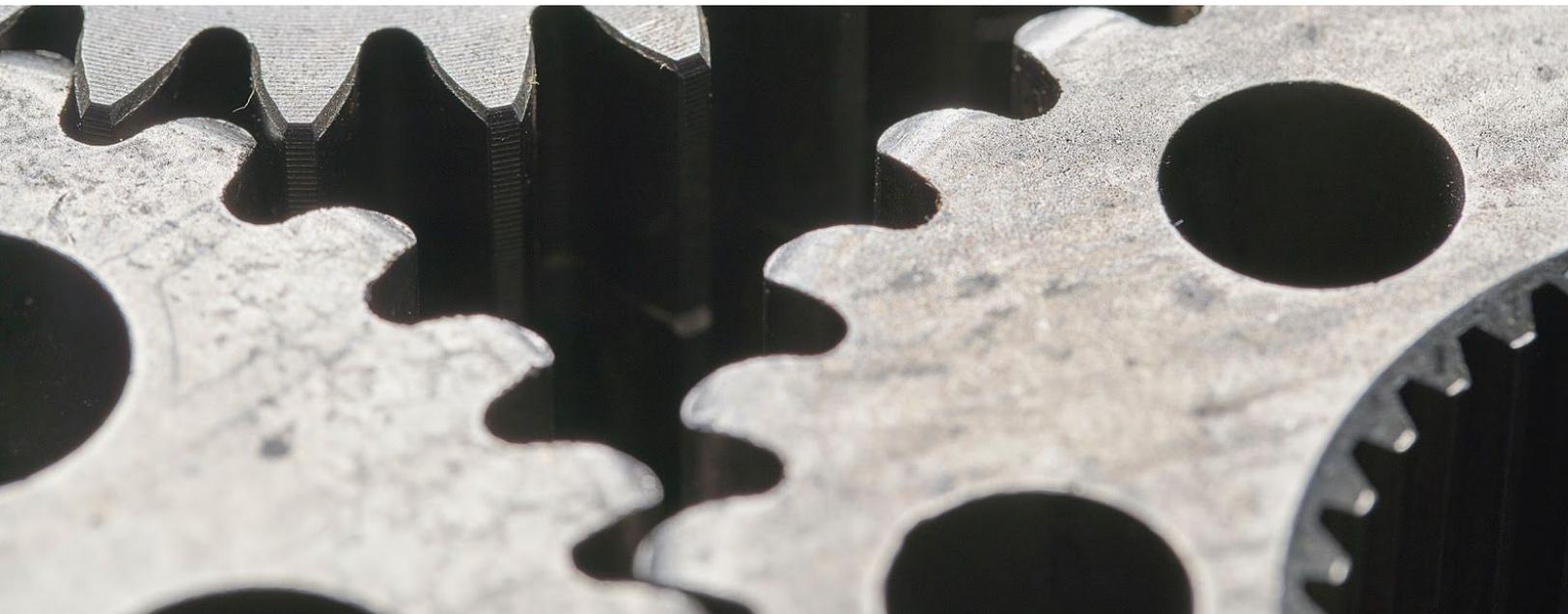




# Future-Proofing Alternative Proteins: Advancing Solutions for Long-Term Resilience

August 21, 2020



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## About The Good Food Institute

As a nonprofit whose mission is to accelerate the growth of the alternative protein industry, The Good Food Institute (GFI) has a unique and vital role to play in transforming each step of the value chain more quickly and on a larger scale than conventional market forces would dictate. GFI is working to accelerate this transition toward a better food system by surfacing the most pressing problems and most needed solutions in the alternative protein market. By offering recommendations for building a resilient and

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sustainable alternative protein industry, GFI helps businesses, investors, nonprofits, academic researchers, and governments prioritize efforts supporting the alternative protein industry and ensure that resources are channeled effectively.

The Advancing Solutions for Alternative Proteins (ASAP) initiative and corresponding deliverables—all open-access and free of charge—were made possible by GFI's generous donors. **If you'd like to support our open-access research and efforts to catalyze the alternative protein industry, please contact [philanthropy@gfi.org](mailto:philanthropy@gfi.org).**

## Introduction

Future-proofing is the process of anticipating possible future risks and building systems that can thrive in all market conditions. Using future-proofing principles to identify threats to the alternative protein industry and gauging their likelihood and expected impact will help create strategies that avoid, postpone, mitigate, or reverse negative developments. This will enable the industry to build for resilience and long-term competitiveness.

For the Advancing Solutions for Alternative Proteins initiative, GFI interviewed over 120 industry experts to learn about the biggest challenges and most-needed solutions for accelerating the industry's growth. Two thirds of these experts participated in a premortem scenario analysis to help identify and assess the most significant risks to the alternative protein industry. [Premortem](#) analyses identify catastrophic and existential risks that have the potential to derail the success of key initiatives. An inversion of the better-known postmortem, premortem analysis is performed at the beginning of an initiative rather than the end so that strategy can be improved in advance rather than autopsied after failing. This “future failure” framing extracts insights that contributors ordinarily wouldn't anticipate or identify as potential problems.

