

Appetite for change

Why the UK should lead
the emerging alternative
proteins market



Summary

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This report is one of a series in which Green Alliance is looking in depth at important sectors to determine how the UK can take a lead in the global transition to net zero and improve the country’s economic resilience and sustainability in a rapidly decarbonising world.

Alternative proteins are protein rich foods not derived from animal sources. Where they replace animal proteins in the food system, they reduce pressure on land use and cut carbon emissions from food production. Rapid growth in this global industry is also creating new highly skilled, high wage jobs.

Even under the least optimistic scenario, it is expected that the global market could be worth £226 billion by 2035. Our analysis suggests that, with the right combination of targeted investments and regulation, the UK industry could be worth up to £6.8 billion annually and create 25,000 jobs by 2035.

A thriving UK sector offers high productivity jobs, not only in research, manufacturing and production, but also in farming. At least 4,000 of the potential 25,000 jobs created could be in traditional farming and food production.

The UK has several sources of competitive advantage, including some of the world’s highest food quality and safety standards, significant consumer demand for alternative protein products, a strong science base and a burgeoning domestic industry to build upon. The growth opportunities are such that countries in Europe, including Denmark and the Netherlands, in east Asia, including Singapore and China, and in the Middle

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East, including Israel and the UAE, are racing to take the lead in this emerging industry, often motivated by the food security it will help to provide. Without intervention, it is likely that most of the alternative protein products bought in Britain will be made elsewhere.

Investing now would give the UK the power to shape how this industry develops to maximise the benefits for the country. The most profitable food is also the least healthy and venture capital funded alternative protein startups are being forced into the junk food cycle, in which they profit quickly by making high fat, high salt and high sugar foods. It does not have to be this way: a UK industrial strategy for alternative proteins could publicly fund nutritional research to develop healthier products than those they replace.

If the UK has aspirations to be a major market for development it should invest £250 million in nascent research and production clusters in Teesside and the ‘Golden Triangle’, centred on Cambridge, Oxford and London. These clusters should also be developed to link up UK farmers, crop scientists and producers to expand the supply chain.

The government should focus on connecting alternative protein development with public health goals; supporting the Food Standards Agency to keep UK standards high and helping startups to navigate a complex regulatory system to bring healthy new products to the domestic market quickly. Finally, it should remove barriers to UK-EU trade so UK companies can expand and rapidly take the products they develop to the EU market.

Introduction

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Alternative proteins are a fast growing segment of the global food industry and an opportunity for the government to deliver on multiple economic and environmental priorities.

Reducing meat consumption in favour of alternative sources of protein can have substantial benefits for the climate and the natural environment. It can cut the carbon emissions associated with food production and significantly reduce demand for agricultural land.

Although other countries have taken a lead in this industry in the two years since the National Food Strategy recommended supporting them, the UK still has several competitive advantages which it could capitalise on now to get ahead in the industry. It is a world leader on food standards, life sciences and agri-tech research, and it already has regional clusters of alternative protein production and innovation, particularly in Teesside and the Golden Triangle of Cambridge, Oxford and London.

Supporting a strong industry would drive job creation in related sectors like agriculture, research and manufacturing. Many of the jobs would closely resemble existing roles in the pharmaceutical and petrochemical industries. These are highly skilled, high wage roles, which would help to increase productivity across the economy.

For consumers turning to alternative protein options, taste, accessibility and affordability are the three main drivers behind their decisions.¹ Plant-based proteins are, by far, the most established category and are the closest to reaching parity with conventional animal products.² In the Netherlands, plant-based alternatives became cheaper than processed meat in 2022.³

Fermented protein products are expected to reach taste and price parity with animal-based products soon. Currently, they cost two to three times more on average, though certain products, such as Quorn chicken alternatives, already cost less than most chicken breasts.⁴ As with plant-based alternatives, fermented products are seeing sharp declines in cost and are projected to be comparable in price with animal-based products by the mid-2020s.

Cultivated proteins are much more expensive than their conventional counterparts, though these costs are also falling fast. This trend is expected to continue and there are some suggestions they could also achieve price parity in the mid-2020s,

though only under the most optimistic scenarios.⁵ Lifecycle assessments of commercial-scale cultivated meat production suggest it could be cost competitive by 2030.⁶

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What are alternative proteins?

