



MOVING FOOD FORWARD

How can new food sources advance the transition to more sustainable food systems?

White paper series in collaboration with EY-Parthenon

Foreword

In our white paper, ‘How could global food systems better sustain our planet and its people by 2040?’, we highlighted how current food systems cannot sustain our planet and its people in the long term, unless they transition towards more ecologically, socially, and economically viable conditions.¹ This transition requires us to reimagine the ‘art of the possible’ by bringing policymakers, businesses, communities, and consumers on a journey that is safe and just.

In this paper, we define “new food sources” as the new generation of alternative proteins. This definition includes plant-based alternatives, insects and insect-based alternatives, as well as cultivated and fermented proteins. These production pillars can be leveraged in a variety of food product uses, but this paper focuses mainly on proteins and applications to diversify conventional animal-derived protein sources, such as meat and dairy.

■ Focus of this paper



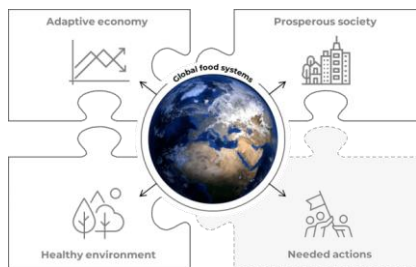
Tetra Pak is collaborating with an international network of stakeholders from the public, private and academic sectors to advance innovation in alternative protein sources that require a less resource-intensive supply chain¹⁷ and, in turn, can contribute to improving sustainable food systems¹⁸.

Our expertise in food processing and packaging enables us to scale up new food technologies, such as biomass and precision fermentation, for making new food sources viable at industrial scale.

We recognise that innovating and scaling new food sources requires collective actions across value chains and geographies, which we cannot achieve alone. Hence, in this paper we aim to:

- Increase awareness of the key challenges ahead and highlight the importance to take action
- Provide perspectives on the key transition enablers that decision makers should acknowledge
- Invite decision makers to take collective actions across the value chain to advance the transition

Tetra Pak white paper series: Actions to drive the transition



This pathway paper is the third part of a white paper series focused on the safe and just transition towards more sustainable food systems¹⁸.

By examining each pathway, we identify critical actions and collective efforts needed to drive meaningful change.

In this paper, we discuss opportunities related to new food sources and highlight key enablers to advance the needed transition.

White paper	Global focus areas and collective actions to drive safe and just transition
Pathway paper	Enabling transition towards more sustainable dairy
Pathway paper	Innovating for new food sources
Pathway paper	Reducing food loss and waste
Pathway paper	Scaling access to safe nutrition via sustainable food packaging

The challenge: Need for more diverse diets to nourish a growing population and to sustain our planet

The world needs to decarbonise and provide sufficient and healthy nutrition to feed the growing global population. Relying only on traditional protein sources is not enough for the needed transition. Hence, scaling alternative proteins in the mix is critical to sustain our planet and its people.

To feed up to 10 billion people by 2050, 70% increase in food production is needed, presenting a substantial challenge due to GHG emissions from meat production, resource and arable land limitations². For instance, the global meat market is projected to increase by 26 percent from 360 to 455 million metric tons from 2022³ to 2050⁴. New food sources have an opportunity to significantly mitigate food production challenges through diversification, reduction of negative externalities, and by improving the efficiency of food production by using plant-based alternatives, cultivating, and deriving proteins from fermentation.⁵

Livestock systems will continue to contribute to addressing food system issues, such as achieving food security, and providing healthy, nutritious diets. However, the diversification of protein sources with efficient production practices is required to sustain the needs of a growing population, while addressing pressing environmental, welfare, and safety issues, especially in incumbent food systems.

