

Strategy Report: Scaling Alternative Proteins

October 2026

Giving Green

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This report was last updated in October 2026.

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Questions and comments are welcome at hello@givinggreen.earth.

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Summary

- **What is the mitigation potential of alternative proteins, and why are they important?**

  Currently, food system emissions account for 21-37% of global greenhouse gas emissions. Animal agriculture is the largest source, contributing to ~57% of food system emissions while providing just 18% of global caloric intake. We think the most promising route to reducing these emissions is decreasing meat and dairy consumption, specifically, through the development of novel alternative proteins (alt proteins) that can compete with animal products in the marketplace. Replacing 50% of animal products with alt proteins would avoid an estimated 3 billion metric tons of CO_2-equivalent (tCO_2e) per year, while freeing up land where a further 3.3 billion tCO_2e per year of carbon could theoretically be sequestered. Combined, these effects would mitigate 6-12% of current global emissions.

- **What do our findings suggest are the most promising philanthropic sub-strategies for scaling alt proteins?**

  We think the most promising pathways to scale the consumption of alt proteins involve developing novel proteins that are taste- and price-competitive with animal products. We identify six top philanthropic sub-strategies to do this:

  - Supporting government innovation and scale-up funding for alternative proteins
  - Catalyzing private sector funding for alternative proteins
  - Salvaging and distributing intellectual property from alternative protein companies that are shutting down
  - Securing corporate demand commitments for alternative proteins
  - Facilitating supportive regulatory environments for alternative proteins
  - Identifying research gaps and funding open-access research into alternative proteins

- **Is there room for more funding?**

  We estimate that scaling alt proteins draws ~$50 million USD per year of philanthropic support, under 1% of climate-related giving. Broader climate funding from the private and public sectors for scaling proteins are $881 million per year and $450 million per year, respectively, with private-sector funding having declined by over 5x since 2021.

  Comparing the funding level to their mitigation potential and funding need, we think that efforts to scale alternative proteins are severely underfunded.

- **Are there major co-benefits or potential risks?**

Transitioning away from livestock farming offers co-benefits by reducing the risk of zoonotic disease, reducing agricultural land and water use, reducing biodiversity loss, strengthening food security, reducing animal suffering, and reducing the risk of chronic disease. At the same time, livestock farmers' livelihoods are likely to be negatively impacted if transition assistance is insufficient.

- **What are the key uncertainties and open questions?**

  Our key uncertainties include the extent to which alt proteins can compete with conventional meat, the scalability of cultivated meat, and whether we have underrated near-term measures to reduce meat intake relative to developing novel proteins.

- **What is the bottom line and what are the next steps?**

  Scaling alternative proteins would lead to substantial reductions in direct agricultural emissions, through substantially fewer direct emissions and land-use change emissions from the livestock sector, while also freeing up substantial land for potential carbon sequestration. Due to this large mitigation potential, coupled with its low levels of philanthropic funding, we prioritize scaling alternative proteins as our top strategy to reduce food, agriculture, and land emissions. We identified six key sub-strategies to advance policy, industry, and research that could catalyze the commercialization of alternative proteins.

  We recommend that philanthropists consider funding organizations that are working to address the challenges outlined in this report and consider grants aligned with the strategies we have laid out.

  The findings in this report will inform the grantmaking strategy for the Giving Green Fund and our list of Top Climate Nonprofits. Therefore, donors interested in progressing this work can choose to donate directly to the Giving Green Fund.

Giving Green's cost-effectiveness analysis for this strategy is still being finalized and will be added to the report when completed.

Introduction

Food systems account for 11.1-19.4 billion tCO_2e per year, or 21-37% of global emissions.[1] Animal agriculture is the largest source of these emissions, contributing to ~57% of food system emissions while providing just 18% of global caloric intake.[2] Livestock emissions arise from land use change (LUC), enteric methane, manure management, pasture management, and fuel use in fisheries. Importantly, energy use represents a very low share of these emissions.[3] Therefore, we cannot expect progress in other parts of the economy, such as power grid decarbonization, to lead to material reductions in livestock emissions.

Livestock farming also has a large land demand and is the leading driver of deforestation, contributing to 35-40% of forest loss.[4] If less new land for livestock farming is needed, we would expect to see a reduction in LUC emissions, and also unlock further potential to sequester carbon on the freed-up land, such as through reforestation or soil carbon sequestration.

In our *Food, Agriculture, and Land (FAL)* Sector Report, we identified scaling alternative proteins (alt proteins) as the top strategy to reduce FAL emissions. In this report, we conduct a deeper analysis of philanthropic sub-strategies to advance alt proteins.

How Would Transitioning Toward Alternative Proteins Reduce Emissions?

The protein transition aims to reduce the share of dietary protein coming from animal agriculture. The protein transition would reduce emissions largely because animals are inefficient organisms at converting raw materials to edible protein. Just 2.5% (for beef) to 21% (for poultry) of the protein fed to animals is retained in meat for food.[5] Other animal products reach a maximum of 31% efficiency (for eggs).

Alt proteins are generally less emissions-intensive than conventional protein, with studies on the mitigation impact of lower-meat diets clustering around the range of 3

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[1] For more explanation on this calculation, see our FAL sector report. Calculation: 0.263 + [10.8, 19.1] = [11.1, 19.4] GtCO2e/year; [11.1, 19.4]/52 = [21, 37]% Table SPM.1 IPCC, 2019; "the total emissions in 2017 for all shellfish and finfish aquaculture would be 263 MtCO2e." MacLeod et al., 2020; We did not include carbon sediments released from bottom-trawling practices in these estimates, which could add another 0.34-0.37 $GtCO_2e$ per year (according to Atwood et al., 2024) because of the higher uncertainty attached to these emissions.

[2] Figure O.2 World Bank, 2024; "to such a degree that meat, aquaculture, eggs, and dairy use ~83% of the world's farmland and contribute 56 to 58% of food's different emissions, despite providing only 37% of our protein and 18% of our calories." Poore and Nemecek, 2018

[3] On-farm energy use is a small amount of total food system emissions in Table 1 Tubiello et al., 2021

[4] "All analyzed commodities explain 57 percent of tree cover loss from agriculture; cattle alone explains 36 percent" WRI, 2026; "whereas livestock grazing is responsible for almost 40 percent of forest loss, according to the new study." FAO, 2021

[5] Table 1: Key parameters(±std. dev.) used in evaluating US feed allocation and conversion among animal categories and energy (caloric) and protein efficiency. Shepon et al., 2016

billion to 8 billion tCO_2e per year.[6] The large range is due to differences in assumptions about land-use change emissions, use of sequestered land, and the proportion of animal products substituted. We choose Kozicka et al. as our central estimate because it specifically examines the effects of replacement with alt proteins. The study finds that a 50% replacement of pork, chicken, beef, and milk leads to 3 billion tCO_2e per year of avoided emissions in 2050, with a potential further 3.3 billion tCO_2e per year of emissions sequestered on freed-up land.[7] We are uncertain about what level of sequestration is realistic, though displacing animal products meets our scale threshold even without additional sequestration.

What Are Alternative Proteins?

Alt proteins can be used as substitutes for food or animal feed. There are three main types of alt proteins:[8]

- **Plant-based proteins** (e.g., Beyond Meat, tofu) are the most developed and widely available alt proteins, but may be less able to replicate the flavor, texture, and cultural significance of animal products.
- **Fermentation-derived proteins** include 1) biomass fermentation, which grows microbial biomass, such as mycoprotein, for use in meat analogues, and 2) precision fermentation, which produces specific animal proteins like whey, casein, and egg white. Examples include Quorn and cultivated eggs.
- **Cultivated meat**, also called cultured meat or lab-grown meat, is grown directly from animal cells, so it is compositionally close to conventional meat while avoiding the negative externalities of animal agriculture.[9]

Hybrid products can be also made by combining any of the above together, or even with conventional meat. We do not include insect farming in our definition of alternative proteins because current insect farming does not yield substantial climate benefits, has

[6] Studies that make up the 3-8 GtCO2e/year range: 3-6.3 GtCO2e/year from Kozicka et al., 2023; 6.6 $GtCO_2e$/year from Poore & Nemecek, 2018; 8 GtCO2e/year from Tilt Collective, 2024; 8.1 GtCO2e/year from Clark et al., 2020; 3.4 GtCO2e/year from Li et al., 2024; 6.1 GtCO2e/year from World Bank, 2024

[7] ""At 50%, carbon sequestration grows by 3.3 Gt CO2 year−1 in 2050 (1.5 Gt CO2 year−1 on average between 2020 and 2050) (Fig. 3f)—doubling the benefits already achieved through the reduction of land use emissions without such restoration. This gives 6.3 Gt CO2eq year−1 of all agriculture and land use emissions reduction compared to REF in 2050." Calculation: 6.3 - 3.3 = 3GtCO2e/year Kozicka et al., 2023

[8] More information can be found at Defining alternative protein | GFI

[9] "Cultured meat or in vitro meat offers a safe and disease-free way forward to meet increasing meat requirement without involving animal sacrifices and at the same time, reducing greenhouse emissions, as compared to conventional meat." Gaydhane et al., 2018

low consumer uptake, and high costs.[10] Therefore, we do not think it is a plausible pathway to reducing livestock emissions.