Our hope is that readers will utilize the insights from this report to inform their work building the alternative protein industry, ensuring that risks are appropriately planned for and addressed. While alternative proteins are a promising industry, it is important for industry leaders to build companies and systems designed to weather future challenges and avoid catastrophic failures. This report describes the key risks identified by GFI and industry stakeholders, as well as suggestions for how to avoid or mitigate each risk.

The experts GFI interviewed for this research were consistently optimistic about the long term success of the alternative protein industry. Most respondents expected that alternative proteins would be able to effectively avoid or mitigate potential threats. While success was not seen as inevitable, the potential demonstrated by early research and recent product launches provided the impetus to build the industry for long-term resilience and competitiveness.

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## Methodology

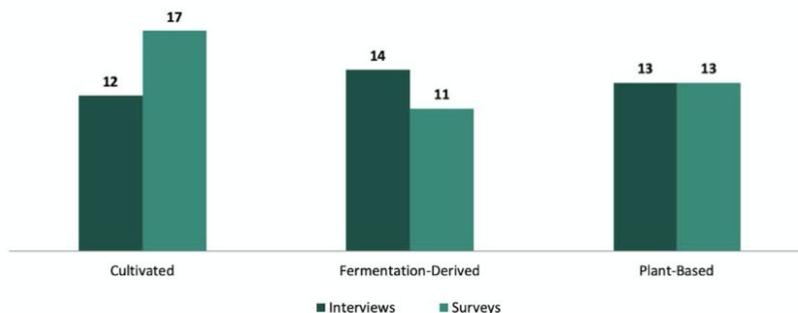
### Step 1: Internal Analysis to Identify Top Risks

GFI conducted an internal analysis to identify major risks to the alternative protein industry over the next 30 years during an in-person working group retreat in December 2019. The exercise asked participants to imagine that alternative proteins had failed to capture 5% of global meat, seafood, eggs, and dairy market share by the year 2050 and to anticipate the major contributors to that failure. Results from this exercise were used to populate the premortem prompts shared with external stakeholders.

### Step 2: Survey Industry Stakeholders

The premortem questions were integrated into online industry stakeholder interviews and surveys that were conducted in winter 2020. Each survey and interview was segmented into one of three alternative protein production platforms: plant-based, fermentation-derived, and cultivated. Participants were given a list of risk factors and instructed to imagine that alternative proteins had failed to capture 5% of meat, egg, and dairy market share by the year 2050. They were asked to estimate the likelihood and impact of these failure scenarios on a scale from 1 (low) to 5 (high) and provide qualitative feedback on the options provided. Additionally, each respondent was asked to contribute additional potential failure scenarios and estimate their likelihood and impact. The premortem assessment was administered through 39 video interviews and 41 online surveys with experts from around the globe.

Figure 1: Interviews and surveys, segmented by alternative protein production platform



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## Key Risks

While each risk area has been evaluated individually, some of the risks highlighted below can happen synergistically and create cascading and compounding effects. The interviews and analysis did not explicitly consider the interdependence or correlation of different risk areas.

The risks below were presented to the expert interviewees, who were asked to rate the expected likelihood and impact alongside commentary or qualifications of their ratings. Additional failure scenarios or risks that were mentioned by participants are included in the “Additional Risks” section. Because of length considerations, not all risks are included in this document. Please [contact GFI](#) if you would like to review all risk areas and their associated impact and likelihood ratings.

### Hypothetical Scenario #1: Alternative Protein Products Fail to Meet Consumer Expectations for Organoleptic Qualities

Experts from all three alternative protein production platforms rated this risk as medium-high impact and medium likelihood. It is important to note the risk differs based on product category. Structurally simple formats such as ground beef, burgers, and sausage are more likely to succeed in meeting consumer expectations, while satisfactorily replicating the structurally complex formats such as fish filets and steaks has a much higher risk of failure.

GFI funds and supports open-access [scientific research](#) to help alternative protein companies formulate products with optimal organoleptic properties, as well as [consumer research](#) to ensure that existing alternative protein products are meeting or exceeding consumer expectations. GFI [advocates increased public R&D funding](#) as well as [private investment and research](#) by startups, academic researchers, and established food companies to improve the ingredients, inputs, processing, production systems, and other factors that affect end product quality and functionality attributes.

