Innovate UK

Innovate UK Global Expert Mission Report

Alternative Proteins in the United States

September 2024

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01. Executive Summary

Innovate UK GEM delegation touring Eat Just site with Joshua Hyman

The alternative proteins landscape

The global alternative protein market continues to grow at pace, driven by a strong desire for collaboration and innovation. The sector has the potential to improve climate sustainability, food security, nutrition in diets and job creation, amongst wider economic opportunities. This growing sector saw governments internationally invest $348 million in 2023, which, whilst promising, remains well below the estimated $10.1 billion required annually to unlock the full potential of the sector.[1]

Against this backdrop of increased support for innovation, the alternative protein industry still faces a challenge when it comes to consumer attitudes and uptake. Research shows both a desire among many consumers to eat healthier diets and to support more sustainable and climate-friendly food.

However, fundamental hurdles around price, taste and texture, as well as a cultural perception, common in the West, that a diet high in meat and dairy products is nutritionally necessary, are holding back wide-spread adoption of alternative protein products for many consumers.

There is, however, a recent wave of products, innovation and public engagement that have given real cause for optimism across the alternative protein sector, where a constructive and collaborative culture is being taken to tackle these challenges through knowledge sharing among stakeholders, helping to drive positive benefits for the good of the sector as a whole.

1 Good Food Institute. (2023). "State of Global Policy: Public investment in alternative proteins to feed a growing world". p7.

The Global Expert Mission

In response to the growing UK alternative protein ecosystem and targeted investments into research and innovation projects, a Global Expert Mission (GEM) was undertaken by Innovate UK to identify collaboration opportunities with the US. Experts from the UK built a greater understanding of the US landscape through this visit, from research and development priorities through to commercialised products already on the market. This was realised through tailored meetings with stakeholders active across the sector, such as alternative protein companies, investors, incubators, retailers, regulators and government. This was a key objective of the GEM, given the substantial global alternative protein market share held by the US and the well-established ecosystem of researchers and businesses in food science and biotechnology within particular US states, such as California and New York.

The GEM also considered how Innovate UK can help UK SMEs to capitalise on this knowledge and understand future global market opportunities. The GEM builds on the earlier Global Business Innovation Programme (GBIP) missions and bilateral co-founding with Protein Industries Canada that focused on plant-based proteins. This provided the GEM a starting point to understand the larger and wider scope of US opportunities across plant-based, fermentation and cultivated meat alternative proteins. To help achieve this objective, the GEM undertook six site visits of key facilities, hosted two expert roundtables, and attended two industry conferences, split across two key US alternative protein epicentres in California and New York.

Innovate UK GEM delegation at the British Consulate New York

Key insights

This information and the connections made on the mission help inform efforts to build greater support for UK businesses looking to build partnerships and collaborations, and to enter the US market. This also informs where UK research and innovation capabilities can help US businesses that may be looking for soft landing opportunities in the UK to access European markets. The findings from this GEM identify potential opportunities for collaborative funding, innovation support, and building bi-lateral connections for mutual benefit.

Key insights included:

- UK firms considering entering the US market need a greater understanding of the specifics of the sector around location and logistics, customer demographics, costs, market scale, and how investment and legislation can differ from state to state.
- Government funding and public investment in the US to support early-stage SMEs is typically provided at state, region or city level, rather than from a joined-up federal source at present. This can create a more complex landscape for new innovation and start-ups looking to find US support mechanisms, when compared to the UK innovation ecosystem.
- The vibrant landscape of US incubators and independent bodies in the alternative protein space provides a valuable resource for early-stage businesses, with the potential to support bilateral knowledge transfer programmes for UK SMEs.
- Securing Venture Capital funding is still possible, but is becoming harder to find in the current market conditions. The importance of specialist investors that understand the business models and the longer timelines associated with exits within the sector was highlighted as being critical to securing deals. Capital is still being secured by companies that have commercial viability and a defined pathway to revenue generation and profitability, have a clear point of market differentiation, and are providing a solution to an industry or consumer problem. There are also 'patient capital' issues among investors when shorter-term returns can be offered in other sectors relative to alternative protein food companies that often require longer timeframes for success - particularly where scale-up is needed.
- Separation from the European Food Safety Authority, following the UK's exit from the European Union, presents a potential opportunity for the UK to become a leader in the global alternative proteins space for new assessment and approvals protocols. There is an appetite among US businesses for engaging more closely with the UK both as an established alternative protein market with its own regulatory control, and as a soft-landing point for entry into the European market.
- The US has a number of significant industry-focused conferences and tradeshows that bring a range of key stakeholders from the industry together, and represent strong anchor points on which to build future international activities.

02. Acronyms

The following are common acronyms used throughout this report:

B2B	Business to Business
B2C	Business to Consumer
BBSRC	Biotechnology and Biological Sciences Research Council
CAGR	Compound Annual Growth Rate
DBT	Department for Business and Trade
DSIT	Department for Science, Innovation and Technology
FCDO	Foreign, Commonwealth and Development Office
FDA	Food and Drug Administration
FSA	Food Standards Agency
GBIP	Global Business Innovation Programme
GEM	Global Expert Mission
GIP	Global Incubator Programme
SIN	Science and Innovation Network
SME	Small and Medium sized Enterprises
UKRI	UK Research and Innovation
USDA	United States Department for Agriculture

03. Introduction

Innovate UK and the Global Expert Missions

Innovate UK, part of UK Research and Innovation (UKRI), is the UK's innovation agency that supports business-led innovation in all sectors, technologies, UK regions and globally. It helps businesses grow through the development and commercialisation of new products, processes, and services, supported by an outstanding innovation ecosystem that is agile, inclusive and easy to navigate.

As innovation is increasingly an international endeavour and more UK businesses have the ambition to grow and scale globally, it is important to create the right opportunities on which businesses can capitalise. Innovate UK's Global Expert Missions (GEM) programme draws on the expertise of the UK business community to better understand the opportunities in specific countries, technology areas and market sector. Delivered by Innovate UK Business Connect, the GEMs provide the evidence base for where Innovate UK, and wider UK Government, should commit resources to enable opportunities for UK businesses to build partnerships and collaborations with key economies.

Built around UK business, policy and research representation, a GEM's objectives are:

1. **Building International Collaborations**
   The expert insights will help inform how Innovate UK can best help UK businesses find and exploit opportunities for innovation partnerships. The GEM creates connections with key organisations and people that will deepen and widen the collaboration with the partner country to the benefit of UK business.
2. **Informing UK businesses and Government**
   The mission findings and expert insights resulting from the GEM are made available to UK businesses and Government departments. These inform UK businesses, Innovate UK, and the Government about potential opportunities for innovation in a country of interest, and how it can help UK businesses make the most of those opportunities.
3. **Sharing UK Capabilities**
   During the GEM visit, the delegation of experts will use the opportunity to share the UK's own innovation strengths.

UK – US Alternative Proteins Global Expert Mission

Alternative Proteins represent an emerging food industry sector with significant potential to improve environmental sustainability and increase food security in the UK, US and globally. Originally focused on developing alternatives to staples such as milk, eggs, sausages and mince, the sector now provides a broader range of protein products, including seafood, as well as new product categories beyond the first tranche of traditional meat or dairy products. Through plant-based, cultivated meat and fermentation production, there is significant potential to reduce carbon emissions, water consumption, biodiversity loss and land use compared to traditional animal sourced food.[2]

To fully exploit the global commercial opportunities of the sector, collaborating internationally is vital in order to develop solutions to the challenges seen across the alternative protein ecosystem

Background

In recent years, the global alternative protein sector has experienced significant growth, fuelled by increasing consumer awareness of sustainability, health and animal welfare concerns. Plant-based alternatives to meat and dairy products have become more easily accessible, with many major retailers expanding their offerings.

The global alternative proteins market was valued at $17.6 billion in 2022 and is anticipated to grow at an average CAGR of 12% in the coming period, reaching $55 billion by 2032.[3]

The UK has seen a surge in start-ups focused on innovative protein sources, such as cultured meat, mycoprotein, plant-based foods and insects, as well as associated investment in these areas. These are areas of priority for Innovate UK and the Biotechnology and Biological Sciences Research Council (BBSRC), with a number of collaborative R&D projects being supported recently in the Future Food Innovation area.[4]

2 UNEP. (2023). “What’s Cooking? An assessment of potential impacts of selected novel alternatives to conventional animal products”.
3 Feed Additive. (2023). “Global Alternative Proteins Market”.
4 Innovate UK. (2024). “Future Food Innovation: Driving the transition towards a healthier future for people and planet”.

Companies are increasingly focusing on developing alternative protein products that provide the taste and texture of traditional animal-based foods, but also offer additional environmental and health benefits, as well as customisation opportunities around functional and fortified foods, personal and stratified nutrition. The strong consumer demand for such products reflects a broader global shift towards more sustainable and diversified food systems, heralding a new era of customised food innovation.

As in the UK, innovation in the US alternative protein sector has also rapidly expanded with North America already accounting for 38.3% of the global alternative proteins market in 2024..[5] The US has a long-standing tradition of entrepreneurship and innovation, with a dynamic start-up culture that fosters creativity. The country further boasts a robust ecosystem of research institutions, universities and private companies dedicated to food science and biotechnology. The US regulatory environment is supportive of food innovation, with agencies like the Food and Drug Administration (FDA) and United States Department of Agriculture (USDA) actively engaging with stakeholders to streamline approval processes for novel ingredients and technologies.

5 Meticulous Research. (2024). “Alternative Protein Market Size, Share, Forecast & Trends Analysis”.

Mission overview

Recent UK-Canada alternative proteins Global Business Innovation Programmes (GBIPs) have been delivered in partnership with the National Research Council of Canada Industrial Research Assistance Program (NRC IRAP) and Protein Industries Canada (PIC). These have been some of the most successful and impactful GBIPs run by Innovate UK in the Agri-Food sector. The success of this visit gave this GEM a starting point to build on, by providing insights to the opportunities and challenges of cross-Atlantic collaboration.

Given the significant size of the US alternative proteins market, there was a clear strategic objective to build on this progress in Canada and identify opportunities to expand collaborative efforts with the US to support direct market entry by UK businesses, as well as create mutually beneficial funding and knowledge-sharing partnerships.

Focused on alternative proteins from plant-based, fermentation and cultivated meat sources, this GEM explored the market landscape and innovation ecosystems in California and New York for potential opportunities for collaboration between the UK and US. To accomplish this, the GEM delegation met with businesses, incubators, policy experts, trade associations, investors and government representatives through roundtable discussions, conferences and site visits to research laboratories, incubators and pilot-scale food manufacturers.

The ambition was to make connections with key stakeholders in the US alternative protein ecosystem that could be leveraged for mutual benefit with UK stakeholders active across the alternative protein sector, including those taking forward research and innovation projects with Innovate UK funding. The mission enabled meetings to take place with these US stakeholders to share insights from the UK and identify priorities areas where partnerships could be made in the future for mutual benefit.

