



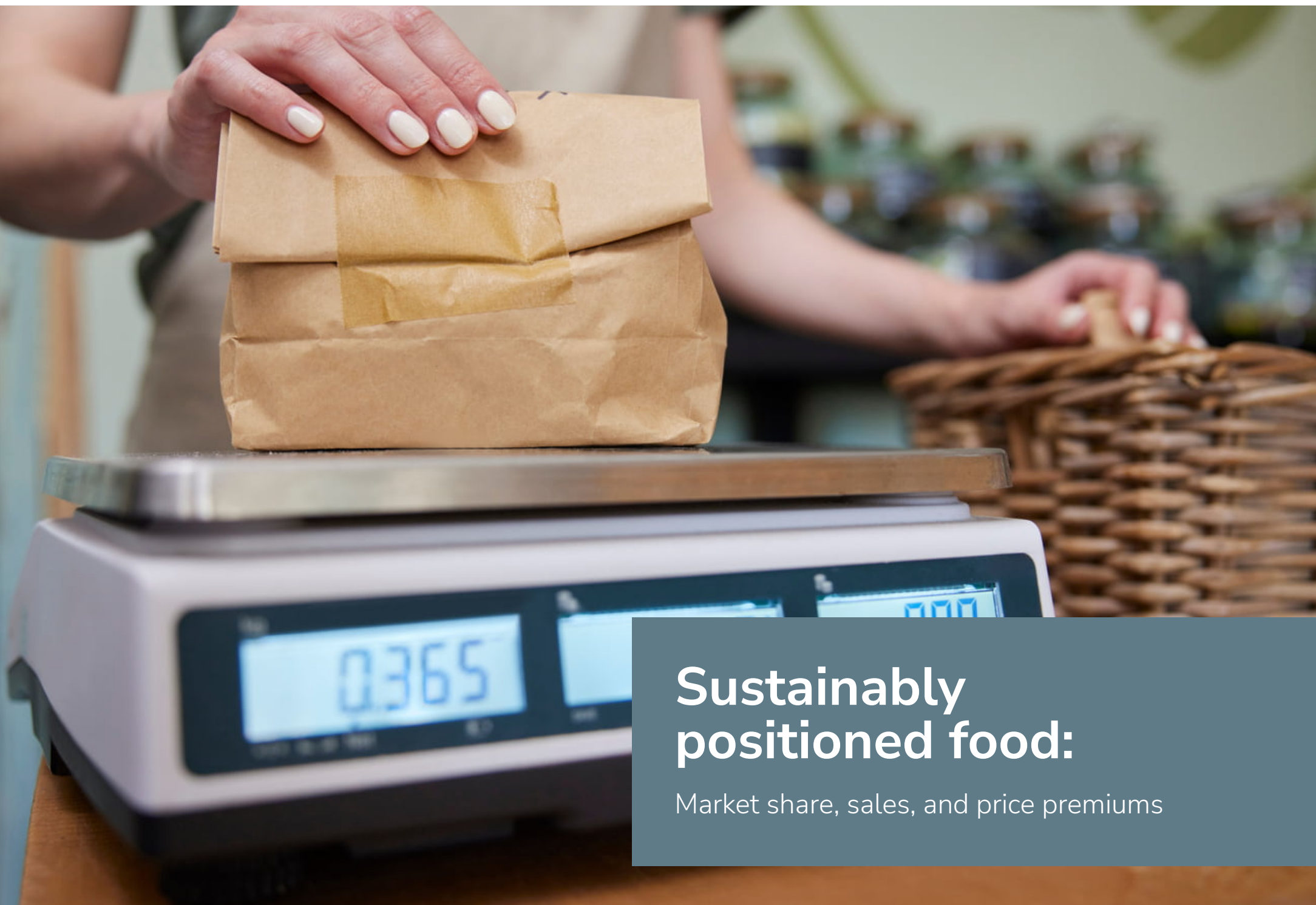
Creating a sustainable food system

Introduction

The food industry's relationship with sustainability is a work in progress, with manufacturers continuing to deliver on commitments while empowering consumers to make sustainable choices. However, as the climate crisis worsens, is enough action being taken?

In this report, we look at recent innovations, action points, and ongoing challenges.





