

Top emerging UK food innovations: 2025-2035

Innovations the Food Standard Agency and Food Standards Scotland expect will shape the future of the UK food system.

About this note

This information note provides a high-level summary of the top emerging food innovations that the Food Standards Agency (FSA) and Food Standards Scotland (FSS) foresee will have relevance to the future of the food system, and which will likely reach United Kingdom (UK) markets between 2025-2035.

This list focuses on innovative food technologies, including:

- precision and biomass fermentation
- cellular agriculture (cell-cultivated products)
- edible insects
- controlled environment agriculture
- molecular farming
- gas fermentation
- 3D printing
- reverse food manufacturing
- new-to-nature proteins

This information note uses 'UK' to describe the wider food system context and innovation landscape.

Where market authorisation is mentioned, this reflects arrangements for Great Britain (England, Scotland and Wales). Arrangements in Northern Ireland may differ. Decisions on whether a product can be placed on the market in the UK are made through the relevant legal and evidence based processes and are assessed case by case.

This information note sets out how UK food regulation applies - and typical authorisation routes in line with - the Government's National Vision for Engineering Biology. [\(footnote 1\)](#)

This note does not make a judgement about whether any technology is likely to succeed commercially or to receive market authorisation.

The National Vision commits around £2 billion over ten years to build the bioeconomy. [\(footnote 2\)](#)
This is supported by targeted programmes that include £1.6 million for the Food Standard Agency (FSA) and Food Standards Scotland (FSS) to deliver the Cell-Cultivated Products (CCP) Sandbox, and £1.4 million to strengthen the FSA and FSS' innovation and guidance through the innovation hub. [\(footnote 3\)](#)

The goal for 2025 to 2035 is to move from research leadership to safe, investable products. This means combining proportionate regulation with scalable infrastructure and practical, early-stage

regulatory support.

Why innovative food technologies matter

The UK food system faces a number of converging pressures including:

- climate risks
- supply chain shocks
- cost volatility
- seasonal import dependencies([footnote 4](#))

Innovative food technologies may provide additional ways to produce proteins, fats and functional ingredients. They may also support the growing of food in controlled environments that reduce reliance on weather and geography.

These technologies are often discussed as potential ways that could support year-round supply; environmental impact will vary by technology and implementation.

Market access in the UK will continue to rely on pre-market authorisation under the novel foods framework before a product is approved for sale.

How the FSA and FSS assessed emerging technologies

Over the next decade, several technological innovations are likely to reshape the UK food system and the regulatory landscape. The FSA and FSS assessed emerging food technologies based on:

- their potential impact on the UK food system
- their feasibility for safe adoption
- the level of regulatory preparedness required

The goal is to enable responsible innovation while safeguarding consumer health. ([footnote 1](#)) Realising their benefits will depend on clear, predictable pathways to market authorisation, sufficient research and pilot scale capacity, as well as early engagement with regulators.

Market access in the UK will continue to rely on pre-market authorisation under the novel foods framework before a product is approved for sale.

At the FSA and FSS, the following pragmatic timeline may guide action: ([footnote 2](#))

Tier 1: 0 to 5 years

Technologies most likely to be relevant in GB in the near-term because they are:

- already authorised on the domestic market
- nearing market authorisation
- generating active regulatory engagement

These are technologies with high impact and near-term feasibility that require immediate guidance and hazard frameworks.

Tier 2: 5 to 10 years

Technologies that are developing quickly and may reach GB markets later in the decade.

These may need further research and scale?up, as well as an understanding of the regulatory route and the evidence that would be needed to demonstrate safe use.

This tier covers technologies with medium-term opportunities where clarity on standards and specifications will support growth.

Tier 3: over 10 years

Earlier?stage technologies that are unlikely to be widely available in the next decade but are important to monitor through horizon scanning and research.

The focus here is to maintain a close watch and identify emerging safety questions early.

This approach helps ensure that regulatory resources are directed to where they are most needed, supporting evidence requirements, consistent assessment and transparent communication.

Tier 1: technologies with immediate growth, impact and feasibility (0 to 5 years)

Tier 1 covers technologies already in commercial use or with active UK regulatory engagement, where the UK can scale responsibly and at pace.

Precision fermentation

Precision fermentation means food or food ingredients containing components such as proteins, sugars, carbohydrates, vitamins and/or fats, produced by precision fermentation. Following fermentation, the desired product is separated from the fermentation broth and purified before being incorporated into food. [\(footnote 3\)](#)

The technology builds on decades of safe use for enzymes and preservatives. It now extends to animal free dairy proteins and similar functional components.

Precision fermentation is well established and scalable (fermentation at industrial scale is widely used), and it is being applied to produce newer, more complex 'functional' ingredients (for example, animal-free proteins) that can improve texture or stability.

Applicants will still need to demonstrate safety and provide evidence (as set out in the relevant application guidance).