Mission Objectives

The objectives of the Mission were to:

- Gain an understanding of the alternative protein innovation landscape in the US, including related challenges and opportunities around functional and fortified foods, stratified and personalised nutrition.
- Understand the alternative protein market dynamics and trends, as well as priorities of the US Government and potential synergies with those of Innovate UK.
- Explore the potential for collaboration, development of partnerships and grounds for long-term engagement through collaborative research and development and business innovation programmes.
- Identify potential collaborators or partner organisations also seeking to invest in and support the development of the alternative protein sector.
- Identify specific programmes or initiatives that may offer international collaboration opportunities between the UK and the US, focused on alternative proteins.
- Explore key geographical hubs and potential locations for future GBIPs.
- Identify incubators and their capabilities to support future Global Incubator Programmes (GIPs) focused on alternative proteins and the broader food and nutrition sectors.

04. Sector Overview

Alternative Protein overview

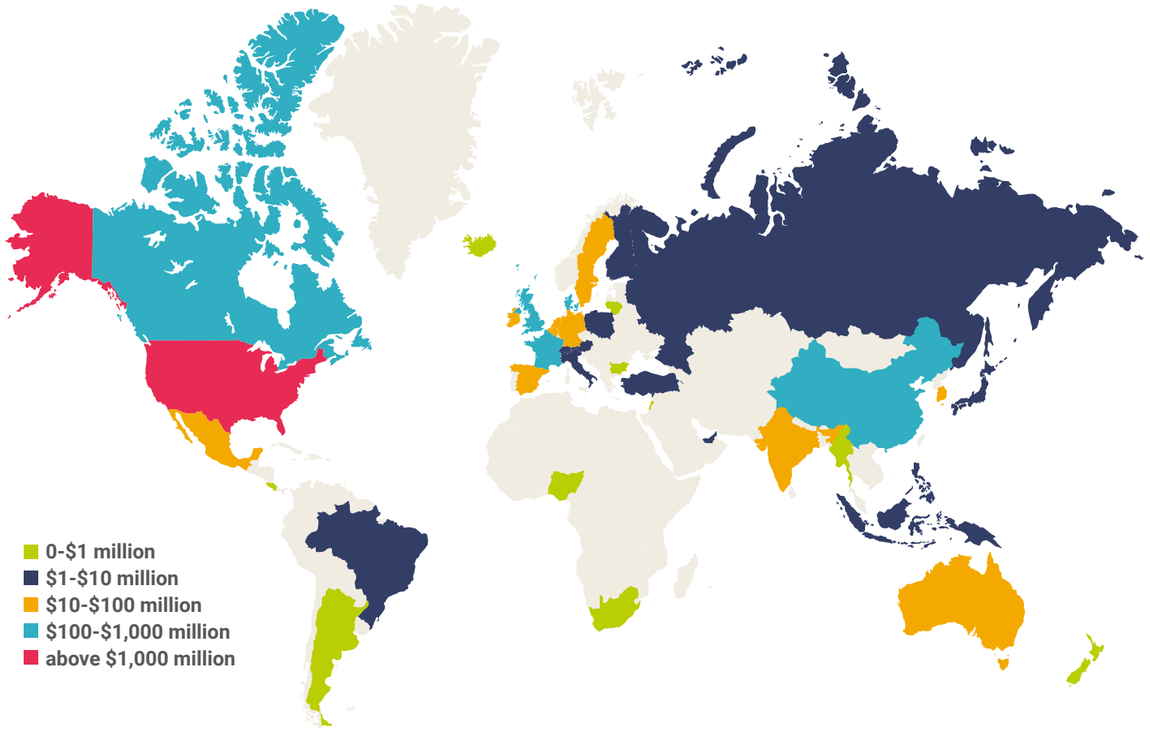
The GEM focused on three interlinked but distinct verticals of alternative protein production: plant-based, fermentation and cultivated meat.

Plant-based is the most commonly adopted method, where protein is sourced from products such as beans, nuts and cereals, rather than from animals. This protein will often mimic conventional meat in taste or texture, or create a wholly alternative product, such as plant-based milk.

Fermentation can be ‘traditional’ in changing the flavour or functionality of plant protein ingredients, ‘biomass’ where microorganisms are used to make large amounts of protein-rich food, or ‘precision’ which helps programme microbial production systems to focus on specific functions and nutritional attributes, such as proteins or fats.

Cultivated meat involves taking a small sample of animal cells and replicating them in a lab environment, before being formed into typical meat products, such as mince-meat.

While each production method has its own advantages, all three approaches are often complementary to the production of high-quality alternative-protein food and therefore the report will focus on these approaches.



Graph 1 Global publicly disclosed private investment in alternative proteins, 2014-2024[6]

Global market dynamics

Engagement with the sector is seen across the world, with private investment for the sector exceeding $8.2 billion between 2014 and 2024, as seen in **Graph 1**. Public investment into the alternative proteins space has risen sharply in the past two years, with announcements in 2023 alone contributing $523 million of the all-time total of $1.67 billion from government backing, according to the Good Food Institute's (GFI) Global Innovation Needs Assessment.[7]

Split evenly between investment into R&D ($190m), commercialisation ($163m) and initiatives that have elements of both ($170m), the 2023 figures mirror a similar pattern from 2022, although at a lower overall level.

6 VC investment analysis insights developed through PatSnap (2024). Results found through the following search: "alternative protein," "plant-based protein," "plant-based food," OR "cultivated meat," AND within "Food Science", Announced Date: "01/01/2014 – 05/11/2024".

7 **Good Food Institute. (2023). "State of Global Policy: Public investment in alternative proteins to feed a growing world". p4.**

Country	Deal Activity by Country ($ Million)
United States of America	6,522.58
Canada	647.22
United Kingdom	224.15
France	160.81
Denmark	113.02
China	105.96
Australia	81.82
South Korea	68.44
Sweden	48.34
Ireland	41.51
Spain	40.63
Germany	38.14
Belgium	19.06
Mexico	18.59
India	11.95
Netherlands	10.50
Austria	8.73
Switzerland	6.87
Brazil	6.14
Japan	6.07
Indonesia	5.40
Italy	5.37
Finland	4.94
Poland	3.78
Russia	1.50
Philippines	1.20
Turkey	1.10
United Arab Emirates	1.09
New Zealand	0.98
Iceland	0.65
Israel	0.48
Argentina	0.33
South Africa	0.25
Nigeria	0.20
Thailand	0.20
Lithuania	0.15
Costa Rica	0.04
Bulgaria	0.03

Graph 1 Global publicly disclosed private investment in alternative proteins, 2014-2024

While these are significant figures, the research identified the need for further increases in public investment from international governments into alternative proteins as a solution for climate and food security. It cited that in order to unlock the full potential of the global sector – which could amount to around 9.8 million jobs and $1 trillion in economic value – around $10.1 billion in investment is required by international governments each year.[8]

Throughout this GEM, we have sought to consider the opportunities across plant-based, fermentation and cultivated meat sectors, although it is evident that investment in, and the focus on, each market differs substantially at present. As shown in **Graph 2**, plant-based alternative proteins have historically secured by far the highest investment level, but fermentation was able to match investment levels in 2023, whilst cultivated meat was considerably lower. While there are still opportunities within each of the three sub-sectors, research from GFI indicates a perception of commercial viability issues within cultivated meat, perhaps connected to both the technology and regulatory hurdles it faces in different markets.

Despite a difficult private funding environment seen across the globe, the growing international interest in the sector saw cultivated meat and seafood companies secure $225.9 million in private funding in 2023,[9] while fermentation businesses ($514.7 million)[10] and plant-based alternative companies ($907.7 million)[11] also fared strongly in securing private backing.

Across the globe, there were a total of 174 publicly announced cultivated meat companies in 2023, compared to 166 in 2022, while fermentation companies grew from 153 to 158 over the same period. The GFI has not published similar statistics in 2023 for the number of businesses focusing on plant-based foods, although this number stood at over 800 in 2020.[12]

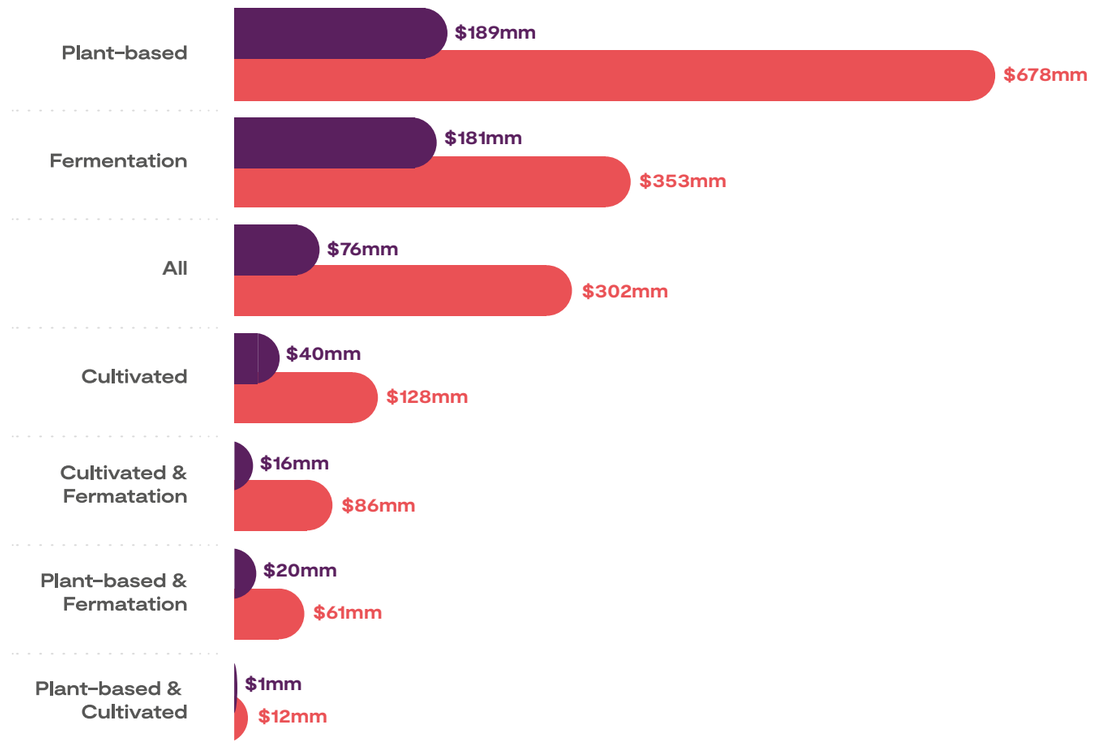
8 ""Good Food Institute. (2023). "State of Global Policy: Public investment in alternative proteins to feed a growing world". p7."

9 Good Food Institute. (2023). "State of the Industry report: Cultivated meat and seafood".

10 Good Food Institute. (2023). "State of the Industry Report, Fermentation: Meat, seafood, eggs and dairy".

11 Ibid., p9.

12 Good Food Institute. (2020). "2020 Plant-Based State of the Industry Report: Plant-Based Meat, Eggs and Dairy"



Graph 2 Global public investment in alternative proteins by sectors[13]

13 Good Food Institute. (2023). "State of Global Policy: Public investment in alternative proteins to feed a growing world". p10.