We collectively refer to cultivated meat, fermentation-derived protein, and hybrid products as novel proteins. Novel proteins differ from traditional plant-based proteins because they are made using advanced biomanufacturing, often with the express purpose of mimicking animal proteins. We prioritize novel proteins in our strategy to scale alt proteins, because we think they could in theory be adopted by a wider consumer base than traditional plant-based proteins. Our reasoning is that several decades of ongoing efforts to shift consumption toward plant-based protein do not seem to have led to substantial reductions in per capita meat consumption, suggesting that the alternatives available were not competitive enough to sustain a meaningful change.[11]

We think making alt proteins more taste- and price-competitive with animal products could increase their popularity and displace some demand for animal products, leading to lower food system emissions. This would involve directing more innovation and scale-up funding from the private, public, and philanthropic sectors toward alt proteins, and shaping research to fill critical research gaps.

Assessment of Philanthropic Sub-Strategies

To determine where we should focus our analysis within this strategy, we broadly considered ways in which philanthropic efforts might be targeted at reducing food system emissions. We evaluate each sub-strategy's scale, feasibility, and funding need (see **Table 1** below). See Giving Green's Research Process for more information on these metrics and our research process.

Table 1: Scale, feasibility, and funding need of sub-strategies to reduce food system emissions

Sub-strategy	Scale	Feasibility	Funding Need
Supporting government innovation and scale-up funding for alternative proteins	High	Medium	High
Catalyzing private sector funding for alternative proteins	High	Medium	High
Salvaging and distributing IP from alternative protein companies that are shutting down	High	Medium	High

[10] "Insect-based proteins encounter barriers across all dimensions, including limited environmental advantages and widespread consumer rejection." Bry-Chevalier, 2026 "Insects are also not expected to reach price parity with meat before plant-based or even single-cell/fermentation-derived proteins. Claims of future cost competitiveness rely on assumptions of near-total utilization of food waste." Project Drawdown, 2026

[11] Per capita meat consumption by type Our World in Data, 2023

Facilitating supportive regulatory environment for alternative proteins	Medium	High	High
Identifying research gaps and funding open-access research into alternative proteins	Medium	High	High
Securing corporate demand commitments for alternative proteins	High	Medium	High
Advocating for retailer protein diversification	Medium	Medium	High
Supporting institutional diet shift	Medium	Medium	High
Shifting cultural attitudes toward protein diversification	High	Low	Medium

We chose to center sub-strategies with two 'highs' and one 'medium' in our sector strategy. Based on the above evaluations, we think the most promising philanthropic sub-strategies are:

- Supporting government innovation and scale-up funding for alt proteins
- Catalyzing private sector funding for alt proteins
- Salvaging and distributing IP from alt protein companies that are shutting down
- Facilitating supportive regulatory environments for alt proteins
- Identifying research gaps and funding open-access research into alt proteins
- Securing demand commitments for alt proteins

We expand on our reasoning for our rankings of scale, feasibility, and funding need for the prioritized sub-strategies below.

Further information on our reasoning for deprioritizing the remaining strategies can be found on Giving Green's research dashboard.

Supporting Government Innovation and Scale-Up Funding for Alternative Proteins

Scale ●●● High

Feasibility ●●○ Medium

Funding need ●●● High

Scale

Because they are still in the early stages of technological development, alt proteins would benefit from additional research, development, and demonstration (RD&D) funding to de-risk private-sector investment and accelerate deployment. There has been a precedent of public funding to support both agriculture and climate mitigation,

though so far, public funding for agriculture is mostly spent on emissions-intensive farming practices.[12]

We think there is substantial room for governments to grow their spending on alt proteins, which is currently well below 1% of what they spend on animal agriculture.[13] Philanthropic dollars are well-leveraged through this sub-strategy, since every dollar spent on advocacy yields an estimated $5 spent on public RD&D.[14] Government innovation funds, such as Advanced Research Projects Agency–Energy (ARPA-E), have achieved additional leverage by catalyzing a further ~$3.6 in follow-on funding for each government dollar spent.[15] Compounding both these effects could lead to an impact multiplier on philanthropic capital of ~18x.

Feasibility

We have observed governments increasingly seeing alt proteins as a key technology to strengthen national food security, biosecurity, and biotech manufacturing, in addition to climate mitigation. From 2021 to 2025, the number of countries actively advancing alt proteins grew from 16 to 33.[16] In parallel, government spending on alt proteins has grown from <$5 million cumulatively up to 2014 to just under $300 million in 2024 (**Figure 1**).[17] For example, alt proteins feature in dedicated funds, national plans, strategies, and priorities for China, the EU, and Japan.[18] Most notably, Denmark invested $200 million into alternative proteins and also launched the world's first action plan for plant-based foods in 2024.[19] The EU also invested $113 million in loans to plant-based and fermentation companies for scaling up, and China committed $1 billion to biotechnology facilities, including food applications.[20] The U.S. was reportedly the only major economy to

[12] "Less than a quarter of transfer payments are used to grow the kinds of foods that are good for human health and the environment, and which a healthy and sustainable food system would need much more of: fruits, vegetables, legumes and nuts." Springmann, 2022

[13] "While alternative proteins account for roughly around 1% of global market share, they don't get close to 1% of the $156B that governments spend on animal products annually." Flores-Kumar, 2025

[14] "When I analyzed the ROI of funding advocacy for public R&D, I found that for every $1 invested in advocacy, governments commit about $5 in public R&D." Flores-Kumar, 2025

[15] "Since its inception, ARPA-E has provided $4.21 billion in funding to more than 1,700 projects at universities, small businesses, and national labs in nearly every state. ARPA-E projects have drawn nearly $15 billion in private follow-on capital investment over the years – more than tripling ARPA-E's all-time project investment with public resources." Association of American Universities, 2026

[16] "the 16 countries that had begun working to advance alternative proteins now number at least 33" GFI, 2026

[17] Major government funding commitments are tracked by GFI. Commitments up to 2014 = 61k + 2.7M + 320k + 213k + 92k + 246k = 3.6M + 2x undisclosed grants

[18] China also aims to "promote the development of the biomanufacturing industry, build key technology and raw material platforms, strengthen R&D and applications in areas such as microbial proteins and functional food ingredients, and drive the transformation and upgrading of traditional industries, serving food security and the construction of new protein supply systems". Green Queen, 2026; "EU leaders identified 'increasing the EU production of plant-based proteins' as a means to improve the EU's food security and reduce food prices." EU Parliament, 2023; "The Prime Minister of Japan, Fumio Kishida, has announced plans to develop a cultivated meat industry in the country." New Food Magazine, 2023

[19] "the Plant-based Food Grant, a $195 million fund for the plant-based transition available up to 2030." Forbes, 2023

[20] "China's state-owned State Development and Investment Corporation announced nearly $1 billion in investments in biotechnology facilities in 2025, specifically including food applications, while the European Union awarded over €100 million ($113 million) in loans to plant-based and fermentation companies for scaling up" GFI, 2026

withdraw from federal funding for food biotechnology in 2025, but still granted $6 million in innovation funding.[21]

From our conversations with relevant stakeholders, we think the sharp increase in government funding (Figure 1) for alt proteins is related to the growth of advocacy activities from researchers and nonprofits during this period.[22] We think further engagement has a strong chance of unlocking additional funding.

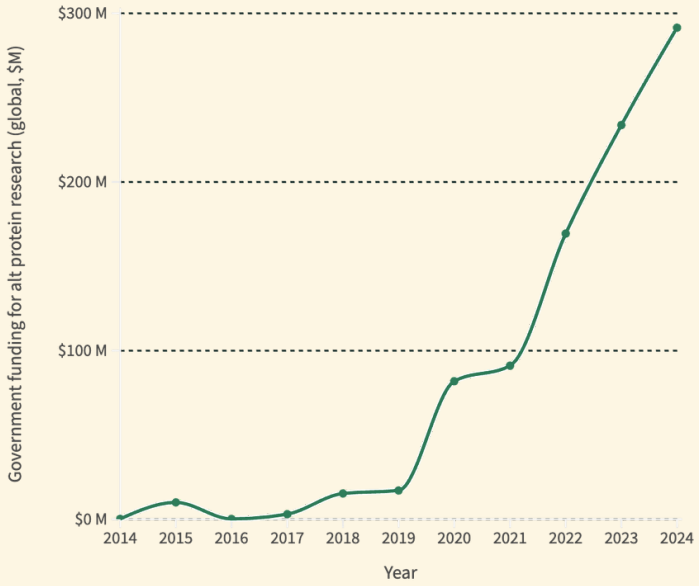


Figure 1: Government spending on alt proteins from 2014 to 2024.[23]

Funding Need

We have observed more nonprofits working to support government investment than private-sector investment, but think this is appropriate, given that the market for alt proteins is still nascent. Given the general lack of philanthropic funding for alt proteins, we generally think sub-strategies to promote alt proteins have a high funding need (see section: 'Is There Room for More Funding?')

