last year, developed 100s of improved formulations or processes to make food products more sustainable and healthier, characterised 100s of ingredients or products to inform future product optimisation, and provided 1000s of hours of technical expertise or in factory audits to support food and drink business compliance.

Over the last year our Future Protein Hub has joined the National Alternative Protein Innovation Centre (NAPIC) as a research partner with membership on the Scientific Advisory Board. In the first round of NAPIC Collaborative Programme Funding the University of Nottingham was awarded five projects partnering with industry on future protein innovations.

These projects include nutritional optimisation of black soldier fly larvae, alternative protein flavour development, high-protein plant-based vegan cheese, smart fermentation technology for fungal protein production, and downstream processing to boost fungal protein quality.

To bring novel Food-tech to market requires more than scientific and technical innovation. It requires parallel innovation in regulation and societal readiness, through consultation, engagement and debate. In 2025, our Future Protein Hub team continued to work with partners across the UK and globally to advance progress on societal readiness for future proteins. The Novel Food Regulatory Network (NFX) launched, our hub associates supported the development and have joined their expert network. The team was also involved in the NFX launch conference in September. The Food Standards Agency (FSA) also launched their new regulatory sandbox on cell-cultivated products and our experts in cultivated meat production have contributed to key working groups that will inform how this new Food-tech product category will be regulated in the future.

Forward look

Over the next year our Food-tech work will continue to accelerate. We are developing a Food & Drink Incubator Hub at our Sutton Bonington Campus that would look to host industry alongside our research teams to full utilise the infrastructure and capabilities that we have at the University of Nottingham. This is an exciting new development that will complement our Food Science and Technology research excellence. We will also be more closely integrating our Food Innovation Centre with the Future Protein Hub to give a single focus for our Food-tech research and innovation activity at the University of Nottingham. With the Food-tech industry currently moving so quickly to adopt novel technology it is more important than ever that we have integrated interdisciplinary Centres that understand how to bring new foods to the market that are safe, nutritious and acceptable for society.

Professor Tim Parr
Director, Future Protein Hub

Rescue Nests at the Food Science Student NPD Showcase Day presenting their pantry staple pasta from surplus bread to judges.

Student NPD projects

The Food Science New Product Development (NPD) module is supported by the Food Innovation Centre team, providing mentoring for students throughout the process and developing industry briefs with partners through the Food Innovation Centre Network. It provides students a unique experience of working with industry in a real-world working environment during their undergraduate or post-graduate education – a high-quality educational experience that can't be offered in many places across the UK. This year the Food Innovation Centre technologists supported 5 student project teams with the following companies:

- British Quinoa Company
- Healy Group
- Legumology
- Rigsby's Seasonal Foods
- Ulrick and Short

Rescue Nests and NØM were both finalists at the national Ecotrophelia competition, with Rescue Nests taking the bronze award. The Rescue Nests team produced a pantry staple pasta with an eco-innovative twist by incorporating upcycled flour valorised from surplus bread waste from local sandwich manufacturers. The pasta is coloured using surplus vegetables sourced from local farms to add a premium visual element. Their Radiant Roots version is made from a blend of rescued root vegetables such as beetroot and carrots. The Garden Greens version is sustainably crafted from a variety of leafy greens and herbs such as kale and spinach. The NØM team developed a vegan, fibre-rich Danish pastry with a sweet strawberry-chia compote. The product also boasts both a 'source of fibre' and a 'reduced sugar' claim.

These teams join a long history of success in the UK Ecotrophelia competition from the University of Nottingham with five previous winning student teams in the last 8 years:

- PlanEat Protein Poppers (2023 Gold)
- Crack(er)ed it (2022 Gold)
- Libero Liqueur (2021 Gold)
- Re-Dessert (2020 Gold)
- Pom Puffs (2018 Gold)

Food Science student team NOM, finalists in the 2025 Ecotrophelia Competition developed a vegan, fibre-rich Danish pastry with a sweet strawberry-chia compote. The product also boasts both a 'source of fibre' and a 'reduced sugar' claim.