UK market dynamics and ecosystem

The UK has a growing alternative proteins sector, with £24 million public of investment in 2023, 138 companies within this market,[14] and sales amounting to £640 million in 2020, making it one of Europe's largest markets for alternative proteins.[15] This makes the UK the partner of choice for international collaboration, with initiatives in the UK including:

- A £16 million Novel Low Emission Food Production Systems (NoLEPS) competition bringing opportunities for alternative protein businesses to secure funding for early-stage development.[16]
- Commitment to the £15 million Alternative Proteins Innovation and Knowledge Centre.[17]
- £1.6 million in funding for The Foods Standards Agency (FSA) and Food Standards Scotland (FSS) to launch an innovative sandbox programme for cell-cultured products,[18] after the first two applications for cultivated meat were received in 2023.[19]
- The Engineering and Physical Sciences Research Council (EPSRC), part of UKRI, has provided £12 million in funding for a new Cellular Agriculture Manufacturing Hub, led by the University of Bath.[20]
- Facilities such as the Centre for Process Innovation (CPI), a leading independent technology innovation centre and part of the UK Government's High Value Manufacturing Catapult. CPI brings together academia, business, government and investors to support the research and development of novel concepts, as well as providing pilot-scale testing and scale-up equipment and facilities for entrepreneurs to develop their concepts towards commercialisation.

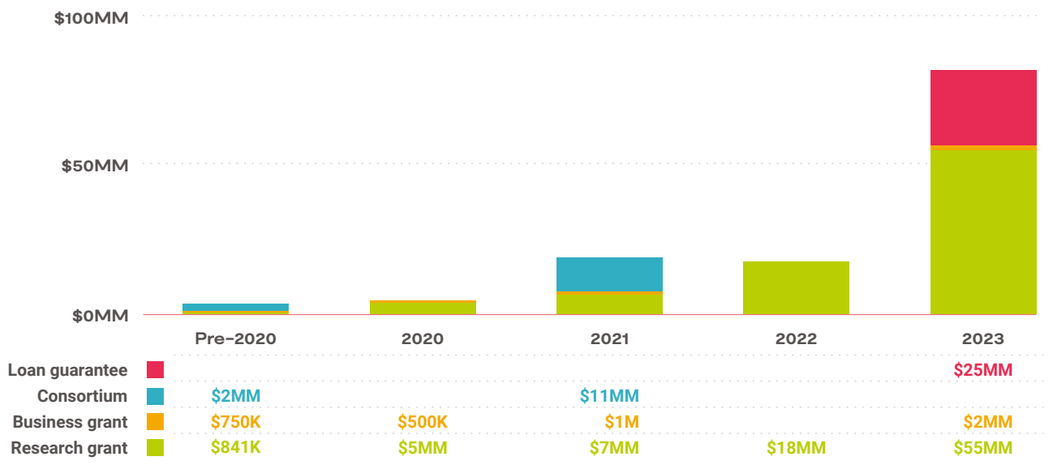
14 Good Food Institute Europe. (2023). "Alternative Protein in the United Kingdom: An ecosystem review"
15 Smart Protein Project. "Plant-based foods in Europe: How big is the market?"
16 Innovate UK. (2023). "Novel Low-Emission Food Production Systems"
17 UK Research & Innovation. (2023). "Alternative Proteins Innovation & Knowledge Centre"
18 Food Standards Agency. (2024). "Groundbreaking sandbox programme for cell-cultivated products announced"
19 Food Standards Agency. (2023). "Novel Foods Regulatory Framework Review"
20 UK Research & Innovation. (2023). "Vaccine and food manufacturing hubs will save lives and cut carbon"

US market dynamics

The US landscape is particularly diverse in its approach and attitudes to the sector in different regions, with initiatives supporting or hindering alternative protein adoption differing in each State. Engaging with the US will often mean focusing on a particular state or states with a suitable ecosystem, but viewing the market overall provides a good indication of how the sector is evolving.

Public investment dramatically increased to $82 million in 2023, focused towards both research and commercial support, as **Graph 3** indicates. This is likely due to the importance of the sector as a support mechanism for the agricultural sector through fermentation opportunities, as well as national defence in terms of longer-term food security.[21]

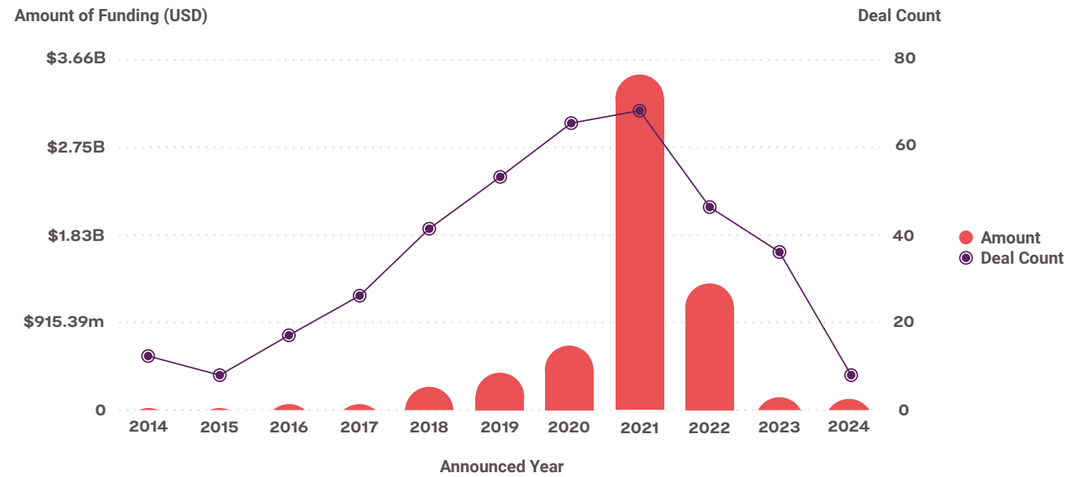
United States public investment by type of investment



Graph 3 United States public investment in alternative protein by investment type[22]

21 Good Food Institute. (2023). "State of Global Policy: Public investment in alternative proteins to feed a growing world". p15.

22 Ibid., p15



Graph 4 United States publicly disclosed private investment in alternative proteins[23]

Private investment for the US remains higher than public, with $137.17 million invested in 2023. However, there was a significant decrease in investments compared to 2021, as **Graph 4** shows. This general retrenchment of investment was largely driven by high interest rates and with the sector seeing non-specialists moving away from alternative proteins as they committed to more traditional markets. Comparing internationally, the US still remains the largest market for publicly disclosed private investment, with $6.52 billion invested in this market since 2014, as Graph 1 highlights.

Globally, among those consumers for whom protein consumption is an important factor, health concerns were found to be the biggest reasons for reducing meat consumption,[24] this is a key group within the US, with 66% of consumers claiming a high-protein diet is important.[25]

For some consumers, concern still exists about whether alternative sources can provide the same level of nutrition that they believe they need.

23 VC investment analysis insights developed through PatSnap (2024). Results found through the following search: "alternative protein," "plant-based protein," "plant-based food," OR "cultivated meat," AND within "Food Science", within the authority of "United States" and patent status (active or pending), Announced Date: "01/01/2014 – 05/11/2024".

24 Euromonitor International. (2023). "Plant-based foods face key challenges"

25 Good Food Institute. (2023). "State of the Industry Report, Plant-Based: Meat, Seafood, eggs and dairy". p.26.

Plant-based

The US plant-based food market is significantly the most established of the alternative protein sectors in the US, valued at $8.1 billion in 2023, a significant growth from the 2017 value of $3.9 billion.[26] This growth has also been accompanied with challenges, as 2023 saw a decline in unit sales by 9%. This is likely due to the recent 'cost of living crisis', in which US consumers are reducing their spend on non-essential goods.[27] This has led to tightened budgets which decreased consumer willingness to try novel plant-based food.

Private and public funding in 2023 saw $907.7 million for plant-based alternatives, with the sector now estimated to be worth $6.4 billion in the retail sector.[28] Whilst positive, this is still far behind the traditional meat sector, and in food services plant-based meat sales account for an estimated 656,000 tons compared to 410 million tons of conventional meat. Between 2019 to 2023 the cost of plant-based meat grew at only 10%, compared to 18% for traditional meat, offering greater potential for the sector to be seen as more affordable to customers, a common concern in consumer insight studies.[29]

26 "Good Food Institute. (2023). "State of the Industry Report, Plant-Based: Meat, Seafood, eggs and dairy". p.35."

27 PWC. (2023). "69% of consumers hold back on non-essential spend as cost of living rises; 90% adopt cost-saving behaviours: PwC Consumer Insights Survey".

28 Good Food Institute. (2023). "State of the Industry Report, Plant-Based: Meat, Seafood, eggs and dairy". p9.

29 Ibid., p43.

Plant based – Rebellyous Foods[30]

In reaction to the need to reduce costs to help increase the viability of plant-based foods and move towards price parity with traditional meat and dairy products, many businesses in the sector have begun to act. By investing in automation, plant-based chicken company Rebellyous Foods were able to greatly reduce energy costs (by 80%), material waste (99%) and workforce costs (90%) through the implementation of their new manufacturing equipment. Rebellyous are now working with the USDA and FDA around the installation of this system in their other food processing facilities.[30]

30 Rebellyous Foods. (2023). "Request for Proposals: Production System Facility Host Site with 10M+ lb/yr Capacity".

Fermentation

A fermentation-based approach to food security and production has tremendous potential to revolutionise the growing alternative protein sector. Precision fermentation methods allow scientists and food technologists to efficiently produce proteins, fats, sweeteners, pigments and flavour molecules in a selective manner. North America is one of the fastest growing markets for precision fermentation, estimated to reach over $1.2 bn by 2031, and is dominated by dairy applications that focus on lactoferrin, whey, casein and egg white production. The US is significantly ahead of other countries when it comes to investment and support too, with $2.8 bn of investment between 2014-22, and in 2023 alone $514.7M has been raised through private and public funding by companies operating in precision fermentation for food ingredients.[31]

31 Good Food Institute. (2023). "State of the Industry Report, Fermentation". p9.

Precision fermentation – Liberation Labs[32]

As an example of the US Government taking strides to support the bioeconomy, Liberation Labs recently began development of a new commercial-scale facility in Richmond, Indiana. Following a $25 million government-backed loan secured in 2023, once constructed, the facility will be able to supply manufacturers and packaged goods companies from late 2024 – with a capacity of 600,000 litres.

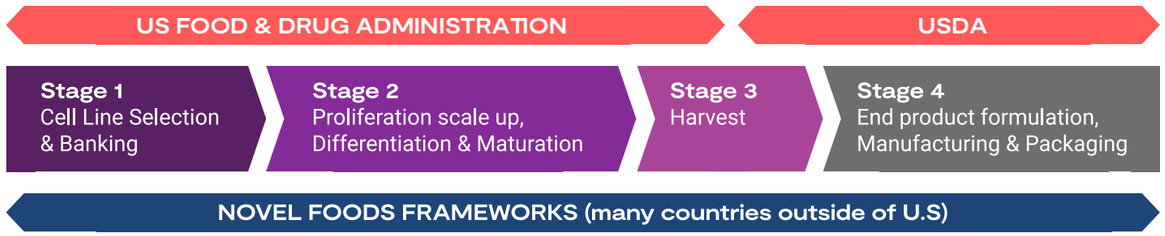
32 AgFunder News. (2023). "Liberation Labs bags $25m USDA-backed loan to fund US biomanufacturing hub: 'What matters is whether the capacity is fit for purpose'".

