



Biotechnology and
Biological Sciences
Research Council

Transforming the UK food system through the appliance of science

Professor Guy Poppy CB FMedSci

Deputy Executive Chair
BBSRC, UK Research and Innovation

- **The importance of Food to UKRI**
- **The BBSRC portfolio**
- **Transforming the UK Food system – an example of what can and needs to be done**



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UK Research and Innovation

We are the largest public funder of research and innovation in the UK – working with the government to invest over £8 billion a year - bringing together 9 councils covering all sectors and disciplines.

We are part of a system, working with academia, business, public sector, third sector, and international partners to create **knowledge with impact.**



**UK Research
and Innovation**



For more information visit [ukri.org](https://www.ukri.org)

UKRI Strategy – transforming tomorrow together

Sets out our priorities for delivering our vision, underpinned by 4 principles for change:

Diversity, connectivity, resilience and engagement



<https://www.ukri.org/publications/ukri-strategy-2022-to-2027/>

Outlines our strategic objectives - **to foster world-class:**



UKRI impacts: our strategic themes

Building a green future

Helping to improve the health of our environment and deliver net zero.

Better health, ageing and wellbeing

Advancing people's health and promoting wellbeing; addressing challenges around ageing, living with multiple conditions, mental health and health inequalities.

Tackling infections

Protecting and enhancing health, our food supply and our natural capital.

Building a secure and resilient world

Strengthening social and economic resilience, and enhancing national security across virtual and physical spaces.

Creating opportunities, improving outcomes

Understanding the causes and effects of place-based disparities and finding new solutions to improve prosperity and outcomes for all.

UKRI impacts: our strategic themes

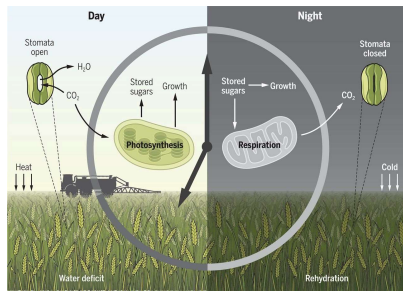
Building a green future	Helping to improve the health of our environment and deliver net zero.
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Food