[21] "Among major economies, only the federal government of the United States markedly drew back from food biotechnology investments amid government-wide cuts to science and technology, announcing only $6 million in new research funding for plant-based, fermentation-derived, or cultivated protein sources." GFI, 2026

[22] "Second, we know it responds to advocacy. Ten years ago, governments were spending almost nothing on alternative protein research. That changed because advocates and researchers made the case that protein diversification is a public good. Since 2014, global public funding for alternative protein R&D has grown from essentially zero to around $290 million in 2024, raising its share of agricultural R&D from 0% to about 1.8%" Flores-Kumar, 2025; The largest alt protein nonprofit, GFI, was founded in 2016

[23] Figure: Government funding for alt protein research has increased in response to advocacy Flores-Kumar, 2025 using data from GFI

Catalyzing Private Sector Funding for Alternative Proteins

Scale	●●● High
Feasibility	●●○ Medium
Funding need	●●● High

Scale

We think the private sector, especially large agribusinesses, has the ability and willingness to substantially grow its spending on alt proteins. For example, a $100 million investment by the meat producer JBS demonstrates the scale of additional capital that can be gained through the private sector.[24]

Mechanisms such as blended finance vehicles and innovation prizes can catalyze private sector funding for alt proteins. For example, a study of blended finance vehicles found that they leverage an average of 4.1X in follow-on commercial investment.[25] Another nonprofit reported a capital leverage ratio of 50X by running innovation prizes.[26]

Feasibility

Despite a decrease in private investments in alt proteins and many startups collapsing, the total market share of alt proteins has grown, and there has been unprecedented investment by major meat producers like JBS and Tyson.[27] Our view is that the private sector is still interested in engaging in alt proteins, but is now more realistic about the challenges of entering the market. We think there is a smaller pool of follow-on funding available to alt proteins, but that it is still available to cutting-edge products.

Funding Need

We have observed fewer nonprofits working to support private-sector investment than government investment, but think this is appropriate, given that the market for alt proteins is still nascent. Given the general lack of philanthropic funding for alt proteins,

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[24] "JBS has opened a US$37 million cultivated protein R&D center in Florianópolis, part of a broader US$100 million investment into the sector." Protein Production Technology, 2026

[25] "The Brief found that the average leverage ratio for blended finance transactions remains in line with what was recorded in 2018, at 4.1." Convergence Finance, 2023

[26] Calculation: 593/12 = 49.4X leverage ratio; "$12M+ in funding given to breakthrough solutions" ;"$593M+ in follow-on support to innovators after working with CXL" Conservation X Labs, n.d. [accessed August 2026]

[27] Decrease in private investment: "funding for the alternative protein sector fell by 20% in 2025, attracting just $881M. It was the first time this figure fell below the $1B mark since 2018." Green Queen, 2026; Startup collapse: "Of the 54 deals announced since July 2025, nearly two-thirds (65%) have involved acquisitions, while the rest have seen companies enter insolvency, discontinue alternative protein brands, or cease operations altogether." Green Queen, 2026; JBS: "JBS has opened a US$37 million cultivated protein R&D center in Florianópolis, part of a broader US$100 million investment into the sector" Protein Production Technology, 2026; Tyson: “The company was an early strategic investor in major cell-cultivated industry pioneers like UPSIDE Foods and Future Meat Technologies.” Yahoo Finance, 2026; alt protein market: “In the past year, global retail dollar sales of plant-based meat, seafood, milk, yogurt, ice cream, and cheese increased by three percent from 2024” GFI, 2026

we generally think sub-strategies to promote alt proteins have a high funding need (see section: 'Is There Room for More Funding?')

Salvaging and Distributing Intellectual Property from Alternative Protein Companies That Are Shutting Down

Scale ●●● High

Feasibility ●●○ Medium

Funding need ●●● High

Scale

Salvaging cell lines, datasets, growth media recipes, and other intellectual property (IP) from companies that are ceasing operations and making them freely accessible to researchers and innovators could provide the alt protein industry with millions of dollars of IP and reduce barriers to entry for future innovators.

In 2025, the Good Food Institute (GFI) acquired Sci-fi Foods' cell line at a heavily discounted price, compared to the cost of resources to develop cell lines.[28] Sci-fi Foods had raised a total of $40 million across investment rounds, and GFI estimates the average cost of cell line development to be $2 million to $10 million per startup.[29] Further acquisitions may vary in procurement and operational costs, but we think philanthropic capital will remain highly leveraged. We do not have sufficient data on the uptake of salvaged IP to be confident in a capital multiplier on philanthropic capital, but estimate that it is at least 15x, based on discussions with stakeholders with knowledge of the Sci-fi Foods acquisition.

Feasibility

The Sci-fi Foods acquisition is a proof-of-concept demonstrating that the acquisition and open-source model works, and we are aware of further ongoing deals, suggesting that the process is replicable. We think this sub-strategy is especially timely given the current consolidation wave among the first generation of alt protein companies. Green Queen reported that 19 alt protein startups have ceased operations or entered insolvency from July 2025 to July 2026.[30]

Our understanding of the IP salvage process is that it is legally and operationally complex, and that complexities can vary from case to case. For example, IP may be

[28] Stakeholders have asked us not to share the actual acquisition cost

[29] "Currently, each cultivated meat startup has to spend a significant portion of their funding and time on cell line development, which is estimated to cost between $2-10 million per startup." GFI, 2025; "The company had raised approximately $40 million from various venture capital funds and notable investors" Cultivated X, 2024

[30] "Of the 54 deals announced since July 2025, nearly two-thirds (65%) have involved acquisitions, while the rest have seen companies enter insolvency, discontinue alternative protein brands, or cease operations altogether." Green Queen, 2026

attached to third-party rights (e.g., CRISPR gene-editing) that must also be negotiated, founders may have fiduciary duties to investors & creditors, and there may be unexpected or well–resourced competitors for IP.

Choosing the most promising deals from the large amount of IP available for acquisition is also a critical challenge. We expect large variance in the value that different cell lines add to the innovation ecosystem, ranging from those that will have little to no use, to those that could lead to breakthroughs. We think nonprofits must have a thorough understanding of the innovation landscape and a strong prioritization system to choose this well.

Funding Need

We think this strategy has an especially high funding need because it tests a new theory of change for nonprofits that could be replicated in other struggling cleantech sectors, like carbon dioxide removal. Given the general lack of philanthropic funding for alt proteins, we generally think sub-strategies to promote alt proteins have a high funding need (see section: 'Is There Room for More Funding?')

Facilitating Supportive Regulatory Environments for Alternative Proteins

Scale ●●○ Medium

Feasibility ●●● High

Funding need ●●● High

Scale

Cutting-edge alt proteins have only achieved regulatory approval in a handful of countries. For example, as of 2026, cultivated meat has only gained regulatory approval in Singapore, the U.S., Australia, New Zealand, and Israel.[31] We think that more countries approving cutting-edge products would increase the number of people willing to substitute animal products with alternative proteins because they would have access to tastier products. For example, according to NECTAR, Impossible Foods has six products with 'taste parity on the horizon,' but its signature product, the Impossible Burger, only has regulatory approval in five countries.[32]

Though regulatory approval would expand the total addressable market for alt proteins, it is not the main barrier to their scaling yet, as evidenced by their low market share

[31] Table of cultivated meats with regulatory approval from GFI, n.d. [accessed August 2026]
[32] Graphic: Leader products have emerged in most categories with taste parity on the horizon NECTAR, 2025; "Food safety regulators in the US, Canada, Australia and New Zealand, and Singapore have all approved the use of soy leghemoglobin for human consumption, paving the way for Impossible Foods to launch these products." Green Queen, 2024

(<2%) in countries with progressive regulations such as the U.S.[33] Novel alt proteins, especially cultivated meat, face even steeper barriers to scaling, given they are still bottlenecked by production capacity and infrastructure. Still, since developing these regulatory processes can take several years, they should start well in advance of product commercialization.[34]

Feasibility

New regulatory pathways for novel alt proteins have grown substantially since cultivated meat's first approval in 2020. In 2026, GFI reported that 11 countries have approved or are engaging with regulations for cultivated meat.[35] We expect the total to be higher when other alt proteins, such as fermentation-based ones, are also included.