Cultivated meat

In a landmark move, 2023 saw two companies, GOOD Meat and Upside Foods, selling cultivated chicken products in the US for the first time, following approval by the FDA and USDA.[33] These accomplishments have provided positive news for the sector, and provided a roadmap for cultivated meat companies to enter the US market. To be approved, businesses are required to go through the US FDA's consultation for cultivated meat products as part of their pre-market authorisation process. The FDA will evaluate the biological end product and the production process, taking into account the cell line used in the manufacturing process. The USDA jurisdiction falls within processing, packaging and labelling.

The sector has also seen challenges, notably in how cultivated meat products are labelled, with court cases in Louisiana, Missouri and Oklahoma contesting how states regulate labelling. Bans on the production and sale of cultivated meat have also been enacted in Florida, , Alabama[34] and Nebraska,[35] with discussions on bans occurring in Arizona, Kentucky, Tennessee and Texas[36] with limited success at present.

Despite complex regulatory challenges, private funding in 2023 invested $225.9 million in cultivated meat.[37] Compared to plant-based and fermentation alternative proteins, cultivated meat is less mature, but with significant potential in the food market. Regulatory challenges and cost of production remain key barriers for this potential to be realised.



33 Good Food Institute. (2023). "State of Global Policy: Public investment in alternative proteins to feed a growing world".
34 Vox. (2024). "Why Florida and Alabama banned a kind of meat that doesn't really exist".
35 Plant Based News. (2024). "Nebraska Governor Takes Steps Towards Banning Cultivated Meat"
36 Wired. (2024) "States Are Lining Up to Outlaw Lab-Grown Meat".
37 Good Food Institute. (2023). "State of the Industry report: Cultivated meat and seafood".

Cultivated meat – BELIEVER Meats

Facilities to make products at commercial scale are a key factor for the growth of the cultivated meat sector. This is necessary to react to market signals from recent research that indicates between a third and half of consumers saying they would likely eat cultivated meat once established,[38] with key factors being environmental benefits and health.

BELIEVER Meats, previously Future Meat Technologies, have constructed a 200,000-square-foot facility in Wilson, North Carolina, which will be the largest in the world. Once fully operational, the site aims to produce more than 10,000 metric tons of cultivated meat a year, bringing with it significant investment in the region and more than 100 new jobs.[39]

38 "Good Food Institute. (2023). "State of the Industry report: Cultivated meat and seafood". P28."
39 Vegconomist. (2022). "Believer Meats Breaks Ground on Largest Cultivated Meat Production Facility in The World".

Commercial Insights

Throughout the global market, the key issue remains that consumers do not feel that price and taste parity have yet been realised for alternative proteins when compared to traditional meat products. A recent survey by the Food Industry Association (FMI)[40] has shown taste, nutrition, sustainability, price and experience to be key factors for consumers, with taste the leading response. Consumers will also consider the number of ingredients, with fewer ingredients considered positive, and how the food was processed, along with its taste, look and feel.

Environmental impact is also highlighted as being of high importance by consumers, but this is not then reflecting in their purchasing habits, according to stakeholders met through this GEM. This is likely due to consumers viewing the issue of environmental sustainability as being of high importance, but not necessarily the primary factor for their own purchasing decisions. However, consumer buying dynamics are shifting with the rise of flexitarianism, with 15% of households in the US buying both conventional and alternative meat, alongside the smaller number of vegan and vegetarian consumers.[41]

Insights such as this from FMI are important for small brands to reflect on for their product, and to inform any adaptation of its production or messaging that may be required as a result. Data analysis, such as through the consumer insights company SPINS,[42] were highlighted as an important resource to utilise ahead of launching or committing to any significant investment.

Through this more detailed understanding, brands can build a better knowledge of consumer dynamics and sales, and how these vary in different locations across the US.

Businesses should also ensure they have a full understanding of the supply chain, warehousing and distribution costs, which are often an important area that new brands underestimate in the US market. To illustrate this **Annex 1** provides a simplification of how a UK brand might try to enter the US. Understanding the scale of the US market is also key, with smaller regional retailers often a more successful stepping stone for new market entrants than targeting national retailers, where their scale of demand and associated costs are often too large to be feasible at an early stage.

For businesses, there is also a valuable alternative protein market within the food service sector, rather than simply targeting retail alone. Supplying products into appropriate restaurants and food service facilities at locations such as universities, hospitals and schools give another avenue for sales without the same public branding challenges as selling direct to consumers in shops. However, similar expectations around taste and price points will still apply here against established meat and dairy products. As with retail sales, understanding regional variations across the US in terms of engagement and audience demographics will also support the need for an effective and informed strategy.

40 The Food Industry Association. (2024). “Power of Plant-Based Alternative Foods and Beverages 2024”.
41 The Food Institute. (2022). “Is the Future Consumer Flexitarian?”.
42 spins.com

05. The Innovation Landscape

Innovation Support

With far reaching opportunities for further innovation and commercialisation of alternative proteins, innovation support in the US is multifaceted. On a federal level this includes agencies such as Agriculture, Defence and Commerce, but is more regularly seen with support from state and city level governments.

Federal level

The United States Department of Agriculture (USDA) is playing a greater role in the alternative proteins landscape at present, following the approval in conjunction with the Food and Drug Administration (FDA) of two cultivated meat products in the market.[43] The USDA has also provided a $25 million loan guarantee to Liberation Labs for a commercial-scale fermentation facility in Indiana.[44]

The department's National Institute for Food and Agriculture has also given funding for new research projects, including developing plant-based seafood at North Carolina A&T State University, Virginia Tech's work on high-protein faba beans, and backing training initiatives for food scientists at California Polytechnic University.[45]

43 US Food & Drug Administration. (2023). "Human Food Made with cultured Animal Cells".
44 Agfunder News. (2023). "Liberation Labs bags $25 m USDA-backed loan to fund US biomanufacturing hub".
45 Good Food Institute. (2023). "State of Global Policy: Public investment in alternative proteins to feed a growing world"., p16."

The Department of Energy's Advanced Research Projects Agency (ARPA-E) awarded $1.7 million to Umaro Foods, a plant-based seaweed business, to investigate the opportunity to produce valuable metal products during their processing techniques.[46] Meanwhile, the Department of Defence commissioned a four-year research project to the University of Illinois focused on fermented alternative proteins.[47] Initially for $10.4 million through the Defence Advanced Research Projects Agency (DARPA), it is estimated that growth in this programme could lead to $40 million in fermentation funding.

Further funding has also been seen through the National Science Foundation, who have provided a $1 million grant for evaluating hybrid cultivated and plant-based meat alternatives to a project between Tender Foods and the Tufts University Center for Cellular Agriculture.[48] The centre at Tufts University also provides the first undergraduate cellular agriculture degree in the world, and has established the Cellular Agriculture Commercialization Lab. This lab is focused on technical development and developing strategies to de-risk commercialisation through intellectual property, regulatory, and commercial initiatives.[49]

46 ARPA. (2023). 'U.S. Department of Energy Announces Teams Selected to Explore Critical Mineral Extraction from Ocean Macroalgae".
47 University of Illinois. (2023). "The Three-Ingredient Food of the Future".
48 Vegconomist. (2023). "Tender Food and Tufts University to Explore Hybrid Meat Products Made with Cultivated Cells and Plant-Based Meat".
49 cellularagriculture.tufts.edu

State level

Support at state level has also seen numerous initiatives from funding, guidance on regulation, programmes to support more sustainable diets and support for local businesses to grow in the sector. Those highlighted from this GEM include:

- The Biotechnology Centre by the North Carolina Department of Commerce, which was the first state-sponsored biotechnology initiative in the U.S.[50]
- The current New York City programme that makes plant-based dishes the primary dinner choice across its public hospitals, this is now being adopted by many private hospitals.[51]
- 'Plant-Powered Fridays' at New York City public schools, where plant-based dishes are served as a main menu each Friday.[52]
- California Governor's Office of Economic Development (Go-Biz) supporting start-ups through California Competes[53] and moving agri-tech manufacturing to lower emissions through Food Production Investment Program.[54]
- The governor of Illinois-led investment of $680 million into the Illinois Fermentation and Agriculture Biomanufacturing (iFAB) Tech Hub, alongside private partners.[55]

50 North Carolina Department of Commerce. "North Carolina Biotechnology Center".
51 New York City Health + Hospitals. (2023). "NYC Health + hospitals now serving culturally-diverse plant-based meals as primary dinner option for inpatients at all of its 11 public hospitals".
52 NYC Food Policy. "Plant-Powered Fridays"
53 California Business and Economic Development. "California Competes".
54 California Business and Economic Development. "Food Production Investment Program".
55 Vegconomist. (2024). "Illinois Invests $680M in Biotechnology Sector to Enhance Biomanufacturing and Precision Fermentation Capabilities".

White Papers and Policies

The 2023 'Bold Goals for U.S. Biotechnology and Biomanufacturing'[56] report from the White House highlights alternative proteins as a solution to reduce methane and greenhouse gases in the agricultural sector. Within this, the report backs feasibility studies around low-cost protein from precision fermentation, increased R&D efforts to develop bioprocessing approaches for scaling up biotechnology-based proteins, and work needed to drive research into regulation, commercialisation and nutrition in relation to new products. It also identified New Centres of Excellence as an initiative that will aim to drive innovation in alternative protein products and processes, train the next generation of the workforce, and enable an information exchange between academia and industry.