Alternative proteins fall into three broad categories:

Plant-based. Soya and peas are two of the most common sources of plant-based alternative proteins. Many of the products commonly found on supermarket shelves are in this category, such as the Beyond Meat brand of burgers. Plant-based protein producers have had some success at closely replicating some processed meat products, like burgers and sausages, but they have not yet been able to replicate the texture of more highly structured cuts of meat, like a leg of lamb.

Fermented. These products contain protein which is partly or wholly derived from a fermentation process. This includes traditional fermentation, used to produce foods like bread and cheese; biomass fermentation, such as the mycoprotein used in Quorn products; and precision fermentation, where specific proteins are extracted from microorganisms and used in products, such as the haem iron used in Impossible Food's burger. These technologies hold a lot of promise with regards to replicating the fibrous structure of meats and making realistic egg and cheese substitutes.⁷

Cultivated or cell-based. These are products derived from animal cells but grown in a lab. The process produces an animal-based meat, without the need to farm animals for food. The technology required to produce cultured proteins is the newest and most uncertain of the three. Outside Singapore, where the first cultured meat products became available to consumers in 2020, these products are not yet widely commercially available.

Why are alternative proteins a good thing?

To restore Britain's depleted nature and achieve the country's net zero goal, land use needs to change. The agricultural sector is responsible for over ten per cent of total domestic carbon emissions, as well as contributing to significant emissions overseas. Today, 73 per cent of UK land is devoted to food production, and food imported to the UK uses an equivalent area overseas, the vast majority of this (around 85 per cent) is devoted to farming animals.⁸

Every three calories derived from beef require 100 calories of feed inputs. This is an inefficient way to produce food.⁹ By comparison, plant crops use just 15 per cent of agricultural land yet produce 68 per cent of the calories consumed in the UK. Even the least efficient alternative protein options are far more efficient than animal derived proteins; for instance only ten calories of input is needed to produce three calories of cultivated meat.¹⁰ And because they need much less land to provide the same level of nutrition, they are an effective way of driving up food self-sufficiency.

To meet its climate and nature targets, the UK must shift land from being a carbon source to a carbon sink. There is a large body of evidence that plant-based foods require significantly less land than animal-based foods.¹¹ Simply replacing processed meat and dairy with alternative proteins would cut UK agricultural land use

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by 28 per cent and emissions from this source by 35 per cent.¹² This would allow a shift away from intensive agriculture to more sustainable food production and make space for some land to be returned to semi-natural habitat, further reducing emissions by sequestering carbon, and contribute substantially to the government’s ‘30x30’ nature restoration goal.

Our 2023 report, *Shaping UK land use*, showed that, if meat and dairy consumption fell, it would be easier to achieve other farming goals. Scenarios where people eat less meat and dairy, leading to land use changes, demonstrate that the incomes of less profitable farms can rise, costing the taxpayer less and enhancing nature, while also increasing food security through greater self-sufficiency.

