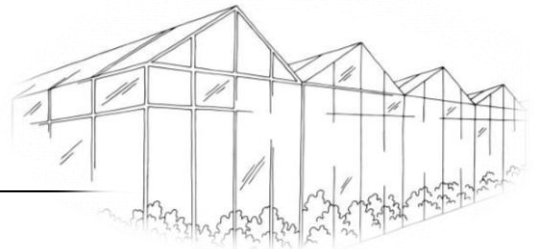




Future State of UK Protected Edibles

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Greenhouse Innovation Consortium

The Greenhouse Innovation Consortium (GIC) based at Edge Hill University, collaborates with UK and global industries to develop, test, and implement cutting-edge technology solutions for the food and flower industry, offering technical expertise, networking, training, and driving policy change through a multidisciplinary approach involving engineers, computer scientists, horticulturists, and plant biologists.

Acknowledging the challenges facing the UK food system, the GIC joined with West Lancashire Borough Council to convene national representatives from the UK food system, to better understand the challenges and opportunities, and to collectively make recommendations that could create food sustainability and economic growth.

Contributing partners:



Executive summary



The UK food system is at a critical juncture, facing converging pressures from climate instability, rising input costs, labour shortages, and persistent trade vulnerabilities. The UK currently imports most of its fruit and around half of its vegetables, leaving the nation significantly exposed to global shocks, particularly in sourcing essential micronutrients. Just ten countries now account for 69% of all UK food imports, with heavy reliance on a few for key fruit and vegetable supplies, greatly increasing supply chain risk. Household food insecurity is also rising, with food-secure households falling from 92% in 2020 to 90% in 2023, and insecurity affecting 20% of the most deprived, compared to 7% in the least. These issues are compounded by chronic underinvestment, skills shortages, and procurement systems ill-suited to support a resilient, sustainable domestic supply. Meanwhile, ambitions to improve public health and food choices should see demand for fruit and vegetables increase. We must therefore strengthen our food system now, before it fails.

Increasing domestic produce is essential, yet the UK weather is notoriously unpredictable, impacting our ability to grow crops. The protected edibles sector (glasshouses, polytunnels and vertical farming) offers a more stable option and could make a sizeable contribution to the UK food system. The sector has strategic potential to contribute to public health, climate resilience, and food security, yet its role remains under-recognised in national planning and investment.

In recognition, the Greenhouse Innovation Consortium (GIC) has been driving research and collaboration in this area, culminating in a national workshop on the future of UK protected edibles in May 2025. Hosted by Edge Hill University in partnership with Lancashire County Council, the workshop brought together growers, researchers, retailers, policymakers, and technology providers from across the sector. The aim was to identify shared challenges, unearth practical opportunities, and co-develop actionable recommendations that position protected-grown fruit and vegetables as a key to a more secure UK food system. This work directly supports the concerns outlined in the UK Food Security Report (2024), the National Food Strategy – The Plan (2025), the Food Strategy for England (2025), Invest 2035: the UK's modern industrial strategy (2025), the NFU UK horticulture growth strategy (2025) and aligns with Defra's Farming and Innovation Programme.

Protected edibles represent a high-value opportunity to align the UK's food system with national goals for resilience, sustainability, and health. But to seize this opportunity, policy and investment must shift from fragmented support to integrated strategy, from isolated R&D to co-creation and adoption, and from undervalued labour to celebrated expertise. The outputs of this workshop offer a practical and ambitious route forward, grounded in what growers need now, and what the UK must secure for the future.

Recommendations

1

Make protected edibles central to UK food resilience strategy

Embed protected edibles in UK food security planning by including supply chain risks in the National Risk Register and recognising food as critical infrastructure. This will strengthen resilience, reduce import reliance, and align land, energy, health and food policy.

2

Invest in infrastructure through strategic finance and planning reform

Support modern glasshouse development with low-interest capital, lighting-as-a-service models, and supported by spatial planning tools to co-locate facilities. This will unlock scalable production and ensure protected cropping is treated as critical green infrastructure.

3

Use public procurement to unlock investment through advanced market commitments

Use multi-year public procurement commitments from the NHS, schools, and others to guarantee demand for UK-grown protected edibles. This will unlock investment, strengthen supply chains, and support healthier, more resilient food systems.

4

Establish a UK institute for protected edibles

Establish a dedicated body to lead strategy, coordinate R&D, develop skills, and represent the protected edible sector. This would formalise and strengthen the role of the GIC, bridging academia, industry and government to deliver joined-up, responsive policy and partnerships.