There has also been pushback to selling cultivated meat, especially via bans in several U.S. states. However, momentum behind such bans has slowed, and as of July 2026, the last permanent cultivated meat ban was signed in May 2025 (though some temporary bans have been enacted since then).[36]

Several countries have also tried to enact strict labeling laws for alternative proteins, restricting the use of terms like 'milk' and 'cheese,' to varying degrees of success.[37] However, we see labeling laws as a lower hurdle than regulatory approval. In fact, several of the strictest labeling laws have since been struck down for violating free-speech rights.[38] A study by the research consultancy Rethink Priorities also found that heterogeneous labeling laws are unlikely to result in significant extra supply chain costs for alternative proteins.[39]

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[33] The US alternative protein market size reached USD 7.0 Billion in 2025" imarc, n.d. [accessed August 2026] "The United States meat market size was valued at USD 370.0 Billion in 2025" imarc, n.d. [accessed August 2026]

[34] U.S. regulation of cultivated meat took ~4 years "The Food and Drug Administration (FDA) worked with the USDA to complete a joint review process that was initially outlined in March 2019. The announcement of these approvals was preceded by the successful conclusion of premarket consultation processes by the FDA (the "no questions" letters), USDA facility approvals, and USDA label approvals in spring 2023." UC Davis Cultivated Meat Consortium, 2023

[35] "Additional cultivated meat products are under regulatory review in at least eleven countries or regions, including the European Union, the United States, Singapore, Israel, Australia, New Zealand, Switzerland, the United Kingdom, Thailand, Hong Kong, and South Korea. Each of these countries has established robust regulatory pathways for cultivated meat, while others around the world are still in development. " GFI, n.d. [accessed August 2026]

[36] Example of cultivated meat ban: "Gov. Pillen Signs Legislation Banning Fake Meat in Nebraska" Government of Nebraska, 2025

[37] "Under current EU law certain terms including "milk" and "yoghurt" cannot be used for plant-based dairy, even if they are accompanied with qualifiers such as "plant-based" or "vegan". GFI Europe, n.d. [accessed August 2026]

[38] "Arkansas Court Blocks Unconstitutional Meat Label Censorship Law" GFI, 2022

[39] After conducting expert interviews, we deem it unlikely that the animal products alternative sector (viz., plant-based meat cell-cultured meat companies) will face steep costs due to a regulatory "patchwork" of product label restrictions across US states." Rethink Priorities, 2025

Funding Need

Given the general lack of philanthropic funding for alt proteins, we generally think sub-strategies to promote alt proteins have a high funding need (see section: 'Is There Room for More Funding?'). Within alt proteins, we do not see this strategy as especially over- or under-funded.

Identifying Research Gaps and Funding Open-Access Research into Alternative Proteins

Scale ●●○ Medium

Feasibility ●●● High

Funding need ●●● High

Scale

We think the field has a high capacity to absorb substantial additional research dollars because 1) it is still a nascent field, with significant research gaps, 2) alternative protein research output is on a steep growth trajectory (for example, European research papers tripled between 2020 and 2024), and 3) the field is losing private sector funding and the consolidation wave of alternative protein startups may leave many specialists open to work on open-access research.[40] We think that on average, philanthropic dollars are less leveraged through this sub-strategy compared to sub-strategies that catalyze large quantities of additional funding from the public or private sector.

Feasibility

We think this strategy is highly feasible, based on the strong uptake of alt protein research projects by academic institutions. In 2024, the Bezos Earth Fund opened three alt protein research centers with combined funds of $100 million.[41] Eleven more centers submitted applications with their own multi-million-dollar research plans, implying that the research field has the capability and willingness to pivot toward alternative proteins. GFI has also established student groups at more than 70 universities since 2020, implying a strong talent pipeline of future researchers.[42]

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[40] Research gaps can be found in Xiong, 2023, Duenas-Ocampo, Eichhorst & Newton, 2023, and Tso, Lim & Forde, 2021; research increase: "Our new reports have found that 798 academic research papers examining plant-based foods, cultivated meat and ingredients, and fermentation-made foods were published in 2024, up 282% compared to 2020." GFI, 2025

[41] "Just five months ago, we announced our commitment to establish these Bezos Centers for Sustainable Protein and today, US$100 million has been granted to make that vision a reality." Bezos Earth Fund, 2024

[42] "Since 2020, we have established student groups at more than 70 universities around the globe that are well-positioned to lead the alternative protein revolution" GFI, n.d. [accessed August 2026]

Funding Need

Given the general lack of philanthropic funding for alt proteins, we generally think sub-strategies to promote alt proteins have a high funding need (see section: 'Is There Room for More Funding?') Within alt proteins, we do not see this strategy as especially over- or under-funded.

Securing Demand Commitments for Alternative Proteins

Scale ●●● High

Feasibility ●●○ Medium

Funding need ●●● High

Scale

Demand commitments, like advanced market commitments (AMCs) and offtake agreements, are commonly cited as key facilitators to incentivize investment in new technologies.[43] For example, an AMC was used to develop the pneumococcal vaccine, and offtake agreements are consistently cited as enablers to secure final investment decisions for industrial demonstration plants.[44] We think that institutional commitments, such as those in Extantia's 'Maslow Pyramid of Offtakes', would strongly incentivize scale-up funding for alt proteins.

Feasibility

Several offtake agreements have been recently announced for fermentation-based alt proteins, such as cultivated dairy, cultivated cocoa, and mycoprotein, demonstrating the feasibility of simple offtake agreements for alt protein ingredients.[45] However, we have not seen evidence that these deals were influenced by nonprofit activities.

Innovative demand-pull mechanisms, such as advanced market commitments (AMCs) and demand guarantees, are more challenging to implement. While there is evidence for their impact in other use cases, like vaccines, the complexity and length of alt protein supply chains, and their decentralized buyer structure, make AMCs especially difficult to co-ordinate.[46] The novelty of alt protein products and functional uncertainty also result in

[43] Examples of advanced market commitments; "Without committed demand, alternative proteins will struggle to reach price parity and mainstream adoption." GFI, 2025

[44] "'The most successful example is the pneumococcal vaccine AMC launched in 2009" Unesco, 2025; "With offtakes, announced projects can become bankable investments, assets under construction and value-creating plants." Mission Possible Partnership, 2026

[45] "An example of a type of channel partnership is Cargill and biomass fermentation startup ENOUGH. In this collaboration, ENOUGH's facility is co-located with a Cargill facility which provides low-cost feedstock, and Cargill plays a role as a reseller, facilitating the integration of ENOUGH's "ABUNDA" mycoprotein ingredient into various products and supply chains where Cargill already has deep customer relationships and expertise." GFI, 2025

[46] "unlike energy or mining, which rely on a few centralised offtakers, food ingredients often move through "merchant offtake", with dozens or hundreds of buyers each taking small volumes." GFI, 2025

added risk for potential buyers.[47] Cost reductions may also be needed at multiple stages of the supply chain for them to succeed. Furthermore, we do not think all types of alt proteins are technologically ready to be produced at scale.

Funding Need

Given the general lack of philanthropic funding for alt proteins, we generally think sub-strategies to promote alt proteins have a high funding need (see section: 'Is There Room for More Funding?') We observe less funding flowing to this sub-strategy compared to others within the alt protein ecosystem, but note that few organizations work on it, which reduces the amount of funding that the field can productively absorb. We are aware of just one initiative, currently in stealth mode, that aims to implement a volume guarantee for alt proteins.

Theory of Change for Philanthropic Engagement

Based on our review of key pathways and philanthropic sub-strategies to scale alt proteins, we developed a high-level theory of change for how donations can reduce emissions (**Figure 2**). Theories of change enable us to better understand the pathways of influence, the likelihood of each pathway, and the avenues of greatest impact for philanthropic and civil society efforts.

We evaluate the main assumptions underlying the theory of change and rate our certainty in each as **low**, **medium**, or **high**.[48] Our assessment is based on both primary and secondary evidence, as well as our general impression of the assumption's plausibility.

We think the philanthropic sub-strategies with the most leverage for supporting the market for alternative proteins are supporting government innovation and scale-up funding for alternative proteins, catalyzing private sector funding for alternative proteins, facilitating supportive regulatory environments for alternative proteins, salvaging and distributing intellectual property from alternative protein companies that are shutting down, and identifying research gaps and funding open-access research into alternative proteins. We think these outcomes will incentivize innovators to develop competitive alt protein products, which would lead to lower consumption of livestock products on the margin. These activities could lead to fewer direct agricultural and/or LUC emissions and more carbon removal potential on freed-up land. Key assumptions behind this model are examined in the following section.

