

State of Agricultural Research & Innovation Methodology

Centre for Agricultural Research Impact

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1 / Introduction

The State of Agricultural Research & Innovation (SARI / 'the project') is an **annual analysis of agricultural research funding, activity and capacity in the UK**, to understand its potential impact in the context of stakeholder priorities, and enable strategic collaboration among research providers and funders in the public interest.

The project is led by the Centre for Agricultural Research Impact (Ag.Impact), a UK non-profit dedicated to enhancing the impact of agricultural research.

The full report for 2026 is available [here](#) with a live dashboard to explore the data. It is anticipated that the dashboard is updated as more data is received and analysed.

This document provides further details on the methodology used across all the data collected.

Objectives of SARI

1. To provide a rigorous annual analysis of agricultural research funding, activity and capacity across the UK.
2. To understand the potential impact of research in the context of stakeholder priorities.
3. To enable strategic collaboration among research providers and funders in the public interest.

Definitions used

'Agriculture' is taken here to include:

- a) Primary agriculture: horticulture, crops, livestock and land management for farming purposes.
- b) Agri-foods: "agriculture, horticulture and food and drink processing technologies".
- c) Agri-tech: "precision technologies to improve agricultural input and output processes that exploit the application of: controlled environments, robotics and automation, advanced sensors, AI and data systems".

'Research' is "a process of investigation leading to new insights, effectively shared".

'Agricultural research' is research which is expected to impact primarily on agriculture.

'Infrastructure' is the "facilities used by scientists and industry to conduct research, such as laboratories, specialised equipment, and supercomputers"¹. For this analysis, it includes physical and virtual facilities.

'Impact' is “an effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia”.

'Across the UK' – research funded or delivered by organisations based in any of the four nations.

Report narrative

The report compares current research funding with what farmers, growers, researchers and others expect, based on a survey of over 600 stakeholders, in-depth interviews and workshops, beside analysis of where the funding has been allocated in recent years for research.

The report provides a strategic overview of the findings within the overall framework of these key features:

- Relevant
- Joined-up
- Useful
- Grounded
- Timely
- Future-proof

The features emerged from analysis of the qualitative survey responses, interviews and workshops, where across the qualitative data, consistent themes emerged. In addition, we explored what the 'features' of an effective agricultural research system looks like using Claude AI (Opus), to analyse convergence across with the qualitative themes. The final six features were developed from these approaches to provide a validated and interpretable narrative structure for the report.

Data sources

Publicly available datasets referred to in the project:

- [Gateway to Research](#) (GtR): project-level data on research funded by UKRI and selected UK government bodies.
- [Defra Science Search](#): project-level data on research funded or commissioned by Defra.
- [Scottish Government](#): Database of research funded by Scottish government as part of Environment, natural resources and agriculture (ENRA) strategic research 2022-2027.
- [Infraportal](#): 2018-19 database of UK research infrastructures compiled for UKRI research infrastructure landscape analysis, including over 200 relevant to agriculture.²

- [Sustainable Farm Networks Dashboard](#) (SFN): map of >1200 UK farms engaged in research or demonstration.
- [Research & Development Expenditure by UK Government](#) (RDE): macro-level data on research expenditure by objective, including agriculture.
- [Global Research on Agriculture: Personnel & Expenditures](#) (GRAPE): global macro-level data on agricultural research expenditure, including imputed values for latest years.
- [Business Enterprise Research & Development](#) (BERD): macro-level data on research expenditure by businesses by product group and industry classification.
- [AHDB](#): AHDB funded and co-funded research projects.

Datasets

Datasets collected and analysed are:

1.	Classification taxonomies
2.	Research projects and funding
3.	Research infrastructure
4.	Stakeholder workshops on infrastructure, horticulture, and livestock
5.	Online survey of stakeholders' research priorities and experiences (farmers, researchers and other stakeholders)
6.	Individual interviews of industry and research leaders
7.	Citizen workshops
8.	Horizon scan literature review

The methodologies applied for each dataset are detailed in the following sections.

2 / Classifications

In order to analyse the data in a **consistent and repeatable way**, we categorised agricultural research and themes to be applied through the multiple datasets and analyses. We developed extensive taxonomies for the following:

Table 1: Taxonomy family used in SARI analyses.

	Taxonomy	Description	Section
1.	Topic	Working taxonomy of subtopics and terms consistent with the definition of agricultural research. Based on existing dictionaries identified through literature review and partners (e.g. UK Innovation & Research Caucus agri-tech dictionary) ³	Topic classification
2.	Pathway to impact	How the research is focused	Pathway to impact classification
3.	Theme	The overall challenge or opportunity the research is looking to solve	Challenges and opportunities theme
4.	R&D type	The nature of the research methods	R&D type taxonomy
5.	Infrastructure	The facilities and networks of R&D	Infrastructure taxonomy

Research project taxonomies

Existing published classifications

We reviewed an extensive set of existing topic lists, including established taxonomies for research classification, to identify their suitability for classifying research projects. Table 2 summarises their strengths and limitations in relation to SARI requirements. No single taxonomy was suitable for use in SARI across the different dimensions in Table 1, so a set of classifications were constructed (details in the following sections).

Table 2: Existing classification lists for research.

Taxonomy	Purpose	Strengths	Limitations
AGROVOC ⁴	Open dataset about agriculture that uses semantic web technologies to link other multilingual knowledge organisation systems.	Highly relevant list of key terms and phrases with a logical attributed hierarchy.	Does not offer clear lists of distinctive themes for surveys, project categorisation or reporting. Large overlaps among key-terms.
ANZSRC Fields of Research (FoR) ⁵	Classifies topics across all research disciplines in a standardised way (Australia and New Zealand).	Highly relevant themes and topics. Used and recognised beyond Australia and New Zealand.	Disciplinary structure means theme names would be misleading or omit important/ relevant topics. Topics within themes are highly technical and specific. Themes would not translate for survey, project categorisation or reporting purposes.

Taxonomy	Purpose	Strengths	Limitations
AUC Research Strategy – Research Topics ⁶	Categorises existing HE research topic areas across UK Universities.	All relevant topics but would need to be rationalised e.g. 'basic plants' and 'applied plants' would become 'plants'. Useful top-level themes to inform surveys, project categorisation and reporting.	No clear topics within themes and so would need to be mapped against a more extensive list of topics to inform keyword attribution. Includes some narrow top-level themes, e.g. biofuels.
BBSRC Research Topics ⁷	Classification for BBSRC's research topic areas and to guide investment and define focus areas. It also works to align research with national priorities.	Some relevant topics within themes. Provides a funder lens to categorising research. Uses meaningful language for the sector.	Bioscience specific. Too few topics to be meaningful for reporting. Would likely omit relevant agricultural projects and survey results.
Defra Areas of Research Interest ⁸	Guiding research to support policies on environment, food, farming and rural matters.	Highly relevant themes and uses meaningful language for the sector.	Would risk missing relevant agricultural projects as the themes are very high-level. No clear topics within themes.
European Environment Agency In-Depth Topics ⁹	Providing information on key environmental issues and offering an overview of EU actions, data and platforms to support policymaking across Europe.	Relevant to some areas of agriculture, though highly focused on specific aspects.	Highly specific list of themes which would miss the broader scope of agricultural research topics. No clear topics within themes.
FAO Thematic Areas of Work ¹⁰	Focus and structure effort towards transforming agri-food systems to be efficient, inclusive, resilient and sustainable.	Several highly relevant themes. Uses meaningful language for the sector.	List of themes is too long to be meaningful in reporting, project categorisation and for surveys. There is some theme overlap and varied levels of specificity e.g. 'nutrition' versus 'transboundary plant pests and disease'. No clear topics within themes.
IP Office - Agrifood ¹¹	Provides an overview of topics within Agrifood.	Useful to outline key areas of Agrifood as a theme and could be used to supplement other taxonomies that omit agrifood.	Not an official taxonomy. Does not provide a full list of other themes.
OECD Agriculture and Fisheries Topics ¹²	Provides structure to OECD's extensive work on food systems and allowing governments to analyse (e.g. for market trends, to support policy design, improve food security).	Several relevant themes. Uses meaningful language for the sector.	Largely focused on policy topics (which are relevant) but would risk missing other relevant agricultural topics that fall outside of a policy focus. Topics are too high-level for meaningful reporting/coding and surveys. No topics within themes.
UK Innovation & Research Caucus agri-tech dictionary ¹³	An agri-tech keyword dictionary built from Innovate UK project summaries.	Highly relevant key terms with keyword waiting attributions. Used in a similar context for UK agri-tech.	Yielded false positives from project summaries. No clear topic hierarchy of themes for project categorisation (beyond agri-tech).
UK Industrial Strategy - Agri tech ¹⁴	Provides an overview of inclusive topics within an agri-tech theme for strategic purposes.	Useful to outline key areas of agri-tech as a theme and could be used to supplement other taxonomies if not included.	Not an official taxonomy. Does not provide a full list of other themes.

Taxonomy	Purpose	Strengths	Limitations
UKRI Research Topics ¹⁵	Classification for UKRI's research topic areas and to guide investment/define focus areas and align research with national priorities.	Extensive list of research themes funded in the UK. Provides a funder lens to categorising research. Uses meaningful language for the sector.	Largely out of scope or highly specific to particular areas of interest. Too many themes to use for SARI and no clear/distinctive topics.
USDA Topics ¹⁶	Agricultural library of research topics related to challenges in food and agriculture.	Mostly relevant list, largely at the right level for a list of themes.	Some themes are partly out of scope (e.g. 'gardening') and would miss some highly relevant projects e.g. those related to agri-tech and social science.
Food systems of the Future ¹⁷	Foresight and scenario analysis – Categorising current trends and plausible future directions of food system outcomes.	Relevant list of topics at an appropriate level.	Themes are detailed but would not alone cover all important areas for SARI.
Crossing the Divide ¹⁸	Policy document for consensus of future agriculture.	Relevant list of topics, largely at the right level for a list of themes.	Themes are detailed but would not alone cover all important areas for SARI.
Roadmap for Resilience: A UK Food Plan for 2025 ¹⁹	A strategic document for agricultural systems transformations and recommendations.	Relevant list of topics, largely at the right level for a list of themes.	Themes are detailed but would not alone cover all important areas for SARI.
Agroecotech – Soil Association Report ²⁰	Recommendations for supporting technological acceleration for transition to agroecology.	Relevant list of themes.	Themes are detailed but would not alone cover all important areas for SARI. Mostly technology and agroecological focus.
Sustainable food and agriculture: Investment deep dive: Esmeé Fairbairn Foundation ²¹	Categorised impact investing into thematic areas.	Relevant list of themes.	Themes are detailed but would not alone cover all important areas for SARI. Limited clear/distinctive topics.
NFU 2013 Feeding the Future ²²	Collated and categorised farmer research priorities for agricultural research.	Clear thematic areas and topic lists, largely at the right level.	Themes are relevant but outdated. More recent work is needed in addition to supplement the list and avoid omissions of important and current topics.
UK farmer & grower research priorities ²³	Collated and categorised farmer research priorities for agricultural research.	Clear thematic areas and topic lists, largely at the right level.	Themes are relevant but would not alone cover all important areas for SARI.
ORC/NIAB report of Regenerative agriculture research priorities ²⁴	Categorised research priorities for crop and soils research.	Clear list of themes.	Themes are relevant but not at the right level for SARI themes.
BBSRC Research in Agriculture and Food Security ²⁵	Strategic framework for BBSRC's focus areas.	Clear list of themes.	Themes are relevant but not at the right level for SARI themes.
TUKFS - Food Systems Transformation Solutions Bank Taxonomy ²⁶	Collection/bank of materials to support food system transformation solutions. Strategic research priorities.	Clear list of themes (programme list).	Themes are relevant but not at the right level for SARI themes. No clear/distinctive topics.

