

IMPERIAL

Microbial foods as a sustainable, healthy and resilient source of nutrients for the UK

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Headlines

Key findings

- The UK's demand for protein is estimated to rise by 5% by 2030.
- Production of protein relies largely on animal agriculture in the UK and abroad.
- A rising dependence on imports (30-40% of most meals) creates vulnerability to external supply challenges and political shocks.
- Production of animal feed and animal products is the largest contributor to detrimental land-use change and agricultural carbon emissions world-wide.
- High consumption of animal products is associated with poor nutritional profile (such a high saturated fat intake, high cholesterol levels) and occurrence of digestive tract cancers. These pose population-level health risks for all ages.

Solutions

- Microbial foods are produced with the aid of microorganisms via processes such as fermentation and have been consumed in various human cultures for millennia.
- Production of microbial foods is much less resource intensive and more sustainable than current animal-based food production and import, with lower greenhouse gas (GHG) emissions, land requirement, water use and pollution (Figure 1).
- Microbial foods can provide alternative sources of protein and fibre and be engineered to have a healthy nutrient dense profile.
- The microbial foods industry has immense potential to become a successful sector in the UK. This is an opportunity for economic growth and job creation, and to improve the national food supply.
- Investment in R&D and infrastructure is needed, paired with a collaborative regulatory office connected to entrepreneurs and researchers, to safeguard the UK's reputation as a leader in this sector.

Policy recommendations

The UK's 'Food Strategy' from 2022 outlined a series of objectives to deliver "a sustainable, nature positive, affordable food system that provides choice and access to high quality products that support healthier and home-grown diets for all".¹

The drive to create a long-term shift in our food system requires a transdisciplinary approach involving expertise in environment, public health, microbiology, engineering biology, farming, entrepreneurship, policy and marketing.

Every aspect of our food system needs to be considered to achieve change; from substrate, energy and food producers to product transport, retail and consumers. We propose a three-theme approach: investing in technology, skills, and product development; establishing regulations to ensure safety and transparency of novel food products; and developing strategies to communicate the benefits of microbial food to consumers.²

Theme 1. Product development

From 2020 to mid-2024, the UK government invested £75 million in developing new sustainable foods.⁴ This rise in funding puts the UK in an excellent position to seize opportunities in this field, including the development of IP for a new, sustainable and healthy protein economy.³

- Fund medium-to-large infrastructure hubs to support production scale-up and the transition from 'lab to market' for start-ups.
- Promote the creation of skills training through university degrees and apprenticeships. Additionally, facilitate short courses focused on scale-up of processes and bioreactor training.
- Invest in building a circular economy approach to utilise waste from current crops as substrates for microbial food production, providing opportunities for farmers to contribute to the green transition.
- Support knowledge-sharing, mentoring and peer-to-peer learning among microbial food industry-entrants.
- Continue investment in engineering biology for a targeted approach to microbial screening, strain development, safety, taste and texture improvements.
- Communicate to investors that the UK will have a stable long-term policy environment that is supportive of microbial foods.

Theme 2. Regulatory context

Current UK regulations are seen as a barrier to home market access. The new Precision Breeding legislation does not mention microbial foods, a lost opportunity as genetic engineering of microorganisms is a more rapid process.⁵ The Food Standards Agency (FSA) includes novel microbial foods in the broad category of "novel foods", a largely unspecified label. It currently takes an average of 2.5 years to get approval for new food.^{4,6}

- Create a well-resourced agency to prepare regulations through co-creation with experts in the engineering biology, food safety and healthcare sectors. An additional FSA sandbox on microbial foods, following on the example of cell cultivated products, would be appropriate.⁴
- Support start-ups by opening a dialogue early on during the regulation process.
- Modernise regulations to adapt to the diversity of novel food alternatives.
- Include microbes in the new 'Precision Breeding' legislation.
- Align regulations and trade agreements to promote exports of microbial foods and simplify the nomenclature and labelling of alternative foods.⁷

Theme 3. Demand

British consumers already buy more alternative protein products than most Europeans.⁸ In the short-term, microbial foods can help reduce meat consumption, rather than entirely substituting it.

- Increase taxes on unhealthy foods coupled with investment to make healthy foods more affordable.⁹
- Build trust through transparent communication about how microbial foods are produced and their nutritional value.
- Promote and market alternative food products in both government-funded awareness campaigns and product advertising.
- Support a market for microbial foods through public sector catering.¹⁰
- Promote the sales of microbial foods not only in large supermarkets but also in smaller shops, where low-income households tend to do their shopping.
- Include microbial foods in official national dietary recommendations.