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[47] "This creates functional uncertainty and performance risk for buyers who would otherwise rely on animal eggs, where functionality is well understood across these uses." GFI, 2025

[48] We describe our certainty as low/medium/high to increase readability and avoid false precision. Since these terms can be interpreted differently, we use rough heuristics to define them as percentage likelihoods the assumption is, on average, correct. Low = 0-60%, medium = 60-80%, high = 80-100%

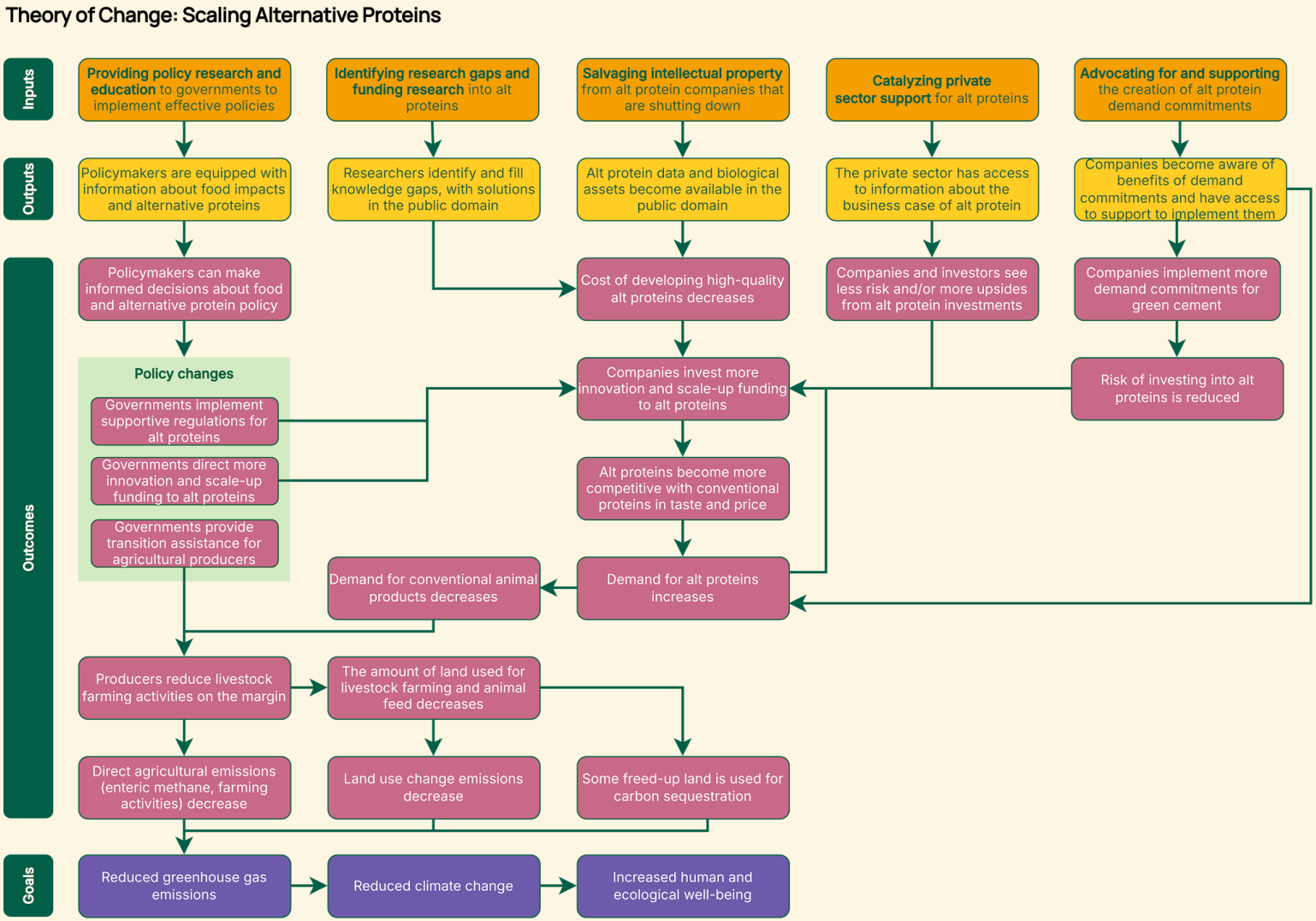


Figure 2: Giving Green's theory of change behind scaling alt proteins

Evaluating Key Assumptions

1. A movement away from livestock farming leads to a reduction in direct agricultural emissions (high certainty)

There is strong evidence that animal products are generally more emissions-intensive than alt proteins (Figure 3). Emission reductions depend both on what meat is being substituted, and what alt protein is consumed instead, since beef and other ruminants are much more emissions-intensive than other meats. Evidence is strongest for plant-based meat, fermentation-derived proteins appear promising, and cultivated meat remains sensitive to production factors, mainly the energy mix.[49]

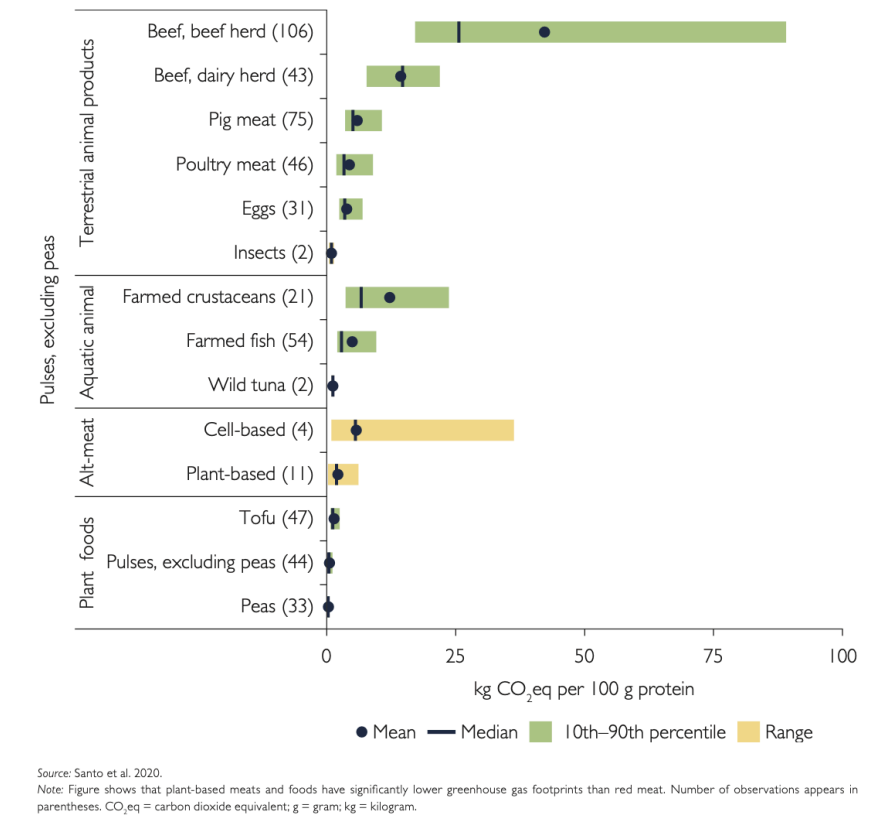


Figure 3: Cradle-to-processing GHG footprints per 100 grams of protein[50]

Cultivated meat emits more than plant-based meat, with its upper-end emissions intensity in the range of beef. This higher emissions intensity would be a risk to the

[49] Figure 4.12, World Bank, 2024; "Five LCAs of mycoprotein-based products were identified. Greenhouse gas emissions (GHGe) were lower for mycoprotein (0.73 kgCO2eq/kg) compared to soy (1.21 kgCO2eq/kg) or pea protein concentrate (1.91 kgCO2eq/kg)." Shahid et al., 2024
[50] Figure 4.12, World Bank, 2024

sustainability of alt proteins if cultivated meat became the dominant alt protein. However, we think this risk is low because: (1) We think the high price of cultivated meat is likely to limit its demand compared to other alt proteins and, therefore, its environmental impact.[51] (2) Emissions of cultivated meat are largely dependent on the energy source used to power bioreactors, and these can be powered by carbon-free energy sources.[52] (3) We think the emissions intensity of cultivated meat production is likely to benefit from more RD&D. Reducing the number of purification steps needed in the process and switching inputs from more energy-intensive biopharmaceutical to food-grade ingredients have been identified as pathways to reduce cultivated meat emissions.[53]

2. Alt proteins can achieve price and taste parity with meat (medium certainty)

A key assumption of our alt protein strategy is that it is technologically feasible for alt proteins to reach price and taste parity with animal products. However, innovation is never guaranteed, and even with substantial investment, alternative proteins may not achieve price and taste parity.

We are concerned about the downward trends for investment in alt proteins, which fell from a peak of $5.1 billion in 2021 to just $881 million in 2025.[54] If investment does not recover over the medium- and long-term, we do not think novel proteins would have sufficient funding to reach taste and price parity.