Taxonomy	Purpose	Strengths	Limitations
Global Farm Metric: Holistic Sustainability Framework for Farming ²⁷	Outcomes-based sustainability framework for farmers, policymakers, businesses and financiers.	Clear thematic areas and topic lists, largely at the right level.	Themes are relevant but there are limited clear/distinctive topics.
LEAF integrated farm management: A Guide – Agroecology ²⁸	Categorised and explained principles of integrated farm management.	Clear thematic areas and topic lists, largely at the right level.	Themes are relevant but are strongly focused on integrated farm management. There are limited clear/distinctive topics.
Agricology: Farming theme categories ²⁹	Categorised resources by farming theme.	Clear thematic areas and topic lists, largely at the right level.	Themes are relevant though are tailored towards Agricology focus. There are limited clear/distinctive topics. No clear/distinctive topics.
Food issues census 2024 ³⁰	Identifies thematic areas for food issues from partner organisations.	Several relevant themes. Uses meaningful language for the sector.	Largely focused on 'needs' topics (which are relevant) but would risk missing other relevant agricultural topics that fall outside the report's focus. Topics are too high-level for meaningful reporting/coding and surveys. No topics within themes.

After constructing draft classifications, we held a design workshop with a selection of experts to test and refine the taxonomies and approach.

The resulting classifications were used for analyses and will be used in future years to classify research funding.

SARI classifications

Challenges and opportunities theme

The following themes were developed as top-line challenges and opportunities that survey respondents were asked to prioritise in the question *“These first questions are about the challenges and opportunities facing UK agriculture. Overall, how do you see the priorities for UK agriculture?”*

- Animal welfare
- Healthy diets
- Food security
- Thriving rural communities
- Profitable farming
- Growing the UK economy
- Resilience
- Circular economy
- Net zero
- Nature recovery

In the overall analyses, the research projects are not classified by these overarching issues as it would be too ambitious and/or misleading to assign a primary theme effectively where often agricultural research seeks to address multiple areas.

Topic classification

The following topics are assigned to each research project.

- Soils & water (e.g. soil health, water quality, flooding)
- Climate & weather (e.g. mitigation, sequestration, adaptation)
- Land use & ecosystems (e.g. biodiversity, habitat, agroforestry)
- Crops (e.g. varieties, pests, nutrition, quality; incl. horticulture, forage)
- Livestock (e.g. breeds, diseases, nutrition, welfare, quality)
- Food production & supply (e.g. primary processing, storage, traceability, cellular agriculture)
- Society (e.g. behaviour, attitudes, mental health, farmworker housing)
- Economy (e.g. trade, farm business performance, labour market)
- Systems (e.g. cross-cutting issues, complexity, transitions, healthy & sustainable diets)

To enable cross-comparison with the survey, the topics were included as respondents were asked to rank their priorities in the question: *“Where can research most help to meet the challenges and opportunities facing UK agriculture?”*

Pathway to impact classification

The following pathways to impact areas are assigned to each research project.

- Infrastructure (e.g. developing and testing animal housing, crop storage, electrification, irrigation)
- Hardware (e.g. developing robots, drones, large machines and processing equipment)
- Software (e.g. implementing AI, decision support and digital twin tools)
- Genetics (e.g. developing varieties, breeds including those more suited to future climates)
- Inputs (e.g. fertilisers, pesticides, biologicals, including reduction of their use and alternatives)
- Practices (e.g. testing the effects of practice such as direct drilling or cover cropping)
- Systems (e.g. measuring outcomes of regen ag, agroecology, vertical farming or cellular agriculture)
- Knowledge & skills (e.g. developing and sharing advice, knowledge exchange and education)
- Markets (e.g. guiding standards, supply chain practices or market development)
- Policy (e.g. providing evidence on payments, regulations, tax or trade)
- Monitoring (e.g. remote sensing, baselining, early warning systems)

To enable cross-comparison with the survey, pathways were included as respondents were asked to rank their priorities in the question: *“For the final questions in this section, we will ask you about how research can make a difference in practice. How is research most likely to help meet the challenges and opportunities facing UK agriculture?”*

Assigning classifications

For the topic and pathway to impact themes, the following data parameters were used to map the classifications using a combination of Claude AI Opus 4.6³¹ and iterative human moderation and adjustment:

- Project title
- Abstract/summary
- Funder and funding programme
- Partners

R&D type taxonomy

One objective of the analysis was to develop a novel way to visualise the expected time-to-impact of research activities, that can inform strategic decisions. The structure of a project can indicate its potential impact timeline based on its complexity, distance to adoption and farmers on the ground, and breadth of scope. Therefore, the project developed a repeatable and coherent way to categorising research projects into types of R&D.

The following table (Table 3) details the different types of R&D relevant to agricultural research, and how the anticipated timeline to impact was gathered from different sources.

Table 3: List of types of R&D and their respective typical research periods, users, time to impact, impact pathways and examples of typical research funders/programmes.

Type of R&D	Definition	Typical project duration	Primary users	Key outputs	Distinctive features	Typical time to impact	Typical impact pathway	Example research funder/ programme
Basic research Also: fundamental research; discovery research; strategic basic research; mission-oriented basic research; targeted basic research.	Projects primarily concerned with generating fundamental understanding, theory, mechanisms, biological/environmental processes, scientific discovery, or exploratory knowledge without a clear immediate application, implementation pathway, policy use, or commercial deployment.	3-5 Years ³²	Scientific research communities, later applied research programmes.	Peer reviewed publications; new theories/theoretical models; datasets; frameworks targeted at a recognised practical domain.	Curiosity-driven; no immediate practical application; advances foundational understanding.	12-30 Years ³³	Generates new knowledge to produce the basis for further investigation and development: ³⁴ -Generates new theories without applied goals. -Inspires/informs applied research. ³⁵ -Has mainly indirect impacts on future work which later realises more practical/measurable implementation. ³⁶ -Can directly support policy. ³⁷	BBSRC Responsive Mode, ³⁸ UKRI collaborative programmes with research institutes. ³⁹
Translational research Also: researcher-led applied research; researcher-centric research; top-down research.	Primarily applied research that moves knowledge, technology, methods, or innovations toward practical use. This includes feasibility studies, prototypes, field trials, demonstration projects, pilots, knowledge transfer partnerships, adoption programmes, technology integration, vaccine/test/tool development, scale-up, implementation, or applied	2-4 Years ⁴⁰	Research funders; some sector stakeholders.	Reports; tools; validated interventions; datasets with practical implementation.	Researcher-driven problem definition; technical depth but less co-creation; impact via dissemination.	3-15 Years. ⁴¹	Generates solutions which need real-world testing: -Often engages with policy and intermediaries to achieve impact. ⁴²	Strategic Priorities Fund. ⁴³

Type of R&D	Definition	Typical project duration	Primary users	Key outputs	Distinctive features	Typical time to impact	Typical impact pathway	Example research funder/ programme
	innovation bridging research and practice.							
Commercial research <i>Also: industry-led innovation; industry-led applied research; experimental development.</i> ⁴⁴	Research which is primarily commercially commissioned, industry-led, client-facing, or directed toward commercial product/service development, validation, testing, market deployment, business value, or private-sector exploitation. Indicators include commercial funders, company-led projects, contract research, product testing, process optimisation for a company, marketable technologies, or research mainly serving a private commercial partner.	1-4 Years ⁴⁵	Practitioner s; buyers; breeders; technology developers; commercial organisations and technology users.	Interventions; prototypes; pilot trials; evaluation reports; commercial products/ processes, patents; performance data.	Problem-oriented; seeks practical solutions or validation of concepts; typically, shorter cycle; market-oriented; iterative testing and refinement; risk mitigation before commercialisation; largely for competitive industry advantage.	3-10 Years ⁴⁶	Translates the results of basic research towards the needs of a specific commercial challenge. ⁴⁷ -Develops new or modified products or processes. -Produces practical innovations. ^{Error! Bookmark not defined.} -Impacts can be realised through IP protection, licensing or commercial scaling. ⁴⁸ -Often provides economic impacts for industry and producers. ⁴⁹	InnovateUK & Defra e.g. business-led feasibility industrial research, ⁵⁰ industry partnerships. ⁵¹ Private funding and some UKRI/Defra co-funding e.g. Farming Futures. ⁵²
Pre-competitive research <i>Also: extension research; field experiments; field trials; industry engagement.</i>	Industry-led research tailored towards the need of a group of businesses or a sector. Includes extension research for the purpose of transferring of knowledge from researchers and science to farmers.	1-4 Years ⁵³	Farmer and producer networks; industry organisations.	Field trial results; demonstration data; extension materials; decision support	Emphasises knowledge transfer and behaviour change; aims to translate science into practice;	0-8 Years ⁵⁴	Directly translates information to end-users and considers relevant contexts. ⁵⁵ ^{Error! Bookmark not defined.} -Directly impacts practices through knowledge translation	AHDB research and knowledge exchange; ⁵⁷ Horticulture Innovation Partnership (HIP) ⁵⁸ ;

Type of R&D	Definition	Typical project duration	Primary users	Key outputs	Distinctive features	Typical time to impact	Typical impact pathway	Example research funder/ programme
				tools/mechanisms.	applied and outward facing; pre-competitive industry research		-Informs practical decision making ⁵⁶	BBSRC research clubs. ⁵⁹
User-centred research <i>Also: Farmer-led research, user-led research, community-led research, co-innovation, farmer-led innovation.</i>	Co-creation and network-based social learning, involving active collaboration between farmers and scientists to enable the co-production of knowledge. Farmers or other practitioners drive the agenda, with scientists supporting e.g. validating innovations in scientific terms. ⁶⁰	0.5–3 Years ⁶¹	Farmers; farming communities; rural networks.	Practice changes; adoption of innovation; case studies; field-trial results; co-produced recommendations.	Farmers or other users set agenda; strong co-design; localised experimentation; focus on peer-to-peer learning and social innovation.	0-5 Years. ⁶² <i>Error! Bookmark not defined.</i>	Directly impacts real-world practices ⁶³ and informs science grounded in contextual, farm-specific examples. ⁶⁴ -Enables network building. ⁶⁵ -Can provide socio-economic benefits related to production and peer learning. ⁶⁶ -Can influence policy. ⁶⁷	Defra e.g. ADOPT. ⁶⁸
Policy research <i>Also: Policy analysis; programme analysis.</i>	A 'catch all' term embracing many information-gathering and processing activities that public agencies engage in to facilitate decision making. ⁶⁹	1.5 – 3.5 Years ⁷⁰ <i>Error! Bookmark not defined.</i>	Policymakers; regulators; practitioners.	Policy-briefs; policy evaluation; impact assessments; scenario models.	Decision-support oriented; synthesises evidence to inform design, implementation, or evaluation of public policy.	2-7 Years ⁷¹	Primarily influences policy and interventions. ⁷² -Evaluates the success of previous policy and processes to inform future policy. ⁷³ <i>Error! Bookmark not defined.</i> -Underpins policy and interventions and informs budget/spending. ⁷⁴ -Can impact adoption of	Defra, Devolved Governments, ESRC, UKRI, DSIT e.g. policy/impact fellowships ⁷⁷

Type of R&D	Definition	Typical project duration	Primary users	Key outputs	Distinctive features	Typical time to impact	Typical impact pathway	Example research funder/ programme
							new practices e.g. technologies and innovation ⁷⁵ and sustainable farming practices. ⁷⁶	
Surveillance research <i>Also: Monitoring research</i>	Research which is primarily intended to inform government policy, regulation, standards, governance, public strategy, public decision-making, evaluation of interventions, or evidence for policy design. Indicators include Defra or public-sector policy programmes, regulatory questions, policy evaluation, standards, guidance, scenario analysis for government, or explicit decision-support for policymakers. ^{Error! Bookmark not defined.}	5-7 Years; ⁷⁸ Continuous/ongoing ⁷⁹ ^{Error! Bookmark not defined.}	Public authorities; industry; society more broadly.	Long-term datasets; trend analysis; early-warning reports; risk assessments.	Continuous or multi-year; operational data collection; informs rapid decision-making and biosecurity; not hypothesis driven.	Constant/ongoing (with short feedback loops) ⁸⁰	Addresses systematic challenges, generating change in management ⁸¹ or mediating factors. ⁸² -Helps to predict, manage and mitigate risks relating to human, ⁸³ ^{Error! Bookmark not defined.} animal, ⁸⁴ and plant ⁸⁵ health and disease. -Predicts and manages economic challenges in the agricultural sector. ⁸⁶	APHA surveillance reports; ⁸⁷ UKHSA environmental public health surveillance systems. ⁸⁸
Infrastructure	Projects that focus on purchasing scientific equipment, developing repositories, increasing access to research facilities, and/or capital grants.							
Training	Doctoral or other training research, including training grants.							