Sustainably positioned food:

Market share, sales, and price premiums

Sustainable business makes business sense. The growth rate for consumer goods marketed as sustainable is nearly four times higher than the market average^{1,2} while further research has established a link between environmental, social, and governance (ESG) and financial performance, connecting a strong ESG proposition or performance with higher equity returns and a reduction in downside risk.³

There is also strong consumer demand. Living a sustainable lifestyle has been a top consumer choice for the last decade or so, reflected in

dietary choices that include veganism, meat alternatives, and Fairtrade-certified (or similar) products.

Research from Mintel's Global New Product Database (GNPD) finds that nearly half (48%) of all new global coffee product launches in 2020 carried an ethical or environmental claim – double the number compared to almost a decade ago (2012) when just one in four (25%) coffee launches were sustainable.⁴

Bloomberg Intelligence has reported the plant-based food market could reach \$162 billion

(€159 billion) within the next decade, up from \$29.4 billion (€27.7 billion) in 2020⁵ and the sustainable food industry could be worth up to \$2.3 trillion (€2.2 trillion) by 2030, according to New Climate Economy.⁶

This has been driven by long-term adoption of alternative food options by global restaurant chains and plant-based market leaders.

Human and planetary health driving growth

The link between sustainability and health is a driving factor with consumers making the link



between climate change, livestock issues, and loss of biodiversity with obesity and chronic disease.

According to market research firm FMCG Gurus, many people deem the topics of health and sustainability to be interlinked. This is something that is resulting in people adopting the notion of “feeling good by doing good” for themselves and the planet. Consumers are therefore looking to ensure that products are fully used up before being replaced and making greater efforts to avoid food waste, as well as searching out sustainable food, such as plant-based proteins.⁷

Quorn’s Footprint Comparison Report, published by the Carbon Trust in 2021, shows that the UK firm’s beef-alternative products can have a carbon footprint up to 13 times lower than beef, and chicken-alternative products up to four times lower than chicken.⁸

While fungal-derived rather than plant-based, the mycoprotein substitute contains all nine essential amino acids, is high in protein and fibre, and low in saturated fat. It is also free from

trans-fat and cholesterol and is a source of micronutrients like riboflavin, folate, phosphorus, zinc, and choline.

Danone has invested in regenerative agriculture for some of its products, through intercropping and crop diversification, and using biological rather than chemical fertilisers, resulting in greater yields and improved crop quality.¹⁰

Other examples of businesses using sustainable nutrition to improve human and environmental health include Unilever-owned Knorr, whose pact with the WorldWide Fund for Nature (WWF) resulted in the Future 50 Foods Report.

The publication identified 50 foods consumers should eat more of to promote a healthier and more sustainable global food system.

“The SDGs offer the greatest economic opportunity of a lifetime,” said Paul Polman, then-CEO of Unilever and co-founder of the Business & Sustainable Development Commission.¹¹



“With an estimated investment of \$2-3 trillion (€1.9-2.8 trillion) a year, the potential value that can be unlocked for society will be immense. In some sectors it is estimated to be worth hundreds of billions, and even more in others. This is a very high pay out for this global agenda and markets are already starting to react.”



Consumer
preferences

For many consumers, sustainable food production and a focus on environmental and social issues are now a requirement rather than an afterthought.¹²

“In general, I think consumers would say that the baseline would begin with transparency, which would inevitably incentivise a brand to: firstly, start activity in this area and, secondly, have something to report,” said Nicola Smith, group senior sustainability manager for Little Freddie, an organic food brand that sells infant and baby food products across the UK and Asia.

“For the more discerning consumer, I think they

expect examples of activities that a brand must carry out. Top of this list would be packaging; it must be recyclable with recycled content or made from sustainably sourced material as a subsequent preference.

“Ethical sourcing - fair trade, organic, Rainforest Alliance - would perhaps be more expected for fresh produce such as fruit and vegetables over processed food because of the types of certifications available and recognition of those standards.”

Data from Euromonitor International's Sustainable Living Claims Tracker show the number of packaged food products with

sustainability claims gradually increased between 2019 and 2022.¹³ This comes despite a 15% price difference between such products and products without sustainable attributes, according to the market research company.

“Low price still plays a significant role when choosing food and beverage products, although it's obvious that some consumers are starting to veer spending towards products that have a positive impact on people and the planet featuring claims such as ‘all natural’ or ‘100% organic,’” it added.

Food labelling

As sustainability moves up the agenda, supply chain traceability is also becoming an important point for consumers.

Food labelling and certification schemes have developed to demonstrate traceability and brands are incorporating more information about products' origins.