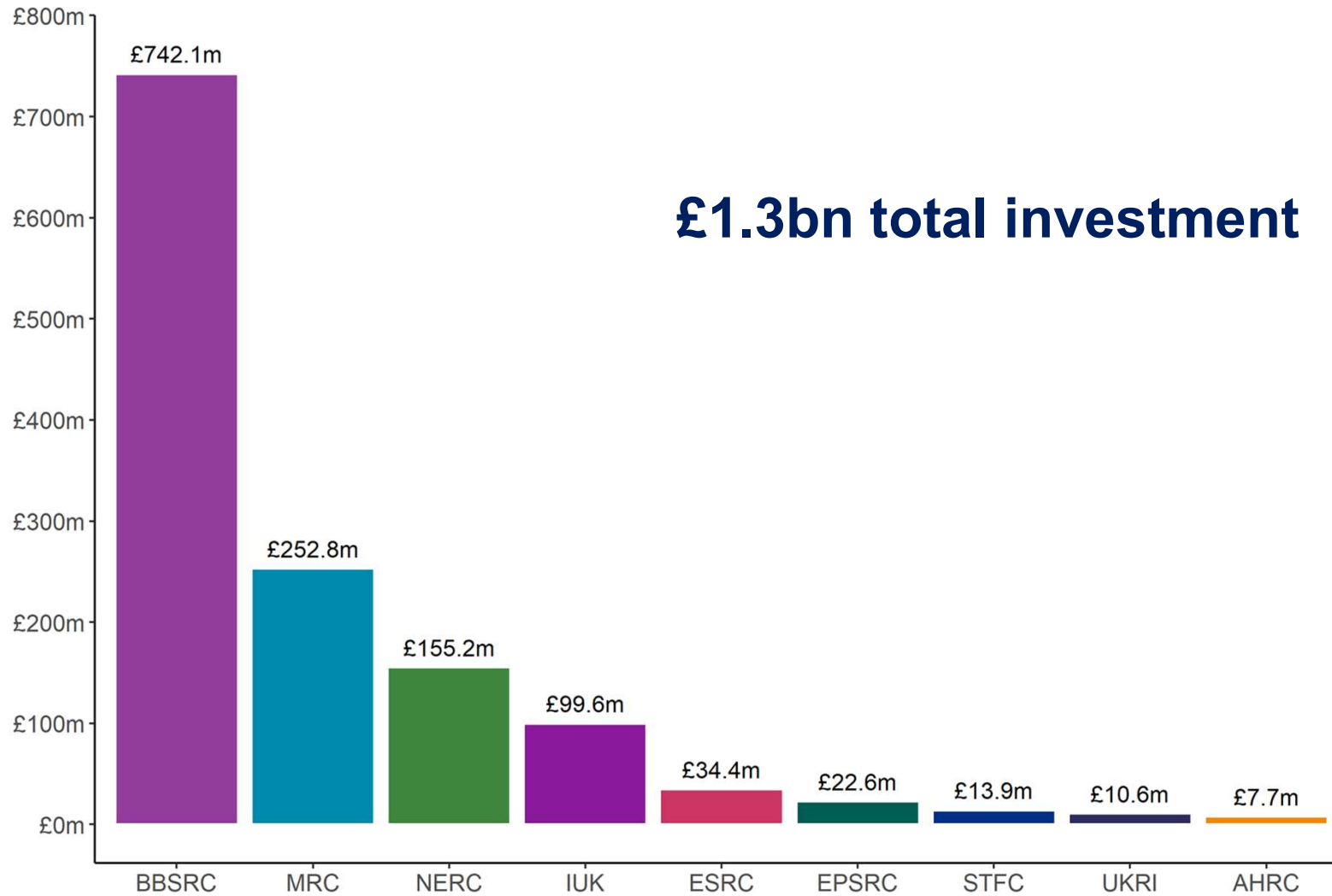


UKRI Food Deep Dive

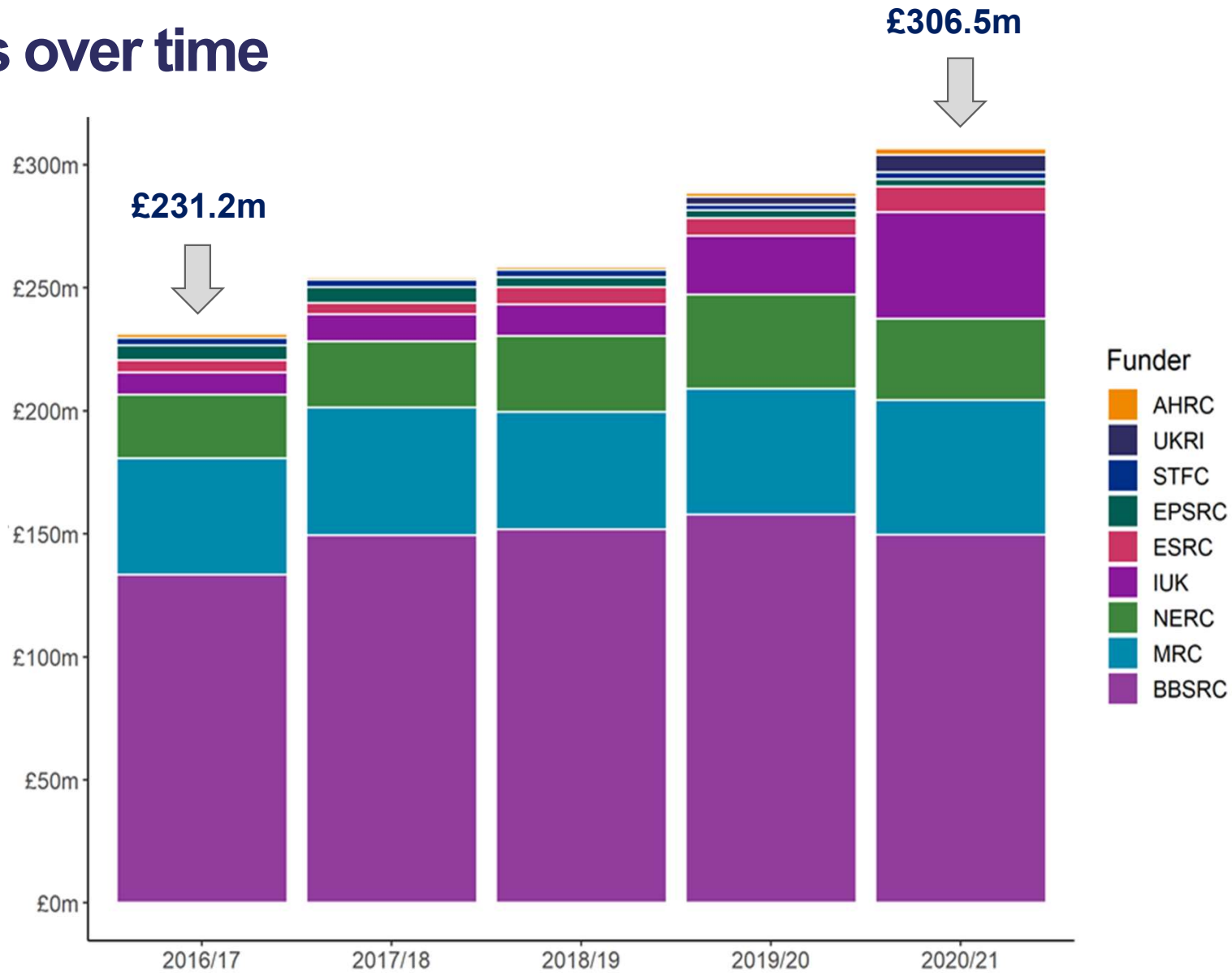
Purpose: To develop a greater understanding of UKRI's food-related research and innovation portfolio and provide recommendations to ensure its effective coordination and delivery.