Infrastructure taxonomy

To determine the types of agricultural research infrastructure across UK, data were collated from the sources outlined in Table 4. Data were manually categorised based on infrastructure type (e.g. physical equipment and labs or virtual networks and databases) and distribution (e.g. virtual, single-site, multi-site). Details on agricultural research infrastructures were then developed into an interactive online directory using classification in Table 5.

Table 4: Data type and sources used for research infrastructure data.

Type	Source (date)	Number of records
InfraPortal	UKRI (2018/19)	251
Data request on infrastructure	<i>By organisation</i>	62

Table 5: Agricultural research infrastructure taxonomies for resources, types and sub-types, (adapted from the ESFRI's InstructERIC RI formats, InfraPortal regions, SCAR AKIS inventory of R&I Infrastructures and the European Commission's taxonomy of RIs).

Category		Options
Format ⁸⁹		1. Single site: A resource at a single location 2. Distributed: Resources at multiple sites 3. Virtual: Resources provided electronically
Geography (UK region) ⁹⁰		1. East England 2. East Midlands 3. Greater London 4. West Midlands 5. North East England 7. North West England 8. South East England 9. South West England 10. Scotland 11. Wales 12. Northern Ireland 13. UK - National 14. International 15. Virtual
Type	Institution ⁹¹	1. Agricultural university 2. Applied research institute/centre 3. Experimental farm
	Repository ⁹²	1. Database: Organised collection of data generally stored and accessed electronically from a computer system.

Category		Options
		2. Digital library: Online database of digital objects that can include text, still images, audio, video, or other digital media formats which provide the means for organising, searching and retrieving content contained in the collection. 3. Knowledge platform: A participative tool to host all existing knowledge developed by research or derived from practical experience (AHDB knowledge hub/national library agrifood). 4. Research specimen archive. 5. Living collections: A collection of living organisms utilised for study and research purposes. 6. Physical library
	Network ⁹³	1. Formal network: An organised, governed consortium of actors (e.g. institutions, labs, farms, policy organisations). 2. Hub: A physical cluster or virtual coordination of independent actors. 3. Community: A peer-to-peer network.
	Facility ⁹⁴	1. Laboratory 2. Static equipment (including digital platforms or software) 3. Mobile equipment 4. Long-term research experiment 5. Advisory service/training service 6. Farm trials

3 / Analysis – research project data and funding

To determine what is **researched and funded across UK agricultural research projects**, data were collated from the sources outlined in Table 6. Over 489k research records were collated from data sources. After scoping, deduplication and consolidation of the dataset, e.g. consolidating parent/child project records with partner lists, filtering out projects that began before 2022 and classifying those out of the scope or less relevant to agriculture, a total of 2131 research projects were further analysed in the SARI dataset.

Table 6: Data type and sources collated for SARI project data analysis.

Type	Source (date range)	Number of records
UKRI projects and funding	IRC/Gateway to Research (to 2026)	406994
Defra projects and funding	Direct from Agri-Food team; Science Search (2021-2025); Contracts Finder (2015-2022)	29900
InnovateUK projects and funding	InnovateUK online (2016-2026)	51633
Data requests on projects and available online	<i>By organisation</i>	1003

Funding

For analysis, each research project record included:

- Full project title
- Abstract/summary (where available)
- Start and end year
- Funding awarded (not total project value)
- Lead partner(s)
- Funder (and funding programme where available/applicable)

Project data analysis

Two approaches to project data analysis were trialled and compared for accuracy and consistency. Both approaches are outlined in this section and the Large Language Model (LLM) was determined to be the most accurate approach for SARI.

Initial approach – text mining

The initial approach involved a two-stage text mining pipeline, to identify agriculture-related projects and classify them. This analytical approach was conducted in Python 3.12 using the following key packages: BERTopic (v0.15) for topic modelling; sentence-transformers for document embedding; umap-learn for dimensionality reduction;

hdbscan for density-based clustering; scikit-learn for text vectorisation; pandas and NumPy for data manipulation and matplotlib and seaborn for generating visualisations.

The sensitivity to vocabulary used in project abstracts were a limitation. Keyword-based classification did not always capture projects that use non-standard or highly technical terminologies, or that described agricultural applications only implicitly. BERTopic topic boundaries are also probabilistic and reflect the statistical structure of the corpus rather than definitive disciplinary boundaries. These limitations resulted in inconsistent classification of research projects, inclusion of out-of-scope projects in the dataset and some exclusion of relevant projects.

Final approach – human-moderated LLM

Given the limitations of text mining, a human-moderated and verified LLM approach was deemed a more effective method to analysis for the nuances of project data themes and contexts.

The LLM approach involved a similar two-stage process to (1) identify agriculture-related projects and (2) to classify them by topic (society, crops, livestock, soils & water, climate & weather, production and supply, systems and land use & ecosystems, see page 9). To achieve this, projects were initially identified using manual keyword searching and project identification. This involved the team's knowledge of relevant programme funding, key agricultural funders, specialist agricultural research organisations and topics. For all records remaining to be classified, further analysis with agricultural context validation was through Claude AI with repeated iterations of meaningful human review and scoping. This process was repeated for the pathways to impact (page 10) and R&D types (page 11) classifications.

The nine agricultural themes were assigned (page 9), based on UK research priorities, using Claude AI, and transparent reasoning was provided for each classification. Confidence scores based on the strength of evidence were provided and primary and secondary theme assigned where applicable (however, primary categories were used for the final analysis).

Several iterations of this approach were conducted to refine prompts and improve outputs. The Ag.Impact team manually reviewed coding attribution for accuracy within a subset of the data. Specifically, the team assessed the accuracy of topic, and pathway to impact categorisations and R&D types. Coding conventions were updated and refined as a result of manual review.

Relevance to agriculture

Some topics were updated iteratively to ensure that all projects could be categorised appropriately and to reduce the frequency of those coded inaccurately or as 'other'. This

highlighted some limitations to the initial LLM approach, including less confident attribution of classifications, largely due to **ambiguity** of agricultural relevance and/or **breadth** of research. Ambiguity included examples of research projects that sit on the boundaries of agricultural research (e.g. biodiversity and ecosystems research, food packaging and agricultural byproducts such as textiles). The breadth of projects included those which covered a wide range of research disciplines with cross-cutting issues, of which agriculture was often a small part (e.g. One Health, veterinary medicine or societal/behaviour change research).

To address this, these projects were still included in the dataset, but Claude AI was prompted to attribute a scoring system to projects where there was notable ambiguity for relevance and/or for projects that were specific to agriculture versus those with a wide breadth but had some implications for agriculture (using Table 7). Further manual review was completed to assess the accuracy of coding, and prompts were adjusted to ensure confidence in the LLM analysis approach.

Table 7: Relevance categories and definitions for ambiguity and breadth used in thematic mapping of projects.

Ambiguity	Definition
Definitely	Projects with a clear and direct focus on UK agriculture, including crop production, livestock farming, agricultural technology, soil/land management for farming, and related policy or evidence.
Fish	Projects focused primarily on fish, shellfish, aquaculture, seaweed/kelp cultivation, or marine protein production, which fall outside some definitions of agriculture.
Horses / equine	Projects focused primarily on equine species - including disease, welfare, or breeding - except where explicitly linked to food production.
Engineering biology	Projects focused on engineered or cell-based food production systems, including cellular agriculture, cultivated meat, precision fermentation, and recombinant protein manufacture.
Biofuels	Projects focused primarily on producing energy from biological feedstocks, including bioethanol, biomethane, hydrogen from biomass, and energy crop cultivation for fuel.
Biomaterials	Projects focused primarily on deriving non-food materials from agricultural or biological feedstocks, including textiles, construction materials, bio-based chemicals, and industrial applications with no direct agricultural end-use.
Ornamental horticulture	Projects focused on non-food plant production, including cut flowers, ornamental plants, amenity horticulture, and pharmaceutical plant cultivation outside the food chain.

Breadth	Definition
Mainly agriculture	Projects whose primary focus and expected applications sit within agriculture - including crop and livestock production, on-farm technology, agricultural policy, and farm-level environmental management.
Landscape & ecosystems	Projects with identifiable agricultural relevance but a primary focus on wider environmental, ecological, or land-use topics not confined to agricultural land, such as biodiversity monitoring, peatland restoration, nature-based solutions, natural capital valuation, water quality, forestry, or rural community development.

Breadth	Definition
One Health	Projects that address the interface between animal, human, and environmental health, including antimicrobial resistance surveillance across sectors, zoonotic disease emergence, vector-borne pathogen ecology, and food chain pathogen transmission, where the scope extends well beyond livestock species alone.
Basic bioscience	Projects conducting fundamental research with potential but not primary agricultural application, such as structural biology, genomics infrastructure, synthetic biology platforms, equipment purchases, and mechanistic studies in plant or animal science where the outputs serve a broad range of bioscience uses.
Food systems research	Projects focused on post-farmgate food chain activities - including food processing, manufacturing, safety testing, dietary health, consumer behaviour, food supply chain logistics, food waste valorisation, and novel food product development - where the primary focus extends beyond primary production.

Funding analysis

Across the dataset, projects starting from 2022 onwards are included in the analysis of spend. Prior to 2022 data on projects becomes patchy, with funding programmes affected by Covid and changes in the relationship between the UK and the European Commission's research Horizon programme.

Data across 2022 to 2026 is aggregated for most of the analysis as the year-on-year projects fluctuated due to timing of funding programmes, published project data, and significant on-off investments. Government has maintained overall investment in research in a challenging fiscal context, despite the annual totals of funding looking 'lumpy' from year-to-year. Data are included for 2026, although incomplete, to ensure the analysis reflects the latest initiatives and emerging trends. In future analyses of SARI, more project data will become available for 2025 and 2026 onwards as more projects are published.

Timelines to impact

Using the R&D type classification and estimated timeline to impact (Table 3), research projects were categorised by their R&D type and start year using the LLM moderate approach described in the previous section.

Once projects were allocated a primary R&D type, the corresponding impact estimates per project were used to model a ridgeline over time relative to funding for each of the topics across the project dataset, using a **novel** approach of predicting an impact area curve estimated of composite projects and funding amounts across the different topic areas. This was achieved using Claude Opus 4.8 (high) using the logic set out in the following sections.

What the charts show

In the report (section 6.2, Box 30) each chart displays how a research portfolio's funding per topic is distributed across its anticipated time to impact. The x-axis is years from project start; the y-axis is funding intensity (£M per year). Two curves are overlaid per chart: all projects in a topic (lighter fill) and the most relevant subset (darker fill).

Modelling project curves

Every project was represented as a single smooth “bump” on the timeline across its topic, built from four inputs: its award value, its earliest anticipated impact, its latest anticipated impact, and a peak position marking the most likely point of impact (earliest anticipated impact year + length of project in years).

Each bump area was modelled as a Beta distribution, chosen because it is naturally bounded at both ends and can be made asymmetric. The distribution was placed so that it:

- rises from zero at $x = 0$ (all project's start),
- peaks exactly at the project's mode point, and
- returns to zero at a closing point set to mode point + (latest anticipated impact – earliest anticipated impact)/2, so nothing is modelled beyond the project's plausible impact horizon.

Because the peak generally sits past the midpoint of the curve's span, each bump was left-skewed: impact builds gradually, concentrates around the expected point, then tails off more sharply. The Beta distribution shape parameters were derived from the normalised peak position p (the peak's fractional position along the bump), with a fixed concentration constant that controls how rounded the hump is; this guaranteed the mathematical peak lands on the supplied mode.

Interpretation

Each bump was scaled so that the area underneath it equals that project's award. This is the critical point of interpretation. It means:

- the **height** at any point reflects how **concentrated anticipated impact** is at that **time**, not money literally spent that year;
- the **total area** under a whole curve **equals the total funding** for that series.

For example, two projects with equal funding awards, but different horizons (e.g. different R&D types) therefore produce curves of equal area but different shape: a short-horizon project gives a tall, narrow bump; a long-horizon one gives a low, broad bump.