A rapidly expanding industry

The global alternative proteins market could be worth

£226bn

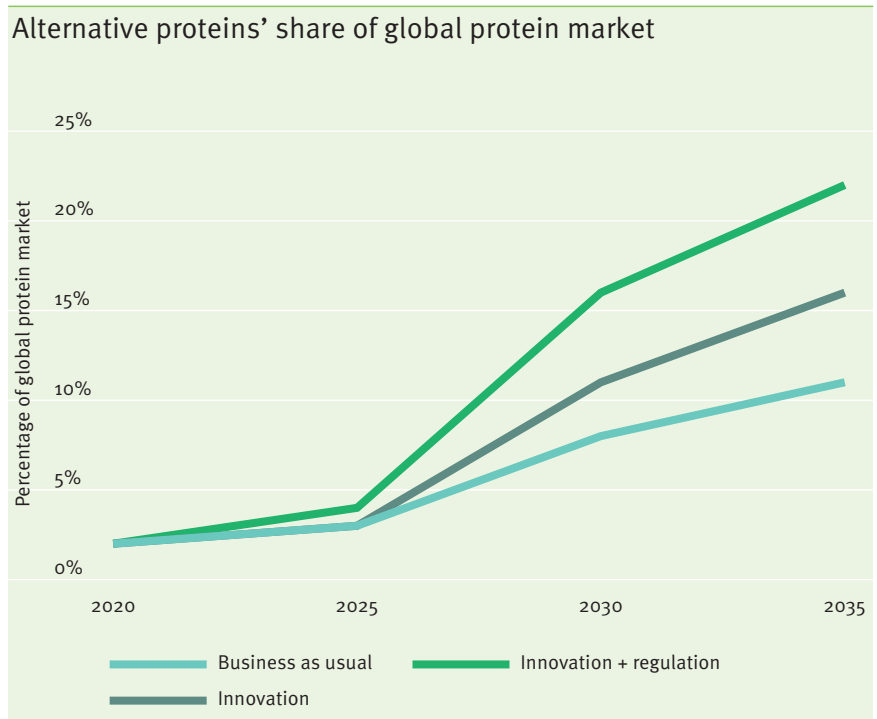
a year by 2035

The global alternative proteins market has expanded rapidly in recent years. Even under the least optimistic scenario, projections suggest it could be worth £226 billion a year by 2035.¹³ This is more than twice the value of the UK construction sector.

However, recent indications are that market growth is slowing, mostly drawn from data in North America, although it is rare for new technologies to experience uninterrupted growth. Indeed, the data we have used for this analysis shows a clear S-curve, typical of the adoption of new products. Fermented proteins and cultivated meat are in their infancy, and plant-based products are still early in their innovation journey.

We have studied three potential scenarios for the growth of this industry in the UK, drawing on research conducted for the National Food Strategy, which looked at the global market. The first scenario is business as usual, the second assumes additional investment and breakthroughs in innovation and the third assumes faster innovation, coupled with a more supportive regulatory environment.

We have assumed that the UK market will follow the same projections as the global market. However, for reasons we have highlighted already, this could be an underestimate of the UK market's potential. Even under business as usual, the research shows that alternative proteins could be 11 per cent of the global protein market by 2035. More technological innovation could increase this to 16 per cent, whilst a combination of innovation and a supportive policy and regulatory environment could see 22 per cent of global protein consumption replaced by alternatives in 2035.¹⁴



The numbers behind the graph above are aggregate across the sector. It is difficult to predict how different technologies will scale up. The plant-based market is the most well established globally with the best available data for the UK. The UK market remains moderately competitive, with some larger players already emerging. It is valued at around £225 million, with a projected compound annual growth rate of between four to seven per cent over the coming decade.^{15,16} Recent sales trends suggest significant growth opportunities for the UK, with 21 per cent growth in plant-based products sold in Europe since 2020.¹⁷

The fermented protein market is less well developed, but the UK is already an industry leader, with Quorn being one of the most established companies globally. Europe alone is projected to account for over half of global mycoprotein revenue over the period to 2030.¹⁸ This market segment has been growing at over six per cent globally, which is expected to continue over the next decade.¹⁹ Precision fermentation technologies have enormous potential, not least because they are better at creating food ingredients, like fats and flavours, and can be used to produce better milk, egg and cheese substitutes.

The cultivated meat sector is still nascent, with Singapore and the US only giving regulatory approval for commercial products in the past three years. An Oxford Economics analysis projects the UK market will grow to between £850 million and £1.7 billion by 2030.²⁰ For context, this is roughly what people spend on coffee from UK coffee shops every year. There have also been recent signs of collaboration in the sector which could help to accelerate innovation and reduce costs. For example, one UK company has launched new low cost cell banks, free from licensing or commercial restrictions, aimed at supporting start ups and cultivated protein research.²¹