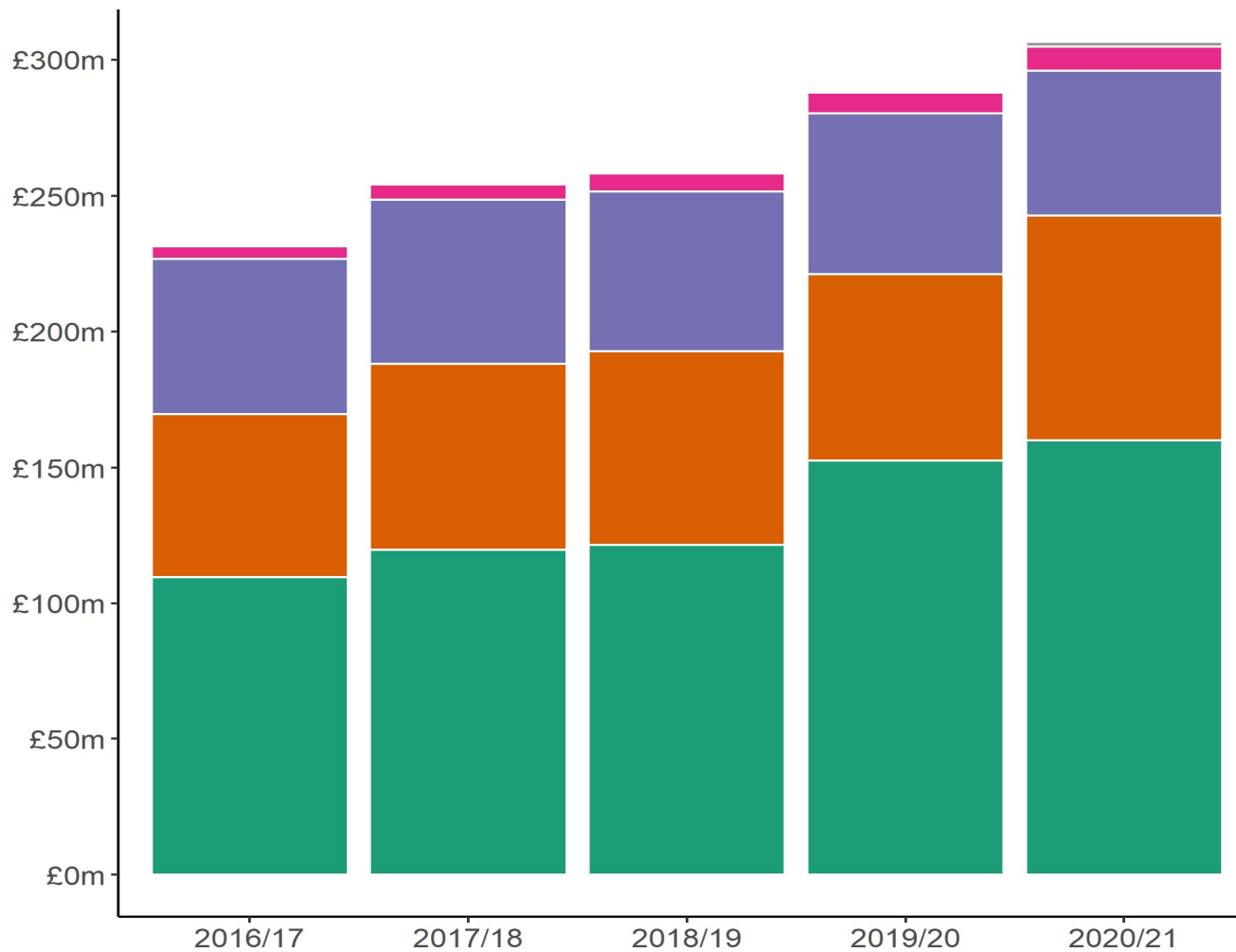
UKRI food-related investments (2016/17 - 2020/21)



Trends over time



Annual spend by investment mechanism

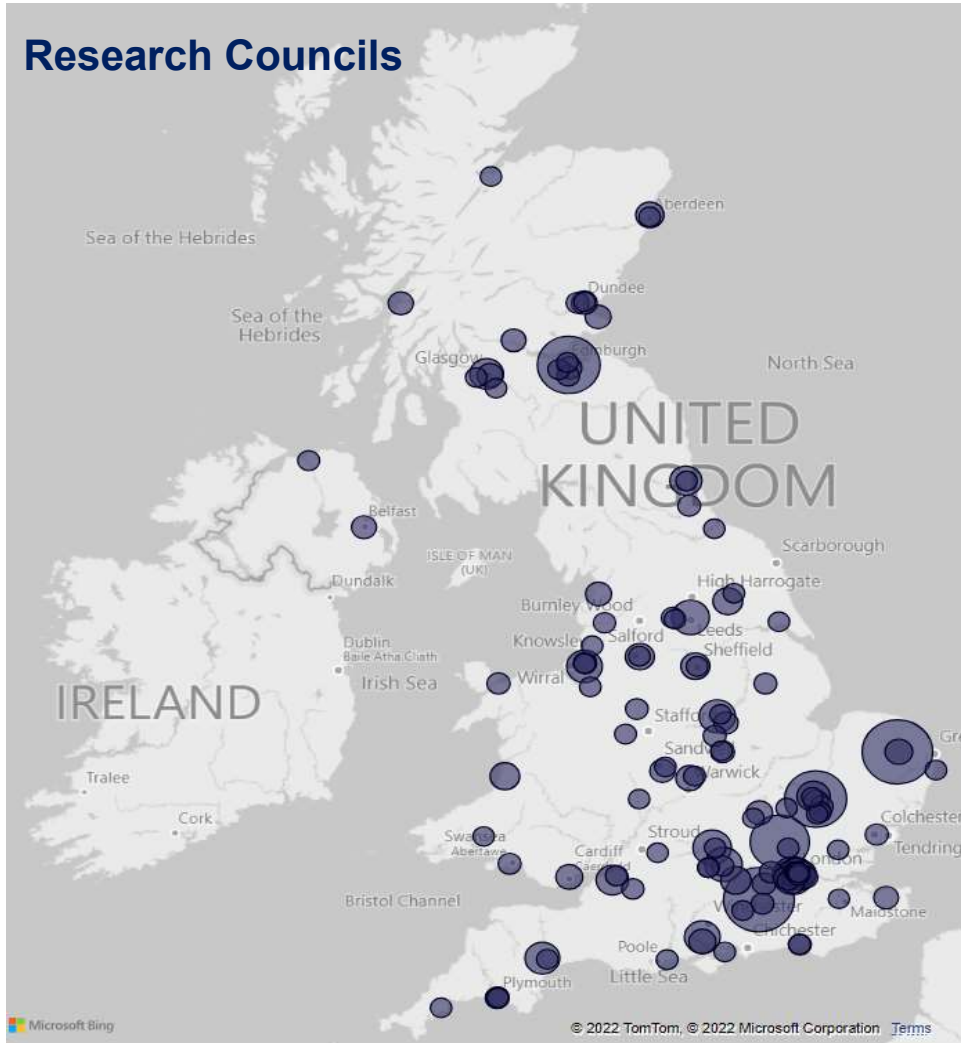


Over 75% of the total UKRI food portfolio has been through **strategic programmes and investments** to UKRI Institutes, Units and Centres.