5

Launch a 'Grow Smarter' programme to accelerate adoption, resilience & workforce training

Build a future-ready horticulture workforce through school engagement, apprenticeships, and clear career paths, combined with regional tech adoption and innovation pilots. Modelled on 'Made Smarter', it will tackle labour shortages, raise productivity, and drive climate-smart, digital growth.

The UK food system

The UK currently imports around 50% of its vegetables and 80% of its fruit, making the national food system increasingly vulnerable to supply disruptions caused by extreme weather, rising fuel costs, and geopolitical instability. This reliance reflects long-standing structural challenges, including limited seasonal capacity, labour constraints, rising production costs, and underinvestment in infrastructure. Although the UK has a mix of field-based production and protected edible systems, not all of these are yet operating at a scale that meets national demand.

These systemic weaknesses have direct public health consequences. When fresh, nutritious food is inconsistent in availability or unaffordable, health outcomes are compromised, especially for the most disadvantaged households. The share of food-secure households has declined from 92% in 2020 to 90% in 2023. The poorest 10% of households consume 42% less fruit and vegetables than recommended. As a result, diet-related conditions continue to increase, and more than one in three children leave primary school overweight or obese. This places further strain on an NHS that is already operating beyond capacity.

A health-led response must be matched by action across the food system. The new Fit for the Future: 10-year Health Plan for England (2025) includes upstream interventions such as ensuring all schools provide healthy meals and requiring large food businesses to report on and meet targets for healthy food sales. These policies are expected to increase demand for fresh produce and highlight the need for a more resilient and responsive domestic food supply.

Government strategies are beginning to address this challenge. DEFRA's Environmental Land Management schemes, the UK Government Food Strategy published in 2022, and the Food Security Report from 2023 all call for greater self-sufficiency, sustainability, and resilience in UK food production. Aligning health and food policy presents an opportunity to build a food system that supports improved public health while reducing dependency on imports and strengthening national resilience.



Protected edible production



The protected edible sector remains one of the most promising areas for growth and resilience within the UK's food system, allowing for secure, domestic production of nutrient-rich fruits and vegetables.

The sector uses controlled environment systems such as glasshouses, polytunnels and vertical farms. These systems enable consistent, climate-resilient production, using less land, up to 90% less water, and produce up to 10 times more food per square metre than open-field production. Together with the ability to deliver year-round, local, high-quality fresh produce, this makes the sector one of the most strategically important assets for national food security.

Economically, the sector is already a major contributor to UK agriculture. In 2023, UK horticulture generated over £2.9 billion, and the wider sector employs more than 670,000 people. With the right support and policies, it could contribute over £50 billion to the economy by 2030. Other countries highlight its potential. The Netherlands, despite having far less agricultural land, is the world's second-largest food exporter by value, thanks to high-tech greenhouse production.

Given its environmental, nutritional, and economic importance - and food's designation within the UK's Critical National Infrastructure - reversing the long-term decline in protected horticulture should be a national priority. A strategic, well-funded approach could position the UK as a leader in sustainable food innovation, strengthen national resilience, reduce reliance on volatile global supply chains, and deliver wide-ranging benefits for producers, consumers, and the environment.



Recognising UK success

Examples of a few growers that showcase scalable, high-performing models of innovation that should inform future expansion efforts.



Established in 2008 on the Isle of Thanet in Kent, Thanet Earth has become the UK's largest greenhouse complex, spanning 90 hectares. It produces approximately 400 million tomatoes, 24 million peppers, and 30 million cucumbers annually, accounting for significant portions of the nation's salad crops. Utilising combined heat and power systems, the facility efficiently generates heat, electricity, and carbon dioxide to optimise plant growth. Beyond production, Thanet Earth collaborates with Hadlow College through the Centre of Excellence in glasshouse growing, training the next generation of horticulturists and donating produce to food charities like FareShare.



Dyson Farming, based in Lincolnshire, has revolutionised UK strawberry production with its 26-acre glasshouse facility. Employing advanced technologies such as LED lighting, robotic pickers, and sustainable practices, the farm produces 1,200 tonnes of strawberries annually, including during winter months. This approach reduces reliance on imports and ensures a consistent supply of British-grown strawberries. The integration of biogas-powered generators and ultraviolet light treatments underscores Dyson Farming's commitment to sustainable and innovative agriculture.



The Summer Berry Company in Sussex has been recognised with the Business Diversification Award in 2025 for its pioneering year-round British strawberry production. Using a state-of-the-art glasshouse system and a £6 million green energy upgrade including LED lighting, combined heat and power, and heat pumps, the farm produces strawberries even through winter. This innovation reduces reliance on imports, lowers emissions, and highlights the company's commitment to sustainable, resilient agriculture.