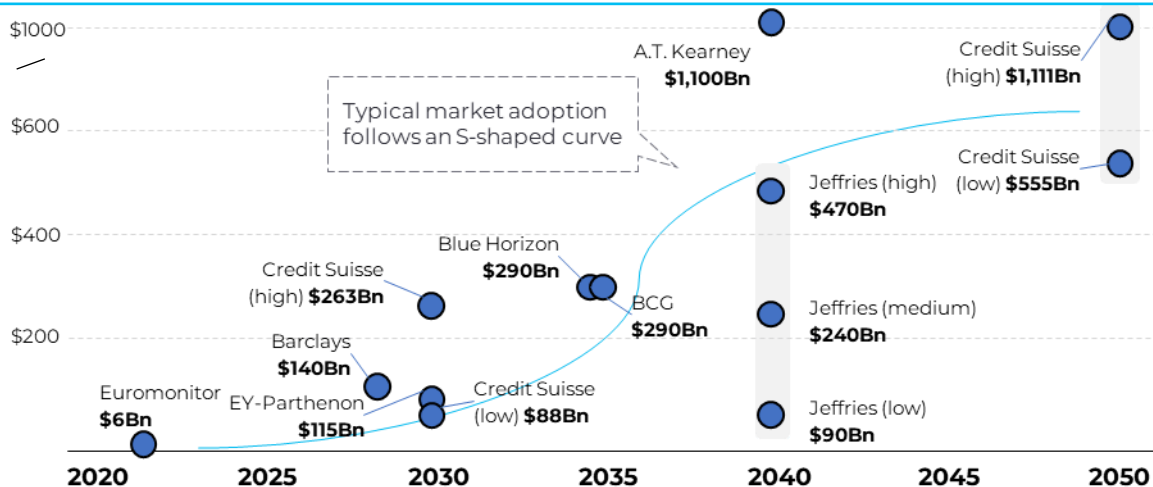
New food sources can provide sizable commercial opportunities for both new and incumbent producers once markets mature. However, to reach significant scale in environmental, nutritional, and food access benefits, there is a need to expedite the pace of such maturing.

In the past decade, the potential of alternative proteins has driven billions of dollars in investment, leading to rapid growth in the plant-based market and increased activity in cultivation and fermentation-derived proteins. However, many alternatives are still more expensive to produce than traditional proteins, acting as a major barrier to their commercial viability⁶.

While plant-based alternatives have made impressive progress in household penetration, the global market today is a small fraction of the multi-trillion-dollar global market for conventional animal products. Mass market adoption for plant-based and new alternatives would provide significant opportunities for novel and incumbent players alike.⁷

A level playing field for alternative proteins is needed in terms of inclusion in food policy discussions, access to capital, and regulation supporting product approvals and faster go-to-market for new food sources. In this paper, we present ways in which businesses, policymakers, and consumers can contribute to the transition by describing a range of key transition enablers under policy, partnerships, technology, and financing categories.

Market size forecasts for alternative proteins, \$USD (Bn)



Source: GFI 2022 Plant-Based State of the Industry Report⁷






Enabling the transition: Policy mechanisms

Diverse interests and motivations drive policy interventions for new food sources.

In the emerging industry of new food sources that is primarily spearheaded by the private sector, the public sector has been historically weak in providing financial support and enabling legislation.⁹ Significant vested interests in policymaking have led to the preservation of status quo. Shifts in policies and public funding allocation are needed to accelerate the adoption of new food sources, increase production, and to reduce the food systems impact on climate, land use, and biodiversity.



Examples of policy approaches

					
Reallocation of public financial support and subsidies to new food sources production	✓	✓			✓
Supporting research and innovation spending for new food sources	✓	✓			✓
Inclusion of new food sources in national food policies and dietary frameworks	✓				
Setting clear regulatory frameworks for new food sources approvals to remove market entry barriers	✓				
Tax benefits or subsidies to new food sources to enable market competitiveness		✓	✓		✓

Sources: Adjusted from GFI: Ensuring a clear path to market⁸, Vallone & Lambin (2023)⁹, WBCSD¹⁰, EIT: Accelerating protein diversification for Europe¹⁹