Aggregating projects

Within each topic series, all individual project bumps were then summed point-by-point along the timeline smoothed to a composite curve. Aggregation preserves the area property, so the composite's area still equalled the topic's total funding.

Limitation

This approach is a novel predictive model of anticipated impact, not measured outcomes: the curves encode judgements (timeline to impact window and estimated peak position) rather than realised results. The shapes are smooth deliberately and should be read as **distributions of expected timing**, not precise year-by-year forecasts. Each project's contribution is strictly confined to its own impact horizon.

4 / Analysis – research infrastructure

To determine the **types of agricultural research infrastructure across UK**, data were collated from the sources outlined in Table 8. Data were manually categorised based on infrastructure type (e.g. physical equipment and labs or virtual networks and databases) and distribution (e.g. virtual, single-site, multi-site). The full classification is in Table 5. Details on agricultural research infrastructures were then developed into an interactive online directory and can be explored in the dashboard.

Table 8: Data type and sources used for research infrastructure data.

Type	Source (date)	Number of records
InfraPortal	UKRI (2018/19)	216
Data request on infrastructure	<i>By organisation</i>	68

Infrastructure workshops

Workshops were completed with the aim to discuss and identify priorities among researchers and industry partners relating to research infrastructure. The aims of the workshops were to:

- Make sense of SARI findings to date, particularly around identifying any priorities for infrastructure investment.
- Test and build on these findings and refine some options suggested by survey participants.
- Gather diverse perspectives based on different expertise and experiences.
- Discuss research in the context of what it is for e.g. farming, food security, wider public interest.

This was completed in two broad phases:

1. Reflection on the types of research and their impact that they deliver, over different timescales.
2. Reflection for research infrastructure investment.

All workshops were recorded and transcribed using the Microsoft Teams record and transcribe function, and all recordings and transcripts were securely stored on a password protected One Drive. The Chatham House rule was agreed with participants prior to commencing each workshop. Informed consent was obtained via email.

Participant recruitment

Workshop participants were provided with an information sheet detailing what the SARI project is and aims to achieve, and what participation means for them.

Invitations targeted researchers involved in agriculture from diverse disciplinary backgrounds, with additional non-academic participants bringing policy, farming, other industry and civil society perspectives. Recruitment involved emailing prospective workshop participants with the participant information sheet and an invitation to the workshop that best aligned with the sector that they worked in.

This approach yielded a total of 59 participants, and details of attendance for each workshop are outlined in Table 9. Approximately half of the attendees were researchers.

Table 9: Total number of participants for the respective infrastructure workshops, including participant's primary sectors and the dates on which workshops were completed.

Sector	Participants (n)	Workshop date
Livestock	22	13.05.2026
Crops & mixed farming	20	18.05.2026
Horticulture	17	20.05.2026

Approach and structure

Three workshops were conducted, each with a focus on a different sector: livestock & mixed farming, crops & mixed farming, and horticulture. Workshops were organised, designed and facilitated by the Ag.Impact team. Each workshop lasted approximately 3.5 hours and were structured as follows:

1. Emerging findings from the project data analysis were presented and Q&As were completed.
2. Impact profiles as per the R&D type taxonomies were presented and led into a breakout session where small groups discussed:
 - Their reflections on the impact profiles presented and whether this was what participants expected to see.

- Views on how impact profiles should ideally look for their particular research area/focus.
 - Considerations of the investment in different types of research and what might be altered to achieve improved impact pathways.
3. Horizon scanning tasks were shared to encourage participants to ‘think ahead’ to what is needed. Breakout discussion prompts included:
- Considerations of where participant might be in ten years’ time.
 - Speculative discussion around what agricultural research could be possible in ten years’ time.
 - Reflections on what might make such research possible in that timeframe, including step changes in the way research is conducted.
4. Research infrastructure types and propositions were presented ahead of the final breakout discussions. Discussion prompts for this section included:
- What would participants advise the focus to be on for large-scale investment in agricultural research infrastructure?
 - Describe the priorities most important to the group.

Data analysis

Initial insights were gathered during the workshops through facilitated discussions and observations about research infrastructure. The workshop transcripts were then analysed with the assistance of Copilot to identify and explore emerging themes. These themes were reviewed and refined. From the infrastructure use reported in the survey, frequency charts were created to provide insight into what infrastructure was critical to researchers, now and in the future.

Propositions

In the report (section 8.4), the survey and workshops revealed concern among researchers and stakeholders over whether the UK’s research infrastructure is fit for purpose, and what may be needed in future. These infrastructure needs and investment priorities identified during SARI were summarised into four distinct high-level propositions:

1. Preserve
2. Predict
3. Ground
4. Connect

These were formulated using the following method:

- a) Claude AI (Opus) was used to assist with thematic analysis of researcher survey responses on (a) research infrastructure needs and (b) investment priorities. The

analysis was organised according to breadth (focused - broad) and format (single-site - distributed - virtual) of infrastructure.

- b) Results were shared and discussed at the workshops. Transcripts were analysed thematically after anonymisation using Copilot.
- c) Using the draft themes pulled out from the discussions, there was further human/manual discussion of survey results and workshop transcripts, creating an informed (human-generated) summary into four overarching propositions as described in the report.

5 / Analysis – surveys

Three surveys were designed with the aim to gather views and yield insights into **stakeholder perceptions of agricultural research** investment and activity, performance and impact and priorities and future direction. The survey was hosted on the QuestionPro online survey software platform.

The survey was designed to be relatively short and simple to complete, to ensure sufficient responses were obtained. Questions were broken up into the following sections for all surveys:

- Views on drivers of change in agriculture.
- Views on how public research funding should be invested.
- Views on how public money is currently invested in agricultural research.
- Views on uncertainties and their influence on participants own priorities.
- Views on how UK agricultural research is performing currently.

Finally, additional question sections for the researcher survey included:

- What infrastructures are used by researchers in different fields?
- What types of infrastructure do researchers expect to use in the future?

These questions were developed into a mix of sorting, rating and open text answers to ensure that rich details can be captured to compliment quantitative data where appropriate. A full list of survey questions is in the appendix.

Participant recruitment

The survey targeted farmers, researchers and other stakeholders including research funders, policy-makers, advisors and NGOs to enable research decision-makers to reflect on the similarities and differences between their perspectives and those of user/beneficiary groups. Participants provided informed consent prior to completing the survey.

Farmer recruitment

Primarily, farmer respondents (n=300 out of 314) were recruited through Five Bar Gate, Grounded Research's proprietary panel of over 2,000 verified UK farmers. Recruitment was incentivised. Multiple parameters were recorded for each respondent: on geographical region (NUTS1), farm size, enterprises, tenure, system, age and gender. Grounded Research gave oversight of the data to ensure participants were broadly representative of the UK farming population.

The use of an established, pre-validated specialist panel enabled recruitment to be conducted efficiently while maintaining a high standard of respondent authenticity and

relevance to the study population. Farmers were recruited between 3-16th February 2026.

To ensure that farmers were appropriately thanked for their involvement in the survey, a payment of £20 was distributed by Grounded Research after they had submitted their response.

Researcher recruitment

All researcher respondents (n=194) were recruited between 16th February and 18th April. A convenience sampling approach was employed, and participants were thanked for their time with either a voucher worth the value of £10 redeemable at over 300 outlets, or with a £10 donation to RABI, the Farmers' Charity. Many participants were contacted directly via email. The mailing list was comprised of emails found via targeted searching on the OpenAlex author list, the Agricultural Universities Council (AUC) mailing list and the Ag.Impact team's professional networks and contacts. Participants were also recruited via posts on LinkedIn, the Ag.Impact website, and through academic networks such as Agri-Food for Net Zero.

Other stakeholder recruitment

Other respondents (n=96) were recruited over the same period. A convenience sampling approach was employed, and no incentives were offered for completion of the other group. Participants were recruited via email from the Ag.Impact teams own professional networks and contacts, via LinkedIn and the Ag.Impact website, and professional networks. Grounded Research also shared the survey with their 'Crop to Shop' non-farmer panel.

Total sample size

This recruitment strategy resulted in a total of 618 survey responses across the three groups. After exclusion of non-UK participants, there was a total of 604 survey responses from farmers, researchers and others (n=314, n=194 and n=96 respectively).

Survey data

All survey results were combined for the purpose of data analysis, and participant demographics were summarised, with personal identifiers being anonymised prior to data analysis. Details included primary role of the respondent, participant location (nation/region), age and gender. Multiple approaches were required to analyse the range of survey question types (e.g. free text versus ranking questions). These approaches included: ranking analysis, linkage analysis, cluster analysis and regression analysis.

Free text responses were also thematically analysed with assistance from Claude AI, Sonnet 5 (medium). Prompts were updated iteratively after human moderation of results,

to ensure that the themes extracted from the data were accurate, clear and consistent with participant views. Data were analysed by participant group (farmer, researcher, other) to provide an overview of different perceptions from all three perspectives. Along with themes, Claude was prompted to provide quotes from the data to illustrate participant views in the context of the proposed themes.

6 / Analysis – key informant interviews

Semi-structured interviews were conducted with the aim to **explore key perspectives on agricultural research**, to identify relevant examples of what is and isn't going well, and to socialise SARI with key stakeholders. All interviews took place via Microsoft Teams or mobile phone and were recorded using Microsoft Teams or Microsoft Voice recorder and transcribed via Microsoft Teams or Word. All recordings and transcripts were securely stored on a password protected One Drive.

Participant recruitment

Interviewees were recruited via email using a targeted sampling approach. Participants (n=21 plus one email participant) provided informed consent via email. Interviewees spanned different research disciplines, including working in universities, institutes and industry, and based across devolved nations. There were also farmer, NGO, funder and supply chain contributors.

Interview approach and structure

A topic guide was used to ensure that there was a level of comparability across different interviews and to ensure that key topics were covered as much as possible. However, the approach could also allow participants to discuss what was important to them and offer their own perspectives.

Key question themes included:

- What interviewees involvement/relationship with research is
- What is going well in UK agricultural research?
- What could UK agricultural research do better?
- Speculative discussion on interviewees visions for how research can best contribute to the growing challenges and opportunities in UK agriculture.
- How might research change long-term (e.g. 2035)? What might drive that change?
- What would interviewee visions mean for research organisations like institutes and universities – priorities/the implications for them?
- What would interviewee visions mean for public research funders and government? [including but not limited to investment priorities and approach – could include governance of research funding, regulation/policy etc].
- Finally, interviewees were invited to offer advice on how SARI should frame research findings to make them as useful and relevant as possible.

Interview data analysis

Personal identifiers were removed and transcripts anonymised. Interviews lasted on average 51 minutes, ranging from 66 mins to 43 mins.

Insights from transcripts were summarised based on emerging and recurring ideas from interview participants. Overall themes were then developed with assistance from CoPilot. Outputs were reviewed and updated iteratively as interviews were completed. Prompts were updated iteratively to ensure that the themes extracted from the transcripts accurately represented participant views. All outputs were further refined to enable comparisons with all other data sources in the final SARI report.

7 / Analysis – citizen workshops

Citizen workshops

Two citizen workshops were held to contribute **independent public interest perspectives** on the emerging findings and research infrastructure investment propositions. One group of citizens met over two workshops with the following objectives.

Objectives:

- Understand citizens' baseline views, values and assumptions about farming and agricultural research.
- Introduce SARI and explain the value of an independent citizen perspective.
- Equip citizens to assess SARI findings by connecting them with the current research landscape and their Food Conversation experience.
- Gather citizens' views on research priorities, the funding landscape and infrastructure investment options.
- Test whether the proposals reflect real-world priorities and identify any gaps.

Participant recruitment

Participant recruitment was completed by the Food, Farming and Countryside Commission (FFCC). Citizen workshop participants (n=20) were drawn from the Food Conversation, across all four nations^{xcv}. They were included in this project because they are already informed and engaged on food systems, having taken part in deliberation on food and farming, worked through evidence, and thought about the future food system they want to see. Because of that shared grounding, the sessions were designed with links back to what they had covered before, including a recap of the Citizens Manifesto to Fix Food^{xcvi}, a key outcome of the Food Conversation, so that participants could situate the new discussions on farming research in work they had already done.