Flavourfresh Salads Ltd, based in Lancashire, is known for producing premium tomatoes, berries, and specialty crops with exceptional flavour. Unlike many growers, they continue to cultivate older, flavour-rich varieties that others have abandoned due to pest pressures. Through careful variety selection and advanced biological pest control, Flavourfresh delivers distinctive taste while maintaining sustainable practices, making them a standout in high-quality British horticulture.

Challenges of the UK protected edible sector

Despite its potential, the UK's protected edible sector is being held back by structural failures at every level. It is widely acknowledged that the industry is 10 to 15 years behind international competitors in adopting advanced technologies. Where other nations have invested in automation, AI-based climate control, robotics, and precision fertigation, much of the UK sector relies on outdated infrastructure and manual systems. The technological deficit is compounded by historic underinvestment and the lack of a coherent national strategy that recognises protected edible horticulture as distinct from traditional agriculture.

Workforce shortages are highly problematic. Protected horticulture is far more labour intensive than other farming types, with an average of 7.1 workers per holding in 2021, over triple the norm in other sectors. Despite this, growers struggle to recruit and retain staff. In 2022, vacancy rates in the wider sector rose to 6.3%, and growers reported a 14% shortfall in required labour. Of those recruited, 17% never turned up and 9% left early. Nearly 40% of producers lost crops as a result. One third of the sector reported over £22 million in wasted produce in six months. Losses nationally likely exceeded £60 million.

This pressure is compounded by over-reliance on non-UK workers. UK residents fill fewer than 4% of seasonal roles. Two thirds of producers rely on migrant labour. The NFU estimated a shortfall of 15,000 workers in 2022 and continues calls for a five-year Seasonal Workers Scheme to give employers certainty. The sector also faces a growing skills gap. Training and education fall behind modern greenhouse needs for technicians to manage lighting, heating, and climate control. Universities can be disconnected from commercial needs, and robotics, often cited as the solution, are not viable at scale for every grower.

Outdated infrastructure further limits productivity. 70% of UK greenhouses are over 40 years old, significantly limiting efficiency and productivity. Fewer than 1% use advanced glazing, and less than 10% have supplemental lighting. Meanwhile, less than 0.1% of UK land is dedicated to controlled environment growing, despite agriculture occupying more than 70% of UK land overall. Energy is another critical constraint. Protected systems depend on stable, affordable electricity and heat. Climate change is increasing the need for both cooling and heating, yet growers face rising costs and limited access to renewables. Without capital support for energy transitions, producers are left exposed.

Additionally, public sector procurement criteria exclude smaller UK growers, while supermarket pricing models leave growers unable to invest. Crops can be rejected for cosmetic reasons, planning systems block expansion, and research rarely reaches the farm gate. The system is fragmented, failing to reward sustainability or resilience, and this is compounded by a governance vacuum, with at least sixteen bodies influencing food policy.

Opportunities



While protected edible horticulture is under pressure, it is also one of the most investable, scalable solutions to the UK's biggest food and public health challenges. More than just a farming sector, is a national asset with the potential to transform how we grow, eat, and think about food. With co-ordinated policy, investment and innovation, the UK could double its self-sufficiency in protected fruits and vegetables, improve diets, reduce reliance on imports, and generate high-value jobs in both urban and rural communities.

The vision is clear: expanding the protected edible sector over the next 10 to 15 years could reduce UK fruit and vegetable imports by up to a third, building regional food resilience and creating a more affordable supply of nutritious food. While the Netherlands is unique in its scale and export orientation, the UK can emulate its ambition for integration, technology and long-term investment, adapting those lessons to strengthen our own food security.

To achieve this, we need to grow not only the infrastructure but the people and systems behind it. Education and career pathways must be modernised to reframe horticulture as a science-driven, socially valuable career with clear technical and managerial routes. Apprenticeships, student placements, digital training, and workplace learning programmes can address skills gaps and link local people directly to emerging jobs in their communities. Along with storytelling and visible role models, we can shift outdated perceptions of growing as low-skilled work. Targeted skills mapping should underpin workforce planning and ensure alignment with business demand.

Leadership and collaboration are also essential. A unified voice across growers, researchers, retailers, and public bodies would give the sector greater influence and access to funding. Sector-wide coordination would allow for joint advocacy, faster knowledge sharing, and a stronger research-to-practice pipeline. A dedicated R&D facility where innovations are tested in commercial conditions would de-risk investment, accelerate adoption, and ensure research meets real-world needs.