Collective actions needed

Despite the climate and biodiversity crises and the urgency to implement effective mitigation measures, most governments have not been sufficiently addressing the mitigation potential of alternative protein sources. A significant shift in food policies to reallocate funds from incumbent systems to new technologies would be required to allow new food sources to reach their potential in contributing to the food system transformation⁹

Governments and policymakers should coordinate food policies with a holistic viewpoint that considers food systems as a whole to address the key negative externalities stemming from incumbent production systems. Protein alternatives hold significant potential in decarbonisation and diversification of incumbent food systems, as well as improving food and nutrition security, and should be included in food systems policy discussions.

Governments also play a key role in increasing consumer acceptance and adoption of new food sources through dietary guidelines and product labelling regulations. New food sources should be allowed a fair and level playing field in terms of how the products are allowed to be presented to consumers with transparent information on the sustainability and nutritional aspects of the products. Additionally, consideration should be given to ensuring a clear and efficient regulatory approval process for the safety and marketing of new foods.





Enabling the transition: Partnerships

Strategic and public-private partnerships are important tools to support market maturing.

Partnerships are an especially significant enabler in the new food sources and alternative proteins sector, where emerging start-ups and new innovations struggle with gaining access to customers, retailers, and food service companies. Hindered by access to capital, manufacturing capacity, and distribution network, many innovations cannot reach commercially viable volumes and market position.¹¹

Established companies in the food systems can play a key role in scaling up the adoption of new food sources, through their existing production and distribution infrastructure and brand value. Many such partnerships exist today, with large food companies forming product development partnerships, joint ventures, or distribution partnerships to accelerate market entry for emerging new food source innovations.⁷

Strategic partnership approaches

Type of partnership	Description
 Product development partnership	Product development partnerships are common for alternative protein companies. Partnerships in the product development stage allow companies to leverage one another's R&D capacity, insights, and product portfolios. Examples in the industry are usually emerging start-ups developing plant-based or alternative protein products in collaboration with established food industry players.
 Joint venture	Joint ventures allow companies to access one another's brand equity along with manufacturing and distribution infrastructure. Examples from the industry are typically larger established brands distributing emerging start-ups' co-branded alternative protein products.
 Scale-up	Manufacturing capacity is one of the key barriers to growth in alternative proteins. Partnerships focused on scaling up production allow companies to access infrastructure and process expertise.
 Distribution	Securing product distribution is a key challenge for alternative protein start-ups, as many of them have to build distribution channels from scratch with distributors, foodservice companies, and retailers. Partnering with an established food industry company can offer faster ways to market through existing access to wider distribution network.

Source: GFI 2022 Plant-Based State of the Industry Report⁷

Collective actions needed

Producers in incumbent systems have the opportunity to consider a more diversified product portfolio through partnerships or joint ventures with new food source companies. Conventional animal production will continue to provide an important source of food and nutrition, while new and commercially promising opportunities in alternative proteins are emerging.

At the same time, public-private partnerships (PPP) should be endorsed to reach sufficient scale and access to capital. Governments and policymakers have the tools available to address institutional factors hindering alternative protein market growth, with the industry being able to contribute to wider societal progress towards food security and environmental targets.