Job creation and economic potential

The UK industry has the potential to be worth up to

£6.8bn

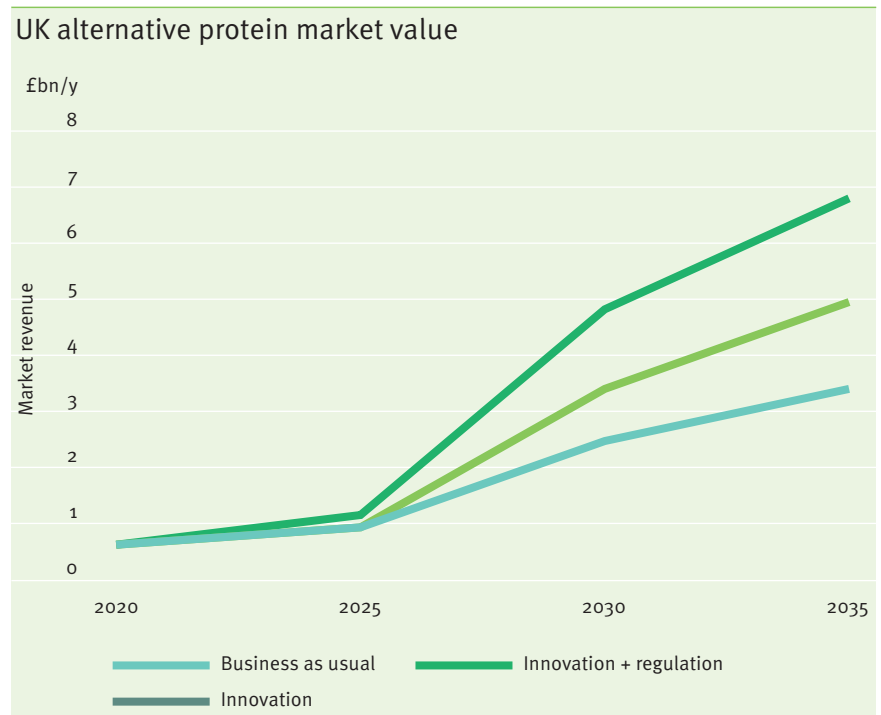
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The UK is already ahead in consumer demand. With investment, it could be a leader in production. With its agricultural research and food science expertise, it is well positioned to compete with other countries.

However, the industry also needs the right regulatory environment to capitalise on this opportunity. On this, the UK is behind the Netherlands, Germany and Denmark, where their governments have set out strategies to guide the development of a supportive policy environment.²² Without swift action, these nations could easily outcompete the UK, mirroring the recent history of the battery manufacturing sector.

The UK industry has the potential to be worth up to £6.8 billion a year by 2035, with investment in innovation and supportive policy reforms.²³

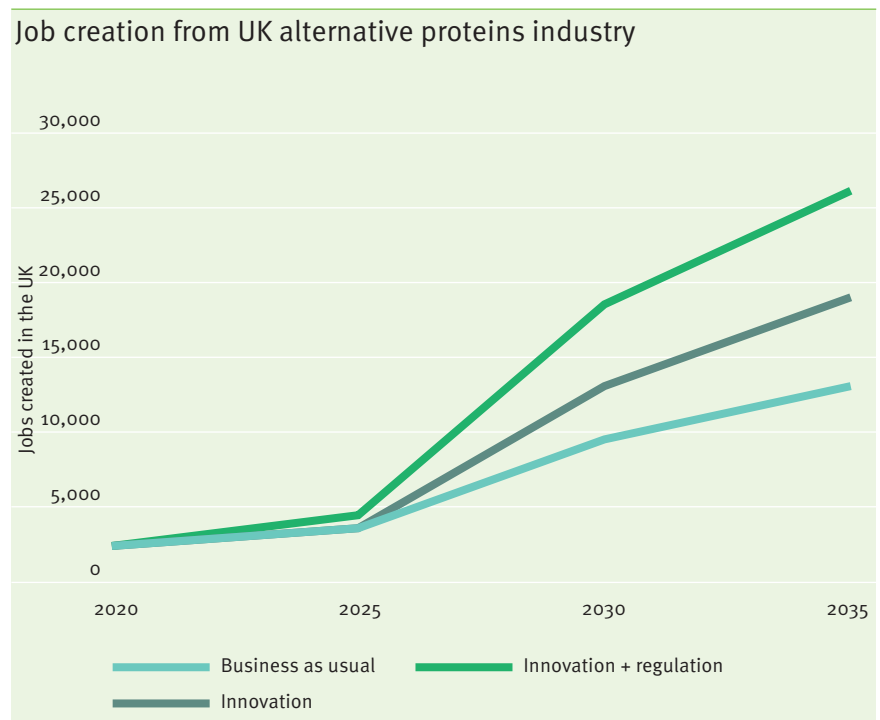
Without a supportive regulatory environment, the ‘innovation’ scenario is the most likely trajectory. Although a valuable market, it is still far below the value of the global meat market. But these figures ignore the export opportunities, as they assume the UK will be the only consumer of what it produces. Additional export market opportunities could add substantially to the market value.