Potential Risks	Risk detail	Risk Response Strategies
<b>Alternative proteins may not live up to quality and functional expectations</b>	<ul style="list-style-type: none"><li>Alternative proteins need to match or exceed the quality attributes of animal protein counterparts, including taste, variety, nutrition, digestibility, ease</li></ul>	<ul style="list-style-type: none"><li>Continue to <a href="#">advocate increased public R&amp;D funding</a> as well as <a href="#">private investment and research</a> to improve the ingredients, inputs, processing, production systems, and other</li></ul>

	<p>of storage and preparation, versatility, and functionality.</p> <ul style="list-style-type: none"> <li>• Some respondents acknowledged the risk that alternative proteins could hit scientific limits where desired improvements in certain attributes become extremely technically challenging without trade offs on other attributes.</li> <li>• It may be difficult to create alternative protein products that can convincingly mimic complex animal products such as whole muscle cuts of meat.</li> <li>• For products not on the market (such as cultivated meat), some consumers may expect first-generation products to exactly mimic meat, even though early products will not necessarily be perfect analogs.</li> <li>• Alternative protein companies and investors may rush to hit distribution, revenue, or non-business milestones based on appealing to niche audiences of early adopters and sacrificing mainstream organoleptic appeal targets, creating products that are less appealing to the majority of consumers.</li> </ul>	<p>factors that affect end product quality and functionality attributes.</p> <ul style="list-style-type: none"> <li>• Ensure that alternative protein companies and investors maintain focus on attaining organoleptic competitiveness or superiority in comparison to animal products.</li> <li>• Continue investing in improving the supply chain and building out better infrastructure to make alternative protein end products as high-quality as possible.</li> <li>• Ensure that alt protein companies, brands, and investors focus on animal protein products as the real competition, not their fellow alt protein companies..</li> <li>• Create exemplar starting point formulations and end product quality parameters.</li> <li>• Conduct market and consumer research to understand the optimal portfolio and balance of attributes, using multi-attribute utility analysis.</li> <li>• Lobby to prevent or strike down policies that place barriers on alternative protein research.</li> <li>• Make product quality analysis, quality assurance assessment, and sensory panels widely available to and used by the alternative protein industry.</li> <li>• Alternative protein companies offering novel foods need to manage expectations and be careful not to over-promise and then under-deliver.</li> </ul>
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## Hypothetical Scenario #2: Alternative Protein Products are Not Economically Viable for Widespread Mainstream Adoption

The risk that alternative protein products would not be able to compete with animal proteins on the basis of price was seen by plant-based interviewees as unlikely. However, respondents across all three production platforms rated the impact of this risk high. Cultivated and precision fermentation experts rated the likelihood of this risk higher than plant-based and whole biomass fermentation experts, given the current uncertainties regarding scientific and engineering challenges and the relative lack of commercial case studies from those platforms.

GFI funds and supports open-access [scientific research](#) to help alternative protein companies produce products and ingredients as inexpensively and efficiently as possible, as well as [consumer research](#) to ensure that existing alternative protein products are meeting consumer expectations around pricing. GFI [advocates increased public R&D funding](#) as well as [private investment and research](#) by startups, academic researchers, and established food companies to improve the ingredients, inputs, processing, production systems, and other factors that affect end product cost.

Potential Risks	Risk detail	Risk Response Strategies
<p><b>Uncertain cost structures and impacts of economics of scale</b></p>	<ul style="list-style-type: none"> <li>Alternative protein companies and investors may rush to hit distribution, revenue, or non-business milestones based on appealing to niche audiences of early adopters, sacrificing price targets, and creating products that are more expensive than animal substitutes.</li> <li>Alternative protein companies may not have access to sufficient data to develop rigorous or accurate cost projections. This may lead to unforeseen</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that alt protein companies and investors maintain focus on attaining cost-competitiveness with animal products.</li> <li>Ensure that alt protein companies and investors focus on the animal protein industry as the real competition and not just the much smaller alt protein competitor set.</li> <li>Continue to <a href="#">advocate increased public R&amp;D funding</a> as well as <a href="#">private investment and research</a> to improve the ingredients, inputs, processing, production systems, and other factors that affect end product pricing.</li> <li>Work with companies in multiple industries and food/beverage categories (such as materials, baking, pasta, and other foods) to make alternative proteins more profitable. Partnering with parallel sectors would allow the industry to</li> </ul>

