UK Agri-Tech Centre

The future of UK Agri-Tech

Understanding the aspirations of the UK agri-food sector and accelerating agri-tech ambitions

A report by the UK Agri-Tech Centre
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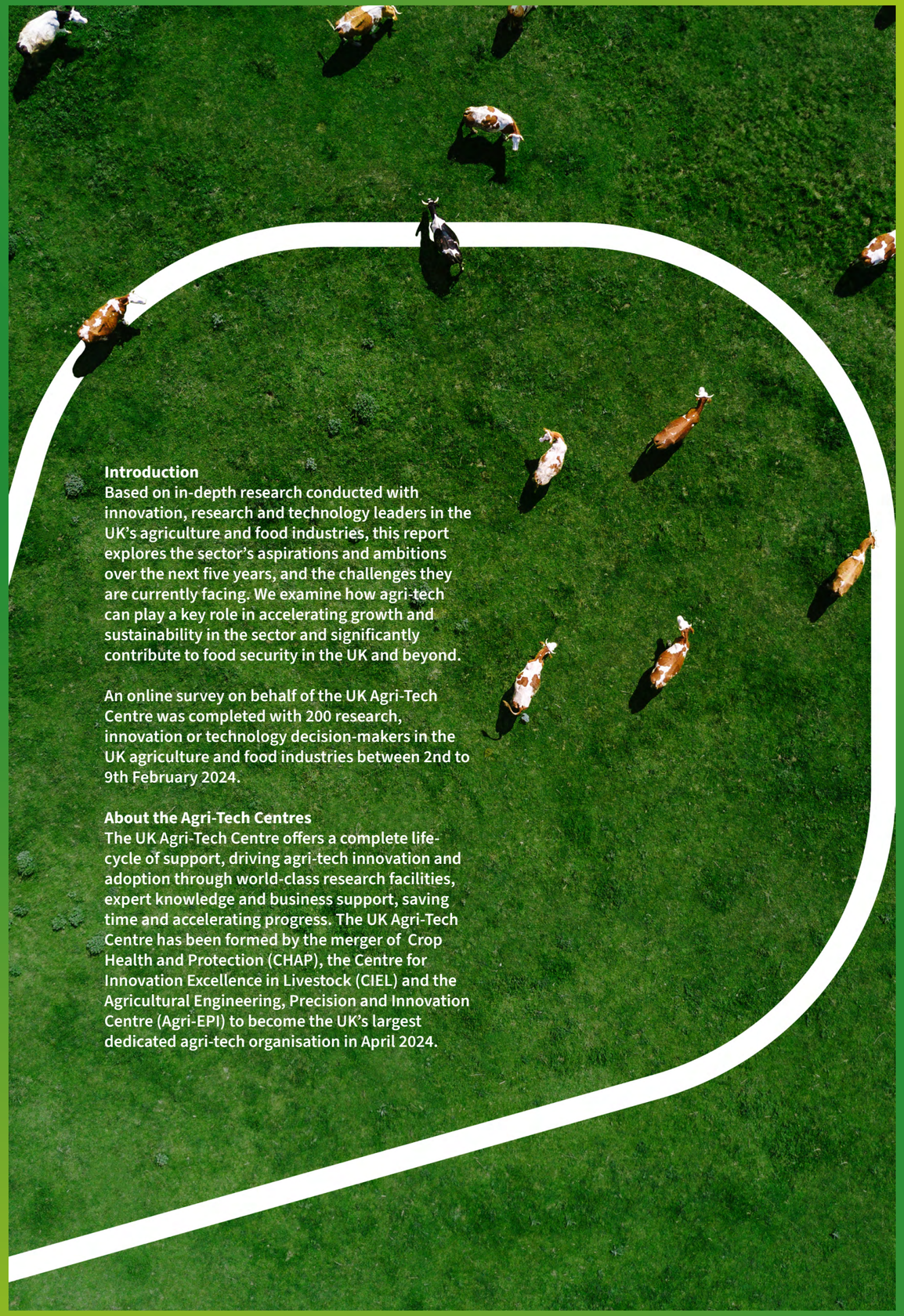


Introduction
Based on in-depth research conducted with innovation, research and technology leaders in the UK's agriculture and food industries, this report explores the sector's aspirations and ambitions over the next five years, and the challenges they are currently facing. We examine how agri-tech can play a key role in accelerating growth and sustainability in the sector and significantly contribute to food security in the UK and beyond.