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Under the ‘innovation with supportive regulation’ scenario, where regulation and innovation align to drive growth, there is the potential to generate up to 25,000 jobs spread across multiple UK sectors. This includes direct jobs in production and in related industries, including farming and manufacturing.²⁴ Over 4,000 of them are in farming. Almost all alternative protein production requires agricultural inputs. Expanding the UK alternative protein sector would increase domestic demand for UK crops, which the government could support further by directing more agricultural research into suitable alternative protein inputs. Doing so would increase UK food self-sufficiency and enhance locally integrated value chains.

Importantly, the job creation potential of this industry is distributed around the country, and is likely to be concentrated in rural regions, with the value added accruing locally.



While the alternative protein industry can continue to provide an income for farmers, many of the roles, including scientists, technologists and researchers, are typically higher productivity and higher wage roles, helping to tackle the low productivity which plagues the UK economy.

The sector also demonstrates significant investment potential. Despite challenging economic conditions, the investment landscape is strong and continues to show signs of accelerating growth. Private investment has increased dramatically in recent years, with 90 per cent of all private capital invested in alternative proteins in the UK raised since 2019.²⁵ Economic analysis suggests that investments in plant proteins have the highest emissions savings per pound of any sector, making this a very attractive option for investors prioritising sustainability and environmental impact.²⁶

What is the UK's comparative advantage?

“The UK has relative strengths in life sciences, agricultural research and food sciences.”

The industry needs sustained investment in both infrastructure for R&D and scaling up. To attract investors, the sector must demonstrate it can meet robust food standards to ensure consumer trust.

The UK already has several structural and regulatory advantages. It has some of the strongest food standards in the world, meaning that if companies develop products in the UK which meet these standards, they will be readily saleable on the global market. The regulator, the Food Standards Agency, must be sufficiently resourced to support companies in demonstrating that they can meet high standards to capitalise on this advantage.

Our recent work highlighted that the UK has relative strengths in life sciences, agricultural research and food sciences.²⁷ The University of Bath, for example, houses an established research centre directly tied to the production of alternative proteins, and this is linked with other projects, at the University of Cambridge, Newcastle University, the University of Manchester and Aston University, to improve production methods. Doubling down on the already established connections between research, academics, scientists and producers would expand the UK's structural strengths.

Further, some of the processes used to create alternative proteins are very similar to those used in the pharmaceutical and chemical industries. The UK already has relative strengths in these sectors, meaning there is a ready pool of existing skills and experience which could be employed in this industry.

The UK also has the edge through its sizeable domestic alternative protein market. UK supermarkets are aware of the growth potential and the strength of consumer demand and are increasing investment. Tesco, for example, aims to triple the alternative meat products it sells by 2025. Research conducted for the National Food Strategy, comparing similarly sized European economies, shows the UK has a clear strength in the way its retailers and manufacturers market new products.²⁸