One major ethical food certification label is organic. The US Food and Drug Administration



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(FDA) certifies organic foods as those grown and processed according to federal rules that address soil quality, animal practices, and additive use, among other factors.

Organic producers must adopt biologically-based farming methods, relying on natural substances, where possible.

Produce can be called organic if it adheres to certain specifications, such as being grown on soil that has had no prohibited substances applied for three years prior to harvest. These prohibited substances include most artificial pesticides, fertilisers, and herbicides.

With processed, multi-ingredient foods, the United States Department of Agriculture (USDA) organic standards carry further considerations, which ban organically processed foods from containing artificial preservatives, colours, or flavours.

There are minor exceptions, with processed organic foods allowed some approved non-agricultural ingredients, like enzymes in yoghurt,

pectin in fruit jams, or baking soda in baked goods.¹⁴

Organic production, labelling, and controls have been regulated at EU level since 1991. These rules were amended on 1 January 2022.

Organic food must now meet these updated criteria which now emphasise sustainable cultivation systems, environmental protection, and biodiversity along with higher standards of animal protection.¹⁵

Under EU organic farming rules, producers should prefer closed cycles using internal resources. If open cycles are adopted, they should use organic materials and/or mineral fertilisers with low solubility.

Genetically Modified Organisms (GMOs) are specifically not permitted. EU rules on GM food stipulates a threshold (0.9%) under which a product's GMO content does not have to be indicated and can be labelled organic.

Another main claim is natural but, unlike organic,

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there is no legal definition of the word for food products. Both the FDA and USDA have loose definitions for natural ingredients that may act as guidelines until more explicit rules are put in place.

The FDA has considered the term natural to mean that nothing artificial or synthetic has been included in, or has been added to, a food that would not normally be expected to be in that food.

However, this policy is not intended to address food production, processing, or manufacturing methods and whether the term should describe any nutritional or other health benefit.¹⁶

In Europe, the term natural is also ambiguous, with labelling unregulated, and the ingredient makeup of products also unclear, leaving consumers in the dark as to the composition of a given food.

Other ethical food certification labels include free-range and animal welfare-friendly (such as Animal Welfare Approved, American Humane

Certified), and sustainably produced (such as Rainforest Alliance certified, Marine Stewardship Council certified) among others.

“It does feel like there has been a shift in the past year with greater scrutiny by the public or consumer watchdogs on sustainability claims,” said Little Freddie's Smith. “Before' you could provide basic descriptions. The emphasis now is providing validation and/or detailed explanations about your claims.

“For Little Freddie, this meant moving artwork around on the back of our packaging - perhaps even replacing other wording - so we could fit in details relating to recycling and our climate footprint.

“We also introduced a sustainability blog and FAQ on our website in addition to our dedicated sustainability pages so that more information could be shared in relation to our sustainability efforts.”



New product development

Baking sustainability
into food design



Changing customer preferences coupled with tightening regulations and investor pressure are driving companies to switch supply networks, manufacturing processes, and business models.

This quest for sustainability has led companies to revise food product design to meet taste and cost requirements while using fewer resources across the full life cycle, notably in the early design stages.

One example is snack firm Simple Mills, which uses ingredients produced from regenerative farm practices that encourage nutritional and crop diversity while ensuring farm to fork sustainability.

“What we eat matters, and so does where and how our food is grown,” said Katlin Smith, Simple Mills CEO and founder.¹⁷ “Whether it’s cover crops, crop rotations or any number of other regenerative agriculture practices, improving the quality of the food supply is directly connected to the quality of the ingredients sourced from growers.”

Sustainable food design has also been applied to the alternative protein market to great success. Manufacturers can use alternative proteins such as plant-based ingredients rather

than conventional, resource-heavy animal-derived ingredients such as cheese, meat, eggs, and milk.





The jump to the mainstream hit a high point with Sweet Earth's acquisition by Nestlé and Danone's \$12.5 billion (€11.8 billion) takeover of WhiteWave, a plant-based, organic dairy, and food producer.

Measuring sustainable impact

As brands continue to innovate, food production has given way to an emphasis on technology that provides a way to assess the reductions made to a food's social and environmental footprint.

Through a combination of advanced value chain modelling and a carbon management platform for consumer products, US-based Planet FWD can provide product life cycle assessments (LCA) and assess water and land use in the creation of a carbon neutral food product, for example.