An online survey on behalf of the UK Agri-Tech Centre was completed with 200 research, innovation or technology decision-makers in the UK agriculture and food industries between 2nd to 9th February 2024.

About the Agri-Tech Centres
The UK Agri-Tech Centre offers a complete life-cycle of support, driving agri-tech innovation and adoption through world-class research facilities, expert knowledge and business support, saving time and accelerating progress. The UK Agri-Tech Centre has been formed by the merger of Crop Health and Protection (CHAP), the Centre for Innovation Excellence in Livestock (CIEL) and the Agricultural Engineering, Precision and Innovation Centre (Agri-EPI) to become the UK's largest dedicated agri-tech organisation in April 2024.

Executive summary: By Phil Bicknell, CEO of UK Agri-Tech Centre

The newly merged UK Agri-Tech Centre has worked closely with industry to understand agriculture and food businesses' key ambitions and concerns over the next five years and the role that agri-tech can play in overcoming their challenges.

An overarching theme is our sector having to produce more food with fewer resources. Sustainability is a key concern, with climate change already impacting food production, most recently demonstrated by this winter's floods predicted to significantly affect yields. Economically, we face challenging times. The latest Agriculture Price Index from the Department for Environment, Food and Rural Affairs shows that the price of agricultural inputs remains considerably higher than 2020, and coupled with market stresses and policy uncertainty, there is pressure on the long-term resilience of farming.

Technology and innovation are key to our agri-food sector creating food security through resilient, sustainable systems and businesses. Agri-tech solutions can provide key ingredients for transformational change across the entire agri-food supply chain, creating financial savings in inputs, enhancing productivity, growth and sustainability.

Together, we can achieve far more collaboratively than in silos. This report looks at how protecting the health of our planet, people, animals and crops is driving us all to develop new solutions through partnerships and collaborations that traverse industry, science, the investment community and government. The UK Agri-Tech Centre is at the beating heart of the agri-tech ecosystem, nurturing connections and making it easier for businesses to access specialised knowledge from scientists, world-class R&D facilities, funding opportunities and business expertise.

To overcome the sector's challenges, the UK Agri-Tech Centre is focused on four strategic themes to support the acceleration of ideas to impactful solutions for UK agri-food businesses:

- **Sustainable Production:** Optimising production efficiency while transitioning to Net Zero and maintaining and enhancing ecosystems
- **Resilient Systems:** Supporting robust and diverse production systems to build more resilient food systems
- **One Health:** Enhancing welfare, safety, nutrition and quality of agricultural products
- **Intelligent Agriculture:** Harnessing the power of intelligent agriculture, including automation, robotics, data and AI to transform current agricultural practices and tackle global economic, environmental and social challenges.

With a systems-wide approach to increasing agri-tech innovation and adoption, agri-tech has the power to make a major impact on the UK's future agriculture and food production and security.

01 The Scale and Scope of the Agri-Food and Agri-Tech Sectors

Whilst crops and livestock are still seen as agriculture's heartland, today's agri-food sector extends to horticulture (cultivating plants for food), aquaculture (rearing aquatic animals and cultivating aquatic plants for food) and forestry (using trees as crops or integrating trees and shrubs into farming systems).

Defining 'Agri-Tech'

Agri-tech (agri-food industries technology) uses research, innovation and technology to develop new tools and solutions that aim to boost growth, sustainability and food security in agriculture and food industries across the entire supply chain. Small and large businesses alike benefit from agri-tech systems, tools and technologies, spanning biotechnologies, nutrition, robotics and automation, sensors, satellites, and much more.

Agri-tech contributes to these goals in the following ways:

- Using precious resources, such as water, soil and land, more efficiently.
- Controlling environmental factors to optimise growth.
- Integrating sensors and technology into agricultural processes to provide continuous updates on measurements like soil health, water quality, pest and disease outbreaks and livestock movements.
- Harnessing AI to make sense of new data streams so that decision-makers in farming, horticulture, aquaculture, forestry and food processing can identify trends and issues to make informed decisions.
- Providing better animal health and welfare system solutions.
- Using technology and automation to reduce the requirement for manual labour.
- Using bioscience and genetics to create sustainable and resilient farmed livestock, aquatic animals, aquatic plants, arable crops, trees, fruit, vegetables and plants.