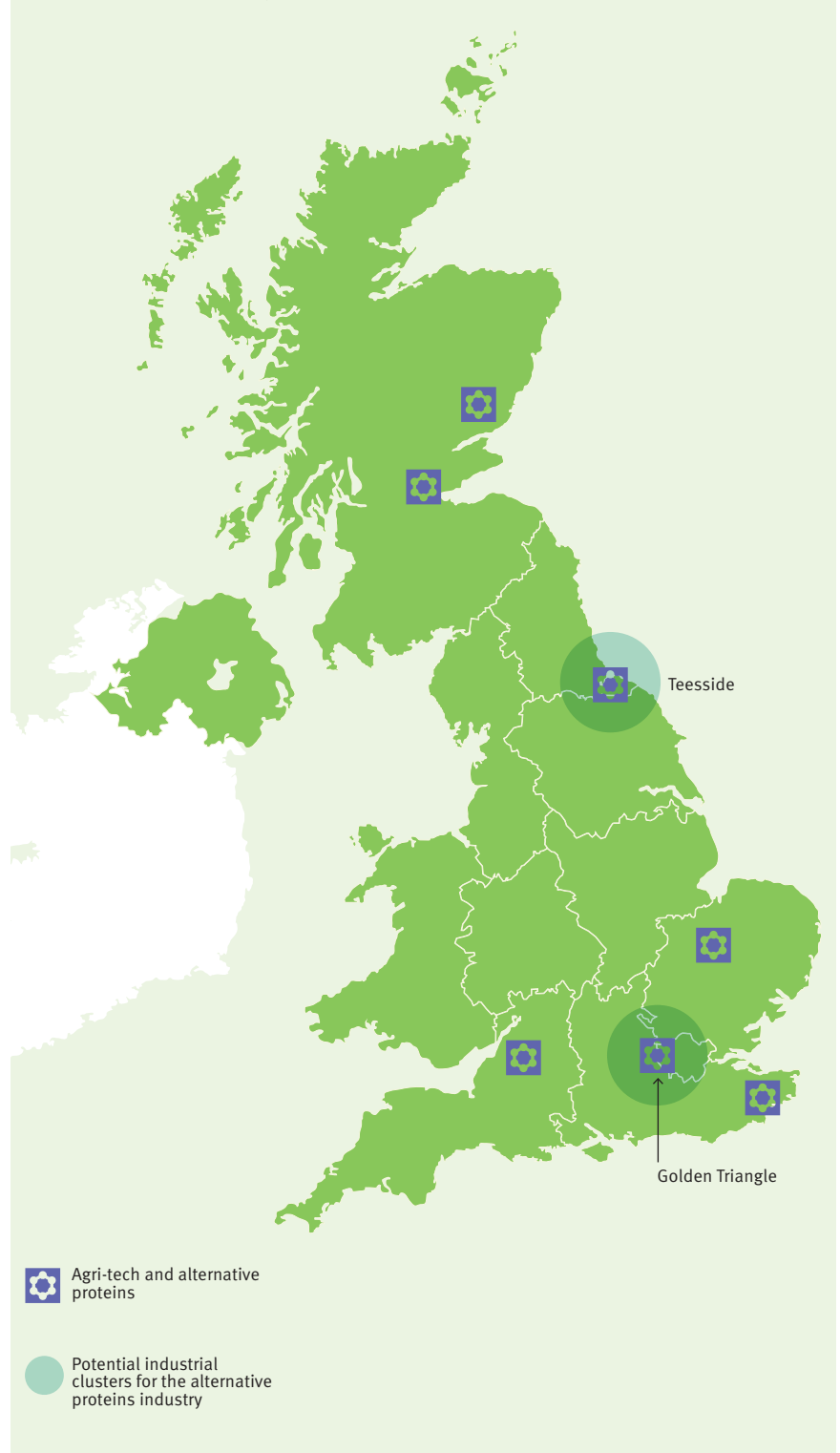
These existing advantages and the scale of the domestic market could make the UK attractive for investors, producers and researchers. Indeed, private investments in UK agri-tech are relatively high when compared to other countries. Commensurate public investment in shared research and development facilities and start up grants would enable the industry to scale up.

Reforming product approval processes would also increase the efficiency with which new products are brought to market.

Outside the UK, investment in the sector is growing and other markets are moving swiftly to consolidate. The US now leads in alternative protein production. The Netherlands has established Food Valley, one of the largest agribusiness regions in Europe, comprised of universities, start ups and established firms, all working collaboratively on new products and innovation. Singapore and Israel have both been proactive in supporting their start ups, and Denmark is investing €168 million in plant-based research and development.²⁹

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Potential alternative protein clusters in the UK



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To support the industry’s growth, the UK needs to act now or risk ceding its existing advantages to other countries. It should first focus on regions where there are already strong foundations. The south east, south west and north east England and central Scotland already have significant capacity in agri-tech, alternative proteins development and related enabling sectors, like renewable energy. We highlight the potential of two of these regions in more detail below.

Teesside

Teesside is a hub for alternative protein development. It has a small scaling up facility at the Centre for Process Innovation (part of a Catapult), with links to farming and agri-tech businesses. There are already several alternative protein companies based there, including:

1. Quorn: a well established brand in fermented proteins, with products on the market in 18 countries.
2. Calysta: using fermentation to make alternative proteins for pet foods
3. Mylkman: specialising in plant-based milk alternatives
4. Beau’s Gelato: making plant-based ice cream
5. V-Bites: producing plant-based meat and cheese alternatives

The region has plans to expand facilities for manufacturing alternative proteins. In 2022, the Tees Valley Combined Authority announced a £2 million investment to build a new food grade manufacturing facility, specifically to expand production. This investment is expected to bring in £4.2 million of investment to the areas by attracting new businesses, whilst contributing over £12 million to the local economy.