In a similar vein, fellow US-software firm Journey Foods offers a portfolio intelligence and lifecycle management platform especially for food development and innovation. The firm harnesses artificial intelligence (AI) to provide

financial and business insights into ingredient alternatives that also include nutritional trade-offs. HowGood is another provider of a product sustainability database, which analyses the environmental and social impact of products and ingredients, aiding designers in choosing the most appropriate ingredients.

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Katlin Smith, CEO and founder, Simple Mills



Sourcing and procurement

As start-ups such as Planet FWD and HowGood offer sector specific data, the onus is now on the industry to apply that knowledge to influence design and minimise waste at the first opportunity.

Organisations and their business models are maturing as a result, with that data also providing sourcing and procurement teams with the necessary insight into suppliers' carbon management practices, improving value chain engagement, and building trust with consumers.

It is imperative that food businesses adhere to traceability safeguards of so-called “high-risk ingredients” such as sugar, coffee, soy, palm oil, cacao, and bananas, which can translate to reputational and financial risks if not managed correctly.

“It is around the type of raw material and the business model you operate under,” said Smith from UK baby food brand Little Freddie. “If you procure all of your own ingredient, as opposed to going through a third-party manufacturer, you

have more control and leverage to gather data or map the supply chain.

“Third-party manufacturers are very reluctant to share information about their supply chains. As an organic business, we know the origin of our ingredients. However, we may not know the full journey before a fruit, vegetable or herb is delivered into our Tier 2 or Tier 1 supplier.

“The emphasis is then on you to work with the Tier 1 or 2 suppliers to encourage transparency and the need to track that ingredient further down the supply chain.”

It is by no means an easy task. With the demand from consumers for sustainably grown products continuing to gain momentum and ever-changing regulations, adopting sustainable sourcing commitments remains a hands-on process.¹⁸

The systemic change needed to promote sustainable food systems was spearheaded by the EU Green Deal, published in 2019, where legislation bans the sale of goods produced on



deforested and degraded land. The list of targeted products includes cocoa and derived products like chocolate.

More recently, the EU's decision to pass its deforestation law in December 2022 has major implications for Indonesia and Malaysia, two of the world's biggest palm oil producers.¹⁹

The new law will require companies to produce a due diligence statement in order to sell products like palm oil, soy, coffee, cocoa, as well as derived products such as beef, or chocolate on the EU market. Those linked to deforestation will be banned from import and export into the EU.

There is general support for such regulations in Europe. A survey conducted by Ingredients Network in 2022 found that 90% of European food industry stakeholders surveyed said governments should establish a minimum legal standard for corporate due diligence, with only 10% opposing such mandatory action.

The conflict between Russia and Ukraine – the world’s biggest sunflower oil producers – provides an insight into how difficult it is to assess the risks within complex dynamic food supply chains.

UK frozen food specialist Iceland decided to temporarily revert to using palm oil due to the war with “huge regret” after it had increased its reliance on sunflower oil in 2018.²⁰

Eliminating one product from the supply chain can involve other unexpected risks. The WWF recommends firms to be drivers of change by supporting sustainable production models and increasing transparency, thereby making high-risk ingredient production more ethical.²¹

Minimising the presence of high-risk ingredients in supply chains

The clamour to ensure companies adopt sustainable production approaches for high-risk ingredients continues to gain traction. Some of the ways being implemented, according to McKinsey & Company, include:²²

- **Create guidelines linked to high-risk ingredients:** These policies can draw inspiration or reference existing frameworks such as the EU Corporate Sustainability Reporting Directive 2022/2464 (CSRD) and Regulation on Deforestation-free Supply

Chains. Guidelines should aim to evaluate, highlight gaps, and quantify compliance to push for improvements along supply chains.

- **Schedule in regular risk assessments:** Highlight certain business operations and supply chains vulnerable to high-risk ingredients that exist or may do so in the long-term.
- **Decide action points to evaluate/oversee risks:** These points can include human and environmental due diligence and creating key performance indicators (KPIs) to screen operational effectiveness and effect of improvements.
- **Stress testing supply chain resilience:** Carry out situational planning exercises as these aid firms to prepare for a real crisis, its possible risks, and opportunities for resolution.
- **Insight proactivity:** Engage in regular company or external reviews where risks are noted. Assess frequently to create a cycle of pre-empting risks or disruptions, addressing them before a problem arises.