We do not think investment headwinds are decisive because of other funding and market signals. Firstly, governments have steadily increased their spending on alt proteins, offsetting part of the private decline. Secondly, the alt protein market has been mixed to slightly positive. The overall alt protein market grew 3% (including inflation) from 2024 to 2025, while the meat and seafood market grew by four percent, driven mainly by the European market.[55] Some markets declined instead, such as the United States' 2% decline.[56]

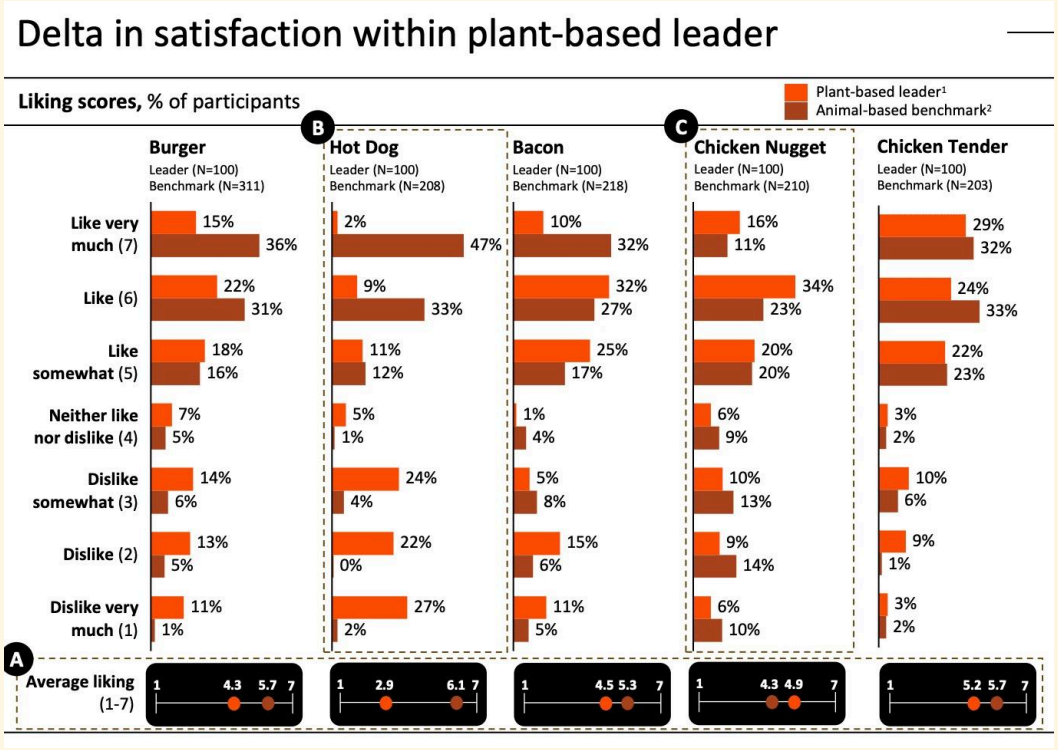
Our view is that much of the early-investment in alt proteins was largely based on hype, and that the bar to mobilize capital is now higher and set by product quality

[51] "Beyond cost concerns, there likely will be value concerns—that high costs balanced against poor taste and other potential drawbacks will result in low value." Tomiyama et al., 2020; "Consumer acceptance of cultured meat is lower than that of pulses, algae, or plant-based meat alternatives" Rosenfield and Tomiyama, 2023
[52] "Where the total emissions from cultivated meat production will fall in this range depends largely on where the energy comes from to run the bioreactors" MIT Technology Review, 2023
[53] "The process that removes those contaminants is the major contributor to the high emissions seen in one group of the preprint's scenarios. However, that purification step won't be necessary in commercial production of cultivated meat" "The other scenarios assumed that cultivated meat production wouldn't require ultra-high-purity ingredients and would instead rely on inputs like those used in the food industry today, meaning lower energy requirements and emissions." MIT Technology Review, 2023
[54] "funding for the alternative protein sector fell by 20% in 2025, attracting just $881M. It was the first time this figure fell below the $1B mark since 2018." Green Queen, 2026; "alternative protein investments almost tripled to $3.2 billion in 2020 before surging to a record $5.1 billion in 2021—a time of broad investor exuberance, with record-breaking venture funding across most sectors." GFI, 2023
[55] "This represents a three percent increase in retail sales (including inflation) from 2024."; "Global retail plant-based meat and seafood market: Estimated at $6.6 billion, up approximately 8% in retail sales, including inflation, and 4% in inflation-adjusted retail sales from 2024, primarily driven by growth in Europe." GFI, 2026
[56] "The U.S. retail plant-based food market was worth $8 billion in 2025 according to SPINS, a slight decline of two percent compared to 2024" GFI, 2026

rather than category enthusiasm. We think it is plausible that alt proteins could become investable by mainstream funders again if government and philanthropic funding is sufficient to improve products, and if the market remains stable or grows.

We are cautiously optimistic about the recent advancements in alt proteins, which have substantially improved their taste and price. On price, an influential techno-economic analysis commissioned in 2021 modeled the price of scaled-up cultivated meat production at $37 to $51 per kg wet cell mass, suggesting a target affordability benchmark of $25 per kg wet cell mass (roughly translated to $50 per kg retail price).[57] However, several companies now claim to produce cultivated meat at $10 to $15 per kilogram, affirmed by Pasitka et al.'s finding that cultivated chicken could be produced at $13.7 per kg.[58]

On taste, NECTAR benchmarks alt protein products against their conventional counterparts. **Its taste tests have found that the best plant-based products are approaching taste parity with benchmark meat products, with plant-based chicken nuggets even being preferred to meat (Figure 4).**[59] We note that these tests provide limited evidence for benchmarking novel proteins, but expect progress in plant-based products to have positive technology-spillover effects to novel proteins.



[57] Table 2; "To assert a threshold on the subjective metric of affordability, this analysis submits a target of ~$25/kg of wet animal cell matter produced in a bulk growth step." ; "products made 100% from bulk cell mass at $25/kg might be expected to reach a minimum of $50/kg at the supermarket" Humbird, 2021
[58] "Several cultured meat companies are now producing cell mass at $10 to $15 per kilogram" The Protein Report, 2025; "showing that the cost of cultivated chicken can drop to within the range of organic chicken at US$6.2 lb−1 by using perfusion technology" Pasitka et al., 2024
[59] Figure: Leader products have emerged in most categories with taste parity on the horizon NECTAR, 2025

Figure 4: The difference in average liking between leading plant-based meats and their meat benchmarks.[60]

We are also cautiously optimistic about the potential for artificial intelligence (AI) to overcome some key technical bottlenecks in the development of alt proteins.[61] AI has the potential to streamline experimental processes by predicting textural, flavor, and structural properties of alt proteins through molecular analysis, which could cut the time and costs for product development.[62] The adjacent field of protein chemistry offers a precedent for transformative AI-assisted research in AlphaFold, the Nobel-recognized AI system for predicting protein structure. One caveat to this success is that AlphaFold's measured effects have so far been far larger on basic research than on applied development.[63]

3. Making alt proteins more taste- and price-competitive with animal products will increase demand for alt proteins (medium certainty)

Studies find that taste and price are the two main drivers of consumer food choices, with nutrition and texture playing an important role.[64] Barriers differ by the type of alt protein: U.S. survey data suggest price weighs more heavily for plant-based meat, while perceived unnaturalness, wanting to support farmers, and lack of understanding are more prominent for novel alt proteins.[65] They also differ by geography. For example, survey participants in India and China reported significantly higher acceptance for alt proteins in

[60] Slide 23 NECTAR, 2024
[61] "AI could provide a large relative uplift for cultivated meat, but actual adoption is far below the ceiling, constrained by data scarcity, company secrecy, funding shortfalls, and a small workforce." Rethink Priorities, 2026
[62] "Optimizing the sensory perception of food is traditionally a costly, time-consuming process involving expert tasting panels and instrumental analysis, including mass spectrometry and gas chromatography. In contrast, an AI-powered pipeline has the potential to predict sensory perceptions from only the chemical or molecular make-up of food, eliminating the need for costly human panels and reducing the time to iterate product formulations." Datta et al., 2026
[63] "we find that basic research on proteins that had no structural information prior to AlphaFold increases by 23 to 32% relative to proteins that already had a structure, with the effects increasing dramatically over time. This represents a significant shift in the direction of research toward less-studied proteins. By contrast, the response of applied R&D, as measured by patents referencing those proteins, has been far more muted" Hill & Stein, 2026
[64] Figure: 'Why did lapsed plant-based meat eaters (who ate previously but not in 2024) stop eating plant-based meat?' GFI, 2025; Figure: 'Barriers to alt-meat adoption', Sorrells, 2022. "Among Plant-Based Decreasers that were asked what would make them more likely to consume plant-based, 64% say lower pricing and/or more frequent sales and coupons, and 58% say better taste and/or texture." Figure 6: 'Reasons why shoppers are decreasing animal-based food consumption in favor of plant-based foods" Plant-based Foods Institute, 2022; "Of these factors, studies from different countries have consistently identified taste, price, healthiness, and convenience as dominating food choices [...] While some differences have been found in how people prioritise these factors, taste is typically ranked as most important, with the other factors varying in their relative subsequent positions" Dana et al, 2021.; Figure 2 Valli et al., 2022
[65] Figure: 'Why did lapsed plant-based meat eaters (who ate previously but not in 2024) stop eating plant-based meat?' GFI, 2025; Figure: 'For Americans who aren't open to precision-fermented dairy or eggs: what are their barriers?' GFI, 2025; Figure: 'For Americans who aren't open to cultivated meat: what are their barriers?' GFI, 2025; Figure: 'For Americans who aren't open to mycoprotein-based meat: what are their barriers?' GFI, 2025

general than those in the U.S., though higher familiarity predicted higher acceptance across all countries.[66]

In U.S. surveys across plant-based meat, cultivated dairy, cultivated meat, and mycoprotein, consumers cited taste and texture as the primary barrier to adoption for every category except cultivated meat, where it was perceived unnatural-ness.[67] We think the surveys on novel proteins likely underweight price, and that revealed preferences would show greater price sensitivity, especially for recurring purchases. This is because a) food choices are generally highly price-sensitive, b) the question was framed as a one-time try or buy rather than a repeat behavior, and c) it was posed only to those already unlikely to try novel proteins, who plausibly hold stronger ideological objections than more open consumers.