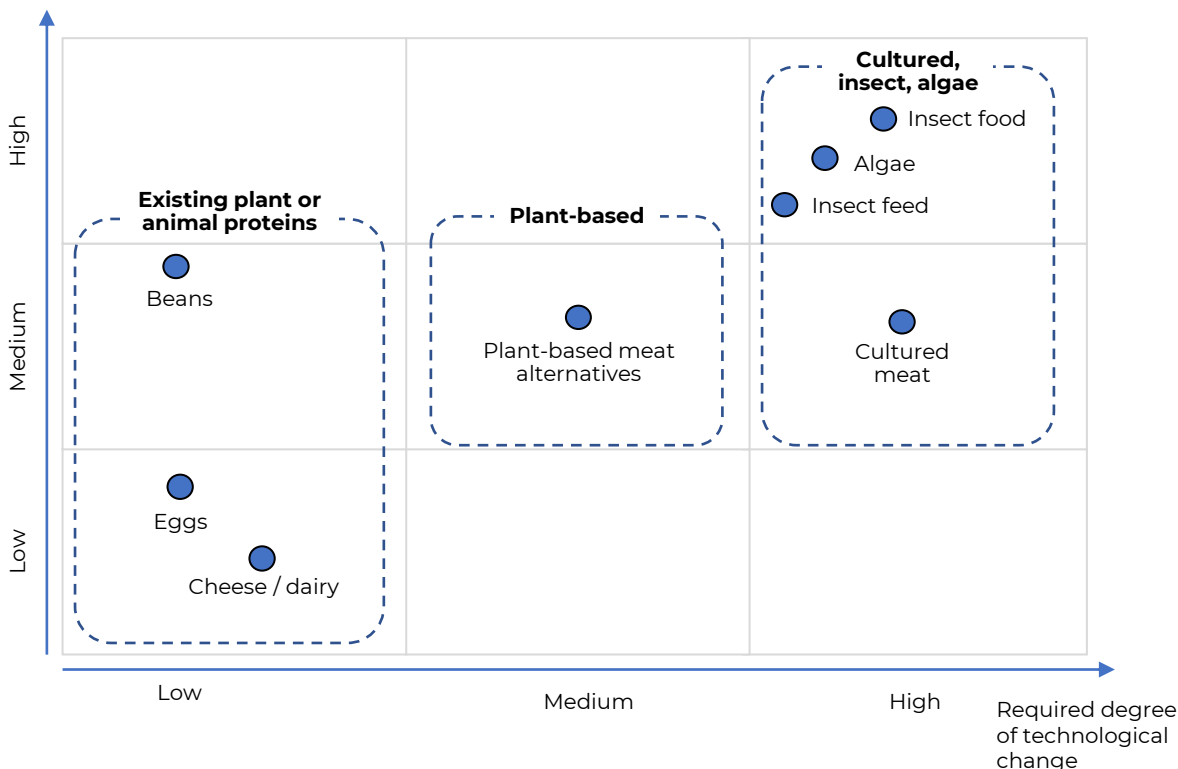
Enabling the transition: Technology

New food sources require parallel advancements in technology, innovation and societal adoption to reach economies of scale.

Technological change, accompanied by social-institutional change, is necessary to achieve cost, taste, nutritional, and convenience parity with conventional animal-derived products.⁷ Especially cultured, insect, and algae-based proteins require a high degree of technological and social-institutional change, while plant-based alternatives have a smaller gap between existing plant and animal proteins, as illustrated in the below picture.

Social-institutional and technological change requirements among examples of protein sources

Required degree of social-institutional change



Sources: Adjusted from van der Weele et al. (2019)¹³, Chriki and Horcquette (2020)¹⁴

Through technological development, alternative protein producers are increasingly able to imitate the sensory profile of conventional products, supporting consumer adoption. Plant-based products have taken significant strides in alleviating bottlenecks in ingredient sourcing, product formulations and extrusion, while emerging technologies in cellular cultivation and biomass and precision fermentation have shown promising results in driving down costs and growing commercial uses.^{12,16}

Collective actions needed

Through the velocity of investment, technological advancements and cost reductions, alternative proteins are emerging alongside the conventional protein industry through declining costs and closer taste and convenience parity.