Challenges remain, including reducing costs while scaling capacity, achieving consistent batch-to-batch quality, and generating comprehensive safety specifications (including allergenicity assessments) that meet dossier or application requirements. [\(footnote 4\)](#)

In Great Britain, most precision fermented ingredients need pre-market authorisation before they can be sold.

Updated scientific guidance from the European Food Safety Authority (EFSA) published in 2024 specifies application requirements relating to product identity, production, composition, toxicology, nutrition and allergenicity. This helps align evidence standards for UK applicants. [\(footnote 5\)](#)

The FSA and FSS provides pre-submission support through the [innovative food guidance hub](#) and the [Business Support Service pilot for precision fermentation](#).

Through the Market Authorisation Innovation Research Programme (IRP), the FSA and FSS are providing regulatory clarity, by developing guidance and supporting more predictable routes to

market. This aims to support clearer expectations for applicants and improve dossier quality, so companies understand the steps needed for safe and compliant commercialisation.

Biomass fermentation (Mycoprotein)

Biomass fermentation exploits rapid microbial growth to produce protein rich biomass for food. A well-known example is mycoprotein (a meat substitute), which has been sold in the UK for decades.

The UK has strong, industrial production and new facilities are expanding ingredient supply for food manufacturers. This shows the technology is not an experimental concept but has established manufacturing capacity. [\(footnote 6\)](#)

While most products would not be considered novel and are covered by general food law, some go through the novel food authorisation process.

The FSA and FSS oversee safety, labelling and safeguard consumer protection.

Research often describes that biomass fermentation can deliver high protein, fibre rich ingredients and notes a range of sustainability impacts depending on the production methods and scale.

Decades of consumer experience with mycoprotein supports rapid retail adoption, while new formats (for example, mince, fillets, ready meals) expands consumer choice. [\(footnote 7\)](#)

More innovative uses of biomass fermentation are emerging, including new fungal, bacterial and microalgal ingredients, and using fermentation approaches to improve taste, texture or functionality in plant-based foods.

The remaining challenges for these newer applications typically centre on scaling cost effectively, [\(footnote 8\)](#) maintaining consistent composition and sensory quality, and managing food safety considerations such as process controls and, where relevant, intolerance or allergenicity.

Cellular agriculture (cell-cultivated products)

Cellular agriculture or cell-cultivated products (CCPs) are new foods that don't involve traditional farming such as rearing livestock or growing plants and grains. They are made by taking cells from plants or animals, which are then grown into food. [\(footnote 9\)](#)

While industry reports there are strong ethical and sustainability drivers for CCPs, there is still low market readiness due to consumer scepticism and issues around scalability. For example, research discusses that CCPs may have the potential to reduce land use and emissions.

Subject to meeting regulatory requirements and demonstrating safe use, this technology has the potential to change protein supply chains.

The FSA and FSS have piloted a regulatory sandbox and published guidance for CCPs. Most applications are expected to be assessed via the novel foods framework.

Commercialisation depends on robust safety assessments, production economics and consumer acceptance. UK guidance and the regulatory sandbox are designed to provide regulatory clarity to industry and safely introduce these products to market. [\(footnote 10\)](#)

Controlled environment agriculture, including vertical farming

Controlled environment agriculture (CEA) - including vertical farming - grows crops such as leafy greens and herbs indoors in climate controlled spaces where conditions are heavily monitored

and nutrients are administered precisely. These farms can produce food year-round, independent of the weather.

UK studies show strong yields and water savings for vertically farmed lettuce, for example, compared with some field grown imports. While their carbon footprint can be higher because of energy use and speciality materials, there are ways to improve on this by boosting efficiency and using renewable energy.

CEA may support winter food security and reduce reliance on volatile imports. Food produced through CEA is generally regulated under existing food safety and hygiene requirements. This includes primary production hygiene and, where relevant, harvesting/handling and packing controls.

There is an emphasis on preventing contamination and maintaining appropriate traceability records to support due diligence and rapid action if issues arise.

Progress will depend on practical steps, such as affordable low carbon energy, better material choices, and well sited facilities (for example, near renewable generation or waste heat sources) to help the sector become commercially resilient.

Edible insects

Edible insects can provide an alternative protein source in whole or processed forms. In GB edible insects must be approved through the novel foods authorisation process before being placed on sale in GB.

No edible insects have been authorised for sale in GB. However, measures introduced following the UK's exit from the EU allow four insect species to remain on the GB market until the FSA and FSS make a decision on their authorisation:?? [\(footnote 11\)](#)

- yellow mealworm (*Tenebrio molitor*)
- house cricket (*Acheta domesticus*)
- banded cricket (*Gryllodes sigillatus*)
- black soldier fly (*Hermetia illucens*)

This means there is already UK market presence (for a limited set of species) and active regulatory engagement through the established novel foods pathway. [\(footnote 12\)](#)

Wider growth is less about the legal route, and more about medium-term adoption factors/barriers, including consumer familiarity, suitable product formats, and explicit labelling (particularly for allergens), alongside the outcome of pending authorisation decisions.