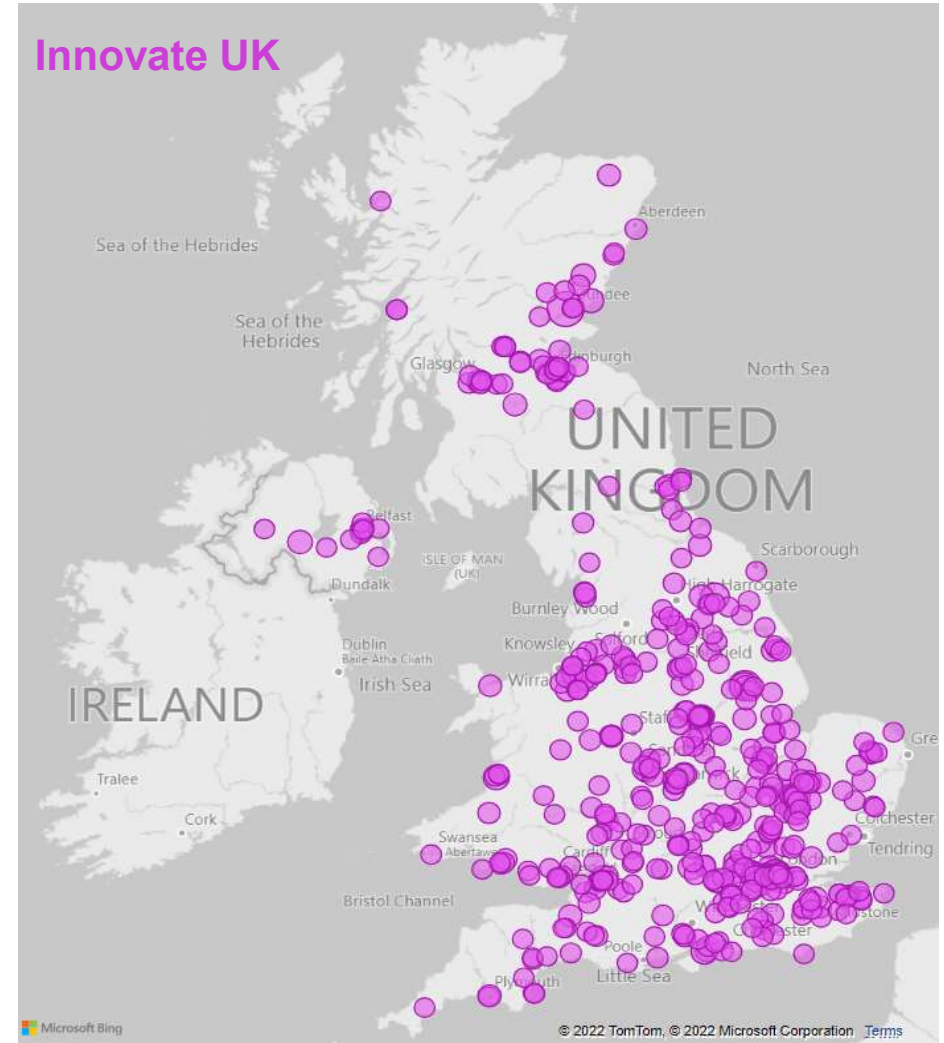
- Other
- Fellowships
- Open Calls
- Institute/Unit/Centre
- Directed Schemes

UK regional distribution of investment

Research Councils



Innovate UK



UKRI Food Deep Dive – next steps

Taking forward recommendations outlined within the Deep Dive to ensure UKRI's food-related portfolio of activities is **effectively coordinated**, both internally and externally, to **tackle challenges associated with the UK food system**.



BBSRC

Investing in **discovery bioscience** and **strategic programmes** to advance the frontiers of **biology** and drive towards a **healthy, prosperous and sustainable future**

**Sustainable
agriculture and food**
2021/22 - £119.1m

Strategic
Institute



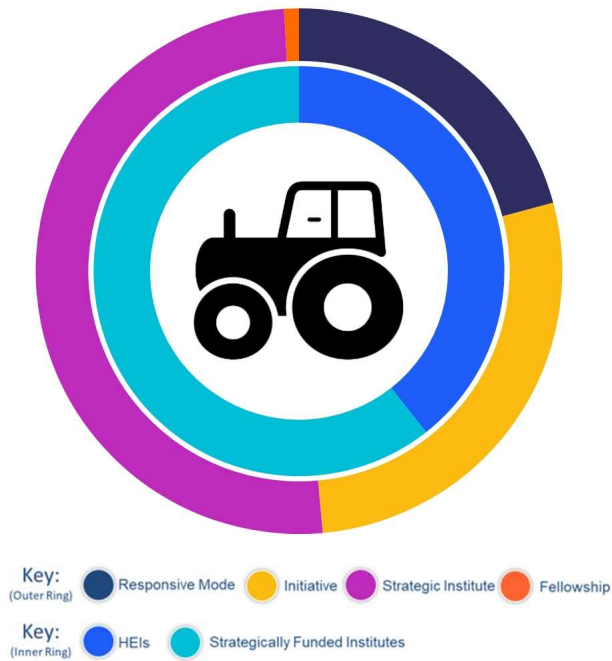
Sustainable agriculture and food: £119.1m

This area is about delivering more productive, healthy, resilient and sustainable, agriculture and food systems.