They were selected from a wider expression-of-interest pool of 108 people, which was broadly similar in spread. The aim was to have a mix within each category (across age, gender, ethnicity, education, employment and socioeconomic mix and voting intention), so that no characteristic was heavily weighted to one side and to make sure a range of people and circumstances was present in the room. Final selection was dependent on availability of participants to take part in workshops on the scheduled dates.

Approach and structure

The citizen workshops took place over two evenings (01.06.2026 and 03.06.2026) and lasted approximately 3.5 hours each. Workshops were planned and led by FFCC, with input and support provided by the Ag.Impact team. Both workshop structures are outlined below.

Workshop 1 introduced SARI and explored participants' views and experiences of farming and agricultural research. Presentations explained the role of agricultural research and current public funding, including early SARI findings, followed by discussion of research priorities, funding and survey results.

Workshop 2 revisited the first session and the FFCC manifesto, focusing on participants' hopes for food and farming and barriers to progress. Participants then reviewed researchers' infrastructure needs and considered which investment options were worthwhile, uncertain or missing.

Analysis

FFCC supported the project by summarising the workshop key discussions points into themes and observations. These were included in the qualitative dataset.

8 / Literature review and horizon scans

The project involved extensive literature reviews to provide the **basis for the approach, analysis and interpretation of results** gathered across SARI. Such evidence reviews included:

- Academic research publications on research classifications, investment assessments, impact timelines, and infrastructure
- Policy reports, evaluations and legislative documents
- Published research funding and priorities analyses, and horizon/foresight reviews
- Existing research infrastructure and classification taxonomies, including frameworks
- National and European investment reviews for research infrastructure
- Institutional press releases and updates

Four horizon scan reviews were completed to inform data analysis, describe the current drivers of change and foresight practices, and provide perspectives for workshops and the final conclusions:

- Drivers of change in research (Table 10)
- Drivers of change in agriculture (Table 11)
- Goals and targets for agriculture (Table 12)
- Research infrastructure lifecycles (Table 6)

All horizon scans were completed with the view to enable application of further context to SARI methods data and findings. Results from the survey, workshops and interviews on future impacts, priorities and challenges were compared with horizon analysis.

Table 10: Potential drivers of change in research.

Change	Drivers
Speed of analysis	The advances in AI suggest dramatic efficiency gains in research and amplified concerns about reproducibility, auditability, safety and equitable access. Recent advances in AI through 2025 enabled automated literature synthesis, hypothesis generation, organoid intelligence and climate scale forecasting. ^{xvii}

	AI is anticipated to enhance experimental design, make data analysis more efficient and interpret complex research findings (e.g. in genomics and epidemiology). AI technology and robotics is consistently increasing abilities to read and write DNA cost-effectively, compressing the time from gene discovery to varietal development. ^{xcviii}
Complexity of modelling	Algorithms designed to run quantum computers can excel at specific problems like factoring large numbers, database searching and simulating systems where quantum effects are important. Quantum computing is predicted to advance high-performance computing and push boundaries of what is currently 'computable'.^{xcix} Application of digital twins to agricultural and aligned sciences is expanding. They are expected to progress insights in precision agriculture (e.g. providing real-time data on soil conditions), weather predictions and offering decision support mechanisms (e.g. optimal planting times, additional irrigation needs and recommendations for specific crop varieties based on environmental conditions).^c Digital twins are likely to enhance the scale of research by enabling computer-based trials that simulate scenarios in parallel and reduce the need for costly and time-consuming physical prototypes or trials.^{ci} Developments in coupled multi-sector models (e.g. climate-food systems modelling) are advancing methods to enable assessments of whole food system pathways. Climate-food systems modelling may enable national and global sustainability research, with clearer and co-design recommendations for policy action. It may also offer a foundation for engaging and fostering dialogue among cross-country and multi sector research and policy actors.^{cii}
Granularity of field data	Adoption of quantum sensors is likely to rise due to outperforming classical sensors (because of their atomic level sensitivity). Sensors also enhance crop growth through the provision of nutrients and antioxidants and are used to detect harmful pollutants and chemicals from water sources and agricultural foods. ^{ciii}
Data interoperability	Advances in digital measurement, reporting and verification (MRV) systems are enabling a methodological standardisation that can develop better project design, bigger datasets and reproducible workflows, whilst narrowing questions to what is measurable. Specifically, such developments can create infrastructures for large-sample longitudinal datasets like greenhouse gas datasets across diverse farm types. ^{civ}
Scale of experimentation	Cyber infrastructures have become an important element of science and engineering research because they increase the scope of simulations and growing volumes of data generated by experimentation. These distributed research infrastructures are expected to underpin revolutions in big data, AI and influence capacity to perform research on a global scale.^{cv} Hyperconnectivity and the Internet of Things (IoT) have advanced real time monitoring and data collection of soil, water, livestock and pests via vast sensor networks. They may increase research potential and collaboration opportunities. Rising adoption of these technologies may lead to debates over openness and data sharing as a result, because it might be more difficult to maintain closed systems and data privacy.^{cvi} Large scale controlled environment agriculture (CEA) systems may influence research as a convergence platform, where multiple factors all operate together. CEA might provide a pivotal role in the global food supply if efficiencies in energy, control of growth environments, and waste stream utilisation are improved.^{cvi}

Automation of research	Self-driving laboratories (SDLs) have been developed to automate experimental tasks in chemical and material sciences. They can optimise research processes and reduce material usage. Advances in SDL development are expected to develop better equipped technologies which address the complexity of real-world challenges and become robust to deal with changing paradigms.^{cviii} The anticipated advances in self-driving laboratories (SLDs) have the potential to significantly reduce experiment turnaround times and operations costs compared to traditional laboratories.^{cix}
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Table 11: A summary of drivers of change in agriculture, collated from reports and research.

Topic	Driver	Details of driver and relevance to agriculture	Expected direction of change	Established or growing
Soils & water (e.g. soil health, water quality, flooding)	Rising public concern for waterway pollution ^{cx}	87.67% of adults in England reported that protecting the environment is important to them in 2023/2024, including sustainable use of natural resources such as waste, water and energy. ^{cx}	Pollution of fresh water (from anthropogenic sources) include excessive nutrients, pathogens, heavy metals, plastic and emerging pollutants. ^{cxii} Reduce nitrogen, phosphorous and sediment pollution from agriculture into the water environment by at least 40% by 2038. ^{cxiii}	Growing ^{cxiv}
	Growing adoption of agri-tech and precision farming ^{cxv}	Precision farming (responding to spatial and temporal differences within fields) has been adopted as a key tool by approximately 25% of UK farmers. ^{cxvi} Modern robotics are used to pick and harvest crops; milkers are widely deployed in dairy farmers to improve yield, sustainability and welfare. ^{cxvii}	Advances in proximal and remote sensing technology and modelling of multi-data resources could enable advanced precision farming products on a wider/affordable scale. ^{cxviii} Use of precision farming and robotics are expected to grow to meet food demands efficiently. ^{cxix}	Established ^{cxx}
	Water scarcity ^{cxxi}	An increase in the global population living in water scarce areas and reduced water availability. ^{cxxii}	Irrigated agriculture and agricultural intensification accounts for >70% of global water withdrawals. ^{cxxiii} Projected 50% of the global population living in water scarce areas by 2050. ^{cxxiv} Likely to need more water efficient agricultural practices.	Growing ^{cxxv}
	Soil erosion and degradation ^{cxxvi}	Soil erosion/degradation is an ongoing challenge, and soil health is required to ensure efficient water filtration and storage, sustainable production and climate resilience of food crops. ^{cxxvii}	Sustainable farming practices are gaining momentum by promoting biodiversity and soil health and minimising negative environmental impact. ^{cxxviii} There is an ongoing shift towards regenerative, ecological and multifunctional agriculture systems; irrigation efficiency improvements and improved fertiliser efficiency. ^{cxxix}	Established ^{cxxx}
Climate & weather (e.g. mitigation, sequestratio	Extreme weather events ^{cxxxi}	Increase in seasonal variations of weather and slow onset processes like rising sea levels. ^{cxxxii} Droughts, floods and storms expected to rise. ^{cxxxiii}	Adapting at farm and systems level to anticipate and respond effectively to extreme weather events is crucial for agricultural sustainability and food security. ^{cxxxiv} Several regions are likely to be affected by severe agricultural and ecological droughts between 2050-2059, even if global warming is stabilised at 2°C. ^{cxxxv}	Growing ^{cxxxvi}

n, adaptation)	Climate change ^{cxvii}	Global greenhouse gas (GHG) emissions from agriculture, forestry and land use have doubled since 1976 with an increase in agriculture-related GHG contributions to climate change by 2025. ^{cxviii}	Agrifood systems produced one third of all anthropogenic GHG emissions in 2015. ^{cxvix}	Growing ^{cxl}
	Net zero regulations ^{cxli}	Global greenhouse gas (GHG) emissions from agriculture, forestry and land use have doubled since 1976 with an increase in agriculture-related GHG contributions to climate change by 2025. ^{cxlii}	Net zero targets and initiatives aim to reduce agriculture's contribution to GHG emissions and climate change and decarbonise the UK economy, ^{cxliii} and the UK aim to reach Net zero by 2050. ^{cxliv}	Established ^{cxlv}
	Food security and food prices ^{cxlvi}	E ^{cxlvii} _{OBJ} The effects of climate change on food security are likely to influence food prices based on food supply systems with significant impacts on agricultural revenues. ^{cxlviii}	cxlix _{OBJ} Substantial reduction of production (due to climate change) will reportedly result in rising food prices. ^{cl} Consequences of large-scale afforestation with the view of increasing carbon sequestration also indicate higher food prices. ^{cli}	Established ^{clii}
Land use & ecosystems (e.g. biodiversity, habitat, agroforestry)	Decreasing land availability ^{cliii}	The UK's land is 'overpromised' _{OBJ} ^{cliv} Agricultural land accounts for 37% of land use globally. Cropland and land equipped for irrigation, available for agriculture per person, decreased between 1966-2019. ^{clv}	Land availability for agriculture is likely to continue to decrease as populations rise. ^{clvi} Multifunctional land use is seen as a way to meet demand for UK housing and infrastructure. ^{clvii} An estimated 1.4million hectares of additional land is needed by 2030 to meet current net zero and biodiversity targets, and a further rise to 4.4million hectares by 2050, which is over twice the land area of Wales and 18% of total UK land. ^{clviii}	Growing ^{clix}
	Ecological footprint and degradation of biodiversity ^{clx}	There is a global decline of genetic and species diversity. ^{clxi} Declining diversity is contributed to by unsustainable agriculture practices, agricultural intensification and resource intensive food supply chains. ^{clxii}	Efforts are likely to shift towards more multifunctional land use to meet targets for nature conservation. ^{clxiii} Reduction of biodiversity is projected to reach 38-46% by 2050. ^{clxiv} All UK administrations have committed to protect 30% of land for nature by 2030. ^{clxv}	Established ^{clxvi}
	clxviiclxviii	Increased temperatures and drought frequency affect heat-sensitive insects causing northward shifts in their geographical ranges. ^{clxix} Forests have seen large-scale diebacks and declines caused by	The degrading status of land and forests pose pressures on the food system and associated loss in biodiversity. ^{clxxi} Efforts might shift towards more multifunctional land use to meet targets for nature conservation. ^{clxxii} Commitments include increasing woodland cover to 14.8% land area by 2030 and 17% by 2050. ^{clxxiii}	Growing ^{clxxiv}