Food Innovation Centre case studies

The Food Innovation Centre provides evidence-based food science and technology support for food and drink businesses of all sizes, start-up to multinational, across a range of innovation development needs and across food and drink product categories. In the last year, the Food Innovation Centre has supported innovation in a range of alternative protein food products, on-the-go foods, a variety of beverages, breakfast cereals, sauces, breads, and more. The team delivers work in partnership with business in sprint projects (weeks to a few months), through to longer term collaborations. Project funding includes InnovateUK, Nottingham City Council's Talent & Innovation Fund (T&I), Regional Innovation Fund (RIF), Higher Education Innovation Fund (HEIF), East Midlands Combined County Authority's High-growth Innovation Fund and direct industry funding. Here is a small sample of projects that have been delivered:

Biomara

The Food Innovation Centre worked with Biomara, through Innovate UK funding, on a series of application trials investigating the performance of Seafibrex, a seaweed-derived functional fibre ingredient, in three popular food formats: pork sausages, vegan burgers, and gluten-free bread. We determined optimal inclusion rates for supporting fat reduction with good moisture and texture in pork sausages; enhanced fibre and water retention without methylcellulose in vegan burgers; and an alternative to hydrocolloids in gluten-free bread.

Alice Jones, FICs Senior Food Innovation Technologist and lead for the elderflower trials.

Working Man's Kitchen

Working Man's Kitchen (WMK) started as a street food business, operated by Paddy Sneath from a van at the Nottingham Forest football ground. In October 2024, Paddy secured a unit at Sneinton Market Avenues, solely producing and selling pizza. Working in collaboration under the T&I Fund, the Food Innovation Centre developed a hot honey pizza sauce, for Paddy to use in the restaurant, and for sale to consumers as a standalone product in the future. Working in collaboration with NTU's Design Matter team, the project also created a DIY pizza box, for Paddy's customers to take home and make their own pizzas.

Adamo Foods

Adamo Foods is a food tech start-up company that have developed natural, plant-based, whole cut meat alternatives to steak, using fungi. The company is aiming to launch products that avoid any unnecessary processing and are clean label. Their focus is on achieving superior textures and high-quality flavours to gain a USP over other plant-based and meat alternatives. For this reason, the company was interested to take a deep dive into the sensory attributes. The Food Innovation Centre, through RIF funding, worked with the company to set up their own sensory evaluation sessions with consumers to support their product development. The team also worked with Adamo to develop methods for them to characterise mycelium on a physicochemical and microstructural level, including water holding capacity, porosity and density.

Students and supervisors working in the development kitchen based in the Sutton Bonington Campus.

Nutrinana

Nutrinana is run by a mother-and-son team, Nana and Ruben Odamo, from their home in Kent. They produce a granola made with activated nuts and seeds, which involves soaking the nuts and seeds in water for an extended period of time. Leveraging HEIF funding, they gained support from the Food Innovation Centre to identify whether activating nuts and seeds provides nutritional benefits, and to evaluate the safety and repeatability of their process.

Carr's Agriculture

Carr's agriculture is a large global company that manufacturers animal feeds. The Food Innovation Centre is working on a project with their Crystalx product, which is a feed block for ruminants aimed at delivering essential micronutrients, to determine practical methods for hardness measurement of the product surface and core, whilst it remains in pack. This will allow them to measure the effect of changing formulations and processes on the hardness of the product for R&D but also produce a methodology for them to use in the factory for Quality Assurance. The project involved interaction with the mechanical engineering department at UoN who will go on to carry out further work with the company that may involve designing a bespoke measurement rig for the company. During the interaction the FIC have put the company in touch with the Flavour lab and Chemistry Depts at UoN to carry out commercial work on other R&D areas of interest to them. This is an example of FIC acting as the Gateway to wider UoN services.

The Food Innovation Centre team from Left to Right: Lizi Thomas, Administrator; Food Innovation Technologist, Jessica Gray; Senior Food Innovation Advisor, Alice Jones; and Food Innovation Technologist, Ruth Price.

Shelf-life

Shelf-Life is a start-up who believes reducing food waste should be simple and affordable. For their first product, they are developing an affordable fridge filter that helps consumers keep produce fresher for longer, aiming to reduce the huge amount of food waste that happens in the home. Shelf-life worked with the University of Nottingham's School of Chemistry to identify the optimal materials for the absorber, before testing the prototype on real produce stored in a domestic-style fridge, with the Food Innovation Centre. The project gathered robust evidence to support future marketing claims and insights into how consumers use the product in practice, forming the basis to shape clear and effective usage instructions.