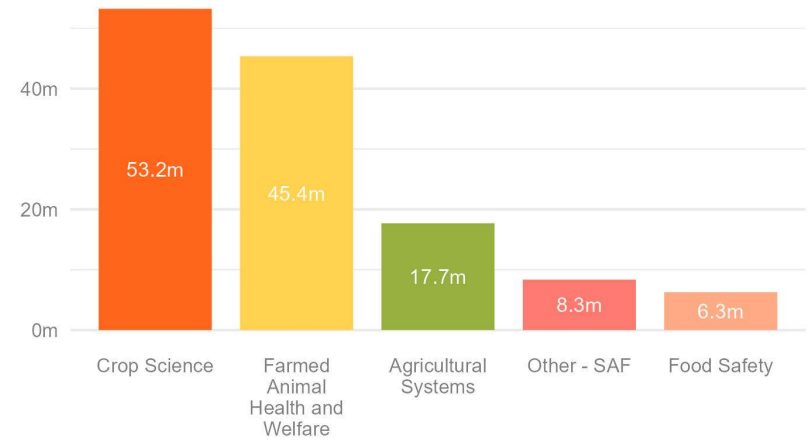
Accounting for 41% of the research portfolio, key areas are Crop Science and (farmed) Animal Health.

Here, the main mechanisms of investment is strategic investment to institutes. 61% of total spend for Sustainable agriculture and food was to the strategic institutes.

Investment mechanism and HEI/Institute split



Science area



Top 10 research organisations



Data Source: Strategic Planning, Evidence and Engagement

Integrated understanding of health: £59.9m

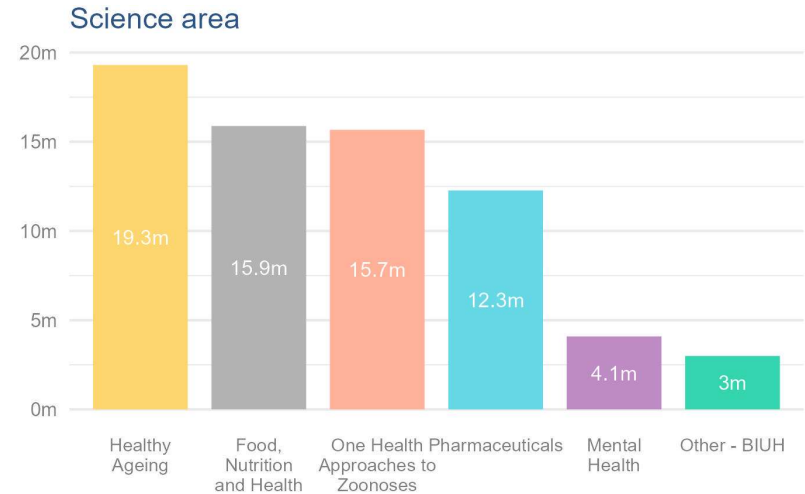
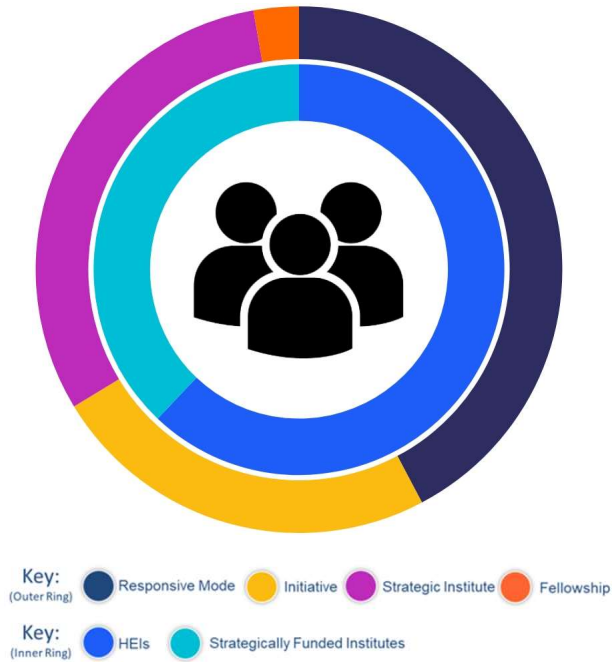
This area is about improving animal and human health and wellbeing across the life course.

This area is supported by a balance across all the three main investment mechanisms.

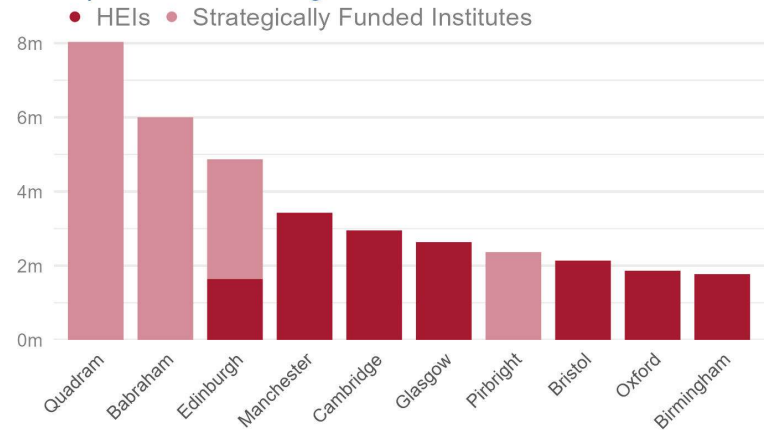
Babraham, Quadram and Pirbright provide critical mass, for Healthy Ageing, Food, Nutrition and Health, and One Health Approaches to Zoonoses, respectively. The latter area encompasses COVID-19 related research accounting for a total expenditure of ~£7m.

HEIs also provide further depth across this research area.

Investment mechanism and HEI/Institute split



Top 10 research organisations



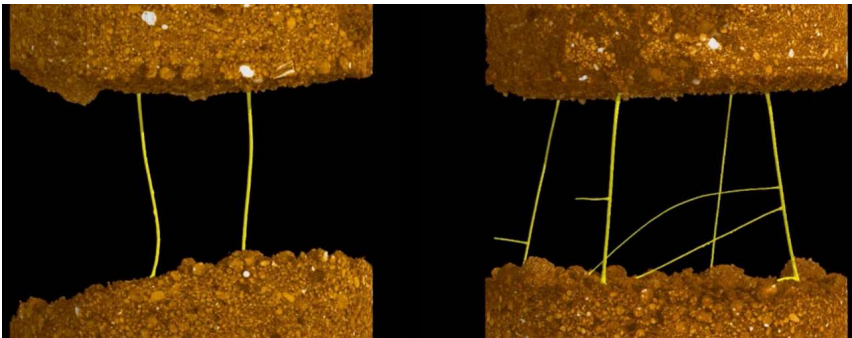
Data Source: Strategic Planning, Evidence and Engagement

Research and innovation – supporting agricultural transition

Discovery bioscience

A novel water sensing mechanism in roots

Using x-ray imaging, researchers at the University of Nottingham have uncovered a new mechanism by which roots regulate branching when soil moisture is low.