	<p>challenges in maintaining sufficient quality while manufacturing at large enough scales to achieve price parity with conventional animal products.</p> <ul style="list-style-type: none"> <li>• Many plant-based products are currently offered at a premium price relative to comparable animal protein products. However, it is not clear to what extent this premium reflects higher profit margins versus higher production costs. Thus, it is unclear what potential exists for cost reduction at the current scale versus cost reduction through economies of scale.</li> </ul>	<p>more easily valorize alternative protein sidestreams, such as residual starch and fiber fractions, as well as find other sources of demand for key alternative protein inputs (such as pulse crops) that can help build up volumes, create economies of scale, and justify investment in crop farming and processing infrastructure.</p> <ul style="list-style-type: none"> <li>• Conduct research on a diverse set of ingredients, processing/production methods, and suppliers for alternative protein inputs in order to create supply chain redundancies and increase the chances of finding maximally efficient options.</li> <li>• Explore spillover benefits to alternative proteins from other emerging and established industries, such as innovations in biomaterials and biofuels that create a large base of suppliers and talent with easily transferable expertise and supply chains to alternative proteins.</li> </ul>
<p><b>Shifting economic pressures</b></p>	<ul style="list-style-type: none"> <li>• Economic depressions could cause consumers to reduce their purchasing of premium food items, which would make it more challenging for smaller or early-stage alternative protein companies—who often rely on premium pricing at market entry—to bring novel products to market.</li> </ul>	<ul style="list-style-type: none"> <li>• Advocate government policies and support mechanisms that will enable alternative protein companies to scale.</li> <li>• Lobby to prevent or strike down policies that drive up alternative protein prices by making it harder to do business, such as <a href="#">varying US state label censorship laws</a>.</li> <li>• Develop partnerships across the animal agriculture value chain—including feed supplement and finished feed companies as well as meat processors—to tap into existing supply chains and repurpose existing infrastructure to support alternative protein growth.</li> </ul>
<p><b>Challenges from applying expensive tech to new, lower-cost applications</b></p>	<ul style="list-style-type: none"> <li>• Cultivated meat today relies on expensive inputs and technologies historically developed for the manufacture of</li> </ul>	<ul style="list-style-type: none"> <li>• Incentivize life science suppliers to develop inputs (e.g., cell lines, cell culture media, scaffolding, bioreactors) for this emerging industry, which offers attractive,</li> </ul>

	<p>human therapeutics, which constitutes a high-margin, low-volume industry. These inputs and processes are likely overengineered for food production purposes, which necessitate lower-cost production to achieve economic viability.</p>	<p>albeit different, economic considerations.</p> <ul style="list-style-type: none"> <li>● To the greatest extent possible, utilize inputs and infrastructure that are currently cheap and widely available, such as animal feed ingredients and existing food processing capacity.</li> <li>● Locate processing and production facilities near input suppliers and production partners to reduce costs and logistical complexity associated with raw material handling and transportation.</li> </ul>
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### Hypothetical Scenario #3: Misinformation Engenders Consumer Mistrust of Alternative Protein Products

The risk of consumers believing misinformation and mistrusting alternative protein products was seen as both highly plausible and impactful by respondents across all alternative protein platforms. Many interviewees emphasized the importance of creating effective operational and marketing strategies and avoiding errors such as product misrepresentation, food safety recalls, or bad product positioning.

GFI works to educate investors, established food & agriculture companies, nonprofits, media, governments, policymakers and policy influencers, entrepreneurs, retailers, foodservice operators, and other stakeholders on the [health](#) and [sustainability](#) benefits of alternative proteins and to counter misinformation about the industry or alternative protein products.

Potential Risks	Risk detail	Risk Response Strategies
<p><b>Novelty and unfamiliarity</b></p>	<ul style="list-style-type: none"> <li>● Some alternative protein foods utilize novel ingredients or production methods that may be unfamiliar to consumers.</li> <li>● Some alternative protein foods could be seen as too “science-based” or as “unnatural.”</li> <li>● Many respondents noted the importance of avoiding backlash akin to that against</li> </ul>	<ul style="list-style-type: none"> <li>● Continue to educate consumers and food industry stakeholders about the sustainability and health advantages of alternative proteins, particularly in comparison to animal protein foods.</li> <li>● Work with influential and highly trusted social, political, environmental,</li> </ul>

	genetically engineered foods, which was prompted both by naturalistic concerns as well as concerns about unethical business practices and exclusive ownership of important technologies.	nonprofit, nutritional, educational, and media organizations to ensure they have accurate information and understand the benefits of alternative proteins.
<b>Processing concerns</b>	<ul style="list-style-type: none"> <li>Many stakeholders expressed concern about alternative protein foods being seen as overly “processed” by consumers due to intensive production methods or lack of “clean labels.”</li> </ul>	<ul style="list-style-type: none"> <li>Conduct research and disseminate best practices on nomenclature, effective promotion and marketing, and consumer education.</li> <li>Conduct high-quality, peer-reviewed research studies on the nutrition, digestibility, allergenicity, and safety of alternative proteins, particularly in comparison to animal proteins.</li> </ul>
<b>Nutrition, digestibility, or allergenicity concerns</b>	<ul style="list-style-type: none"> <li>Key ingredients or sources (such as soy) could be demonized for health reasons or for having an undesirable country of origin.</li> <li>New information could emerge that shifts public opinion on the healthy perception of alternative protein foods, or nutritional fads could shift to suggest that animal proteins are nutritionally superior.</li> </ul>	<ul style="list-style-type: none"> <li>Conduct research on and develop a diverse set of ingredients, production methods, and suppliers for alternative protein foods in case the need arises for reformulation to accommodate shifting consumer trends.</li> </ul>