Since technological gaps are highest among novel technologies, such as cultured or fermentation-derived alternatives, R&D efforts and partnerships between academic institutions, governments, and businesses should be fostered in order to pave the way for scaling up new food sources.⁷

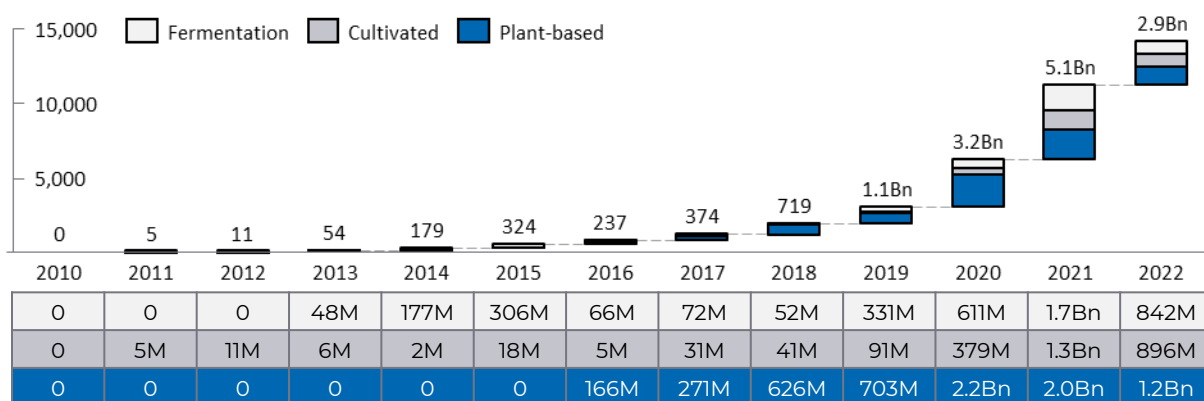
Enabling the transition: Financing

High CAPEX slows the industrial scaling of alternative proteins manufacturing. This could be partially tackled by accelerating financing from governments and incumbent actors towards projects that target positive environmental and social impacts in addition to traditional targets.

From 2010 to 2022, alternative protein companies raised \$14.2 billion USD, nearly doubling investment on average each year.⁷ In 2022 this rapid growth slowed down alongside a broad global deceleration in venture and private capital.

While the market environment may remain challenging for some time, opportunities to advance positive environmental and social impacts with alternative proteins provides a potential upside for institutional investors and incumbent companies to make the required CAPEX investments in capacity expansions and production equipment innovation.¹⁵ Especially the large conventional food companies can support the acceleration of new food sources adoption, through their access to the necessary funding, infrastructure, and distribution partnerships.⁷

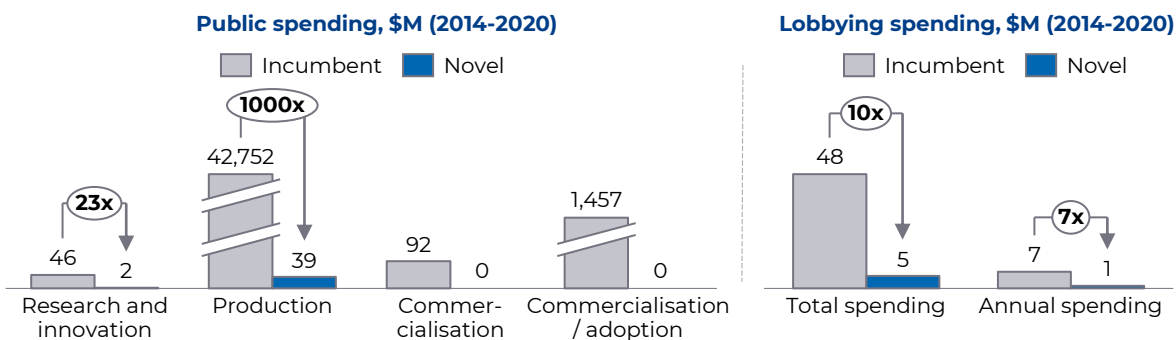
Annual global alternative protein investment trend, \$USD (2010-2022)



Source: Adapted from GFI, PitchBook Data⁷

Public financing plays a key role in accelerating production and adoption of new food sources.⁹ Historically, public spending has been disproportionately allocated to incumbent systems in the EU and the US, as illustrated below.