		biotic and abiotic factors with consequences for the maintenance of biodiversity, ecosystem function and resilience of native forests and woodland. ^{clxx}		
	Global deforestation and UK woodland creation targets ^{clxxv}	An increase in global yearly deforestation rates in primary tropical forests. Forested lands have been historically replaced by agriculture. Cattle accounted for 36% of all tree cover loss associated with agriculture between 2001 and 2015. ^{clxxvi}	The global forestation movement includes the recovery of degraded forests (reforestation and afforestation). ^{clxxvii} The UK aims to increase national woodland cover to 16.5% by 2050. ^{clxxviii}	Established ^{clxxix}
Crops (e.g. varieties, pests, nutrition, quality; incl. horticulture, forage)	Adoption of gene editing technologies ^{clxxx}	Gene editing technologies are being used to develop crops with greater resistance to pests, disease and climate stress. ^{clxxxi}	^{clxxxii} ^[OBJ] Development of novel breeding technologies could reduce the cost of developing crop varieties, enabling SME's ^{clxxxiii clxxxiv} Farmers are likely to modify the crops that they grow, but uncertainty of external factors (e.g. weather) makes it challenging to anticipate desirable traits. ^{clxxxv}	Growing ^{clxxxvi}
	Declining agrobiodiversity ^{clxxxvii}	There has been a global focus of international research, subsidies and support for a few crop species (e.g. high value crops), which has contributed to a decline in agrobiodiversity. ^{clxxxviii clxxxix} ^[OBJ]	A lack of adaptive capacity may drive farmers away from diverse crops, reduce the resilience of food systems (e.g. by increasing the risk of crop loss from pests, disease, drought and a loss of local/indigenous knowledge) and favour monoculture. ^{cxc} Global goals to reduce risks and negative impacts of pollution from all sources, to levels that are not harmful to biodiversity and ecosystem functions/services by 2030. ^{cxi}	Established ^{cxcii}
	Plant pest and disease outbreaks ^{cxciii}	Pests and diseases hamper yields and yield growth. ^{cxciv} Plant pests and diseases are responsible for the loss of 20-40% the global crop production annually. ^{cxcv}	Prompt interventions, the application of crop protection, and providing adequate resources will ensure protection methods are mobilised promptly. ^{cxcvi} UK National Action Plan aims to support farmers, growers and other land managers to voluntarily embrace alternative measures to reduce harm from pesticides by 10%, by 2030, whilst controlling pests and pesticide resistance effectively. ^{cxcvii}	Growing ^{cxcviii}
	Pesticide withdrawals ^{cxcix}	Overuse of pesticides impact the health of producers, consumers and can cause biodiversity loss. They also pollute water and	There are ongoing efforts to encourage the uptake of Integrated Pest Management (IPM) in agriculture and horticulture, and to prioritise nature-based solutions, supporting improved soil health,	Established ^{cciii}

		soil; damage living organisms and contribute to spreading of pest resistance. ^{cc}	biodiversity and water quality. ^{cci} It is also possible that a greater shift towards genetically engineered crops with herbicide tolerance or insect resistance will be seen. ^{ccii} Global targets have been set to reduce pesticide use by 50% by 2030	
Livestock (e.g. breeds, diseases, nutrition, welfare, quality)	Rising frequency and risk of zoonotic infections ^{cciv}	Human health is intrinsically linked to animal, plant and environmental health. ^{ccv} Emerging infectious diseases are increasing, and global public health is severely affected by agricultural management of livestock. Zoonotic disease and antimicrobial resistance (AMR) challenges pose concern for global food security, and the global threats have been estimated to impact 25% of animal production. They also cause reduced consumer confidence. ^{ccvi} Pandemic potential and AMR threaten food security, and have broad economic, social and environmental impacts. ^{ccvii} However, antimicrobial use (AMU) in UK livestock sectors have reduced by 57% to date, and by 83% for High Priority-Critically Important Antimicrobials (HP-CIA's). ^{ccviii}	An estimated 10million lives a year and \$100 trillion in economic output estimated to be at risk from drug-resistant infections, through disruption of food supply chains, by 2050. ^{ccix} Committed international coordination to develop and implement collective global health protection strategies.^{ccx} A shift to support existing antimicrobial stewardship efforts and to improve disease surveillance to pre-empt and minimise pandemic potential.^{ccxi} UK targets to reduce (e.g. by 20% in farmed pigs) or maintain (e.g. laying hen production to remain below 1%) low levels of AMU by 2029 across all livestock sectors.^{ccxii} <i>Targets for other sectors to be included in RUMAs Summer 2026 Ruminant Roadmap.</i>^{ccxiii}	Growing ^{ccxiv}
	Impact of livestock farming on climate change ^{ccxv}	Animal products (meat, eggs, dairy, or fish) contribute the highest amount of agricultural GHG emissions. Contributions from the livestock sector to GHG emissions are projected to increase nearly two-fold by 2050. ^{ccxvi} Global GHG contributions from animal production are projected to almost double by 2050. ^{ccxvii}	A shift in livestock farming towards low carbon farming practices, increased carbon storage on farms, carbon sequestration through livestock grazing systems and exploring methods of methane suppression to tackle the challenges associated with the livestock sectors contribution to climate change. ^{ccxviii} The UK Net Zero Strategy has outlined ambition for 75% of farmers in England to be engaged in low carbon practices by 2030, rising to 85% by 2035. ^{ccxix}	Established ^{ccxx}

	Public concern for animal welfare ^{ccxxi}	82% of EU citizens felt that increased efforts are needed to protect animal welfare in livestock production. ^{ccxxii}	The livestock sector will likely focus on assuring animal welfare status in livestock production. Trade and important standards are being reviewed to maintain bans on hormone treated meat and poultry, and considering animal welfare clauses in trade agreements. The Livestock health and welfare strategy also makes commitments to systemic welfare improvements and powers to provide support. ^{ccxxiii}	Established ^{ccxxiv}
	Genetic improvement targets for livestock ^{ccxxv}	Rising populations and increasing income is likely to stimulate demand for higher quality food ^{ccxxvi} and there have been notable efforts in the last decade to select traits in livestock for robustness, efficiency, growth and product quality. ^{ccxxvii} Genetic improvements have also been encouraged to meet climate targets. ^{ccxxviii}	There will likely be a shift towards selecting for functional traits including health, resilience, productivity and reducing emissions. ^{ccxxix} These might include further advances in technology for selective breeding, artificial insemination, development of estimated breeding values and genomic profiling. ^{ccxxx}	Growing ^{ccxxxi}
Food production & supply (e.g. primary processing, storage, traceability, cellular agriculture)	Population growth and increased demand on food supply ^{ccxxxii}	Population has accelerated and saw a 48% increase in global population between 1990 and 2020. ^{ccxxxiii} Estimates from 2022 indicate that 29.6% of the global population were moderately or severely food insecure. ^{ccxxxiv}	Global population is projected to peak at 10.3billion and will increase both production pressures and food security risk. ^{ccxxxv} There is a need for food systems transformation to enable sustainable food production for growing populations and reduce food insecurity challenges. ^{ccxxxvi} Populations are expected to peak at 10.3billion by 2084. ^{ccxxxvii} Global food demand is expected to increase by 30-60% by 2050. ^{ccxxxix}	Growing ^{ccxli}
	Post-harvest food loss and food safety challenges ^{ccxlii}	Higher temperatures and humidity increase post-harvest loss from pests and diseases, increase occurrence of food-borne diseases and contamination, and raise the cost of refrigeration and other forms of preservation. ^{ccxliii}	Supply chains are seeing technical innovations to develop more efficient cold chains for perishables and sustainable packaging that maintain the quality, safety and nutritional value of products. There is likely to be a shift towards sustainable food preservation via technological developments. ^{ccxliv} Projected impacts of big data and technological development to reduce food loss by 2-5% by 2030 ^{ccxlv}	Established ^{ccxli}
	New food sources and production systems ^{ccxlvi}	New food sources and production systems were identified as an emerging issue with significant implications for future food safety. Technological advancements have	An evolving human-food-computer interaction (HFCI) is a reported trend, which aims to transform food by making it personalised and sustainable whilst reducing waste. HFCIs are expected to contribute to food safety in the next 5-15 years. ^{ccxlviii}	Established ^{ccxlix}

		allowed for the development of new food sources including plant based products which mimic animal-based foods; whilst new food production systems include cell-based food production. ^{cclxlvii}		
Society (e.g. behaviour, attitudes, mental health, farmworker housing)	Global pandemics ^{ccli}	The Covid-19 pandemic emerged as a driver for uncertainty of food systems, impacting multiple facets from production to consumption ^{ccli}	Disruptions to supply chains, altering demand patterns and highlighted food insecurity. Lockdowns and travel restrictions previously resulted in labour shortages and logistical challenges, further causing delays and increased food waste. Monetary poverty and job losses were notable during the Covid-19 pandemic globally, and consumer behaviour shifted towards non-perishable foods leading to supply-demand imbalances. ^{ccliii} Improve biosecurity and manage endemic disease risk. Support goal to eradicate bovine tuberculosis (bTB) by 2038. ^{ccliii}	Growing ^{ccliv}
	Farmer mental health pressures ^{cclv}	Extreme weather conditions, poor harvest and uncertainty around the sustainability and future direction of the agriculture industry influence the mental wellbeing of the farm workforce. ^{cclvi} These factors are further exacerbated by contextual stressors (e.g. policy changes, negative public perception), farm stressors (e.g. long hours, poor physical health) and barriers to support (e.g. stigma, limited mental health education, social isolation). ^{cclvii}	The ongoing mental health pressures require shifts towards better support for farmers and farm workers. ^{cclviii}	Established ^{cclix}
Economy (e.g. trade, farm business performance)	Agricultural policy and payments ^{cclx}	Revised agricultural payments such as Sustainable Farm Incentives (SFI26), aim to spread funding across more farms and reduce the number of available actions to 71 (from 102) and is capped at £100,000 per year. ^{cclxi}	Changes including new requirements for each farm to hold only one SFI26 agreement mean that arrangements between farms require multiple farm businesses to work together to deliver environmental outcomes at scale. ^{cclxii}	Established ^{cclxiii}

e, labour market)	Global economic growth ^{cclxiv}	Annual growth is forecast for the world economy of 2.7%. ^{cclxv}	Global economic growth is expected to rise, and its influence on food choices and dietary behaviour are uncertain, with starkly diverging growth patterns among low- and middle-income regions. ^{cclxvi} Global GDP is predicted to increase to \$126 trillion in 2050 (from \$50 trillion in 2005-2007). ^{cclxvii}	Growing ^{cclxviii}
	Food price volatility ^{cclxix}	The real food price index (RFPI) shows steady decline between 2010 and just before the Covid-19 pandemic. A drastic spike was observed in the RFPI in 2020-2021 which stabilised in 2022-2023. ^{cclxx}	Since 2023, there have been increases in the RFPI for vegetable oils, dairy products and sugar which was counterbalanced by decreases in those of cereals and meat. RFPI forecasts are uncertain because of various/unpredictable factors including technological changes, policies, yields, market modifications and conflicts. ^{cclxxi} In 2030, healthy diets are projected to remain more expensive than nutrition options ^{cclxxiicclxxiii}	Established ^{cclxxiv}
	Concentration in the food value chain ^{cclxxv}	Concentration of agri-food activities within a limited number of corporate giants provide an example of structural change. ^{cclxxvi}	Concentration of agri-food activities influences pricing, bargaining power, data ownership, access to resources and diets. This may result in exploitation of farmers, inequitable distribution of profits, and challenges in achieving sustainability and resilience for the agricultural industry. ^{cclxxvii} Market concentration is already profound in the agri-input sector. ^{cclxxviii}	Established ^{cclxxix}
	Decreasing ^{cclxxxclxxxi}	Geopolitical competition and the rise of populist nationalisms have placed strains on the foundations of international cooperation (e.g. halting the World Trade Organisation and United Nations Security Council). ^{cclxxxii} Food trade is historically, a catalyst for geo-economic and geopolitical conflict. ^{cclxxxiii}	There is a shifting political landscape (Western relative decline and Eastern ascent), alongside growing influence of non-state actors. ^{cclxxxiv} This shift has notably led to uncertainties for future conflicts and crises e.g. 54 armed active conflicts took place globally in 2019. ^{cclxxxv} There is also an increase in forced migration and displacement caused by conflict-related crises. ^{cclxxxvi} This shift has been linked with significant disruptions in agricultural production and food supply chains. ^{cclxxxvii}	Established ^{cclxxxviii}
Systems (e.g. cross-cutting issues, complexity,	Calorie demand ^{cclxxxix}	Calorie demand is predicted to rise between 49-56% depending on uncertain factors. ^{ccxc}	Demand for animal products, vegetable oils, sugar, ultra-processed foods and high fat and salty snacks is expected to grow by 2050. ^{ccxci} Future diet choices are uncertain, but projections suggest that the food system will need to adapt to growing calorie intake and dietary shifts. The gap between high-income and low-middle	Established ^{ccxciii}

transitions, healthy & sustainable diets)			income countries, in calorie intake, is likely to reduce towards 2050. ^{ccxcii}	
	Consumption of processed foods ^{ccxciv}	Patterns of dietary shifts show consumption of processed and ultra-processed foods, particularly in urban lifestyles and those who have both high and low incomes (due to disposable income and/or inexpensive processed foods being more accessible). ^{ccxcv}	Projections are not available, but assumptions for different scenarios can be seen via endnote. ^{ccxcvi}	Established ^{ccxcvii}
	Plant-based diets ^{ccxcviii}	Preferences for plant-based diets have risen in recent years. They have also been linked with digitisation and innovation in plant-based food production. Food industries continue to leverage on consumers awareness of impacts and ethical concerns around animal-based diets and are increasingly producing plant-based alternatives. ^{ccxcix}	41% of the UK population reported following diets that are either reducing or contain no meat, and 56% reported plant-based consumption in the previous month. Monthly consumption of vegetable-based meals was recently reported at 37%, followed by plant-based milk alternatives at 27%, and plant-based meat at 23%.^{ccc} Plant-based diets have been associated with reduced pressure on natural resources because plant-based foods typically require fewer resources to produce compared to animal products.^{ccci} It is likely that innovation will continue to develop plant-based foods to accommodate changing diets, but many products are typically ultra-processed and implications for health are not understood.^{cccii}	Growing ^{ccciii}

Table 12: A summary of targets and goals relevant to UK agriculture. These include examples set by: multilateral agreements, UK government, national governments and independent advisory bodies (e.g. Committee on Climate Change).