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Sustainable innovation for future foods

The food sector is turning to innovation to create ingredients with a lower environmental footprint using techniques such as precision fermentation, cell-culturing, and genetic modification for crop yields.

Precision fermentation

Within the alternative protein landscape, traditional fermentation has established itself as



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an enabling technology with companies touting the improved taste, nutrition, and sustainability of these ingredients.

But it's the application of precision fermentation to produce synthetic forms of palm oil, dairy ingredients, and food flavours that could be the real game-changer.

C16 Biosciences is using precision fermentation to offer a new and eventually cheaper palm oil source, using a yeast strain that produces a similar fatty acid profile to palm oil.²³ With an expected food industry launch likely in 2024, the US-based firm recently completed a 50,000-litre fermentation, taking the technology out of the lab and into commercial scale production.

Dutch startup NoPalm is also using precision fermentation to produce palm oil without the oil palms and, in 2023, announced a joint pilot launch with CPG giant Colgate-Palmolive for the personal care and cosmetic sectors.

Precision fermentation is being used to produce dairy protein alternatives to casein or whey.



Here, yeast and fungi microbes are “programmed” to produce complex organic molecules, where they are blended with water, sugar, and micronutrients to feed on.

The genetically engineered microflora are then sifted out and the remaining yield is isolated and

dried ready for development. Start-ups in this space include Estonia-based ProProtein, UK-based Better Dairy, Israel's Remilk, and German operation Formo.

Cell-cultivated meat

Cultivated meat's potential and commercial opportunity lies in its promised indistinguishability from conventional meat, offering a means of meat production that can be decarbonised.²⁴

Increased investment in the technology has solidified cultivated meat as a powerful ESG and growth theme in investors' portfolios and has signalled a shift away from plant-based proteins that peaked in July 2019, when shares of Beyond Meat hit an all-time high.²⁵

For investors, cultivated meat is presently more exciting than plant-based alternatives for one key reason: the opportunity to own intellectual property in an emerging market with massive potential.²⁶

UK IP specialists GovGrant identifies the US as

responsible for over 60% of global investment in cultivated meat, hitting €1.5bn.²⁷

In fourth place is Singapore, attracting €114m in global investment, no doubt buoyed by the country's Food Agency approving the commercial sale of a lab-grown chicken product in December 2020.

In 2022, meat supplier JBS invested \$100m (€94.6m) in acquiring cultivated protein firm BioTech Foods as well as in the construction of a new production facility in Spain.

Meanwhile, meat industry giant Tyson Foods joined a \$400m (€378m) investment in Upside Foods (formerly Memphis Meats) last year, adding to its portfolio that also includes Future Meat Technologies.

Cultivated meat is at an earlier developmental stage when compared to plant-based products. It has just become available to buy in Singapore, with regulatory hurdles still to be negotiated in other regions.



GM/GE for crop yields

Genetic modification (GM) and gene editing (GE) in agriculture is not recent. Since 1994, GM crops have been used, with supporters saying they contribute to food security and food supply chain resilience.

Whilst plants and animal genomes can be changed via both approaches, GM refers to the transfer of genes from one species to another. GE uses molecular tools like CRISPR to edit existing DNA crop sequences without the addition of other genes.

There are currently 14 commercialised GM crops: corn/maize, soybean, cotton, canola/rapeseed, alfalfa, sugarbeets, sugarcane, papaya, safflower, potatoes, eggplant, squash, apples, and pineapple, according to pro-GM, non-profit association, the International Service for the Acquisition of Agri-biotech Applications.²⁸

According to proponents, GM and GE agriculture is an essential part of making the food industry more sustainable while scaling food production

to meet demand of a growing world population, expected to reach 10 billion people by 2050.

According to agri-chemical giant Bayer, which acquired GM corporate Monsanto several years ago, intensive agriculture – made possible by advances in breeding technologies, fertilisation, irrigation, and pesticides – is the only time-tested way to grow food without turning more natural habitats into farmland – although it has a clear vested interest in promoting this agricultural model.²⁹

Biotechnology has increased global production levels of soybeans by 278 million tons and of maize by 498 million tons since the introduction of the technology in the mid-1990s, according to one study.³⁰

But as much as GM and GE crops have been hailed as a significant breakthrough in modern agriculture, their potential has been mitigated by the potential negative impact on the environment.

Questions have been raised about the impact on



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biodiversity, contamination of non-GM crop fields caused by gene flow from GM crops, and a decline of local and indigenous crops.