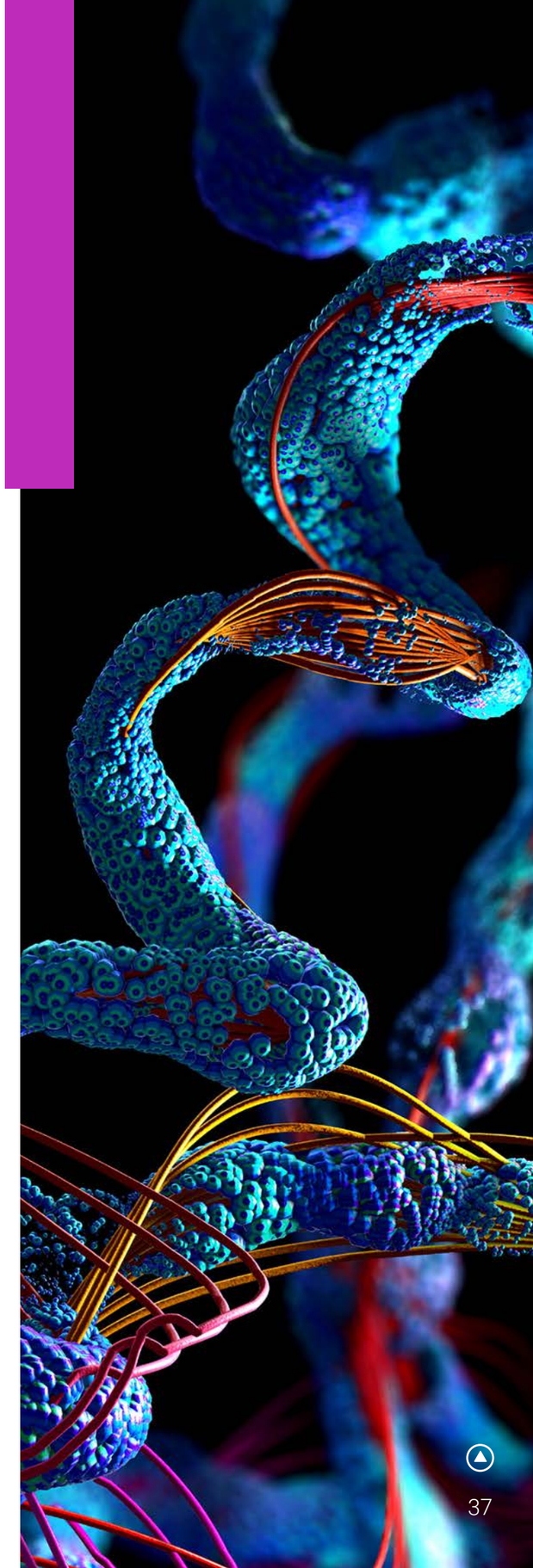
A subsequent report, entitled 'Building the Bioworkforce of the Future',[57] supported the development of biomanufacturing facilities as part of a wider effort to build an ecosystem of research, public-private partnerships and infrastructure around alternative protein sources in food production. The report outlines how supporting this industry and the growth of these manufacturing facilities will create further benefits of supply chain security, skilled job creation and economic development.

Further opportunities in the use of alternative proteins were included in the 2022 report from the President's Council of Advisers on Science and Technology, entitled 'Biomanufacturing to advance the bioeconomy.[58] This report outlined alternative proteins as part of innovations that will reduce reliance on petrochemicals, but more fundamentally as a replacement for traditional livestock industries that generate a significant proportion of greenhouse gas emissions. The report highlights current successes from alternative protein businesses in creating sustainable products that have helped stimulate local economies, and reduce the need for land, fertilisers and pesticides

56 The White House. (2023). "Bold Goals for U.S. Biotechnology and Biomanufacturing – Harnessing research and development to further societal goals".

57 The White House. (2023). "Building the Bioworkforce of the Future – Expanding equitable pathways into biotechnology and biomanufacturing jobs".

58 President's Council of Advisors on Science and Technology. (2022). "Biomanufacturing to advance the bioeconomy".



International Cooperation

The UN's Environment Programme outlined the significant benefits of bilateral and multilateral research efforts in their 2023 Frontiers Report.[59] The study advised that co-ordinated multi-state research can reduce duplication and accelerate the pace of innovation, as well as building expertise and capabilities in different countries when utilising the skills and knowledge of private companies within the co-operative framework. The UK and US have a history of collaboration that can be built on to further joint efforts in alternative proteins,[60],[61] while already active US-led international initiatives can lay a foundation for these efforts.

The Agriculture Innovation Mission for Climate, launched at COP26 by the US and United Arab Emirates, has brought together 600 partners from 56 countries to tackle climate change and global hunger. It has mobilised $17 billion in investments for climate-smart agriculture and food systems innovation, and improving structures to coordinate international collaboration.[62] From this funding, $41 million has supported sustainable protein innovation initiatives, including international support for open access research.[63] As part of this, the Bezos Earth Fund Sustainable Protein Innovation Sprint brought three of its Centres for Sustainable Protein from the US, UK and Singapore together.[64]

59 UN Environment Programme. (2023). "What's Cooking? An assessment of potential impacts of selected novel alternatives to conventional animal products".
60 Foreign & Commonwealth Office. (2017). "UK/USA: Agreement on Scientific and Technological Cooperation".
61 The White House. (2023). "The Atlantic Declaration: A Framework for a Twenty-First Century U.S.-UK Economic Partnership".
62 aimforclimate.org
63 Aim for Climate. (2024). "Cultivating Transformative Investments in Climate Smart Agriculture and Food Systems Innovation". p18.
64 aimforclimate.org/innovation-sprints

Innovate UK GEM delegation with participants of the San Francisco roundtable

The Office of International Research Engagement and Cooperation, is the USDA's international engagement arm. Its scope covers emerging/re-emerging plant and animal diseases, food safety threats, inadequate nutrition, invasive species, changing environmental conditions, water scarcity and flooding, and access to genetic resources and scientific collection.[65] It has various international bilateral partnerships, such as the US-Israel Binational Agricultural Research and Development Fund, which supports doctoral funding and bilateral collaboration in novel food technologies, amongst wider challenges.[66]

A further initiative was the 2023 international call from the NASA Deep Space Food Challenge, this sought solutions to feed astronauts for long-term space travel. Two of the teams to advance to the final round utilised alternative proteins technology to provide answers to this issue, winning $150,000. Mycorena a Swedish microprotein company, now owned by Naplasol, developed a system that produces microprotein from a combination of microalgae and fungi. Air Company, a US-based carbon capture company, developed a system and processes for turning air, water, electricity, and yeast into food. [67]

65 ars.usda.gov/office-of-international-research-engagement-and-cooperation/international-research-engagement-and-cooperation-partnerships/
66 bard-isus.org/funding-opportunities
67 NASA (2023). "NASA Selects Winners, Announces Final Phase of Space Food Challenge".

US Innovation Ecosystem

Incubators

One strength of the alternative proteins sector in the US, particularly in the regions of focus from the GEM, is the existence of incubator facilities and early-stage support for innovation. Many of these are backed by leading universities that also play a key role in plant and food science research, education and skills development in the US. Examples of these incubator facilities include:

- **AgStart**[68] - established in 2021 with the support of UC Davis, with the aim of supporting innovators and early-stage entrepreneurs with affordable lab space, cutting-edge facilities for product testing, a commercial grade kitchen, and fermentation and tissue culture work. As well as providing a base for proof-of-concept stage innovation, AgStart have also developed a network of experts, mentors and investors, partners within farming to support testing, as well as local research talent from the UC Davis campus.
- **LifeSpace Labs**[69] - a 10,000 square foot incubator facility based in the City of Vacaville, focused on supporting start-ups across food and life sciences through their commercial journey of testing and product development. LifeSpace Labs provides wet-lab co-working space, office space, and shared lab equipment – including fermentation facilities from 500ml to 1.5L and above. The facility was created through a combination of private funding and a grant from the City, who were keen to establish an incubator site to help boost the success rate of innovations from concept through to commercialisation, and with the aim of anchoring research, jobs and expertise in the area.

68 agstart.org
69 lifesplabs.com

Innovate UK GEM delegation tour Mista with Jesse Villar

- **MISTA**[70] - a food innovation platform and ecosystem, bringing together a network of start-ups, established businesses, researchers, producers and industry experts to help drive methods to transform the global food system. Based at their new Food Innovation Centre in San Francisco, MISTA provide incubator support to businesses through a number of specialist lab facilities, extrusion technology, product development kitchens and co-working spaces. MISTA was created as an independent entity that focuses on supporting cutting-edge food industry start-ups and encourages collaboration throughout the sector.
- **The Rutgers Food Innovation Centre (FIC)**[71] - opened in 2008 and sitting within the Rutgers New Jersey Agricultural Experiment Station (NJAES) as part of the State University. It was established as a business incubator to provide training and specialised information services, business and technology mentoring, and product manufacturing in a shared-facility. The FIC has formed one of only a few university-backed sites that is fully USDA and FDA certified to allow the manufacture of saleable foods within the centre itself, enabling it to support early-stage entrepreneurs and existing businesses both in the US and overseas, looking to either create or improve their route to and success in the food market.

Similar facilities and organisations also exist across other key parts of the US alternative protein landscape. Among others, these include MBOLD[72] – a Minnesota-based business coalition bringing together entrepreneurs and innovators to tackle key food and agriculture challenges - and North Carolina's NC Food Innovation Lab,[73] a 16,000 square foot R&D space dedicated to supporting plant-based food innovators with pilot-plant production equipment, training and consulting support.

70 mistafood.com
71 foodinnovation.rutgers.edu
72 mbold.org
73 ncfoodinnovationlab.org

Innovate UK GEM delegate and Joshua Hyman cooking scrambled egg from JUST Egg

Alternative protein companies

There are also a number of highly innovative commercial companies, leading the way in bringing new alternative protein products and concepts to market for consumers. The GEM included site visits and meetings with a number of these businesses:

- **BlueNalu**[74] -a cell-cultured seafood business based in San Diego. BlueNalu was established to explore the opportunity for using cellular agriculture techniques in seafood, in order to establish an alternative bluefin tuna product for use in sushi. Given the regulatory, supply chain, sustainability and food safety challenges faced by seafood suppliers, this alternative solution can help tackle the problems with a nutritional, sustainable and reliable product.
- **Eat Just** [75] - a food technology company looking at sustainable alternatives to traditional food products through the use of plant proteins and cultivated animal cells, developed with novel extrusion technology and an in-house pilot plant facility. They currently have commercially available chicken and egg alternative products in the US and overseas.
- **Every Company**[76] - an innovative company focused on an egg alternative through precision fermentation techniques, which can be used in food production and baking. Every are focused on bio-identical egg production, as well as a powdered egg white product from a clear protein that replicates traditional eggs for manufacture and cooking uses without changing texture, taste or colour.
- **NotCo**[77] - a B2B joint venture to bring AI into product formulation, focused around plant-based alternatives. The company now has a range of commercialised products developed through a joint venture with Kraft Heinz, from burgers to milk and mayonnaise, as well as an AI platform developed to identify flavour, cost and nutritional values for ingredient combinations and product formulations that alternative protein companies can access through a fee for service model.

74 bluenalu.com
75 ju.st
76 every.com
77 tech.notco.com

Commercial insight and networking organisations

The vibrant ecosystem for alternative proteins, particularly with plant-based foods, is boosted by an array of organisations developing networking and data analysis, as well as by engaged trade associations.

- **The Food Industry Association (FMI)**[78] - a national trade association for the food industry, with 90% of the food retailer and wholesaler industry represented, covering 40,000 stores and key organisations across the supply chain. Their plant-based proteins data insights inform alternative proteins organisations on trends in the consumer market, the organisation also facilitates networking events for its members.
- **Good Food Institute (GFI)**[79] - a non-profit think tank connecting stakeholders to help advance alternative proteins in order to meet global climate, health, food security, and biodiversity goals. Their work maps out the sector to find gaps in science and policy, produce reports, educate policy makers and connect industry through seminars and their databases.
- **Plant Based Food Association**[80] - the largest plant-based food trade association in the US, they provide more than 200 members with consultancy and networking opportunities to scale across the US market. Key to their insights is the use of data analysis from SPINS, which allows the Association to generate commercial insights reports for its members.
- **SPINS**[81] - a consumer data analysis specialist, their data insights enable brands to focus their R&D on gaps in consumer needs, and adapt to changing trends. With the diversity of the US demographic across its states altering taste and demand, these insights were often used by plant-based food businesses met through this GEM.
- **Vegpreneur**[82] - a media brand and global community for plant-based businesses, they create networking organisations for the sector, as well as brand-building mentorship opportunities for their members. Their community offers opportunities to share initiatives and insights to tackle common problems faced in the industry.