## Hypothetical Scenario #4: Alternative Protein Products Fail to Penetrate Markets in Low- and Middle-Income Countries

Most interviewees were optimistic that alternative proteins would be able to penetrate markets in low- and middle-income countries and did not see this as a likely or impactful risk. While the concept of emerging economies “leapfrogging” past industrial animal agriculture paradigms is attractive, this idea is grounded in a Western view that doesn’t necessarily apply to these markets, which have different cultural and economic conceptions of food. Globally, poorer populations generally eat mostly plant-based diets and don’t eat animal products frequently. The well-established link between rising income levels and animal product consumption needs to be overcome, but that involves positioning alternative proteins as aspirational products, an endeavor that needs to be highly culturally contextualized.

GFI partners with nonprofit organizations, governments and regulatory bodies, universities, researchers, and companies around the world. In addition to GFI-US, there are GFI affiliates in [Europe](#), [Asia-Pacific](#), [India](#), [Israel](#), and [Brazil](#).

Potential Risks	Risk detail	Risk Response Strategies
<p><b>Alternative proteins fail to gain significant traction in developing economies</b></p>	<ul style="list-style-type: none"> <li>● If alternative protein production or key input processing is reliant on advanced technologies, industrialized supply chains, or specialized expertise, it will have significantly reduced growth potential in countries where these technologies, infrastructure capabilities, capital, or talent are not available or accessible.</li> <li>● Many multilateral institutions and global development organizations currently view animal protein as integral to nutritional and economic development aims, and may not embrace alternative proteins as a solution for low- and middle-income countries.</li> <li>● Alternative proteins may struggle to be profitable in regions with limited arable land where ruminant animals rely primarily on grazing to produce protein in the absence of an animal feed industry.</li> </ul>	<ul style="list-style-type: none"> <li>● Position alternative proteins as aspirational products in countries that do not currently have high levels of animal protein consumption.</li> <li>● Integrate alternative proteins into global cultures and cuisines and obtain religious food certifications such as halal and kosher.</li> <li>● Invest in and conduct R&amp;D to support democratized and distributed means of alternative protein production.</li> <li>● Engage in product and market research to identify most desired product attributes and most effective promotional strategies in non-Western contexts.</li> <li>● Explore innovative partnership structures to leverage and empower grassroots entrepreneurs and local established food companies in emerging markets.</li> <li>● Make targeted investments to build the alternative protein industry in low- and middle-income countries.</li> <li>● Work with locally trusted and respected social, political, environmental, nonprofit, educational, nutritional, celebrity, and media influencers to ensure they have accurate information and understand the holistic benefits of alternative proteins.</li> </ul>

## Hypothetical Scenario #5: The Alternative Protein Field is Unable to Secure Timely Private-Sector Investment

While this risk did not seem likely to most respondents, its impact was rated highly, underscoring the value of private-sector investment. GFI works to [increase the quantity and quality of private investment](#) by engaging directly with investors and providing informational resources to help them evaluate the business potential, consumer trends, regulatory considerations, and underlying technological innovations of the alternative protein industry.

Potential Risks	Risk detail	Risk Response Strategies
<p><b>Alternative proteins struggle to attract sufficient private investment</b></p>	<ul style="list-style-type: none"> <li>• Recessions could dry up investor funding (note: interviews were held in February 2020, mostly predating the economic repercussions of the Covid-19 pandemic). Pre-market companies doing R&amp;D in cultivated and fermentation-derived proteins would be particularly vulnerable.</li> <li>• If one or several noteworthy alternative companies failed, it could have a chilling effect on investment across the industry, reducing investor and corporate interest in alternative proteins.</li> <li>• An overabundance of alternative protein companies seeking investment could dilute resources and drive early-stage competition, leading to company failures.</li> <li>• Growth in supply could start outpacing growth in demand. For example, the initial success of refrigerated plant-based meat has caused many companies, including conventional meat companies, to launch products in that category. This explosion in product assortment makes it difficult for individual products to maintain enough sales velocity to justify their shelf space. In turn, this could lead to contractions as categories are scaled back after overambitious growth, potentially damaging the category.</li> <li>• Alternative proteins have attracted</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure that valuation and business growth is pursued rationally and strategically, and set realistic expectations for industry stakeholders and investors.</li> <li>• Pursue a balanced strategy of meeting short-term milestones while investing for long-term growth.</li> <li>• Engage in investor outreach and education to build strong connections between alternative protein companies and capital providers for every stage of maturity and growth.</li> <li>• Utilize events, consultants, online communities, and brokers to foster connections</li> </ul>