Sectoral and regional comparisons of public and private spending in the EU and the US, \$USD



Source: Vallone & Lambin (2023)⁹

Collective actions needed

Benefits of alternative proteins outside of short-term economic returns should be considered in public financing decisions. By taking into account the wider environmental and social impacts of new food sources, and incentivising investments based on these benefits, capital could be mobilised more efficiently towards bringing new food sources into the mix with conventional protein sources.

Endnotes

- 1) Tetra Pak: How could global food systems better sustain our planet and its people by 2040? Global focus areas and collective actions to drive safe and just transition
- 2) FAO: The future of food and agriculture: Alternative pathways to 2050, <https://www.fao.org/3/CA1553EN/ca1553en.pdf>
- 3) FAO: Meat market review: Emerging trends and outlook 2022, <https://www.fao.org/3/cc3164en/cc3164en.pdf>
- 4) Silva G (2018), Feeding the world in 2050 and beyond – Part 1: Productivity challenges, <https://www.canr.msu.edu/news/feeding-the-world-in-2050-and-beyond-part-1>
- 5) Xu et al. (2021), Global greenhouse gas emissions from animal-based foods are twice those of plant-based foods, <https://doi.org/10.1038/s43016-021-00358-x>
- 6) OECD: Opportunities and challenges for food systems' transformation, OECD Food, Agriculture and Fisheries paper. 182 (2022), <https://www.oecd-ilibrary.org/docserver/387d30cf-en.pdf?expires=1697440144&id=id&accname=guest&checksum=405EF4E9EA8831240E49D4D7B839FC29>
- 7) GFI: 2022 Plant-Based State of the Industry Report, <https://gfi.org/wp-content/uploads/2023/01/2022-Plant-Based-State-of-the-Industry-Report.pdf>
- 8) GFI: Ensuring a clear path to market, <https://gfi.org/ensuring-a-clear-path-to-market/>
- 9) Vallone & Lambin (2023), Public policies and vested interests preserve the animal farming status quo at the expense of animal product analogs. <https://doi.org/10.1016/j.oneear.2023.07.013>
- 10) WBCSD: Meat & dairy analogues: Opportunities, challenges and next steps, <https://www.wbcd.org/contentwbc/download/17211/242630/1>
- 11) EY: How the next generation of alternative proteins can drive long-term growth, https://www.ey.com/en_us/food-system-reimagined/alternative-protein-innovation-in-a-reimagined-food-system
- 12) Smetana et al. (2021), Meat substitution in burgers: nutritional scoring, sensorial testing, and Life Cycle Assessment, <https://doi.org/10.1016/j.fufo.2021.100042>
- 13) Van der Weele et al. (2019), Meat alternatives: an integrative comparison, <https://doi.org/10.1016/j.tifs.2019.04.018>
- 14) Chriki & Hocquette (2020), The Myth of Cultured Meat: A Review, <https://doi.org/10.3389/fnut.2020.00007>
- 15) GFI: Plant-based meat: Anticipating 2030 production requirements, https://gfi.org/wp-content/uploads/2021/11/Plant-based-meat_-anticipating-2030-production-requirements.pdf
- 16) GFI: 2022 Fermentation State of the Industry Report, <https://gfi.org/wp-content/uploads/2023/01/State-of-the-Industry-Report-Fermentation-2022.pdf>
- 17) GFI: A global protein transition is necessary to keep warming below 1.5°C, <https://gfi.org/resource/a-global-protein-transition-is-necessary-to-keep-warming-below-1-5c/>
- 18) Tetra Pak: Our four pathways to drive change, <https://www.tetrapak.com/sustainability/acting-for-sustainability/moving-food-forward>
- 19) EIT: Accelerating protein diversification for Europe, <https://www.eitfood.eu/files/EIT-Food-PDIT-Policy-Brief-Accelerating-Protein-Diversification-for-Europe.pdf>