The Innovate UK GEM delegation gained insights of the US ecosystem at the Plant Based World Expo in New York

78 fmi.org
79 gfi.org
80 plantbasedfoods.org
81 spins.com
82 vegpreneur.org

Innovate UK GEM delegation engaged in discussion with New York roundtable participants

Businesses engaged with alternative protein companies

In addition, other meetings were held with key stakeholders providing support for innovators and healthcare providers who are enabling the uptake of alternative proteins via procurement, which include:" to "The delegation also met with stakeholders from the broader alternative proteins ecosystem, such as those providing support for innovators and food services who are enabling the uptake of alternative proteins via procurement, which include:

- **Bühler Group**[83] - an international supplier of food manufacturing equipment, their high-moisture extruders are used globally, including with incubators met through this GEM. These extruders are used to retexture proteins from sources such as soy, pulses, and microalgae.
- **Clear Current Capital**[84] - a venture capital firm with a focus on a sustainable food system for the planet, people, and animals. Their funding is directed at initiatives creating alternative food, increasing productivity, engaging consumers and reducing waste.
- **Hawkwood Biotech**[85] - a specialist consultancy focusing on synthetic and engineering biology. Hawkwood work with SMEs to support scaling up through guidance and modelling around infrastructure, engineering and business structures. The company also advises VC firms with investments in the sector, including screening and analysis work, as well as with governments and NGOs to give advice on how to best deploy capital.
- **Keller and Heckman**[86] - an international law firm focusing on areas of regulatory law, public policy, and litigation, their clients include global food and food additives companies, as well as trade organisations. Their publications have included insights on regulations around alternative proteins, globally.

83 buhlergroup.com/global/en/industries/Extrusion-solutions/Alternative-Proteins.html
84 clearcurrentcapital.com
85 hawkwoodbiotech.com
86 khlaw.com/practices/alternative-proteins-0

Innovate UK GEM delegation meet with representatives of Northwell Health

- **Northwell Health**[87] - the largest health system in New York, spanning 21 hospital sites, 88,000 employees, and providing more than 20 million meals every year to patients, visitors and staff.

Northwell Health developed a mission to revitalise the quality, diversity and message behind the food produced and provided by their network of hospitals, and work alongside a range of specialists to revolutionise patient and staff experience. This work included a plant-based approach to using alternative protein sources.

87 northwell.edu/about-northwell/corporate-social-responsibility/environmental-sustainability/programs/healthy-foods

Food services

Food services provide another route to market for alternative protein products, distinct from direct sales to retailers. Products sold to food services, such as those offered in restaurants, hospitals, or schools, are often more malleable, without an overpowering taste, allowing them to complement other ingredients in a wide range of dishes. These products retain essential qualities, such as taste, texture, and nutritional value, while enabling chefs to provide immediate feedback and gain insights from internal consumer surveys conducted by food service operators.

One benefit of this approach is the opportunity to secure significant sales through a small number of engaged food service customers, rather than relying on individual pack sales in retail. This model can then generate awareness and enhanced brand credibility by establishing the product within reputable institutions, where high-quality preparation can inspire consumers to seek out the product in retail stores as well where available.

While there are a number of opportunities in the food service sector, there can be significant challenges in selecting the brands which provide superior taste quality but also cost-effective. Quite often lower quality products are used to increase profitability. In addition, some consumers are often resistant to alternative meat, however, stakeholders met through this GEM have indicated there is demand and curiosity from students in universities.

06. Collaboration Opportunities

Innovation priority area

The alternative protein innovation landscape in the US is a varied and active ecosystem, exploiting the opportunities that the expansive retail and food services market has created. For the businesses that this GEM met with, there is a sense of drive and optimism that their innovations will fill gaps the market for alternative protein products around taste, texture and nutrition.

Precision fermentation – which enables specific products like proteins or fats to be produced in microorganisms, such as fungi or bacteria, has significant potential to enhance alternative protein products by replicating the desired taste and texture of animal-based products. Potential collaboration channels exist within the US market, with many of the companies met through this GEM offering insights to the application of this technology area, including:

- **Pow.Bio**, who utilise continuous precision fermentation to tackle a common challenge of contamination and high operational costs by decoupling the growth and production phases. This continually extracts the desired products without resetting processes between batches, which significantly boosts efficiency and yield.[88]

Sample of Melibio's honey, created through fermentation

- **Perfect Day** similarly use precision fermentation with their product ProFerm, which replicates the taste and texture of dairy to be used easily in baked goods, a common challenge area for dairy alternative products.[89]
- **Helaina** offers a further example of precision fermentation by replicating human lactoferrin to create commercial breast milk with enhanced nutritional profile.[90]

88 pow.bio
89 perfectday.com
90 myhelaina.com


Innovate UK GEM delegation discuss the production of GOOD meat through cultivated production at Eat Just site visit

Cultivated cell line scale up is still in its early stages, but advancements of the cultivated meat sector provide optimism that this will increase over the next decade. The approval of two cultivated meat burgers by the FDA and USDA in 2023 provide a roadmap that the technology can follow to enter the US market.

Liberation Lab's development of the world's largest cultivated-meat factory in North Carolina demonstrates the potential for this sector to scale over time and provide strong economic benefits.[91] These developments in the US coincide with the UK's Engineering and Physical Sciences Research Council's £12 million investment for cultivated meat,[92] and the Food Standards Agency releasing £1.6 million in funding for an innovative Cell Cultivated Products sandbox programme.[93]

91 AgFunder News. (2023). "Liberation Labs bags $25m USDA-backed loan to fund US biomanufacturing hub: 'What matters is whether the capacity is fit for purpose'".
92 UK Research & Innovation. (2023). "Vaccine and food manufacturing hubs will save lives and cut carbon".
93 Food Standards Agency. (2024). "Groundbreaking sandbox programme for cell-cultivated products announced".

Knowledge exchange mechanisms

There is clear support across the US ecosystem for a collaborative approach to working with the UK through sharing knowledge and experiences for the long term benefit of the sector. Building upon established networks to create a forum which brings together stakeholders within the sector would allow the UK and US to identify synergies to co-develop solutions to shared challenges.

The incubators such as MISTA and Rutgers who already possess market knowledge and connections, were each keen to play a central role in hosting conversations and facilitating partnerships, or to host future GBIPs and GIPs. There is a demonstrable appetite among incubators to facilitate this connection between UK and US stakeholders to aid international collaboration and drive innovation towards successful commercialisation. These opportunities for collaboration should be facilitated by existing knowledge, such as current trade associations, networking organisations or Artificial Intelligence focused companies, such as NotCo.

Similarly, it would be valuable to give SMEs the opportunity to learn and engage with more established businesses, as well as investors, retailers and industry specialists, on how to achieve scale and success while avoiding common pitfalls on the path to commercialisation, through the establishment of a peer-learning network. Alongside these connections, 'hacks' were identified as a useful mechanism to explore the challenges the sector faces, and to develop solutions through targeted analysis.

The MISTA Growth Hack 2024 Symposium on Biomass Fermentation is a recent example of this, inviting 100 industry experts to partake in addressing the technical challenges that need to be overcome to realise biomass fermentation's potential for the food sector.[94]

NotCo[95]

NotCo have developed a database focused around plant-based alternatives, identifying flavour, cost, sugar, nutritional values and regulatory barriers for different ingredient combinations and product formulations. Its Guiseppe AI tool works with this database to identify trends and gaps in the market through social media analysis and can be used by companies to develop new recipes and alternative protein products from these AI generated ingredient combinations.

94 MISTA (2024) "MISTA Growth Hack 2024 Symposium".

95 tech.notco.com

International alternative protein networking association

Connecting to established retailers and food services would further allow UK SMEs to understand the specific needs that currently exist, and whether their product can overcome them in the US marketplace. These connections help UK businesses understand unique landscapes found in the US and adapt their approach accordingly, such as the strategy Plantega have undergone to focus their plant-based products as to-go sandwiches in New York delis. The inclusion of trusted companies, as well as chefs, would also allow the network and associated companies to achieve a 'seal of approval' status, building trust from consumers that products are safe, tasty and of high quality.

A network such as this must also include farmers and those engaged in the wider agricultural landscape, to showcase how the sector can work collaboratively with farmers. Through plant-based alternative proteins, there are opportunities to grow a wider variety of crops such as pulses and legumes, and to also look at circular economy approaches, where precision fermentation and cell culture systems may be able to use inputs arising from agricultural co-product streams within their production processes.[96] This has the potential to reduce waste and could offer potential new revenue for agricultural co-products.

96 Perfect Day. (2021). "Comparative Life Cycle Assessment of Perfect Day Whey Protein Production to Dairy Protein".

Plantega[97]

Based in New York city, Plantega's plant-based sandwiches are targeted to be sold at delis, allowing their product to expand through word of mouth with established networks. Originally selling ready to eat and packaged products, they found that deli customers wanted products for lunch or on the go, rather than purchase food for later. Through adapting to this, their sandwiches are available in over 55 stores across New York city.

97 plantega.com

US ecosystem and talent development

While historically there has been limited federal-level funding and support in the US for the alternative protein sector, there are signs of change with greater investment and policy initiatives for the industry. The USDA are committing funding to R&D through universities, with the Department for Energy also supporting alternative protein innovation that has climate benefits. Given this trend towards greater engagement and support, there may be future opportunities for the UK to put forward a case for bilateral funding competitions that build on the momentum of domestic initiatives like the Novel Low Emission Food Production Systems competition funded by BBSRC and Innovate UK.

There is also an opportunity to create a mutually beneficial international approach to skills development and research opportunities for entrepreneurs, start-ups and early-stage academic innovators through a joined-up programme between UK and US authorities.

Skills development does not need to be focused solely on entrepreneurs, but could include bilateral educational exchange trips for university researchers and students within the sector. A potential collaboration opportunity in this space is the USDA's NEXTGEN initiative, launched in 2023, to support students and young professionals to cultivate the next generation of diverse food and agriculture talent.[98]

In support of initiatives such as this, the UK has an opportunity to play a role that may involve a complementary educational piece for participants around understanding the UK alternative proteins market. Bilateral educational exchange trips build greater sector knowledge, and the industry experience may lead to further opportunities for the US and UK to work more collaboratively together in future. Engaging with individuals entering into, or already active in the agriculture and farming sector helps them to better understand the potential benefits of alternative proteins and where they can engage in the industry, for example through supplying protein crops.

98 The White House. (2023). "Building the Bioworkforce of the Future – Expanding equitable pathways into biotechnology and biomanufacturing jobs", p16.

Market access and expansion

Due to the scale of the US market, its consumer landscape is varied with diverse challenges across states and regions. UK alternative protein businesses should therefore ensure they understand the market and focus on the regions where they are best suited to provide innovations or products that meet these regional market needs and consumer requirements, rather than considering the US as a single ubiquitous market place. The incubators met through this GEM were of particular assistance for overcoming these challenges.