Strategic programmes

Transforming UK Food Systems SPF

Pasture to Plate - using targeted chemical processing and novel biotechnology to convert grass into nutritious edible fractions for healthier and more affordable alternative foods.



Raising the Pulse - a systems analysis of the environmental, nutritional and health benefits of pulse-enhanced foods.



- **Defra Farming Innovation Programme (delivered by UKRI)** - supporting farmers, growers, foresters and other businesses to embrace innovative ways to maximise productivity and drive sustainability
- **UKRI Agri-food for Net Zero Network+** - setting out a roadmap for R&I to support the sector to transition to net zero

Supporting strategic programmes

Designing Future Wheat

A national UK wheat research programme involving ~25 groups of scientists.

Developing new wheat germplasm containing the next generation of key traits to make wheat more resilient.

Providing this new germplasm in a readily accessible and referenced form to commercial crop breeders and the plant science community.

Outputs include identification of major QTLs associated with dietary fibre in white wheat flour.



North Wyke Farm Platform – ‘living farm lab’

A unique national and global research facility linked to real-world farming

Using research to identify land management strategies to optimise transfer of essential nutrients from soil to crops, livestock and then into food.

Includes investigating the potential to reduce GHG emissions from cattle by up to 50%.

FarmINN programme - enabling UK farmers to test innovative ideas/practices in a safe, risk-free environment.



UK Food Safety Network

£1.6m investment, launched in June 2022

Connecting food industry, food and health policymakers and academia to collaboratively pursue shared research priorities that will protect the UK from foodborne hazards.

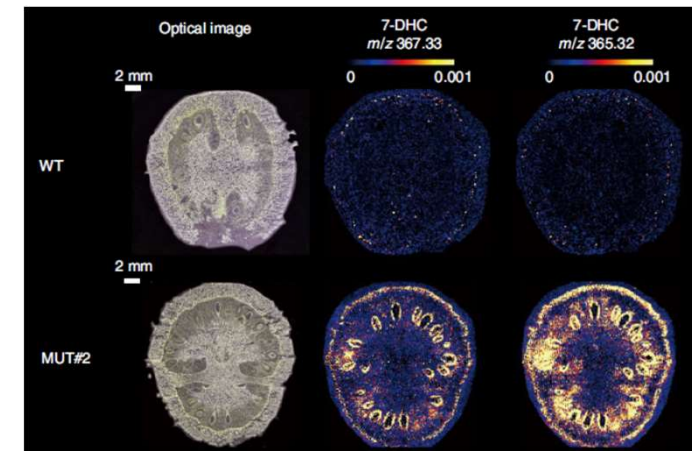
Three priority areas identified through stakeholder engagement:

1. Reducing microbial risk of known pathogens
2. Understanding risk of alternative proteins and new plant-based foods
3. Applying food safety knowledge and new tools to ready-to-eat foods



Gene-edited tomatoes could be a new source of vitamin D

- Vitamin D (Vit D) is important for bone health. Vit D insufficiency has been linked to an increased risk for a number of diseases, e.g. cancer & neurocognitive decline.
- We obtain Vit D from food (eggs and fish) and through exposure to sun; UVB light converts 7-dehydrocholesterol (7-DHC; provitamin D3) to Vit D.
- 7-DHC is present in tomato plants, but at very low levels, as the enzyme **SI-DR2** efficiently converts 7-DHC into cholesterol.
- Researchers at the John Innes Centre have used gene editing to create tomato plants that lack *SI-DR2*.
- In these *SI-DR2* tomato plants, 7-DHC accumulates in the fruit and leaves and produced Vit D when exposed to UVB.
- These findings suggest that tomatoes, and related crops, could provide a sustainable source of vitamin D3, helping to tackle increasing Vit D insufficiency and improve global health.



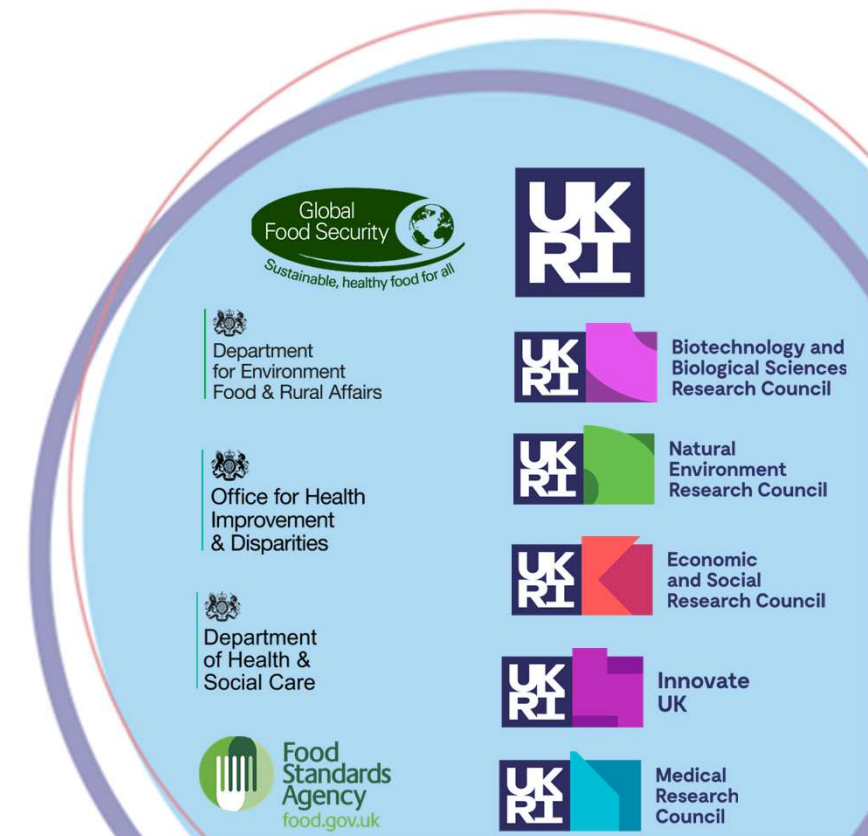
Increased expression of 7-DHC in the flesh and peel of *SI-DR2* knock-out plants