Topic	Policy/legislation	Targets	Significant date	Where?
Soils & water (e.g. soil health, water quality, flooding)	Environmental improvement plan 2023 ^{ccciv}	Restore 250,000 hectares of degraded peatland by 2030.	2030	Scotland
	Water demand: Environment Act target delivery plan 2025 ^{cccv}	Reduce the use of public water supply in England per head of population.	9% by 2027 14% by 2032	England
	Water demand Environment Act target delivery plan 2025 ^{cccv}	Reduce water leakage (which currently represents 20% of water demand).	20% by 2027 30% by 2032	England
	Courtauld 2030 Water Roadmap (WRAP) ^{cccvi}	50% of the UK's fresh food to be sourced from areas with sustainable water.	2030	UK
	25 Year Environment Plan ^{cccvi}	Minimise the harmful bacteria in designated bathing waters and continue to improve the cleanliness of waters and warnings of short-term pollution risks.	2030	UK
	Environment Act 2021 ^{cccix}	Reduce nitrogen, phosphorous and sediment pollution from agriculture into the water environment by at least 40%.	2038	UK
	Environment Act 2021 ^{cccix}	Reduce phosphorus loadings from treated wastewater by 80%.	2038	UK
	Environmental Improvement plan 2023 ^{cccxi}	40%-60% of agricultural soil to be under sustainable management.	40% by 2028 60% by 2030	UK
Climate & weather (e.g. mitigation,	Climate Change Act 2008 (Amended 2019) ^{cccxi}	Reach net zero greenhouse gas emissions.	2050	UK

sequestration, adaptation)	Global Biodiversity Framework 2022 ^{cccxi}	Reduce pollution risks and the negative impact of pollution from all sources, to levels that are not harmful to biodiversity and ecosystem functions and services.	2030	Global
	Government Plan for Change ^{cccxiv}	Achieve 95% low-carbon electricity generation; fully decarbonised power systems.	95% by 2030 100% by 2035	UK
	25 Year Environment Plan ^{cccxv}	Minimise waste, reuse materials and manage materials at the end of their life to mitigate the impact on the environment.	Eliminate avoidable plastic waste by 2042 Ambition of zero avoidable waste by 2050.	UK
Land use & ecosystems (e.g. biodiversity, habitat, agroforestry)	Environmental Act 2021 (updated 2025) ^{cccxvi}	All new developments deliver a 10% net gain in biodiversity.	2026 induction date for nationally significant infrastructure projects (NSIPs)	England
	30 by 30 ^{cccxvii}	Protect 30% of land and seas.	2030	UK
	30 by 30 ^{cccxviii}	At least 30% of areas of degraded terrestrial, inland water, and marine and coastal ecosystems are under effective restoration.	2030	UK
	Sustainable Farming Scheme ^{cccxi}	Create or restore wildlife habitats on at least 10% of farmed land.	2025	Wales
	Global Biodiversity Framework 2022 ^{cccxx}	Conserve 30% of land, waters and seas.	2030	Global
	Global Biodiversity Framework 2022 ^{cccxxi}	Prevent, reduce and work towards eliminating plastic pollution.	2030	Global
Crops (e.g. varieties, pests, nutrition, quality; incl. horticulture, forage)	Global Biodiversity Framework 2022 ^{cccxxii}	Reduce risks from pesticides and highly hazardous chemicals by 50% (considering food security and livelihoods).	50% by 2030 100% by 2050	Global
	Global Biodiversity Framework 2022 ^{cccxxiii} & UK Pesticides National Action Plan 2025 ^{cccxxiv}	Reduce each of the 20 Pesticide Load Indicator (PLI) metrics By at least 10%.	2030	Global

Livestock (e.g. breeds, diseases, nutrition, welfare, quality)	Global Biodiversity Framework 2022, ^{cccxv}	Genetic diversity within populations of wild and domesticated species, is maintained, safeguarding adaptive potential.	2050	Global
	The Seventh Carbon Budget ^{cccxvi}	Allow land to be released out of livestock production for alternative uses, reducing the number of cattle and sheep by 27%.	2040	UK
	Animal Health and Welfare Pathway 2025 (updates due 2026) ^{cccxvii}	Improve biosecurity and manage endemic disease risk. Support goal to eradicate bovine tuberculosis (bTB).	2038	UK
	RUMA Targets Task Force (TTF) 3 ^{cccxviii}	20% reduction in antibiotic use in the pig sector.	2029	UK
	RUMA Targets Task Force (TTF) 3 ^{cccxix}	Maintain laying hens treated with antibiotics below 1%, and HPCIA use below 0.05% (same targets from TTF2 to TTF3). Continue annual rolling reductions of antibiotic use for other livestock sectors.	2029	UK
Food production & supply (e.g. primary processing, storage, traceability, cellular agriculture)	Industry Strategy, Scotland 2023 ^{cccxix}	Grow the food and drink sector to £30 billion in turnover.	2030	Scotland
	Defra Farming Innovation Programme ^{cccxix}	£200 million investment to drive agri-tech innovation, supporting robotics and automation, sensor systems, precision breeding and low-emission farming.	2030	UK
Society (e.g. behaviour, attitudes, mental health, farmworker housing)	Sustainable Development Goals (SDGs) ^{cccxii}	SDG 1 – Reduce poverty in agricultural communities, improve rural livelihoods, and secure farm income stability.	2030	Global
	Sustainable Development Goals (SDGs) ^{cccxiii}	SDG 2 – End hunger, achieve food security and improved nutrition and promote sustainable agriculture.	2030	Global

	Sustainable Development Goals (SDGs) ^{cccxixiv}	SDG 12 – Ensure sustainable consumption and production patterns.	2030	Global
Economy (e.g. trade, farm business performance, labour market)	Global Biodiversity Framework 2022 ^{cccxv}	Mobilise finance to close the biodiversity finance gap of \$700bn.	2050	Global
	Global Biodiversity Framework 2022 ^{cccxvi}	Eliminate or reform harmful subsidies by \$500bn per year.	2050	Global
	Growing Skills and Innovation ^{cccxvii}	Seasonal worker visa route extension ends.	2029	UK
	The UK Modern Industrial Strategy – Advanced Manufacturing Sector Plan ^{cccxviii}	Drive growth across the economy via doubling annual business investment in the sector from £21 billion to £39 billion.	2035	UK
Systems (e.g. cross-cutting issues, complexity, transitions, healthy & sustainable diets)	Global Biodiversity Framework 2022 ^{cccxix}	Ensure that areas under agriculture, aquaculture, fisheries and forestry are managed sustainably via increase of sustainable intensification, agroecology and other innovative approaches, contributing to resilience and long-term efficiency and productivity of production systems, and to food security.	2030	Global
	Global Biodiversity Framework 2022 ^{cccxl}	Take effective legal, policy, administrative and capacity-building measures to ensure fair and equitable sharing of benefits from the utilisation of genetic resources and from digital sequence information on genetic resources and traditional knowledge.	2030	Global
	Sustainable Development Goals (SDGs) ^{cccxli}	End all forms of malnutrition.	2030	Global
	Climate Change Committee ^{cccxlii}	Reduction in meat and dairy consumption.	20% by 2030 35% meat reduction by 2050	UK

9 / Appendix

Survey in full

Share your views on the State of Agricultural Research and Innovation. The UK spends millions each year on agricultural research, but there is currently no overall picture of where that money is going, or how well it fits with anyone's priorities. This survey is part of a project to provide that evidence. Called the 'State of Agricultural Research and Innovation' (SARI), the project is run by an independent team from the Centre for Agricultural Research Impact (Ag.Impact), working with the main UK agricultural research organisations and public funders. The survey is open to anyone with a professional interest in agriculture, food or land use. It takes around 15-20 minutes to complete, though researchers will be asked a few extra questions which will take a bit longer. SARI is supported by Economic and Social Research Council (ESRC) grant ES/X010759/1 to the Innovation & Research Caucus (IRC). We are very grateful to the project sponsors at UK Research & Innovation (UKRI) for their input into this research.

How your data will be used The survey is hosted using QuestionPro, a GDPR-compliant survey platform, and distributed with support from Grounded Research. Your responses will be used only for this research, analysed in aggregate and reported anonymously. Any personal data will be stored securely, handled in line with GDPR and removed before analysis. If you are already a member of a Grounded Research panel (such as Five Bar Gate), your response may be linked internally for research management purposes, but your name and contact details will not be shared with the SARI research team. At the end of the survey, you may optionally choose to sign up to receive updates about SARI, and/or to a Grounded Research community for future research invitations. This is separate from this survey and entirely optional. Taking part is voluntary and you may stop at any time. For questions or concerns, contact: hello@ag-impact.org Consent By continuing, you confirm that you understand how your data will be used and consent to take part in this survey.

1. I consent to take part

Which of the following best describes your primary role?

1. Farmer or farm worker
2. Researcher (university or research institute)
3. Agricultural adviser or consultant
4. Agri-tech or agricultural input business
5. Food processing, manufacturing or distribution
6. Food retail or food service
7. Estate, land or environmental management
8. Government or public body
9. NGO, charity or industry body
10. Other _____

As a researcher, you are eligible for a £10 incentive for completing this survey. Please choose how to receive it: as a digital voucher redeemable with over 500 brands which you will receive within 14 days of completing the survey as a donation to RABI, the farmers's charity or you can choose not to receive an incentive. How would you like to proceed?

1. As a digital voucher
2. As a donation to RABI, the farmers' charity
3. I prefer not to receive an incentive

In which nation or English region is your main place of work?

1. Northern Ireland
2. Scotland
3. Wales
4. North East England
5. North West England
6. Yorkshire and the Humber
7. East Midlands
8. West Midlands
9. East of England
10. South East England
11. South West England
12. Greater London
13. Outside the UK

What is your age range?

1. Under 18
2. 18–24
3. 25–34
4. 35–44
5. 45–54
6. 55–64
7. 65 or over
8. Prefer not to say

Please tell us the gender you identify as?

1. Male
2. Female
3. Non-binary / third gender
4. Prefer not to say

The next questions are about your experience and knowledge of agricultural research. Thinking about agricultural research and innovation in general, how would you describe your level of understanding?

1. Very good understanding
2. Fairly good understanding
3. Some understanding
4. Limited understanding
5. No real understanding
6. Not sure

Which field of agriculture is your research most closely related to?