Exploring this opportunity through the design of tailored GBIPs can help innovative UK SMEs identify potential markets and partnerships that will give them opportunities to be successful in the US. Utilising experts from across business, incubators and industry specialists in the US, including some of the key stakeholders that have been engaged through this GEM, would provide invaluable business insights to help UK SMEs understand how to get a foothold in the market and avoid naive mistakes.

Lessons from commercial experts met through the GEM have identified how a lack of knowledge of the US market, particularly around costs, scale and retail channels, have hindered the success of many overseas food businesses. Having focused support and guidance as part of a future GBIP or GIP would tackle many of the pitfalls businesses face when launching in the US, increasing the potential success rates for UK companies looking at entering the market.

Innovate UK GEM delegation visit the Food Innovation Center at Rutgers with Nolan Lewin

The Food Innovation Center at Rutgers (FIC) International Soft Landing Programme[99]

The FIC International Soft Landing Programme is designed to help international companies assess the US landscape by providing a range of expert insights. Through the provision of mentors for companies to help founders understand the landscape, this programme tests consumer interest of products by state, allowing for the varied preferences of consumers in each state to be tested. Alongside consumer trends, the programme also provides resources to support understanding of, and decisions around, logistics, regulation, distribution and food safety for importing products to the US market. FIC can also act as a co-manufacturing partner for international companies, enabling them to test or trial products in the US market.

99 Foodinnovation.rutgers.edu/services/#International-Soft-Landings

Consumer and market research

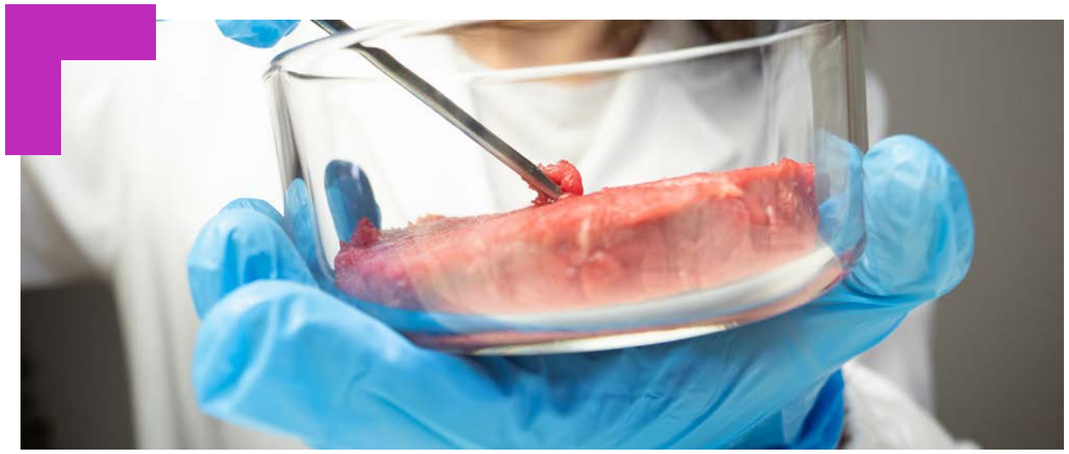
There is a real opportunity for the industry stakeholders, universities and SMEs within the two countries to form longer-term strategic partnerships around consumer research, investment and sector-wide marketing to inform product and business development.

An immediate opportunity exists to raise awareness of the current alternative protein landscape in each country, including market dynamics and consumer trends, as this GEM found that a number of organisations were engaged with and interested in learning and sharing information in this way. This could cover key areas such as the demand and success of different product types, the reactions from consumers to different alternative protein products, and where investment and retail focus lies at present. It can also look at insights relating to the current customer base in terms of size, consumer spending power and engagement with these products.

In the longer-term, continuing to share market insights, as well as changing consumer habits, and those of retailers, wholesalers and food service businesses will be beneficial to inform the commercial strategy of new and existing businesses looking at the US market, as well as helping to provide insights to Government on the focus of potential bilateral funding initiatives.

With the failure rate of novel food businesses currently high, partnering on the provision of strategic insights can help new start-ups and early-stage companies from making poor business decisions, as these founder-led businesses often lack commercial experience within their senior teams. As found through discussions during the GEM by the experts attending the Plant Based World Expo[100] and the iCAMP 3rd Annual Cultivated Meat and Alternative Protein Summit,[101] as well as the Innovate UK-hosted roundtables, private investment in this sector is focused on those businesses who are solving a need or filling a gap for consumers.

100 plantbasedworldexpo.com
101 icamp.ucdavis.edu/annual-summit



Regulation

While joined-up policy on regulation may be more challenging to achieve, establishing joint efforts around improving regulatory science in the precompetitive space would be beneficial for both countries to help in solving mutual challenges.

Experts attending the Innovate-UK led roundtables, as well as the US SMEs engaged with during the GEM, highlighted the opportunity that the UK now has following its exit from the European Union to develop regulatory frameworks that are agile, whilst also ensuring food safety as novel foods are developed across the sector. There was a belief that separation from the European Food Safety Authority presents an opportunity for the UK to become a regulatory leader in the global alternative proteins space for new assessment and approvals protocols, whilst maintaining its respected high standards for food safety.

Stakeholders also showed an appetite for engaging more closely with the UK both as a major consumer market for alternative proteins, as well as a soft-landing point to the larger European market, with 440 million consumers.[102]

The new £1.6 million funding secured by the FSA from the Department for Science, Innovation and Technology to deliver a cell-cultivated products regulatory sandbox,[103] announced shortly after the GEM took place, also provides an opportunity within the UK, with overseas business input, to explore regulatory issues and inform guidance standards that could help unlock the route to market in the UK for these cell--cultivated products.

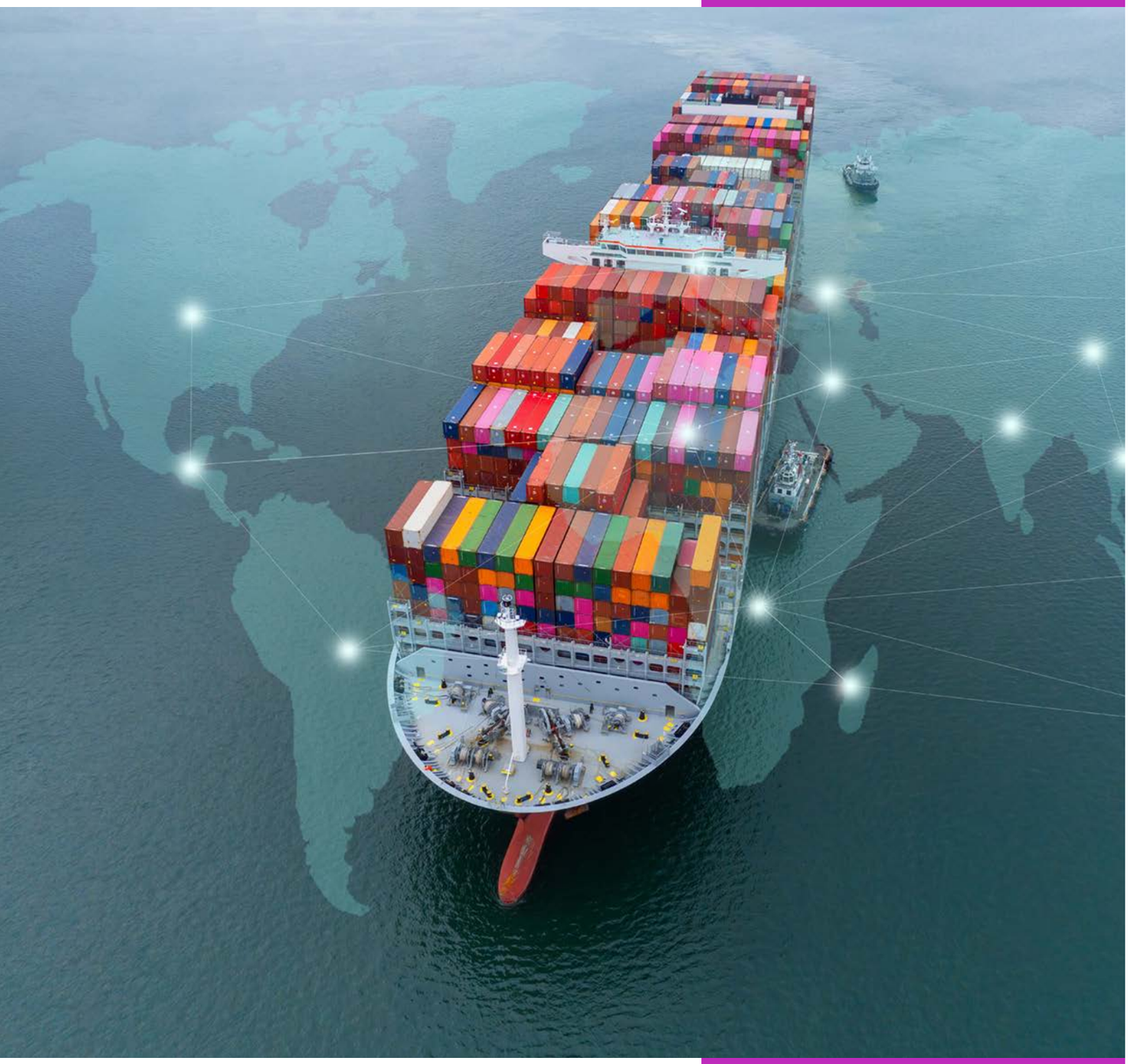
102 European Commission. “EU position in world trade”.
103 Food Standards Agency. (2024). “Groundbreaking sandbox programme for cell-cultivated products announced”.

Investment landscape

The attitude towards investment trends in alternative proteins varied greatly across stakeholders met through the GEM, indicating there is a lot of nuance for investors in the market. Whilst private investments into alternative protein companies and with wider agri-food sector have been challenging over the last 24 months, there are positive trends for the sector, as discussed in further detail in **Section 4, Sector Overview**, which highlights that opportunities exist with this sector for further collaboration.

Conversations through this GEM have indicated that there has been a recent reduction of non-specialist investors involved in this sector due to a perception of economic uncertainty and a lack of confidence in investments providing a clear exit route, relative to other sectors. However, some of the US companies that met with the UK GEM delegation had secured funding from specialist investors that understood the longer-term opportunities in the sector and the need for patient capital, as well as from non-venture capital sources, such as family offices.

The difference in perception of this investment landscape between specialist and non-specialist investors offers an opportunity for network building and educational activity to include investors from both of these backgrounds. This would help to introduce the opportunity for syndicates to be formed, where specialist investors could lead an investment round alongside non-specialist investors, to provide due diligence for those less familiar with the sector and share risk across the different investors. This has been used with good success through the Innovate UK Investor Partnership competitions in the agri-food sector. This type of initiative will help bring stakeholders together, from SMEs and private equity, and presents opportunities for capital to drive company growth and scale-up within the sector.