Transforming UK Food Systems Programme

£47.5M to support interdisciplinary research and training

Aims:

- Transform UK diets to be healthier and more sustainable
- Change the behaviour of actors across the food system
- Model the interdependencies across the UK food system
- Co-produce research between academia and stakeholders (UK government, business and civil society)
- Develop a pipeline of skilled people who are able to apply critical interdisciplinary systems thinking to the food system



The Programme so far

- Four £6M large 5-year projects
- A Centre for Doctoral Training
- 12 smaller 2-3 year research projects
- A series of reports have been published
- Knowledge Exchange Fellow and UKRI/FSA Fellow



The Four Consortia Projects

- Four £6M large 5-year consortia projects
- Multi-centre, interdisciplinary and bring together the different parts of the food system.
- 19 different Universities, more than 50 organisations involved (DEFRA and FSA, supermarkets, SME's Trade bodies and Third Sector)
- **Fix Our Food**, Professor Bob Doherty and Professor Katherine Denby, University of York
- **Healthy soil, healthy food, healthy people (H3)**, Professor Peter Jackson, University of Sheffield
- **FoodSEqual**, Professor Carol Wagstaff, University of Reading
- **Transforming urban food systems for planetary and population health (The Mandala Consortium)**, Professor Martin White, University of Cambridge



Centre for Doctoral Training in Food Systems



UK FOOD SYSTEMS
CENTRE FOR DOCTORAL TRAINING

Developing the next generation of food system thinkers

- Led by the University of Greenwich, 2 cohorts of students so far, recruiting for the 3rd cohort
- Interdisciplinary research projects integrating natural and social science
- Placements in UK food system stakeholder organisations (government, business and civil society)
- Centrally delivered food system training
- Peer to-peer learning and cohort building activities
- Producing a pipeline of skilled people able to apply critical interdisciplinary systems thinking to health and sustainability challenges, across academia, industry and government.



Action Focused Research Projects

- 12 projects awarded ranging between £250K-£2M, supported for 2-3 years
- High informed risk, high reward research
- Interdisciplinary and codesigned with food system stakeholders
- Integrating the natural and social sciences as well as linking up production and consumption across the food system.



Lincolnshire beans could provide British solution to imports

Scientists have developed a haricot seed they hope will thrive in the UK after a 12-year project.

BeanMeals, University of Oxford



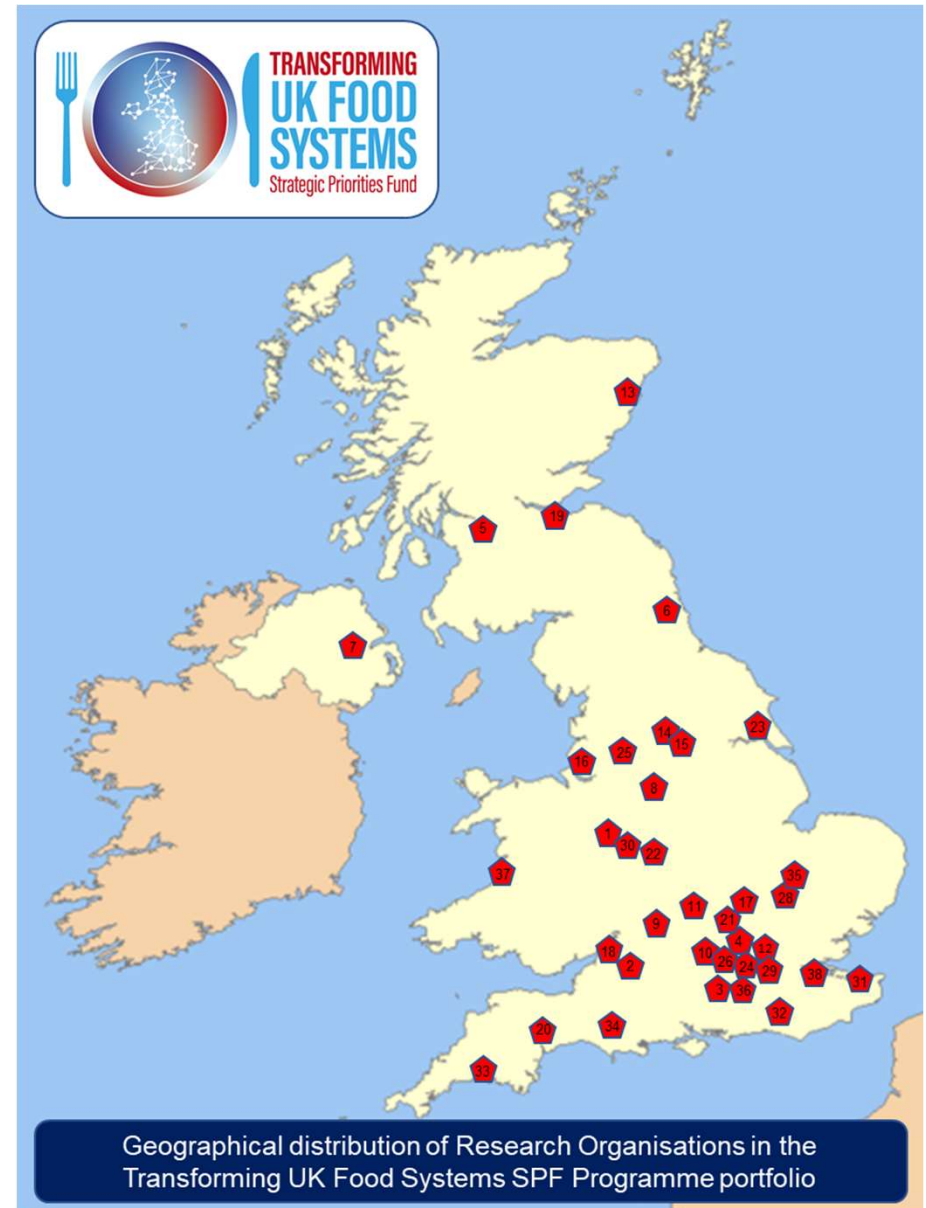
Beans in toast: UK should switch to broad bean bread, say researchers