Good Pulse

The Good Pulse Co., a business-to-business company, that provides a range of pulse-based ingredients (flours) for use in food products. Good Pulse have produced a vegan cheese prototype, to demonstrate applications for their split-pea flour. The formulation uses coconut oil as the fat source but The Good Pulse were looking to reduce the amount of saturated fat in the product. The Food Innovation Centre trialled different ingredients/modifications to the process in the lab to reduce the saturated fat content, before conducting a rapid sensory session on 11 prototypes to profile each product. Saturated fat content was decreased and other areas needing improvement were highlighted. A follow-on project investigating the time required after production for the vegan cheese product to stabilise ("cure time") and the shelf-life beyond the stabilisation point was also done in collaboration with the Food Innovation Centre.

Centre for Equitable and Inclusive Food Systems

FSI Director Peter Noy and CEIFS Director Professor Anne Touboulic were joined by Bite Back Research Manager, Caitlin Mahoney and FoodRise Campaigner, Paula Freehan for a panel discussion at the CEIFS launch in October 2025.

Creating a just, equitable and inclusive food system for people everywhere

We were thrilled to welcome colleagues, partners, and community members to the official launch of the Centre for Equitable and Inclusive Food Systems that took place over lunch on 15th October 2025. The event marked the beginning of a bold, collaborative journey to support food systems transformation, putting equity and inclusivity at the fore. The Centre is committed to supporting transitions to food systems that benefit both society and nature, locally and globally. We aim to:

- Challenge dominant narratives and practices
- Amplify marginalised voices
- Co-create meaningful initiatives
- Translate research into policy and action (working with CFPF)
- Foster partnerships rooted in shared values

The Centre is organised around key hubs of expertise, namely:

1. **Socio-Technological & Ecological Systems -** Critically analysing the relationships between societal, ecological and technological systems, through contextually sensitive approaches.
2. **Food Labour -** Exposing labour exploitation and (re)valuing labour across the food system.
3. **Food Narratives, Cultures & Education -** Exploring underpinning narratives and discourses in food systems and their role in supporting or hindering positive change. Developing new food stories and educating generations of food citizens.
4. **Community Flourishing -** Revealing inequitable food systems, access to adequate nutrition, and co-creating inclusive interventions.

We are building on strong foundations of research and collaboration in the East Midlands, including partnerships with:

- Nottinghamshire & Leicestershire Sustainable Food Partnerships
- Nottingham City Council
- The UoN Edible Campus community
- Organisations such as FoodRise, BiteBack, Himmah, the Food Ethics Council and more

2025-26 Theme: Youth - We're centring young people in our work this year—supporting their voices, ideas, and leadership in shaping the future of food systems.

Forward look

2026 will be shaped by our Centre's community, we have been flooded with ideas from across our Centre Associates, collected both during and after the Centre launch event. We will co-produce a range of activities including workshops, seminars, community engagement activities and partnerships throughout the year. Since the launch we have built a partnership with the advocacy charity Foodrise as part of its vision to support transitions towards food systems that work better for people and planet. As part of their nitrogen fertilisers campaign, Foodrise have recently launched their new report 'Exhausted Earth' and have successfully secured some funding to work with an academic team to carry out some research in early 2026 to take the campaign to the next level. This is just the start.

Professor Anne Touboulic,
Centre for Equitable and Inclusive Food Systems Director

Outreach & engagement activities

Nottinghamshire Food Summit 2024

The Food Summit was held at the Great Hall at the University of Nottingham (UoN) on Oct 16th, World Food day. Over 140 people attended from across different groups and sectors to discuss ways to improve sustainable food in Nottinghamshire. Attendees were welcomed by Councillor Bethan Eddy, Chair of the Nottinghamshire Joint Health and Wellbeing Board, and Dawn Jenkin, consultant in Public Health at Nottinghamshire County Council. The event was drawn to a close by Prof. Zoe Wilson, Pro-Vice Chancellor for the Faculty of Science at UoN.

Building a Nottinghamshire food plan

There were facilitated discussions on 6 priority themes during the morning and afternoon sessions. These discussions were led by a range of partners with experience in these areas. Attendees were asked to choose their preferred theme and identify key priorities to focus on in the food plan. These themes covered:

1) Creating a good food movement
2) Food for good health
3) Food insecurity
4) Food economy
5) Procurement and catering
6) Food for the planet

Attendants of the Nottinghamshire Food Summit participating in group discussions to provide input for focus on the Nottinghamshire Food Plan.