	<p>significant investment and attention, creating a speculative bubble that is raising valuations and expectations to levels that may be hard to justify or sustain in the long run and that may complicate future rounds of investment.</p> <ul style="list-style-type: none"> <li>• The alternative protein industry may be too focused on high-margin technology plays during this bubble period, neglecting the need to build the production capacity and durable infrastructure necessary for steady long-term growth.</li> </ul>	<p>between alternative protein companies and institutional and corporate capital providers.</p> <ul style="list-style-type: none"> <li>• Conduct consumer-facing campaigns to drive popular support for alternative proteins to ensure continued demand growth.</li> </ul>
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## Hypothetical Scenario #6: The Alternative Protein Field Experiences a Lack of Government Support

Experts across all three platforms rated this risk as medium likelihood and medium impact. Many interviewees indicated that government R&D funding would be very helpful, and that it is likely to come from at least some countries as the public health, sustainability, animal welfare, food sovereignty, efficiency, and nutritional benefits of alternative proteins are further demonstrated.

GFI has made securing governmental support and funding of alternative protein research a top organizational priority. GFI [advocates increased public R&D funding](#) for open-access research to improve the ingredients, inputs, processing, production systems, marketing, and other factors that affect end product quality and cost. If you would like to discuss regulatory or legislative risks to alternative proteins in further detail, please [contact GFI](#).

Potential Risks	Risk detail	Risk Response Strategies
<p><b>Governments continue supporting incumbent animal proteins while failing to provide R&amp;D funding, subsidies, and other support for alternative</b></p>	<ul style="list-style-type: none"> <li>• Some governments may decline to provide research support and funding at the same levels provided to animal protein research, limiting the rate at which scientific advances can help</li> </ul>	<ul style="list-style-type: none"> <li>• Engage in proactive campaigns with governments to advocate R&amp;D funding, subsidies, and other supportive measures.</li> <li>• Engage in lobbying via alternative protein trade groups and individual companies.</li> <li>• Demonstrate the value of open-access alternative protein research for supporting national employment, food sovereignty, food</li> </ul>

<p><b>proteins</b></p>	<p>the alternative protein industry grow and improve product quality.</p> <ul style="list-style-type: none"> <li>Some jurisdictions may decline to support alternative proteins, leading to cost, supply, demand, and regulatory imbalances.</li> </ul>	<p>security, and GDP growth.</p> <ul style="list-style-type: none"> <li>Work with influential social, political, environmental, nonprofit, educational, and media organizations to ensure they have accurate information and understand the holistic benefits of alternative proteins.</li> <li>Ensure alternative proteins can support the goals of policymakers focused on issues such as food sovereignty, food system resilience, nutrition, sustainability, etc.</li> <li>Conduct consumer-facing campaigns to drive popular support for alternative proteins.</li> <li>Demonstrate fair employment and ample workforce development opportunities for alternative industry participants such as farmers and food production workers.</li> <li>Conduct analyses on job creation potential among constituents of key policymakers who may otherwise be incentivized to protect the incumbent industry.</li> </ul>
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## Additional Risks

The following risks were contributed by interviewees as additional hypothetical scenarios worthy of consideration for preemptive risk mitigation strategies.

Potential Risks	Risk detail	Risk Response Strategies
<p><b>Difficulty building out vital supply chains; competition for capacity by other industries</b></p>	<ul style="list-style-type: none"> <li>Suppliers may not focus on alternative proteins if their profits and growth are coming from other industries, making it hard for startups to establish critical partnerships. A good example of this is the recent Covid-19-driven spike in demand for medical and pharmaceutical supplies, which may divert the attention and capacity of life</li> </ul>	<ul style="list-style-type: none"> <li>Growers and their suppliers can be incentivized to grow crops needed for alternative proteins.</li> <li>Balance the reliance on currently available agricultural inputs to support near term growth with long-term investment in novel input supply chains.</li> </ul>

	<p>science companies away from supporting technologies like cultivated meat.</p> <ul style="list-style-type: none"> <li>● Not enough alternative protein sources are available. While the industry is exploring raw materials such as fava beans, rapeseed, sunflower, agricultural residues, and algae, it is challenging to develop supplies of novel protein sources. Novel cultivars can take 5-10 years to develop, and it requires a lot of expertise, human capital, and resources to get to market.</li> <li>● Transitioning to novel crops is capital-intensive and requires training and supporting infrastructure. There is a relatively fixed supply of agricultural land, so planting novel crops requires that they carry a higher per-acre profitability than animal feed crops or other uses.</li> <li>● There is a limited amount of global fermentation capacity. Higher-value fermentation targets (pharmaceuticals, nutraceuticals, biofuels, etc.) could outcompete alternative proteins. While alternative proteins have limited control over demand from other industries, this issue underscores the need for additional investments in infrastructure.</li> </ul>	<ul style="list-style-type: none"> <li>● Support continued R&amp;D and investment into the infrastructure for the inputs and processes used to bring alternative proteins to market.</li> <li>● Build partnerships early with established companies in relevant industries, utilizing personal networks, consultants, events, and other matching mechanisms.</li> <li>● Conduct investor outreach and start new investment vehicles to support the expansion of needed infrastructure and incentivize partnerships with incumbent corporate players.</li> </ul>
<p><b>Global instability due to various crises could create conditions that are not amenable to</b></p>	<ul style="list-style-type: none"> <li>● Economic downturns related to global crises would likely have a chilling effect on investments in alt proteins.</li> <li>● Major climate/weather events may render current crops and growing techniques insufficient to meet growing</li> </ul>	<ul style="list-style-type: none"> <li>● Research and invest in creating supply chain redundancy and capacity.</li> <li>● Support a variety of companies and partnerships with diverse strengths.</li> <li>● Research and invest in</li> </ul>