Switch to flour made from legumes would make loaves healthier and more sustainable, says professor

Raising the Pulse, University of Reading

Food Systems SPF Network

- Over 37 different Universities/ Research Organisations across 4 consortia, CDT and 12 new projects
- More than 200 organisations involved in the SPF Programme (incl. Gov, supermarkets, SMEs, Trade bodies & Third sector)
- CDT partnering with 17 gov bodies, 12 charitable organisations & 31 private sector companies as part of its UK Food Systems-CDT Academy



SPF activities mapped to the National Food Strategy

Escape the junk food cycle and protect the NHS

- Using biofortification to enhance the nutritional value of foods, *H3 project*
- Exploring interventions to reduce sugar, salt and fat in foods eaten outside the home, *SNEAK project*
- Using a complex systems approach to understand reinforcing cycles, *Mandala project*

Reduce diet-related inequality

- Co-developing transformational strategies between people with lived experience of food insecurity and obesity, *FIO-FOOD project*
- Identifying barriers and drivers for change in disadvantaged consumers, *FoodSEqual project*
- Exploring interventions focused on food affordability, including economic assessments of direct policy interventions, *Sus-Health*

SPF activities mapped to the National Food Strategy

Make the best use of our land

- Understanding the regional dynamics of land use governance to inform land use strategy and local nature recovery, *FixOurFood project*
- Understanding how novel food production techniques affect farm practices and change land use, *Is Cultured Meat a Threat or Opportunity for UK Farmers? project*

Create a long-term shift in our food culture

- Working with Leicestershire County and Leicester City authorities on school meal provision, *BeanMeals project*
- Bringing social enterprises and local people together to discuss what healthy and sustainable food is, and what the barriers and opportunities are locally, *Social Enterprise as a Catalyst for Sustainable and Healthy Local Food Systems project*
- Examining the centrality of meat and the relationship between production and consumption, *TRAnsforming the DEbate about Livestock Systems Transformation project*

Fit4Food 2030 EU Programme – Sustainable Food Systems Network

- Programme's aims to become internationally recognised for outstanding food system research making it important for us to collaborate and learn from other international programmes
- Workshop in development with the leaders of the Fit4Food team, to build collaborations, network and learn from their findings and lessons



Towards FOOD 2030
future-proofing
the European food systems
through Research & Innovation

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Tools for transformation

Search our growing and up to date library of resources driven by the power of community.



SPF Programme recent report

Transformation: An introductory guide to fundamental change for researchers and change makers in a world of crises.
Professor Ioan Fazey and John Colvin, University of York, Emerald Network Ltd

This report outlines the concept of transformation and highlights some of the critical aspects that need to be considered when embarking on an initiative, approach or campaign which is intended to be transformational.

1. Why transform?
To transcend the systems, thinking, and mindsets that have led to, and perpetuate, contemporary challenges

2. What is transformation?

- A fundamental change occurring over time;
- Qualitatively distinct to adjustments or reforms;
- Subjective and normative: What is considered desirable transformation depends on a person's perspective and values;
- System change;
- Change at different social, geographical or temporal scales;
- Inner and outer change.

3. Transformation through what?

1. Working with many different interacting elements;
2. Working to support change in three layers:
 - Behaviours & Technologies;
 - Systems & structures;
 - Values, mindsets, beliefs, cultures, paradigms.
3. Cohering or orchestrating leaders, policy professionals, advocates and capacity developers.

4. Transformation to what?
An aspirational vision of the future

- To meet, and go beyond, the SDGs;
- Regenerative systems where human and environmental benefit spiral up and reinforce each other;
- People centred governance.

5. Whose transformation?

1. Transformation is always embedded in politics.
2. Shifts in power relations, agency, inclusion and distributional impact;
3. Working with patterns of resistance by incumbent power holders and the least powerful;
4. Using productive forms of conflict;
5. Coalitions of different actors - 'rebels', 'reformers', 'organisers' and 'helpers' - can help bridge different perspectives linked to differences in power.

6. Examples of transformation

- Agroecology revolution over the last 90 years:** Gradual, over long-time frames;
- Transformations of the Nordic diet:** Shifting identity and food cultures through co-operative endeavours;
- Regenerative Costa Rica:** Bottom-up processes combined with strong vision and strategic transformational intent.

7. Conceptualising transformation processes and pathways

Concept 1: The Iceberg & leverage points model;

Concept 2: Three Horizons pathways;

Concept 3: Conceptualising power for transformational conflict and resistance within social movements.

6 FOOD SYSTEMS TRANSFORMATION

7



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Questions?