Next steps

1) **Development of the Nottinghamshire Food Plan** from the engagement with partners at the Food Summit, identifying actions to take forward work on the key priorities.
2) **Changes to the Nottinghamshire Sustainable Food Network (NSFN)** governance and development of the working groups will see new members and a more structured approach as we take forward the Nottinghamshire Food Plan. The NSFN Strategy group will oversee changes and make sure that milestones and timescales are met.
3) **Expand Nottinghamshire food system stakeholder collaboration**. The Food Summit has been an opportunity to increase the reach of the NSFN and engage further across the food system and build collaborative partnerships. NSFN will focus on connecting with these partners and building a leadership group for each of the theme areas.
4) **Integrate with the East Midlands Combined County Authority (EMCCA)**. EMCCA has the potential for a food innovation and action working group with Derby/Derbyshire food partnerships. NSFN will be looking at these opportunities taking forward the priorities in the Nottinghamshire Food Plan.

FSI engagement highlights

The Food Systems Institute is open to engage with all stakeholders across the food system to facilitate knowledge sharing, promote innovation and collaborate on shared challenges and priorities. Since launch FSI has hosted 10+ events on University of Nottingham campuses, with more than 600 participants.

Industry experts attending a facilities tour facilitated by FSI associate Dr Vincenzo Di Bari after the Food Sector Meeting.

Innovate UK Connect Food Sector meeting event

In 2024, FSI hosted the Innovate UK Business Connect Food Sector meeting, with 30+ industry experts, where we facilitated a conversation about the future of our food systems, introduced by Jack Bobo. The day included tours of our Centre for Dairy Science Innovation, Hounsfield Facility and the Food Processing Facility, with a working lunch that included an SME marketplace pitch and tasting session that included “cheese from peas” vegan cheese samples and flapjacks wrapped in edible packaging.

Farmed Insects Protein Conference: NEST 1.0

In April 2025, we partnered with the leading trade association or edible insect industry in the UK to bring a unique opportunity to industry, academia and alternative-protein stakeholders. The hosted conference held at the University of Nottingham Sutton Bonington Campus brought together 140+ people across the UK to develop plans for advancing the UK’s protein sector. This partnership supported UKEIA’s goal of connecting a broad range of stakeholders that will work together to transform the sector.

The event speakers featured inspiring industry and business experts, including alternative-protein leading startups in the UK. The conference also served as an opportunity for stakeholders to learn about the innovations being developed and the facilities available at the University of Nottingham to support these, enabling them to leverage the resources and knowledge provided by our academics.

Attendees of NEST 1.0 during the final day of the three-day conference hosted by FSI at the University of Nottingham Sutton Bonington Campus.