<p><b>alternative protein industry growth</b></p>	<p>demand.</p> <ul style="list-style-type: none"> <li>Alternative protein production is currently reliant on some consolidated producers and key input suppliers.</li> </ul>	<p>making processing and production more decentralized and distributed.</p> <ul style="list-style-type: none"> <li>Conduct frequent analyses of threats and failure scenarios to guide alternative protein industry focus on strategic risk management.</li> </ul>
<p><b>Key alternative protein processes or inputs may not be as sustainable as anticipated</b></p>	<ul style="list-style-type: none"> <li>Some key agricultural or other inputs may prove to be less sustainable to produce than originally anticipated.</li> <li>Some key processes, such as separating protein out from novel sources, take a lot of energy and can generate lots of side streams.</li> </ul>	<ul style="list-style-type: none"> <li>Research and invest in a variety of inputs and processes to ensure access to multiple options if one key input or process proves untenable.</li> <li>Make sustainability a key goal and consideration as the alternative protein supply chain is being built out.</li> <li>Identify value-generating uses for every portion of biomass input, including residual starch and fiber fractions.</li> </ul>
<p><b>Some sectors of alternative proteins may outcompete others</b></p>	<ul style="list-style-type: none"> <li>A subset of alternative protein production platforms (among plant-based, fermentation-derived, and cultivated proteins) could end up developing such high-quality and affordable products that other types of alternative proteins would not be able to compete.</li> <li>As alternative proteins capture greater market share, alternative protein companies and brands may ramp up their competitive positioning against other alternative protein products rather than primarily against their animal-derived counterparts.</li> </ul>	<ul style="list-style-type: none"> <li>Capitalize on the fact that different alternative proteins exhibit complementary raw material needs. This can leverage side streams and leftover biomass input fractions from other alternative technology sectors.</li> <li>Embrace the distinct advantages offered by different alternative protein platforms, such as unique end product attributes or cost structures.</li> <li>Leverage the formulation capabilities offered by hybrid products that incorporate alternative proteins and other</li> </ul>

		<p>ingredients from a variety of plant-based, fermentation-derived, and cultivated sources.</p> <ul style="list-style-type: none"> <li>● Market different types of alternative protein products to different consumer segments based on their unique strengths and attributes.</li> </ul>
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## Recommended Next Steps

If you would like to dig deeper into the risk areas covered by our research, provide or receive support on addressing key risks, or find collaborators or risk mitigation solutions, please [contact GFI](#).

Many of the risk mitigation and avoidance strategies have been listed in GFI's [Solutions Database](#), which includes research, commercial, and ecosystem-level solutions designed to support the growth of the alternative protein industry.

Some of the risk considerations identified through our future-proofing analysis have been added to GFI's [Innovation Priorities](#) webpage, which lists the major needs in the current alternative protein market.

Given the dynamic and complex nature of the global food system and its interconnectedness with political, economic, socio-cultural, technological, environmental, and ethical systems, regular renewal of this future-proofing analysis is warranted. Over time, new threats may surface and the relative importance of various risks may shift. One of the keystone needs is to effectively integrate insights, tools, and expertise from case studies in other industries. Please [let us know](#) if you are interested in contributing to or conducting this type of research.

## Conclusion

The experts GFI interviewed were consistently optimistic about the long term prospects for the alternative protein industry. There was a clear consensus that alternative proteins will be able to overcome challenges and weather adverse developments. While success was not seen as inevitable, early wins from recent product launches and promising

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research results have provided the confidence to invest in building the industry for long-term resilience and competitiveness.