Devolution and local government reform create a unique opening for regions to put protected edible production at the heart of joined-up local growth, health, and climate strategies. By making the most of brownfield and underused land, investing in local skills, and supporting the shift to protected systems, regions can build resilient, zero-mile food supply chains and reduce reliance on imports. Yet food policy remains fragmented, limiting national progress. Policy and strategy leaders have the chance to drive real change: by enabling partnerships between growers, anchor institutions, and communities, place-based action on protected edibles can turn food from a supply chain risk into a strategic asset for public good. The NHS presents one of the clearest and most immediate opportunities to connect sustainable food production with public value. Although net zero and social value now feature in NHS procurement, food sourcing is still dominated by centralised, national

supply chains with little connection to local or regional growers. As the largest public food buyer in the UK, the NHS spends nearly £1 billion each year on food and drink, but only a small fraction directly supports local supply, shortens food chains, or strengthens regional resilience. By investing in local grower cooperatives and greenhouse farms, the NHS could reduce the estimated 20% food waste across its estate, improve nutritional quality, and deliver on its role as an anchor institution committed to public health, local employment, and environmental sustainability. NHS farms or local procurement partnerships would not only support regional horticulture but also reinforce the value of food as healthcare.

Unlocking investment is essential. The sector needs capital expenditure support, tax incentives, and innovative finance mechanisms, from pension funds to supermarket reinvestment, to build modern facilities and drive green innovation. All funding should be strategically aligned to wider goals, including net-zero, public health, and DEFRA's land use frameworks. Strategic investment now can unlock long-term savings in NHS spending, environmental restoration, and rural regeneration.

The public appetite is already shifting. Interest in sustainability, local food, and health is growing. But the narrative around protected edible horticulture has yet to catch up. The sector must be promoted not just as agriculture, but as part of the wider food economy, one that spans health, energy, planning, education, and innovation. Aspiration, opportunity, and fairness should drive how we talk about it and how we legislate for it.



APPENDIX 1 UK Protected Edibles (SWOT)

Strengths

High productivity per square metre: Protected systems can produce up to 10 times more food per m² than open-field agriculture.

Efficient resource use: Greenhouses use up to 90% less water, support precision inputs, and can reduce chemical dependency.

Year-round, climate-resilient production: Controlled environments mitigate the impact of weather extremes and allow off-season harvesting.

Urban and brownfield potential: Systems can be located near population centres, supporting zero-miles supply and food access.

Link to national public health outcomes: Direct potential to support NHS priorities through improved nutrition and local food procurement.

Innovation-ready: A growing number of UK businesses and researchers are developing climate tech, lighting systems, and automation tools suitable for scale-up.

Weaknesses

Chronic labour and skills shortages: Ageing workforce, lack of young entrants, and low visibility of career pathways.

Underinvestment in infrastructure: 70% of greenhouses are over 40 years old; less than 1% use advanced glazing and less than 10% suppl. lighting.

Planning and policy fragmentation: Poor alignment between food, land use, energy, education, and health policies.

Weak market power and low margins: Growers face centralised retailer control, short contracts, and pressure for low-cost, cosmetically uniform produce.

Slow adoption of technology: Low uptake of automation and digital systems due to cost, skills gaps, and lack of testing facilities.

Limited scale and land coverage: Less than 0.1% of total UK land is dedicated to protected horticulture, despite strategic potential.

Opportunities

Public procurement reform: Redirecting NHS and public sector food spend (~£1 billion annually) toward local protected produce.

Resilience and food security planning: Inclusion in the National Risk Register and designation as critical infrastructure would elevate strategic importance.

Green finance and alternative funding models: Use of lighting as a service, pension fund investment, and Section 106 contributions to support growth.

Regional innovation hubs: Co-locating research, growers, and tech developers to accelerate adoption and localised job creation.

Workforce transformation through education: Early engagement in schools, modern apprenticeships, and visible role models can rebuild talent pipelines.

Place-based systems and devolved leadership: Support from local authorities for mapping, co-location, and land access can unlock hyperlocal production.

Threats

Import dependency and geopolitical shocks: 80% of fruit and over 50% of vegetables are imported; exposed to climate, trade, and fuel volatility.

Loss of domestic growers: Without targeted support, many producers will exit the market due to rising costs and unstable returns.

Policy and incentive misalignment: Carbon policies currently disincentivise CO₂ reuse; food production undervalued in land planning.

Retailer dominance and unfair contracts: Large supermarkets continue to hold disproportionate influence over pricing and production standards.

Food inequality and declining nutrition: Poorest 10% consume 42% less fruit and veg than recommended; food insecurity is rising (from 92% to 90% between 2020–2023).

Underdeveloped tech infrastructure: Without investment in digital tools, training, and traceability systems, the sector risks falling behind global competitors.