The Golden Triangle

The Golden Triangle, encompassing the research capabilities of Cambridge, Oxford and London, is well suited to drive the innovations that cultured meats and precision fermentation require to scale up and bring down prices. Oxford is home to Ivy Farm, developing cultured meat, and is looking to invest £16 million for a new research and development facility in the region. The business was spun out of the University of Oxford, and is planning to stay nearby to have access to the university’s expertise. This is a clear example of the benefits of establishing strong academic and business links in the emerging industry.

Cambridge is home to the National Institute of Agricultural Botany (NIAB), which is world leading in its plant breeding research. NIAB runs projects in collaboration with the University of Cambridge, including on breeding plants for high quality protein content. Meanwhile, London hosts New Wave Biotech, a start up aiming to optimise precision fermentation using computer modelling, to improve products and make them cheaper.

Securing a leading UK alternative proteins industry

“The government should focus on establishing a more cohesive, coherent approach.”

The alternative proteins industry is still in its infancy and there is clearly potential for both substantial growth in the coming decades and significant disruption to the existing food sector. In light of this, the UK should make sure it is in a leading position as these changes come, to capitalise on its existing strengths and get ahead in the global market.

The UK should shape the development of the sector in line with its existing high food standards so it can develop a new export industry, deliver thousands of highly skilled, high productivity jobs and contribute to economic growth. The five recommendations we set out below, if implemented, would be a strong foundation for this development:

1. Support research and infrastructure to scale up production

Greater innovation in alternative proteins would increase consumer choice, supporting people to change their diets and reduce climate impacts. The £125 million recommended in the National Food Strategy to support the industry, with £50 million for facilities in a single commercial cluster and £75 million for grants to start ups, would be a good start. The current pace of investment lags behind other leading economies, and more is needed to drive innovation and commercialisation across the industry. We recommend the UK should commit a minimum of £250 million which could fund the development of at least two clusters. We recommend these should be Teesside and the Golden Triangle, based on their existing advantages. This level of support would ensure that pilot scale shared facilities, focused on both fermented protein and cultivated meat production, are covered.

2. Join up existing institutions and tailor regulations

Existing institutional support for agri-food innovation is fragmented. The government should focus on establishing a more cohesive, coherent approach, with clear links between relevant sectors. The Food Standards Agency should be better resourced to develop regulations suited to enabling companies to bring new alternative protein products to market swiftly, while maintaining consumer confidence. The total cost of this intervention is likely to be very small, at under £10 million. With this additional funding,

the agency could establish a more effective regulatory regime which both protects the UK's high food standards and creates a market where newly developed alternative protein products can proceed efficiently to market through a clear and thorough regulatory process.

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3. Put public health at the heart of alternative protein development

In today's food market, junk food is more profitable to produce than healthy food, and privately funded alternative protein products are innovating in line with this commercial incentive. The government should allocate additional public health funding to identify how alternative protein products could be made healthier than the products they replace, encouraging companies and food scientists to develop healthier options.

4. Build direct links between UK farmers and alternative protein producers

Most inputs used for production are from plants grown through traditional farming. The government should build on existing links between UK farmers and alternative protein companies. The Canadian Protein Industries Supercluster is a good model to follow, as it connects farmers and suppliers directly with producers.³⁰ In the UK, organisations like the Agricultural Industries Confederation and the Nature Friendly Farming Network could offer important platforms for this. A more transformational intervention could be to support crop scientists in developing UK varieties especially suited to plant-based protein products, as most of the plants used, like soya, are still largely imported.

5. Improve food standard agreements with the EU

UK and EU food standards are essentially still equivalent, but the risk of future regulatory divergence, and current sanitary and phytosanitary border regulations, undermine the commercial rationale to invest in this industry in the UK, so investment could go to countries within the single market instead. Dynamic alignment, a new deal on common food safety standards or a UK-EU veterinary accord could all help to overcome these barriers. Avoiding divergence and trade obstructions should be a priority for the upcoming review of the UK-EU Trade and Cooperation Agreement.

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Appetite for change

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Green Alliance

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