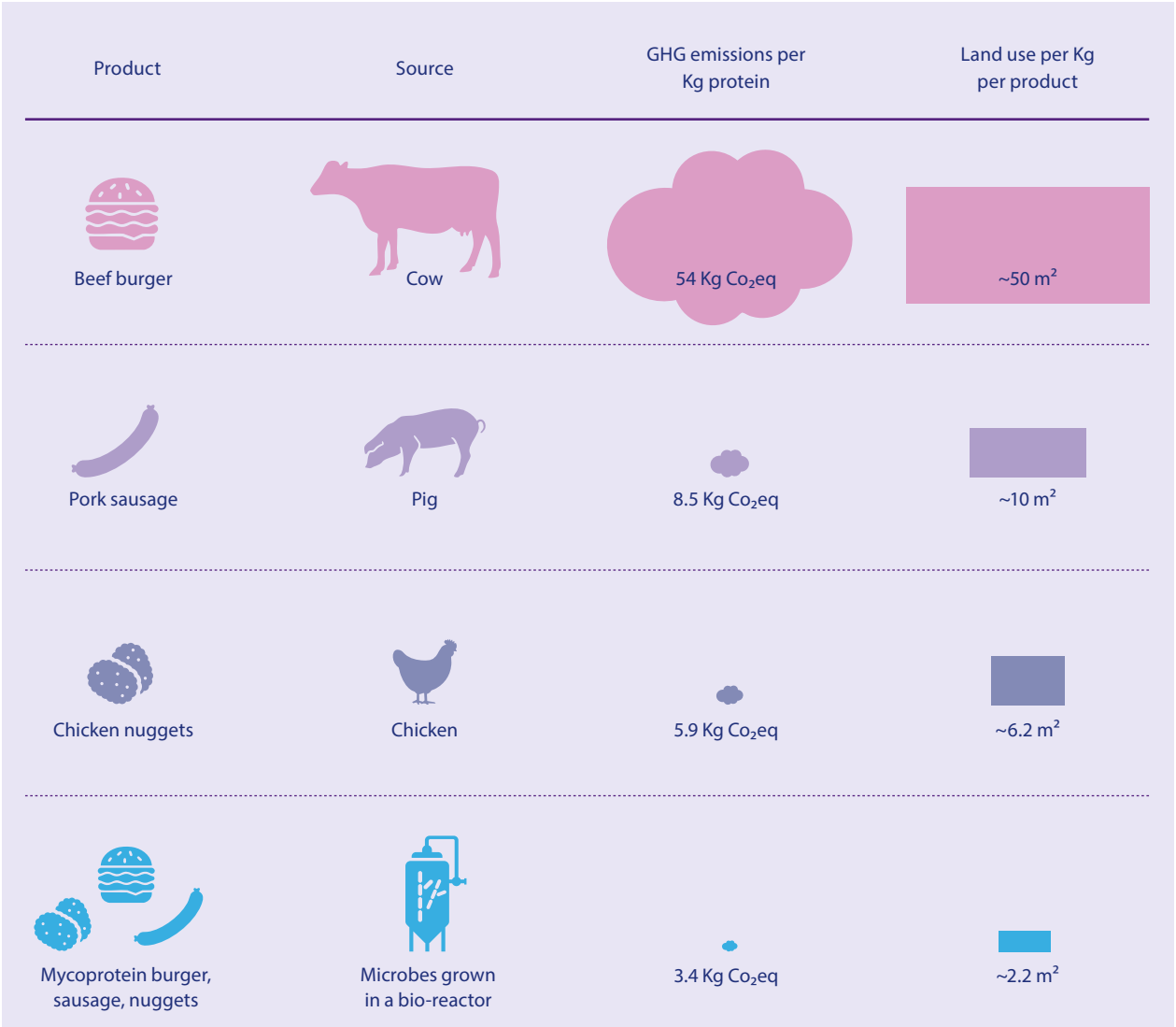


Figure 1. Comparison between animal-derived food products and microbial food products. Data obtained from Mazac et al., 2022 (doi: 10.1038/s43016-022-00489-9)

Our current food system presents three key challenges. Livestock agriculture is a major contributor to GHG emissions and causes other environmental harm, while it is also vulnerable to the consequences of global warming and extreme weather events. Our current diets lead to health inequalities and contribute to increased rates of obesity. The UK’s food supply chains are exposed to external political shocks due to our heavy reliance on imports. Microbial foods present an opportunity to reduce the environmental impact of our diets while, in parallel, meeting the nutritional needs of the wider population, and minimising the UK’s dependency on imports.

These recommendations are designed to contribute positively to the UK’s economic growth, improve food security and help to reduce the current environmental and health crises by capitalising on the nation’s track record in microbial foods.

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