Empirical evidence shows price can shift alt protein demand in the right contexts. When the German supermarket Lidl brought its plant-based range to price parity, sales rose by over 30%.[68] We think Europe is especially open to adopting plant-based products, with meat consumption per capita now decreasing in some European countries, so we are uncertain if this result is replicable globally.[69] Across four U.S. consumer trials, cutting the price of plant-based burgers raised selection by 3 percentage points among regular meat eaters and 6 points among those on alternative diets.[70] However, at price parity consumers still chose meat more often, and on average were willing to pay $1.11 more for a beef meal than a plant-based one.[71] We are unsure how this would change if the products were also at taste-parity.

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[66] "We found significantly higher acceptance of clean and plant-based meat in India and China compared to the USA."; "higher familiarity predicted higher acceptance of plant-based and clean meat across all countries." Bryant et al., 2019

[67]Figure: 'Why did lapsed plant-based meat eaters (who ate previously but not in 2024) stop eating plant-based meat?' GFI, 2025; Figure: 'For Americans who aren't open to precision-fermented dairy or eggs: what are their barriers?' GFI, 2025; Figure: 'For Americans who aren't open to cultivated meat: what are their barriers?' GFI, 2025; Figure: 'For Americans who aren't open to mycoprotein-based meat: what are their barriers?' GFI, 2025

[68] "Lidl freut sich über eine positive Resonanz der Kunden, die mit einem Anstieg der verkauften veganen Artikel um über 30 Prozent seit der Preisanpassung vor einem halben Jahr einhergeht." Translation: Lidl is pleased with the positive response from customers, which has been accompanied by an increase in the number of vegan items sold by over 30 percent since the price adjustment six months ago. Lidl, 2024

[69] "The average German ate 52 kilograms of meat last year, down around 4.2 kilograms from 2021 levels and the lowest since the government started tracking meat consumption in 1989." Just Food, 2023; "People in the UK consumed less meat last year than at any point since records began in the 1970s, in a trend driven by the cost of living crisis, the continued impact of Covid and broader lifestyle changes." The Guardian, 2023; "Furthermore, concerns over the environment and climate change will result in consumers paying further attention to the production process and products' origin. Consumers habits will also be driven by health considerations as well as convenience. Overall, EU meat per capita consumption is expected to drop from 69.8kg in 2018 to 67kg by 2031." European Commission, 2021

[70] "If both Beyond Beef and Impossible Burger were available for $1/lb less, the combined plant-based share for regular meat consumers would increase from 2% to nearly 5%. Those declaring an alternative diet would have a larger combined plant-based selection rate of 31% (vs. a base of 25%)." Tonsor, Lusk & Shroeder, 2022

[71] "Going further, the median WTP of $7.74 for a Beyond Meat Burger meal indicates the typical person would pay $1.11 more for a beef burger meal." Tonsor, Lusk & Shroeder, 2022

Outside of taste and price, various social and cultural dynamics also influence the number of people open to trying alt proteins. For example, trends of alt proteins being perceived as unnatural or unhealthy, right-wing opposition to cultivated meat in the U.S., and meat as a symbol of social status, can all lead to fewer people being open to eating alt proteins.[72] Alongside taste and price, supportive regulation, positive health perceptions, and a favorable social environment have been cited as conditions for alt proteins to reach large market share.[73]

Our current conclusions are that:

1. Taste and price are two of the most important factors influencing consumer protein choices.
2. Taste and price improvements can increase alt protein demand on the margin, but reaching parity is unlikely to be sufficient for a substantial share of consumers.
3. Motivations vary substantially across markets, geographies, and alt protein types.
4. There are several other factors that influence consumer protein choices, and we are not sure how much of a barrier they will present, should alt proteins reach taste- and price-parity.

Because of the uncertainty in the current evidence-base, we will continue to monitor this space to update our views. In particular, the global evidence base is still relatively sparse. We also note that the evidence base for taste-parity is less certain than price-parity, since there is an insufficient availability and range of products on the market for it to be empirically assessed.

4. More demand for alt proteins will lead to less demand for meat (medium certainty)

We are unsure whether increased demand for alt protein actually displaces meat, since consumers may choose to consume both alt proteins and meat. For example, a study on alt protein buying patterns found that ~86% of alt protein buyers also buy meat, though they spent ~13% less on meat than their non-alt protein buying counterparts.[74] Another study on the effect of promoting plant-based products in supermarkets found that although this led to greater sales of plant-based products, there was no corresponding

[72] "Concern that plant-based meat is 'ultra-processed' is widespread" Chapman, 2023; "How lab-grown meat became part of America's culture wars" The Economist, 2024; "Thus, from various perspectives, meat is symbolic of status." Chan and Zlatevska, 2019

[73] "In countries with high meat consumption, altering social norms is also important" and "The food industry should make sure that plant-based meat alternatives are of similar nutritional value to meat; otherwise, there might be a backlash against highly processed plant-based meat alternatives due to their lack of healthiness" Siegrist and Hartmann, 2023; "Furthermore, incomplete safety assessments and a lack of clear regulatory guidelines confuse the food industry and hamper progress." Malila et al., 2024 "In general, the following drivers of acceptance consistently show to be relevant for the acceptance of various alternative proteins: motives of taste and health, familiarity, attitudes, food neophobia, disgust, and social norms." Onwezen et al., 2021

[74] "About 2.79% of households only purchased PBMAs. About 86% of PBMA buyers also bought ground meat; however, PBMA buyers spent about 13% less on ground meat." Neuhofer & Lusk, 2022

reduction in meat sales.[75] Different meats have also been shown to have different sensitivities to substitution. For example, reducing the price of Beyond Meat was shown to have a greater reduction in chicken consumption than beef consumption.[76]

Our conclusion from these studies is that alt proteins substitute for some animal products, but are not a one-to-one substitute. We think that substitution rates will be higher for products that more closely mimic animal products, such as cultivated meat, compared to plant-based meat. We will continue to monitor the evidence-base to update our views.

Is There Room for More Funding?

We think there is a funding gap for making alt proteins more taste- and price-competitive with meat. For the scale of emissions that could be influenced, alt proteins are highly neglected by climate philanthropy. We estimate that it is under 10% of the $510 million of philanthropic foundation funding for food & agriculture, which is dominated by regenerative agriculture (estimated $300 million to $700 million per year).[77] Tilt Collective has a similar estimate of $50 million per year for plant-rich food systems (which may include activities unrelated to alt proteins).[78] At these levels, it would make up less than 1% of climate philanthropy from foundations.[79]

Similarly, alt proteins receive only modest funding from the private and public sectors, at $881 million per year and $450 million per year, respectively.[80] Funding from the private sector is especially poor, considering it has declined by over 5x from 2021 to 2026.[81]

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[75] "Results suggest that increasing visibility, accessibility, affordability and availability of plant-based products led to increased sales, with evidence of lasting effects. No significant changes in meat sales were observed." Trewern et al., 2022

[76] "If Beyond Meat was available for $1/lb less, regular meat consumers would slightly increase (3% vs. 1%), their rate of selection with this increase coming more at the expense of Chicken Breast than any other item" Tonsor, Lusk & Shroeder, 2022

[77] Figure 4. Known foundation funding to sectors, 2024, USD Millions Climateworks, 2026; "Philanthropy recognizes the urgency to shift financial flows and is also invested in this transition, contributing an estimated USD 300 to 700 million annually." Global Alliance for the Future of Food, 2024

[78] Figure: Current & future funding potential to advance a plant-rich food system Tilt Collective, 2024

[79] Figure 3: Foundation for climate change mitigation, 2020 to 2024, USD millions Climateworks, 2026

[80] "funding for the alternative protein sector fell by 20% in 2025, attracting just $881M. It was the first time this figure fell below the $1B mark since 2018." Green Queen, 2026; Calculation: (2.5-0.7)/4 = $0.45 billion/year "GFI's 2021 report's cumulative total of approximately $700 million in government investments has become at least $2.5 billion as of 2025, and the 16 countries that had begun working to advance alternative proteins now number at least 33." GFI, 2026

[81] Calculation: 5.1B/881M = 5.8X reduction "alternative protein investments almost tripled to $3.2 billion in 2020 before surging to a record $5.1 billion in 2021—a time of broad investor exuberance, with record-breaking venture funding across most sectors." GFI, 2023

We think the climate impact of livestock farming is especially neglected by traditional environmental groups. In part, because these groups are more incentivized to 'play it safe' because of the expected political backlash caused by criticizing farmers and agribusiness corporations.[82] We believe more funding is needed for groups willing to disrupt livestock farming's role in a sustainable food system.