The agri-tech sector is currently worth over £13 billion*. In the same way we have seen fintech experience exponential growth over recent decades, the agri-tech sector needs to follow suit. An ever increasing global population is fuelling unprecedented demand from our sector. Coupled with this soaring demand is the need to urgently produce food, fuel and fibre more sustainably. Businesses up and down the entire supply chain are turning to agri-tech to help them generate more output with smarter inputs with less impact on the planet. Together they aspire to transformational changes, such as alternative fertilisers, new protein foods and novel preventatives and treatments for diseases and pests.

*Data City, 2024

02 The Role of the UK Agri-Tech Centre

At the heart of the UK's agricultural sector is the new UK Agri-Tech Centre - a rich and diverse ecosystem of organisations spanning the whole agricultural supply chain - working to nurture growth, identify opportunities and help businesses overcome barriers to innovation.

In combining world-class expertise, facilities and knowledge, the UK Agri-Tech Centre provides a major boost to agri-tech innovation through greater cross-sector working opportunities - such as supply chain consortiums and partnerships between research organisations, agri-tech innovators, funders and industry. To-date, the individual Centres have an excellent track record in creating partnerships with more than 450 organisations, including research institutes, start-ups, SMEs and multinational companies, and delivered 350 innovative projects involving over 500 businesses with a sector value of almost £100m.

By taking a systems-based approach to the many challenges in the agri-industries sector, the UK Agri-Tech Centre will play a key role in securing our supply of food, fuel and fibres - driving collaboration across the UK innovation ecosystem to stimulate growth.

The UK Agri-Tech Centre through core workstreams of Connect, Inspire, Grow, Adopt will provide:

Strategic leadership to identify the most commercially viable solutions.

Access to an **innovation ecosystem**, encompassing scientists with world-class knowledge, investors and funders, industry collaborators and cutting-edge facilities, which would otherwise be beyond the grasp of many businesses.

Adoption of innovation through support for agri-tech businesses all the way from R&D through to commercial launches and beyond.

High quality business services offering advice across business functions.

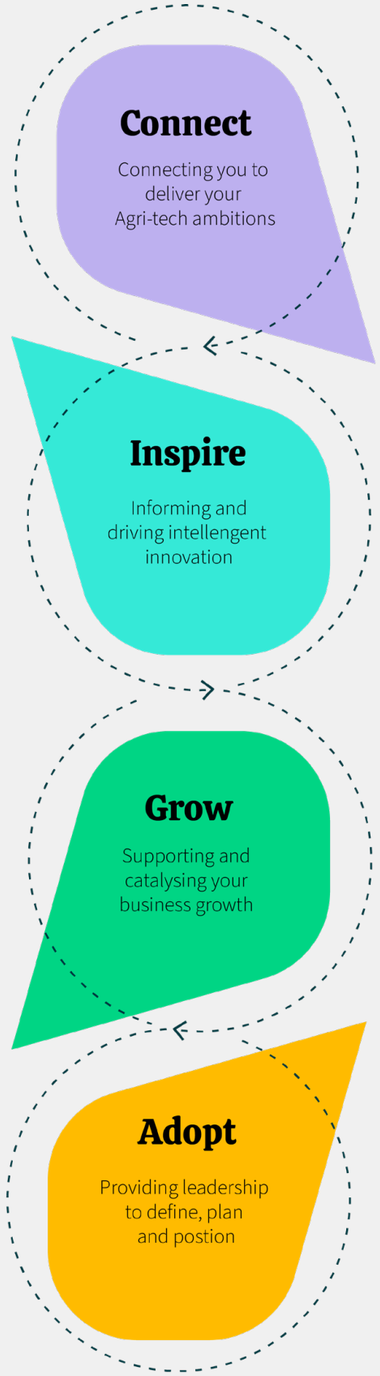
Thought leadership with expert knowledge, depth of insight and advice in specialist fields.

Business incubation that nurtures early-stage businesses with support and resources including access to networks, mentors and investors.

Accelerating your agri-tech ambitions

...matching the solution to the problem

...driving impactful and rapid change.



Sustainable Production

Intelligent Agriculture

Resilient Food Systems

One Health

03 Priorities for the Agri-Food Industries

In a challenging economic environment, growing and expanding core business is a key priority over the next five years for over half of agri-food business leaders (58%). The second highest priority reported overall was becoming more sustainable, identified as a key priority by four in ten (40%) leaders across agriculture and food industries businesses.

For the food industry specifically, adopting new technologies (51%) was the second highest priority, with investing in research and development (39%) the fourth highest priority.