07. Barriers to Collaboration

While there are a number of opportunities to collaborate either in an R&D or a market insight space, or in providing commercial support for businesses, it should be noted there are a number of differences between the UK and US that should be considered when looking at the design and implementation of future partnership programmes.

Market size and disparity

Although the US represents a considerable market internationally for alternative proteins, and is therefore a key target for businesses, it has been consistently advised during discussions with US stakeholders throughout the GEM just how diverse and disjointed the US market is geographically in terms of funding support mechanisms, differing state regulation, consumer diversity, expertise and facilities.

This variation across the US, often referred to as feeling like 50 individual countries within one nation, not only creates challenges for UK businesses to enter the market effectively, but also in terms of structuring any collaborative funding or R&D efforts to the right locations with the right support. **Annex 1** provides a simplification of how UK businesses could consider entering the US market, but any sustainable collaboration would require a highly detailed understanding of the landscape.

In the absence of an equivalent body to Innovate UK in relation to central funding and the support for early-stage innovation, developing collaboration opportunities for bilateral funding may instead need to be considered at regional or state level or alternative approaches used.

Regulation and labelling

Similar disparity and diversity between the US and UK can also be seen in relation to product labelling and regulatory approval of products and ingredients.

Experts met through the GEM cited the complex state-by-state regulatory landscape, particularly around cultivated meat, as a hurdle for the sector to overcome, and flagged the importance for UK businesses looking to launch in the US to thoroughly research appropriate locations and markets. A number of US states, including Louisiana, Missouri, Oklahoma and Texas, have strict label censorship laws and limitations on the use of certain terminology and information in product descriptions and ingredient lists. These alter across regions, with the FDA and USDA yet to publish any consistent guidance regarding cultivated meat and other alternative protein products – instead working on a case-by-case basis during the regulatory approvals process for new food submissions.

Regulations around the use of ingredients and processes are also misaligned in some respects between the two countries, which should be considered when developing bilateral programmes.

IP protection with incubators

It has been clear throughout the GEM that incubators can play a key role in helping acclimatise UK SMEs to the US market, provide valuable connections to US industry stakeholders, and also to facilitate innovation-driven hacks and problem statement sessions.

One potential drawback here surrounds the control of intellectual property (IP). Although relevant NDAs and safeguards can be put in place around collaborative working, there is a feeling that this may not always fully protect SMEs, particularly where larger players are either involved directly or to 'sponsor' the session by setting a problem statement to be tackled. This would need to be considered and planned carefully to help minimise any unease among both UK and US start-ups in relation to the control of their IP when working in this way.

AgStart[104] serves as a potential case study on how this barrier can be mitigated, through their non-equity model of collaboration in their incubator programme. Instead of requiring equity stakes or intellectual property sharing, AgStart provides members with opportunities to collaborate in a shared facility that offers mentorship, education, and access to fully equipped laboratory and kitchen spaces. This model fosters innovation while allowing startups to maintain ownership and flexibility in their development processes.

104 agstart.org

Logistics of overseas collaboration

The distance between the two markets, particularly in relation to the US west coast region, could limit the uptake of collaborative efforts. The time and cost required to travel and take part in any programme can be prohibitive for SMEs and start-up entrepreneurs.

It is also likely that any UK businesses who are keen to partner with experts and businesses in the US would need to work alongside a co-manufacturer in the US to create products. Although this can often be more financially attractive than international exports from the UK, it creates a logistical hurdle to overcome while a new agreement is formed and production established.

Competition with established market

A barrier for growth in both the UK and US alternative protein sector is the strong presence of traditional foods with retailers and food services which these new products would need to expand into. Where these alternative products are positioned in retail stores has an impact on potential consumer uptake. Plant-based products, located in their own aisle, can restrict the number of customers who see the product and will potentially limit sales beyond existing customers as traditional meat and dairy consumers may not equate it with similar products that are not plant-based. Subsidies, strong marketing and an established industry that benefits from economies of scale also contribute to barriers for new alternative protein products.

There is also a perception that while there is new talent being drawn into the alternative protein sector, many innovators do not have the business skills to bring their products successfully to the market, potentially due to a lack of opportunities and effective training for developing these skills. This has the potential to hold back collaboration between a UK and US company, with the issue apparent internationally. This could be overcome through the inclusion of, training workshops in any future collaborative initiatives.

08. Conclusions

Throughout the GEM it was clear that there is a real appetite for collaboration across the alternative protein sector, both within the US market and internationally. The potential for the sector to improve food security, reduce environmental impact and improve economic growth are the driving forces for stakeholders within this ecosystem. For these outcomes to be realised, more is required to understand the needs of investors, retailers and consumers, and to showcase how the sector can tackle these challenges.

This visit highlighted how vibrant the US ecosystem is, with opportunities to work with existing networks to further engage UK businesses with the US. This ecosystem includes a number of valuable incubators and scale-up resources who are not only keen to support early-stage businesses from overseas in gaining a foothold in the US market, but also to foster international knowledge sharing to solve problem statements within the industry. Within this, there has been a recognition of the strengths of UK R&D in the sector and the positive support from public funding initiatives, which may help support future collaboration.

With the diverse landscape of the US market, these incubators provide a valuable resource to build an understanding of the US market for UK businesses. This has been a central theme throughout the GEM that too many companies try to launch in the US without having properly understood the landscape, scale, costs, customers and wider business opportunities. These unique insights for the commercial landscape of individual states and demographics across the US, are vital for filling knowledge and commercial guidance gaps. Alongside an active forum and other networking resources, these can help companies from the UK and US pinpoint valuable opportunities to move an idea towards commercialisation.

The active and engaged alternative protein sector that the GEM engaged with is ripe for further activity through international collaboration. The strengths of both the UK and US ecosystems within this sector, and the commercial opportunities of their markets, can be built on further through improving networks and targeting efforts on common challenge areas.

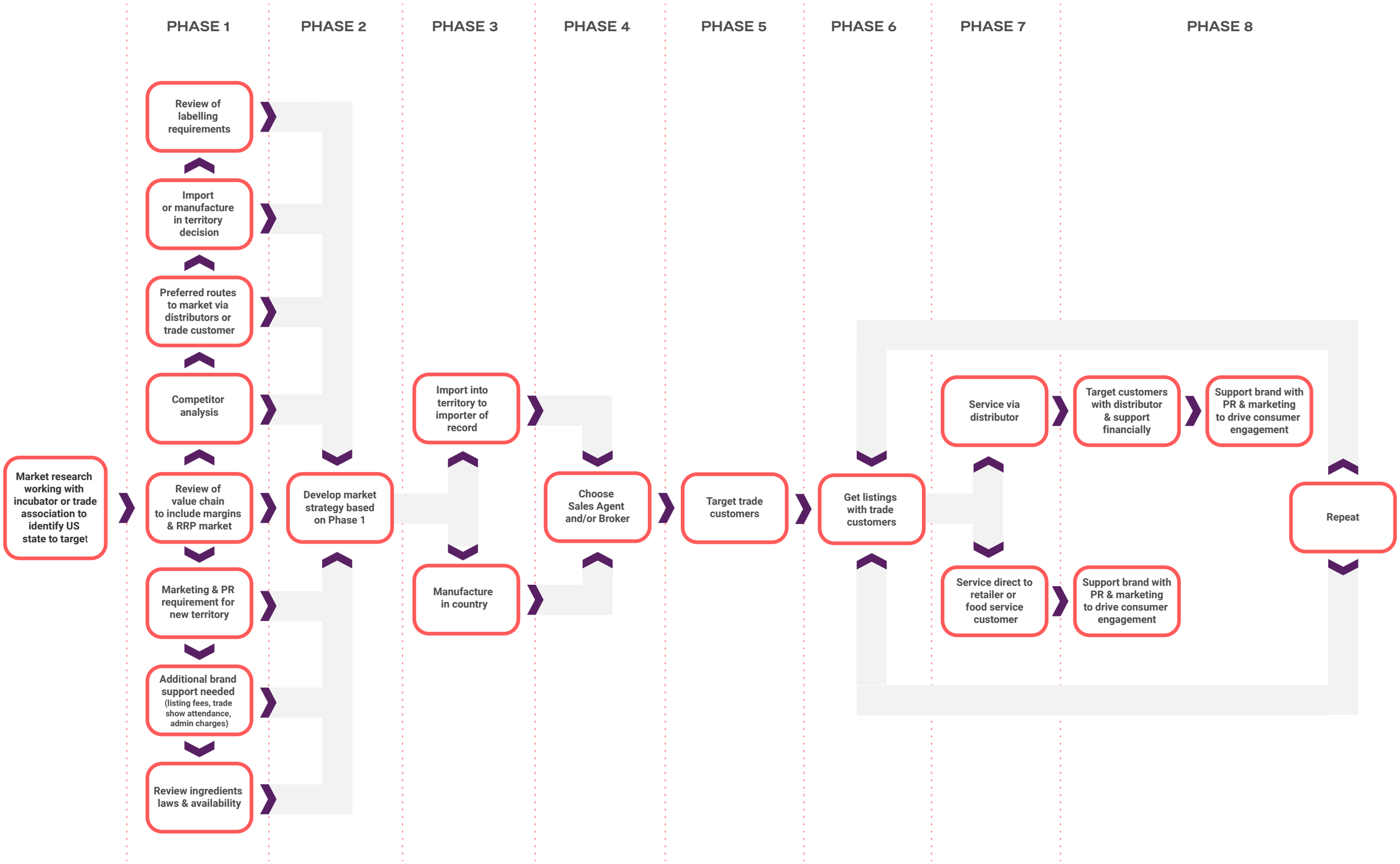
Some key actions and opportunities taken from this GEM include:

- The potential benefits to be gained from a further GEM that visits other key alternative protein hubs in North Carolina and Minnesota, in order to build a more complete picture of the US landscape that can help better inform UK businesses.
- The opportunity for GBIP and GIP initiatives to be designed for UK alternative protein SMEs to be given first-hand market insights, networking and partnership opportunities, and opportunities to assess the viability of their product for the US market.
- Collaborative UK/US forums and 'hack' opportunities would be popular among incubators, who are keen to facilitate knowledge sharing and drive innovation using bi-lateral expertise, as well as for supporting a smoother entry for UK SMEs into the US market.
- Supporting a more joined-up UK ecosystem that offers mutual promotion and collaboration, as was seen within the US sector during the GEM, has a real benefit. Achieving this through undertaking a thorough assessment of the UK alternative proteins landscape (capabilities, key stakeholders, funding and investment dynamics, regulation, leading innovators and research specialists, opportunities for growth, etc.) would be valuable for informing future government support and industry initiatives. Using this research to create a roadmap for UK alternative proteins would also help shape future direction and produce common goals that can help make the sector more aligned.

There was also a belief from meetings and learnings throughout the GEM that the UK now has a real opportunity to create its own joined-up and single-focused system in this space. This was not only identified due to the greater autonomy in policy and regulations after leaving the EU, but also as the UK does not have the same issues faced by the US in terms of legislation variations between states, as well as geographical and logistical hurdles due to market size.

Creating effective strategies for a more unified UK alternative proteins industry and to build upon the evident appetite for international collaboration are therefore clear areas of focus for the future.

09. Annex 1 — Entering the US Market



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