Future market presence of edible insects will depend on authorisation outcomes and public perceptions.

Tier 2: innovative technologies developing potential (5 to 10 years)

Tier 2 technologies need further research and development, scaleup infrastructure and clearer regulatory pathways. They offer significant longer-term potential for the UK food system.

Molecular farming

Molecular farming uses plants or plant cells as tiny factories to make specific food ingredients, such as proteins and enzymes.

UK research strengths in transient plant expression mean new ingredients can be prototyped quickly. It can enable rapid prototyping and, if scaled successfully, molecular farming could broaden the UK's ingredient options - alongside approaches like precision fermentation - by providing a different route to produce high value functional ingredients. [\(footnote 13\)](#)

Any products for sale will be assessed case by case under the regulated products framework. This is because the applicable route depends on both the ingredient and the production method.

In molecular farming, the right approval route depends on what the ingredient is and how it is made. In some cases, more than one set of rule may apply.

For example, rules about whether an ingredient is 'novel' and rules about whether the plant used to produce it is classed as a genetically modified organism (GMO) or precision bred. Therefore, early classification is vital to determining the correct evidence, safety information and authorisation pathway. [\(footnote 14\)](#)

Gas fermentation

Gas fermentation uses microbes to convert captured carbon dioxide, hydrogen or other industrial gases into single cell proteins and other useful food ingredients. UK pilot projects have already shown this can make single cell protein for animal feed. [\(footnote 15\)](#)

To sell products for human food in GB, companies will need to submit evidence to the FSA and FSS for a safety assessment under the novel foods framework.

Research indicates that gas fermentation could support wider policy objectives where relevant (for example, around circular economy and net zero), by providing a domestic, year-round source of protein that doesn't rely on farmland or fishing.

Tier 3: future technologies (over 10 years)

3D food printing, reverse food manufacturing and new-to-nature proteins

The UK will need to 'monitor' the development of 3D food printing, reverse food manufacturing and new-to-nature (designer) proteins.

3D printing builds foods layer by layer. In the UK, it's likely to remain smaller scale and specialist because it is expensive, and hard to keep consistently clean and reliable across recipes. [\(footnote 16\)](#)

Reverse food manufacturing means taking nutrients out of food by-products and turning them into new ingredients. These technologies are largely at pilot or concept stage. [\(footnote 17\)](#)

New-to-nature proteins are tailor-made using advanced computing or artificial intelligence to create new molecules that don't exist in nature. These could eventually be used to improve food texture or nutrition but are early stage. They would require novel foods approval with evidence that they are safe to eat. [\(footnote 18\)](#)

Across all 3 technologies, scaling depends on demonstrating safety and supply chain integrity over the next decade and beyond. Companies would need to show food safety and consistency, including compliance for any materials, and good manufacturing controls under food contact and regulated products application requirements.

How the FSA and FSS support responsible innovation

The UK regulatory approach aims to support proportionate regulation, science-led assessment, and predictable routes to market. This makes sure innovators understand the evidence required for safe market authorisation and can plan investment and scaleup with confidence.

The FSA and FSS will continue to foster innovation while maintaining high safety standards, building public trust through consumer research, clear guidance and labelling, and transparent communication. In practice this means:

Safety assessment and authorisation

The FSA and FSS assess safety and advise respective ministers in England, Scotland and Wales responsible for authorising innovative products.

Many innovative products will require novel foods authorisation, with EFSA's updated guidance providing a useful reference point for information typically needed in an application.

FSA and FSS guidance and support

The FSA's Innovative Food Guidance Hub, and the precision fermentation and cell-cultivated products Business Support Service pilots provide practical pre-submission help and signposts relevant application guidance and requirements for market authorisation. [\(footnote 19\)](#)

Supporting research and development capability and scale-up

The FSA and FSS draw on UK research hubs and university centres to stay sighted on emerging evidence and to inform safety assessment and guidance as technologies develop. [\(footnote 20\)](#)

Next steps

This information note provides a high-level summary of emerging food technologies based on the evidence available at the time of publication. It will be reviewed and updated as the science and products develop.

The FSA and FSS will continue to:

- monitor technologies as they come into scope for regulated products and food safety considerations
- build a practical understanding of intended uses and production approaches
- highlight the key food safety and consumer protection questions that businesses may need to address through appropriate evidence, controls and (where required) market authorisation routes
- engage with industry and delivery partners to test assumptions, identify new developments early, and ensure any new guidance is clear and practical for businesses and consumers

Read the full [thematic report on emerging food innovations in the UK](#). Visit the FSA [innovative food guidance hub](#) for further information, advice and support.

Disclaimer

We may use automated tools, including artificial intelligence (AI), to assist with drafting or processing information. All outputs are reviewed by a human before publication or decision-making.

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