In agriculture, adopting new technologies was a priority for a quarter of respondents, while making the supply chain more efficient was the second most identified priority (40%).

These findings signal a clear movement towards harnessing new technologies and solutions in order to realise their ambitions for growth and sustainability, particularly in the food sector. A vast connected ecosystem is working together to drive responsible agri-innovation at unprecedented levels. The UK Agri-Tech Centre will play an important role in strengthening and growing connections between science, innovators, funders and businesses to accelerate innovation and drive on-site adoption of the raft of exciting new technologies being developed.

04 Today's Challenges for Agri-Industry Businesses

A myriad of critical economic and environmental challenges are focusing the efforts of agri-industry players. When asked what their number one challenge is for the next five years, decision-makers across agriculture and food industries identified food security and adapting to climate change as the biggest issues, each with 15% of responses. These were closely followed by sustainability (14%), carbon/greenhouse gas emissions (13%) and labour availability (12%). The responses particularly highlight clear concern about climate change, achieving sustainability and net zero related issues.

The Link Between Climate Change, Sustainability and Food Security

Sustainability is a critical challenge for the agri-industries. The sector acutely feels the effects of climate related challenges like extreme weather in terms of impacting productivity and yields, but at the same time, DEFRA's Agri-climate report 2022 showed agriculture to be responsible 11% of greenhouse gas (GHG) emissions.

The changing climate is also enabling new invasive pests to establish themselves and threaten crops. Novel or exotic pest and disease threats include Bluetongue, African Swine Fever, wheat yellow rust, potato flea beetles and tomato brown rugose fruit virus and demand innovation to reduce their impact on food security.

The UK Agricultural Labour Market

The sector is experiencing severe labour shortage issues. New solutions are needed to streamline production, not just on farms but across the entire supply chain.

05 Agri-Tech Projects Boosting Sustainability

Agri-tech innovators have an acute focus on developing accessible and commercially viable technologies that provide significant benefits for both sustainability and efficiency. These are some of the projects and partnerships that are already transforming agri-food industries businesses.

Towards Net Zero
In January 2020, the Committee on Climate Change identified the scope for agriculture, land use and peatlands to collectively reduce their carbon emissions by 64% by 2050.

Many agri-tech businesses are focused on finding sustainable solutions to this urgent carbon challenge and are working with the UK Agri-Tech Centre to trial and develop promising options. One technology undergoing trial is a new zero-waste on-farm slurry management system that transforms dairy slurry into valuable by-products. In the aquaculture field, a new sustainable marine shrimp is being farmed as an alternative marine protein feed for young chickens. Genetic developments are also thriving such as the Breed for CH4nge project and its genetic improvement tools that help low methane sheep farming.

It's encouraging that more agri-tech solutions are now focused on working in a nature-positive way and modelling the assets that it provides. This deeper understanding of our natural environment is creating innovative science-based solutions which include new cropping systems and advanced methods for animal husbandry.

Mitigating Labour Shortages with On-farm Automation
The UK Agri-Tech Centre has an ongoing mission to harness innovation to help mitigate labour shortages for specific roles, including those filled by skilled seasonal workers. Working in collaboration with innovative businesses, producers, government agencies, the UK Agri-Tech Centre is supporting intelligent agriculture projects, including automation and robotics solutions.

06 Unlocking Innovation to Overcome Critical Challenges

Our research highlighted that agri-food businesses have a clear appetite for exploring new technology to address challenges and optimise productivity, and the market appears ready to adapt to new trends and agri-tech opportunities. In fact, over a third (36%) highlighted adopting new technologies as a business priority for the next five years.

In line with their key business priorities, four in ten leaders across the sector want to explore sustainable production (40%), food security (38%) and resilient food systems (31%).

Furthermore, the research found that the average spend on research, development and innovation in the past year was an impressive 10% of their business turnover.

Agri-tech solutions that agriculture and food industries leaders are interested in exploring are:

Technology Trends	Percentage of respondants
Sustainable Production	40%
Food Security	38%
Resilient Food Systems	31%
AI & Machine Learning	28%
Robotics & Automation	26%
Alternative Feeds	23%
Net Zero Technologies	21%
Circular Economy	21%
Genetic Technologies	18%
Vertical Farming	15%

The Economics of Agri-Innovation
Heightened investment in agri-tech offers strong growth prospects for the UK economy and for private investors across the globe. Focussing on this growing sector will also support the UK Government's mission to make the nation a global science superpower. In 2023, UK agri-tech businesses attracted $1.3bn of investment*, second only to the United States in terms of the highest level of investment in agri-tech globally.