1. Soils & water (e.g. soil health, water quality, flooding)
2. Climate & weather (e.g. mitigation, sequestration, adaptation)
3. Land use & ecosystems (e.g. biodiversity, habitat, agroforestry)
4. Crops (e.g. varieties, pests, nutrition, quality)
5. Livestock (e.g. breeds, diseases, nutrition, welfare, quality)
6. Food production & supply (e.g. primary processing, storage, traceability, cellular agriculture)
7. Society (e.g. behaviour, attitudes, mental health, farmworker housing)
8. Economy (e.g. trade, farm business performance, labour market)
9. Systems (e.g. cross-cutting issues, complexity, transitions, healthy and sustainable diets)
10. Other _____
11. Prefer not to say

In the past five years, have you personally been involved in any of the following? (Select all that apply)

1. On-farm trials or demonstrations
2. Providing data for research or monitoring
3. Participating in research interviews, surveys or workshops
4. Collaborative projects with research organisations
5. Using findings from agricultural research in decision-making
6. None of the above

We are now going to ask about the big issues driving change in UK agriculture. Thinking about the biggest changes you have seen in UK agriculture over the past decade (since 2016), what influence did the following have?

	No impact	Mainly negative impact	Mixed impact	Mainly positive impact	Not sure
New technology (e.g. inputs, machinery, software, infrastructure)	☐	☐	☐	☐	☐
Changing practices (e.g. direct drilling, cover cropping)	☐	☐	☐	☐	☐
New systems (e.g. regen ag, agroecology, short supply chains, vertical farming, diversification)	☐	☐	☐	☐	☐
New knowledge & skills (e.g. advice, knowledge exchange, education)	☐	☐	☐	☐	☐
Changing markets (e.g. standards, supply chain practices, customer demands)	☐	☐	☐	☐	☐
Changing policy (e.g. payments, regulations, trade)	☐	☐	☐	☐	☐
Events (e.g. weather extremes, pest or disease outbreaks)	☐	☐	☐	☐	☐

Were there any OTHER factors that had a major influence on UK agriculture over the decade? Please leave blank if there were none.

We are now going to ask you about the big issues driving change in UK agriculture. Thinking about the biggest changes you have seen on your farm over the past decade (since 2016), what influence did the following have?

	No impact	Mainly negative impact	Mixed impact	Mainly positive impact	Not sure
New technology (e.g. inputs, machinery, software, infrastructure)	☐	☐	☐	☐	☐
Changing practices (e.g. direct drilling, cover cropping)	☐	☐	☐	☐	☐
New systems (e.g. regen ag, agroecology, short supply chains, vertical farming, diversification)	☐	☐	☐	☐	☐
New knowledge & skills (e.g. advice, knowledge exchange, education)	☐	☐	☐	☐	☐
Changing markets (e.g. standards, supply chain practices, customer demands)	☐	☐	☐	☐	☐
Changing policy (e.g. payments, regulations, trade)	☐	☐	☐	☐	☐
Events (e.g. weather extremes, pest or disease outbreaks)	☐	☐	☐	☐	☐

Were there any OTHER factors that had a major influence on your farm over the decade? Please leave blank if there were none.

Now looking to the future, how soon do you expect changes in the following areas to have a major influence on UK agriculture?

	0-5 years	6-10 years	More than 10 years	Never	Not sure
Migration	☐	☐	☐	☐	☐
UK standard of living	☐	☐	☐	☐	☐
Global prices	☐	☐	☐	☐	☐
Corporate power	☐	☐	☐	☐	☐
Diets & consumer behaviour	☐	☐	☐	☐	☐

AI & cyber	☐	☐	☐	☐	☐
Climate & weather	☐	☐	☐	☐	☐
Land & nature degradation	☐	☐	☐	☐	☐
Pandemics	☐	☐	☐	☐	☐
UK politics	☐	☐	☐	☐	☐
International politics	☐	☐	☐	☐	☐

Research can influence agriculture in many ways – understanding farming practices, developing tools, shaping policy – though it can take years or even decades to have this impact. Please keep this in mind as you answer the next questions...

The next set of questions is about where research effort should be focused. It will be in three parts. Challenges and opportunities facing UK agriculture. The topics where research can most help. How research might be applied in practice

1. Challenges and Opportunities. These first questions are about the challenges and opportunities facing UK agriculture. Overall, how do you see the priorities for UK agriculture? Please rank from most important to least, leaving out any that you think are irrelevant or unimportant.

- Animal welfare _____
- Healthy diets _____
- Food security _____
- Thriving rural communities _____
- Profitable farming _____
- Growing the UK economy _____
- Resilience _____
- Circular economy _____
- Net zero _____
- Nature recovery _____

2

How would you describe the biggest challenge or opportunity facing UK agriculture?

2. The Topics. Now we will ask about the topics research should focus on. Where can research most help to meet the challenges and opportunities facing UK agriculture? Please rank from most help to least, leaving out any that you think are irrelevant or unimportant.

- Soils & water (e.g. soil health, water quality, flooding) _____
- Climate & weather (e.g. mitigation, sequestration, adaptation) _____
- Land use & ecosystems (e.g. biodiversity, habitat, agroforestry) _____
- Crops (e.g. varieties, pests, nutrition, quality; incl. horticulture, forage) _____

- Livestock (e.g. breeds, diseases, nutrition, welfare, quality) _____
- Food production & supply (e.g. primary processing, storage, traceability, cellular agriculture) _____
- Society (e.g. behaviour, attitudes, mental health, farmworker housing) _____
- Economy (e.g. trade, farm business performance, labour market) _____
- Systems (e.g. cross-cutting issues, complexity, transitions, healthy & sustainable diets) _____

Please explain why you chose the topic at the top of your list.

3. In Practice. For the final questions in this section, we will ask you about how research can make a difference in practice. How is research most likely to help meet the challenges and opportunities facing UK agriculture? Please rank the following, from how you think research can make most difference to least, leaving out any that you think are irrelevant or unimportant.

- Infrastructure (e.g. developing and testing animal housing, crop storage, electrification, irrigation) _____
- Hardware (e.g. developing robots, drones, large machines and processing equipment) _____
- Software (e.g. implementing AI, decision support and digital twin tools) _____
- Genetics (e.g. developing varieties, breeds including those more suited to future climates) _____
- Inputs (e.g. fertilisers, pesticides, biologicals, including reduction of their use and alternatives) _____
- Practices (e.g. testing the effects of practice such as direct drilling or cover cropping) _____
- Systems (e.g. measuring outcomes of regen ag, agroecology, vertical farming or cellular agriculture) _____
- Knowledge & skills (e.g. developing and sharing advice, knowledge exchange and education) _____
- Markets (e.g. guiding standards, supply chain practices or market development) _____
- Policy (e.g. providing evidence on payments, regulations, tax or trade) _____
- Monitoring (e.g. remote sensing, baselining, early warning systems) _____

Please explain why you chose the option at the top of your list.

The next question is about your general views of UK agricultural research. Based on what you know or have experienced, to what extent do you agree or disagree that UK agricultural research is currently:

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Not sure
Good value for public money	☐	☐	☐	☐	☐	☐
Being applied in practice	☐	☐	☐	☐	☐	☐
Focused on the most important issues	☐	☐	☐	☐	☐	☐
In touch with farmer and other stakeholder priorities	☐	☐	☐	☐	☐	☐
Communicated effectively	☐	☐	☐	☐	☐	☐
Coordinated efficiently across organisations	☐	☐	☐	☐	☐	☐
World-class	☐	☐	☐	☐	☐	☐
Delivered by organisations acting in the public interest	☐	☐	☐	☐	☐	☐

Please visit this interactive directory of infrastructure available for agricultural research before answering the next questions. Explore UK research infrastructure >

Having explored the infrastructure directory, please let us know of any important infrastructure that is missing.

We are going to start by asking about the research infrastructure (repositories, networks, and facilities) you have used in the past five years, and then move on to what you plan to use in the future. Firstly, how have you used the following types of repository in your research in the past five years? Please tick all that apply.

	Not used	Based at my own institution	At another institution in my region	At another institution outside my region	At another institution outside the UK	Prefer not to say
Database	☐	☐	☐	☐	☐	☐
Digital library	☐	☐	☐	☐	☐	☐
Physical library	☐	☐	☐	☐	☐	☐
Knowledge platform	☐	☐	☐	☐	☐	☐
Specimen archive	☐	☐	☐	☐	☐	☐
Living collection	☐	☐	☐	☐	☐	☐

How have you used the following types of network in your research in the past five years? Please tick all that apply.

	Not used	Based at my own institution	At another institution in my region	At another institution outside my region	At another institution outside the UK	Prefer not to say
Formal network	☐	☐	☐	☐	☐	☐
Hub (physical or virtual)	☐	☐	☐	☐	☐	☐
Community (peer-to-peer)	☐	☐	☐	☐	☐	☐

How have you used the following types of facility in your research in the past five years? Please tick all that apply.

	Not used	Based at my own institution	At another institution in my region	At another institution outside my region	At another institution outside the UK	Prefer not to say
Laboratory	☐	☐	☐	☐	☐	☐
Static equipment (including digital platforms or software)	☐	☐	☐	☐	☐	☐
Mobile equipment	☐	☐	☐	☐	☐	☐
Long-term research experiment	☐	☐	☐	☐	☐	☐
Advisory/training service	☐	☐	☐	☐	☐	☐
Farm trial facility	☐	☐	☐	☐	☐	☐

Please name or describe the repository, network or facility you have most relied on in your research over the past five years.

We are now going to ask about how you plan to use research infrastructure in the future. What types of repository do you expect to need in your research in the next five years?

	None	Ones I have already used	Ones that exist that I have not used	Ones that do not yet exist	Not sure	Prefer not to say
Database	☐	☐	☐	☐	☐	☐
Digital library	☐	☐	☐	☐	☐	☐

Physical library	☐	☐	☐	☐	☐	☐
Knowledge platform	☐	☐	☐	☐	☐	☐
Specimen archive	☐	☐	☐	☐	☐	☐
Living collection	☐	☐	☐	☐	☐	☐

What types of network do you expect to need in your research in the next five years?

	None	Ones I have already used	Ones that exist that I have not used	Ones that do not yet exist	Not sure	Prefer not to say
Formal network	☐	☐	☐	☐	☐	☐
Hub (physical or virtual)	☐	☐	☐	☐	☐	☐
Community (peer-to-peer)	☐	☐	☐	☐	☐	☐

What types of facility do you expect to need in your research in the next five years?

	None	Ones I have already used	Ones that exist that I have not used	Ones that do not yet exist	Not sure	Prefer not to say
Laboratory	☐	☐	☐	☐	☐	☐
Static equipment (including digital platforms or software)	☐	☐	☐	☐	☐	☐
Mobile equipment	☐	☐	☐	☐	☐	☐
Long-term research experiment	☐	☐	☐	☐	☐	☐
Advisory/training service	☐	☐	☐	☐	☐	☐
Farm trial facility	☐	☐	☐	☐	☐	☐

Please describe the repository, network or facility you expect to need most in your research in the next five years.

Thinking about UK agricultural research overall, where do you think investment is most needed in research infrastructure?

Thank you for your time. Your response will contribute to the State of Agricultural Research and Innovation (SARI) report, publishing Autumn 2026. We'd like to acknowledge your contribution. How would you like to be acknowledged and kept updated?

1. Acknowledge me personally (you will be asked to enter your name)
2. Acknowledge my organisation (you will be asked to enter your organisation's name)
3. Send me updates and a copy of the SARI report (you will be asked to enter your email)
4. None of the above

Please enter your organisation's name. If you've changed your mind, leave blank.

Our chosen research partner, Grounded Research, run research communities spanning the entire food supply chain, from growers right through to consumers whose opinions are sought on everything from products to policy and pesticide resistance. Most importantly, they are passionate in getting the right voices included in big decisions that affect the sector and where relevant, pay participants for their time. As you have taken part in this survey, we think you might also be interested in having your opinions taken on board. Would you like to receive a no-obligation invitation to join any of the communities they run?

	Yes please	No thanks
Five Bar Gate Farming community	☐	☐
Crop to shop supply chain community	☐	☐
Insight with Bite consumer community	☐	☐

First Name

Last Name

Email Address

Thanks for your time on this survey, if there is anything that hasn't been covered, that you feel needs to be added for consideration, please share below. If nothing comes to mind, please click 'done' to submit your responses and end the survey.

10 / Endnotes

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