Regulatory uncertainty is limiting further innovation. Currently 19 of the 27 European Union (EU) member states partially or fully ban cultivation and sale of GE and GM food products.³¹

Public opinion on the use of GMOs within food production remains polarised with younger consumers aged between 18-24 having a more positive perception than older generations, particularly those over 65.³²

The UK government found most individuals (87%) and businesses (64%) believe gene edited organisms posed a greater risk to human health/environment than conventionally bred organisms.

Similar numbers of people (88% and 64% respectively) support continued regulation for the products of gene editing. However, these views were balanced by academic institutions

(63%) and public sector bodies (82%), which felt the risks were equal and that they should be



regulated differently (58%, 55%).³³

Reducing food waste

According to estimates by the FAO, up to as much as one-third of food that is produced every year is wasted. Food waste can happen due to supply chain inefficiencies such as a lack of cold storage or in the home.

Reducing food waste is therefore a major challenge. Portuguese startup Bio2Coat

produces edible coatings and packaging that extend the shelf life of fresh produce such as fruit and vegetables while removing the need for plastic.

Kern Tec is another startup reducing food waste by upcycling a previously unused biomaterial. The Austrian startup has developed a process to make the kernels of stone fruit, such as apricots and plums, edible. Its ingredient can be used to

make plant-based drinking milks, yoghurt alternatives, and oil.

Sustainability watch: New product launches

Mighty Oat M.lk Powder

Dairy alternative brand Mighty made its eco credentials the focus of its oat milk powder,

launched at the start of 2023 and produced using an enzyme-treated oat flour with coconut oil and salt added.

Mighty's Oat M.lk Powder's powdered form contributes to reduced packaging and less weight with implications for related transport emissions, it says. The packaging is also fully recyclable.



Food waste is also minimised with the shelf life of oat milk powder typically being one year. As a dried product, it can be kept for a minimum of six months once opened.³⁴

Wild Hare's Ben and Poppy range

Wild Hare Group has launched The Ben and Poppy Range, a selection of children's ready meals that emphasise nutrition and an appreciation for the meals' ingredient journey along the supply chain.

The product's packaging highlights its ethical stance and encourages sustainable food product use, it says. The meat comes from grass-fed, outdoor reared animals with poultry coming from high-welfare farms.

Ingredients like barley, spelt, and quinoa are unrefined and are the products of regenerative agriculture.

The Wild Hare Collection consists of Cheesy Roasted Broccoli & Cauliflower, Cauliflower & Chickpea Dhal, British Red Wine Braised Chuck Steak, Butternut Squash Curry, Chicken Caesar

Risotto, British Chicken Dhal, British Grass Fed Beef Lasagne, and Shepherd's Pie.³⁵

Seabloom Vegan 'Tuna-Free' Flakes

Seabloom Limited makes a tuna fish alternative using pea protein, organic Scottish seaweed, and nutrient-rich flaxseed oil.

Its Olive Oil 'Tuna-Free' Flakes and Lemon 'Tuna-Free' Flakes offer similar nutritional benefits and taste to canned tuna while using natural, plant-based ingredients.

The primary protein source is pea-based and the product is a good source of omega-3 fatty acids and iodine. The flakes are also free from mercury making them suitable for children and pregnant women.³⁶

Northern Wonder's coffee-free coffee

With ingredients like lupin beans, chickpeas, and blackcurrants, Dutch start-up Northern Wonder has launched its Coffee-Free Coffee that addresses the effects of deforestation in the supply chain.

Four varieties are now available from its webstore: filter grounds and compostable Nespresso-compatible capsules, both available with and without caffeine, which is synthetically produced.

The capsules are made from starch, glucose, and lignin. The cups are industrially compostable and can be disposed of as organic waste.

Northern Wonder says the ingredients used do not contribute to deforestation, and the footprint of its bean-free coffee is lower than regular coffee. The product is also much more environmentally friendly when it comes to water, land use, and kilometres travelled, it says.³⁷