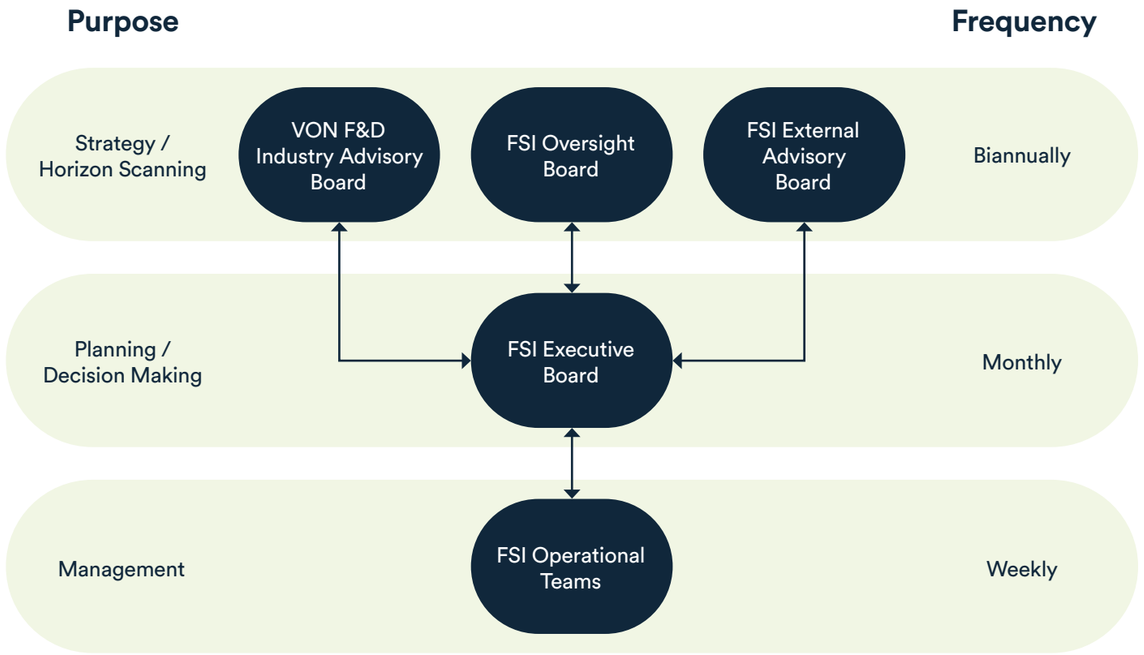
Cereals June 2025

Agriculture poses a great threat to climate change, with food production related emissions contributing up to around one-third of all human-caused greenhouse gas emissions globally. Our Centre for Sustainable Agricultural Systems brought together a team of academics for the flagship arable CEREALS event which took place in June in Lincolnshire. We showcased agricultural research expertise and innovation facilities for driving industry and academic partnerships available at the University of Nottingham to over 10, 000 visitors. The team spoke with dozens of farmers, associated trade representatives and academics, sharing insights on how to benefit from the innovation and services available and UoN and the successes that businesses can expect to shape the future of agriculture and the agri-food industries.

Governance and structure

FSI governance structure

Our governance structure provides key direction and feedback from internal and external stakeholders, setting the course for advancing interdisciplinary research knowledge, innovation, partnership building, training, outreach and engagement across our food systems portfolio.



Sustainability Equity Nutrition

External Advisory Board

The External Advisory Board consists for expert members from key actors in the UK and international food system, from academia, business, farming, NGOs and government. Their role is to guide the strategic direction and development of FSI through challenging the leadership team, provoking them to reflect upon the external messaging from the institute and supporting the team to build productive partnerships externally and internally.

Professor Bob Webb (Chair) - Emeritus Professor University Nottingham

Professor of Practice Jack Bobo – University of California Los Angeles Food Studies Institute Executive Director

Minette Batters – Cross Party member of House of Lords

Dr Craig Leadley – Chief Executive Officer of the Institute for Food Science and Technology

Judith Batchelar OBE – Chief Executive Officer of Food Matters International

Dawn Jenkin – Consultant in Public Health, Nottinghamshire County Council

Dee Woods – Member of the Food Ethics Council, Co-founder of Granville Community Kitchen, Co-founder of the African and Carribbean Heritage Food Network, A Food Justice Policy Co-ordinator for the Landworkers' Alliance.

Professor Festo Massawe – University of Nottingham Malaysia Lead for Food Systems Diversification Research

Professor Andrew Salter – Emeritus Professor University of Nottingham & Secretary of Nutrition Society

Oversight Board and Executive Board

The Oversight Board connects FSI into the broader strategy for the University of Nottingham, whilst the Executive Board provides strategic direction, decision-making, and connectivity across FSI activities. The EB is responsible for developing and implementing the FSI's overall strategic plan, settings goals and objectives and allocating resources to achieve them.

Oversight Board only members

Professor Tom Rodden – Pro-Vice-Chancellor for Research and Knowledge Exchange at the University of Nottingham

Niall O'loughlin – Director of Research and Innovation Strategy at the University of Nottingham

Oversight Board and Executive Board members

Professor Zoe Wilson – Pro-Vice-Chancellor for the Faculty of Science

Professor Phil Williams – Associate Pro-Vice-Chancellor for Research Knowledge & Exchange for the Faculty of Science

Professor Sacha Mooney – Head of School of Biosciences

Jonathan Lamley – Director of Operations, Faculty of Science

FSI Leadership Team

Dr Peter Noy – Director of the Food Systems Institute and Food Innovation Centre

Professor Paul Wilson – Director of the Centre for Food Policy and Foresight

Dr Nick Girkin – Co-Director of the Centre for Sustainable Agricultural Systems

Dr Hannah Cooper – Co-Director of the Centre for Sustainable Agricultural Systems

Professor Anne Touboulic – Director of the Centre for Equitable and Inclusive Food Systems

Professor Tim Parr – Director of the Future Protein Hub

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