Current barriers to developing new technologies
There is an urgent need to develop innovative solutions, but it takes time to bring agri-tech innovation to the marketplace - owing in part to the highly fragmented nature of the sector. With R&D being seen as inherently risky and expensive, with no guarantee of success, it's unsurprising that our research found the biggest barrier to developing new technology was access to funding - cited by 39% of respondents. Resource and time constraints came a very close second (38%) followed by being able to attract investment (27%). Regulatory hurdles were experienced by a similar number of respondents (26%)

*AgFunder Report 2024

Our surveyed agriculture and food businesses see seven potential important actions that government, at national and local level, could take to support research and innovation:

36% (of respondents)
Creating tax benefits for participation

34%
Long-term strategy and policies

31%
Recognition of food and farming standards

31%
Investing in infrastructure

30%
Streamline regulatory process

28%
Increased funding

27%
Encouraging collabaration

Growth is a major priority
Our research clearly shows that growth is a business priority for 57% of agricultural and food businesses. Agri-tech growth will be crucial to realising these ambitions. In February 2024, the UK Government announced it would allocate £220 million towards agricultural technology to boost the farming industry's productivity and resilience. This signals an increasing priority status for food security and confidence that the agri-tech sector is well placed for growth.

Driving that growth will be the UK's ability to turn ideas and knowledge into real world products and services that bridge the gap between ideas and impact. Long-term, strategic funding will enable and stimulate long-term commitment to critical agri-tech developments that will address fundamental agri-food industries issues. As the UK's largest independent agri-tech organisation, the UK Agri-Tech Centre will provide leadership and practical guidance to support long-term growth across the entire agri-tech ecosystem, from boosting access to funding to accelerating innovation to driving adoption by end-users.

07 Accelerating the Adoption of Agri-Tech Solutions

95%
of R&D and technology leaders in the sector feel that collaborations and partnerships are valuable in driving innovation

Overcoming barriers to end-users adopting new technology
A range of reasons currently discourage businesses from adopting existing agri-tech solutions - the cost of purchasing the technology itself (38%), the cost of implementing it (33%), insufficient knowledge and support (30%), or a lack of skills or training (29%). Accessing the technology itself and the awareness of agri-tech solutions was an issue for just over a quarter of businesses.

Strengthening connections across the agri-tech ecosystem will be key to overcoming these barriers to adoption of innovative new technology and solutions. Overwhelmingly, 95% of R&D and technology leaders in the sector feel that collaborations and partnerships are valuable in driving innovation. Two fifths (43%) specifically thought food supply chain collaboration or partnerships would help. Similarly, technology developers (41%) were seen as a valuable partnership opportunity, as were investors (33%) and funding agencies (30%).

Agri-tech businesses themselves have an acute focus on developing accessible, affordable and commercially viable technologies that provide significant benefits for both sustainability and efficiency. Drone technology and smart monitoring systems are widely adopted examples of affordable systems that are already helping monitor and manage farm issues, like soil condition, crop health or livestock. These solutions use less resources which improves the availability and affordability of produce.

Strengthening connections to expertise, networks, funding and facilities
There is no question that accelerating the adoption of agri-tech solutions by agriculture and food industry businesses will drive meaningful change that benefits society and the planet. Speeding up the pace at which successful commercial solutions reach the marketplace also supports new jobs and economic growth. So how can we accelerate this process?

Adoption is a key focus of the UK Agri-Tech Centre, using its understanding of sector challenges and expertise to ensure valuable new developments reach far beyond early adopters. The Centre aims to diffuse innovation by creating collaborations that allow ideas to be tested in real life scenarios and formulating demonstration networks so innovations are showcased and businesses can make informed data-driven decisions on purchasing new technology.

The UK Agri-Tech Centre will play a key role in strengthening and building connections between science, business and funders to accelerate research and development, and connect businesses to funding, world-class knowledge, expertise, facilities and collaborators to accelerate progress. It will also address funding and investment issues by providing a gateway to funding programmes, such as the Farming Innovation Programme and Horizon Europe.