Alternative protein is a relatively small and young industry, but offers multiple advantages over rival systems. Despite its scale and maturity, industrialized animal agriculture has many weaknesses and vulnerabilities. The recent food industry issues laid bare by the Covid-19 pandemic are a stark reminder that food production is inextricably linked with wider global challenges. Currently, our food system contributes to climate change, deforestation, pollution, biodiversity loss, soil erosion and degradation, and water scarcity. Meat production also drives antibiotic resistance, animal infectious diseases, and increased risk of zoonotic diseases. These ecological factors are compounded by political, economic, socio-cultural, and technological developments that make for a complex and ever-evolving environment. In a fast-changing world, diversifying the global food system away from its reliance on animal proteins is the best way to feed a growing population in a healthy, safe, and sustainable way.

## Acknowledgments

The Good Food Institute would like to thank the many experts we interviewed for their generous donations of time and expertise. Their insights were invaluable in surfacing and prioritizing key challenges, constraints, and risks for the alternative protein industry, as well as identifying the most needed solutions to enable long-term sustained growth for the alternative protein industry. We are deeply grateful for their valuable input. A list of all expert participants who agreed to be identified is available in the [ASAP Full Report](#).

We appreciate the numerous GFI team members who guided strategy, contributed content, performed editorial review, and conducted promotional efforts for the ASAP project.

We also gratefully acknowledge the generous donors who fund the The Good Food Institute and make all of this work possible. As a 501(c)(3) nonprofit organization, GFI is powered by philanthropy, relying on gifts and grants from our family of supporters to fulfill our mission. Please visit [www.gfi.org](http://www.gfi.org) to learn more about GFI and the ways you can get involved and support this important work.

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## Appendices

### Appendix 1: Recommended Reading

#### **The Innovator's Solution**

*Clayton Christensen and Michael Raynor*

In this classic work on the dynamics of innovation and disruption, Christensen and Raynor outline how companies can avoid being disrupted by new technological and value models and instead become disruptors themselves. Characteristics of disruptive models can include lower gross margins, smaller target markets, simpler products, or differentiated features that may not appear as attractive as existing solutions when compared against ingrained performance metrics.

#### **How to Measure Anything**

*Douglas Hubbard*

Hubbard's work is a highly approachable guide to rigorous decision analysis. Defining measurement as a quantitatively expressed reduction of uncertainty based on one or more observations, Hubbard argues that anything can be measured. He stresses the importance of determining the value of information and defining what is actually important to measure, instead of just what is easy to measure.

#### **Blue Ocean Strategy**

*W. Chan Kim and Renée Mauborgne*

Blue Ocean strategy proposes that incumbent organizations should create new demand in uncontested market spaces, or "Blue Oceans," rather than compete head-to-head in well-established and fiercely contested segments. By questioning the existing paradigms (such as that animals are necessary for producing meat, eggs, and dairy), firms can unlock new demand, move simultaneously towards differentiated and low-cost product strategies, and find new value propositions with fewer tradeoffs.

#### **SMASH: Strategies for Market SHaping**

*Suvi Nenonen and Kaj Storbacka*

Recognizing that markets are complex adaptive systems that are constantly shaped by their participants, Nenonen and Storbacka argue that organizations need to shift from accepting the market as a constant to seeing it as a malleable ecosystem. They stress the need to focus on value creation and cooperation using non-predictive strategizing and experimentation.

#### **Who Gets What and Why?**

*Alvin Roth*

Roth won the 2012 Nobel Prize in economics for research on market design for non-monetary markets where matchmaking occurs, including making non-financial markets safe for buyers and sellers to reveal their true preferences. According to Roth,

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markets need to provide three things to function properly: 1) thickness, to bring together enough buyers and sellers to allow for value-added transactions, 2) safety, to allow participants to reveal or act on information they know, and 3) low congestion, to give participants sufficient time and means to conduct transactions that reflect satisfactory choices.

## **Appendix 2: Methodological Recommendations**

### **What would we do differently for future research**

Future iterations of future-proofing and premortem analysis would benefit from trying additional scenario prompts that vary the timeline and market share parameters. Additional benefits could come from focusing scenarios on specific product categories or geographic regions. Finally, our survey and interviews presented experts with a pre-populated list of risk factors and asked them to rate the likelihood and impact of each risk before soliciting open-ended feedback; future versions would likely be improved by soliciting the respondents' own risk scenarios before providing the list of prompts.

### **What we changed our minds about**

GFI's internal analysis initially placed high expected impact and likelihood ratings on two areas: food safety risks and the risk of alternative protein not being able to achieve scale and market penetration in developing countries. However, the experts we interviewed assigned lower impact and likelihood ratings to these scenarios and provided feedback that caused us to lower some of our ratings for these risk categories.

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## About the Authors

This memo is part of the Advancing Solutions for Alternative Proteins (ASAP) project, collaboratively authored by members of the ASAP team. If you have questions, please reach out to the corresponding author.

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## About GFI

The Good Food Institute is a global nonprofit building a sustainable, healthy, and just food system. With expertise across the scientific, regulatory, industry, and investment landscape, we are accelerating the transition of the world's food system to alternative proteins, using the power of food innovation and markets.



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