Are There Major Co-Benefits or Potential Risks?

Co-Benefits

- **Reduced antimicrobial resistance and risk of zoonotic disease:** Animal agriculture uses 73% of global antibiotics, and the United Nations Environment Programme states that "the widespread and excessive use of antibiotics in animal agriculture has been linked to the rise of antimicrobial resistance in both animals and humans."[83] It also found that the expansion of animal agriculture has led to the increased risk of zoonotic disease, which causes 70% of emerging infectious diseases and almost all known pandemics.
- **Reduced biodiversity loss:** Animal agriculture is the main contributor to land use change, which is the leading driver of terrestrial biodiversity loss.[84] In Giving Green's Strategy Report on Reducing Biodiversity Loss, we found that advancing alt proteins was the most promising strategy to protect biodiversity.
- **Lower land, water, and fertilizer demand:** Producing animal products is generally more resource-intensive than plant-based alternatives. For example, plant-based alt proteins use 76-89% less water and 41-98% less land than farmed meat.[85] Because fewer crops are involved, alt proteins also require less fertilizer and pesticide inputs than livestock products.[86]
- **Lower levels of animal suffering:** Over 100 billion land-animals are killed for animal products each year.[87] A shift in protein sources toward more alt proteins would lead

[82] "Many environmentalists, I discovered, understand the science but are afraid of the political backlash that could come if they are seen as trying to snatch burgers, nuggets, and ribs away from the American public." Vox, 2024
[83] "The widespread and excessive use of antibiotics in animal agriculture has been linked to the rise of antimicrobial resistance in both animals and humans; globally, 73 percent of all antimicrobials sold are used in livestock agriculture. Animal agriculture expansion and industrialization... have also been linked to increased risk of zoonoses emergence. The majority (70 percent) of emerging infectious diseases and almost all known pandemics (e.g. influenza, HIV/AIDS, COVID-19) are zoonoses." UNEP, 2023
[84] Point estimate of the dominance of land use change in the terrestrial realm: 3.16/4.00 (95% confidence interval: 2.77–3.40, n=87 studies) Figure 1B Jaureguiberry et al., 2022
[85] "For every 100 grams of protein, plant-based alt-proteins have a water footprint that is 76–89 percent smaller than the water footprint of farmed meat." "Per 100 grams of protein, plant-based alternative proteins have a median land use that is 41–98 percent smaller than the median land use of farmed meat." CSIS, 2023
[86] "Similarly, because there is no animal waste to discharge and fewer crops and fertilizers are needed, alternative proteins reduce the discharge of nitrogen and phosphorus" GFI, n.d.
[87] "More than 100 billion animals are killed for meat and other animal products every year." OWID, 2024

to fewer animal deaths, and reduced animal suffering from practices such as lack of space, artificial insemination, increased risk of disease and lameness, and slaughter.[88]
- **Increased local air quality:** Livestock waste contributes to ammonia emissions, which leads to particulate matter pollution that causes respiratory problems and premature death.[89]

Potential Risks

- **Just transition:** Livestock farmers' livelihoods are likely to be negatively impacted if insufficient transition funding and technical assistance are provided to reduce livestock production. We think there are likely to be some regions where incomes are more vulnerable to change than others, and that the level of financial and technical assistance given should be context-dependent.[90] Efforts, such as the Danish Government's Action Plan on Plant-Based Foods, aim to mitigate the potential harms of a protein transition.

Key Uncertainties and Open Questions

- **Consumer acceptance of alt proteins:** We think alt proteins' emissions reduction potential will depend on consumer acceptance, and we are unsure how this will unfold over time. We think taste and price are currently the primary barriers to consumer acceptance of alt proteins and believe there is room for improvement. This is because they have not yet reached taste and price parity with conventional meat, and there are remaining avenues of research and product development that we think could close this gap.[91] At the same time, other factors, like social and cultural perception, influence the acceptance of alt proteins, and efforts to improve taste and price will not address these barriers. We recognize their significance and think they could feasibly become the main bottleneck if sufficient improvements in taste and price occur.

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[88] "The genetic component underlying milk yield has also been found to be positively correlated with the incidence of lameness, mastitis, reproductive disorders and metabolic disorders" European Food Safety Authority, 2009

[89] "Livestock waste is the dominant contributor to ammonia emissions, which are responsible for particulate matter (PM) that affects air quality, and leads to respiratory problems and premature deaths." ACS Axial, 2024

[90] "In addition to individual farms and businesses, there are likely to be rural regions and communities where incomes are more vulnerable to change than others." "The policies deployed to achieve a smart and just transition must include both the means to assist and compensate where this is fair, reasonable and effective alongside the capacity and willingness to regulate where this is necessary." IEEP, 2022

[91] Section: Future prospects for alternative protein development, Hefferon, 2023 and section: Future trends and opportunities, Malila, 2024

- **Scalability of cultivated meat:** We have several uncertainties about the scale-up of cultivated meat and, therefore, its ability to displace demand for conventional meat. These include its production costs, ability to overcome the technical and process development challenges to scale up, its political tractability, and threats posed by bans on cultivated meat.[92] For these reasons, we advocate for a strategy that includes all types of alternative proteins to hedge against the risk that cultivated meat is unable to scale.
- **Underrating near-term measures to incrementally reduce meat intake:** Our alt protein strategy focuses on long-term measures such as R&D for novel proteins, because we think these have greater scale than near-term measures targeting traditional plant-based proteins. But we could be wrong on two counts: novel proteins may never reach the quality needed to shift consumer behavior at scale, or motivators other than taste and price may prove sufficient to move consumers toward existing products. We plan to keep monitoring the evidence base, funding landscape, and nonprofit activities for near-term measures.
- **The carbon sequestration rate of freed-up land (e.g., former pasture and croplands):** There will be some delay before people can restore land previously used for livestock production and before the land begins storing carbon. We are unsure how much of the freed-up land is usable for carbon sequestration, how much carbon can be stored in total, and how long carbon can be stored.

Bottom Line and Next Steps

In summary, our view is that scaling alt proteins is the most promising strategy to reduce food, agriculture, and land emissions, with a mitigation potential of 3 billion to 6.3 billion tCO_2e per year (6-12% of global emissions).

Based on our research into relevant mitigation sub-strategies, we believe making alt proteins more taste- and price-competitive with animal products could increase their popularity and displace some demand for animal products, leading to lower food system emissions. This would involve sub-strategies to catalyze innovation and scale-up funding from governments and the private-sectors, support favorable regulations, and streamline activities to fill the most important research gaps. Due to the low level of funding this impact area has received and its projected mitigation potential, we plan to consider organizations working on these topics for our Top Climate Nonprofits and as potential grantees from the Giving Green Fund.

Acknowledgments

Enzia Schnyder researched and wrote this report, and Greer Gosnell managed and oversaw the research. Dan Stein provided valuable feedback on the report and drafts.

[92] Cultivated meat bans: “Alabama became the second U.S. state to ban lab-grown meat, joining Florida which earlier this month outlawed the alternative protein.” “Officials in other states including Kentucky, Arizona, West Virginia and Tennessee have similar measures cooking” USA Today, 2024

This work has benefited greatly from the feedback provided by a variety of advisors, experts, and reviewers throughout the research process. Giving Green is grateful for those who shared their time, experience, and ideas. We would especially like to acknowledge the principal reviewer, Kelly McNamara, for providing a deep review of this strategy report during its final stages of development. All opinions remain those of Giving Green alone and any remaining errors are our own.

Giving Green

Giving Green was founded to help donors cut through the complexity of climate philanthropy and direct their resources for maximum impact.

Our founder, Dan Stein, Ph.D., spent 15 years developing evidence-based strategies in global philanthropy. He saw people eager to fight climate change but paralyzed by its scale. In 2019, with support from IDinsight, he launched Giving Green to rigorously evaluate solutions and share clear guidance.

What began as a side project is now a team directing tens of millions of dollars to high-impact initiatives. Our success is shared—with donors ranging from kids donating allowances to retirees investing in a better future. We believe anyone can start small and still make a huge difference.

Thank you for joining us on the path to net zero. Together, we keep moving forward.