08 Conclusion

In a dynamic yet complex agri-food sector, it is imperative that we find new ways to feed an ever growing population using less resources whilst minimising environmental impact. The sector urgently needs to supercharge innovation to produce affordable, safe, nutritious, high-quality food, whilst ensuring food supply chains are viable and sustainable.

There are clear steps to take to facilitate this transformation and drive economic growth:

Bridging the gap between ideas and impact with strong leadership
The new UK Agri-Tech Centre will take a leadership role to capitalise on the UK's excellent R&D base by identifying and prioritising agri-tech innovation efforts on current industry challenges to develop scientifically robust and commercially viable agri innovations that will enhance productivity, economic growth and sustainability.

Creating greater cross-sector collaboration
As an independent UK hub with a global reach, the UK Agri-Tech Centre will increase connections between specialists in science, developers, funders and businesses to accelerate agri-innovation, unlock investment opportunities and drive adoption. Through the creation of greater cross-sector working opportunities and systems-wide approaches to industry challenges, connections across the agri-tech ecosystem will be strengthened and the sector can flourish.

The sector urgently needs to supercharge innovation to produce affordable, safe, nutritious, high-quality food, whilst ensuring food supply chains are viable and sustainable

The role for government and policymakers
Growing the UK-incubated agri-tech sector can help the government achieve sustainable food production targets, increase agri-food exports and inward investment, while contributing to its aspiration to become a science and technology Superpower. One area of focus should be to direct more strategic and targeted government funding to longer-term research and adoption programmes. De-risking funding for private investors would also stimulate long-term investment in critical agri-tech areas to address fundamental sector issues.

Science and innovation have developed at a rapid pace over recent years. We have seen sectors such as financial technology 'fintech' deliver innovative solutions for the marketplace. This report provides a high-level insight into the challenges and huge opportunities for agri-tech.

Now is the time for agri-tech solutions to permeate through our agri-industries at a scale never before seen to help solve fundamental global issues, provide food security and drive sustainable economic growth.

09 Glossary

Aquaculture Technologies: In addition to traditional agriculture, agri-tech also includes technologies used in aquaculture, such as automated feeding systems, water quality monitoring, seaweed harvesting and fish tracking.

Artificial Intelligence (AI) and Machine Learning: AI and machine learning algorithms analyse large datasets to provide insights and can learn to detect disease or pests, and predict yield. These technologies help farmers optimise their practices based on historical and real-time data.

Alternative Proteins: These are protein sources derived not from traditional sources, where they either replace animal proteins in the food system or replace protein (sometimes from imported sources) for the livestock feed sector. There are many subsectors, from novel to cellular to fermentation.

Biotechnology: Advances in biotechnology involves the integration of natural and engineering sciences through the application of organisms to make or modify products or develop microorganisms for specific agricultural uses. From genetically modified crops that can have enhanced resistance to pests or diseases to improving animal health and welfare for the livestock sector.

Drones and Earth Observation Technologies: Drones equipped with cameras and sensors are used for crop monitoring, mapping, and surveying. Satellite imagery provides valuable data on crop health, forage availability, soil conditions, and overall farm management.

Livestock Genetics and Veterinary Science: Utilising cross cutting research to improve disease prevention and animal nutrition and utilising extensive breeding programmes and genomic analysis to increase efficiency of animal production systems, enhance welfare and disease resistance.

Nutrition: The composition of material consumed by animals and understanding how the material is metabolised by the animal in the digestive tract and how this impacts on animal performance, health, welfare and the environment.

Precision Technology: This involves using technologies such as GPS, sensors, and data analytics to optimise crop or livestock yields, reduce waste, and manage resources more efficiently. Precision agriculture helps farmers make data-driven decisions on managing their inputs and outputs more efficiently and sustainably.

Smart Farming: Smart farming integrates various technologies like Internet of Things (IoT), robotics, and automation to enhance farm operations. This includes the use of sensors to monitor soil conditions, crop health, and livestock, as well as automated machinery for tasks like planting, harvesting, and sorting.

Vertical Farming and Indoor Agriculture: These methods involve growing crops in vertically stacked layers or indoor environments using controlled conditions such as hydroponics and aquaponic systems.

Water Management Technologies: Innovations in water management include drip irrigation, precision irrigation, and moisture-sensing technologies, which help optimise water usage and reduce water wastage.

With a unique capability to deliver strategic leadership on sector challenges and opportunities, the UK Agri-Tech Centre will accelerate the adoption of innovative agri-tech by farmers, growers and the wider industry supply chains

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