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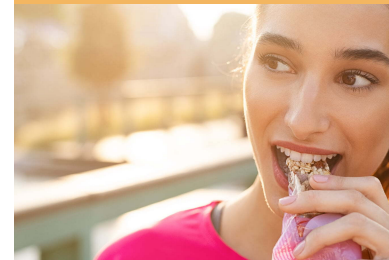
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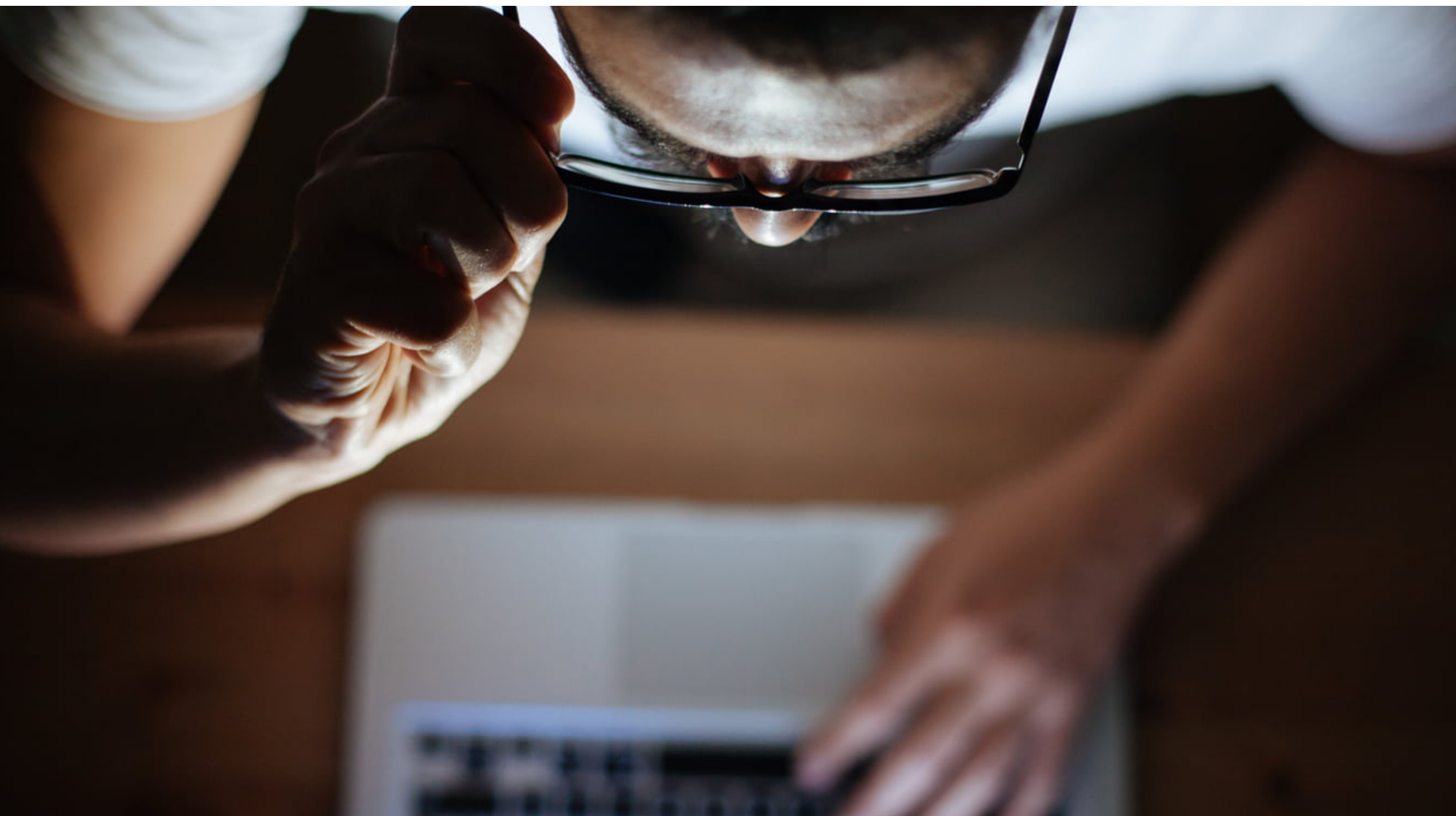


Key takeaways



- Greater collaboration must be encouraged along the value chain to create a sustainable food system; agrifood stakeholders cannot innovate in a bubble.
- Both low-tech and high-tech innovations, such as regenerative agriculture and protein diversification through precision fermentation, can result in more resource-efficient production methods. But these innovations require consumer education, clear regulatory frameworks, and access to finance.
- Sustainability must be part of company culture, led from the top down through procurement, operations and NPD teams.
- Creating sustainable food systems is not just about the environment; it is also an opportunity to tackle societal issues such as poverty, human slavery, and child labour.





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