

Executive Summary of Alternative Protein Sector & Midwest Region Analysis

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Sente manages CVC as a Service platform to invest in pre-seed stage startups within Human Essentials (food, agriculture, and water) and Industrial Circular Economy domains, since 2017.

> ations on short list of international startups



We have a track record of locating and investing in promising human-centric startups in developing and emerging ecosystems across the globe.





Growing interest in alternative diets , and environmental awareness pave the path for industry growth	Emergence of Protein Highway not only as a R&D powerhouse, but also as the epicenter of commercialization
There are 20 * potential plant-based sources —wheat and soy are leaders, with pea rapidly growing, and hemp emerging	Novel ingredients and a rising protein imperative fuel the replacement of industrial meat with insects and fungi
Ongoing concerns for product taste, price , safety , and " naturalness " may pose significant barriers for lab-grown meat	Significant costs of R&D, and expensive production processes, and go-to market strategy pose challenges for new entrants

*See appendix for detailed breakdown of the plant-based sources

Commitment to this new market has been rewarded by investors



Ecosystem market map



Bio-Engineered Foods VC Deal Activity: 2021-2026





Note: Market map is a representative overview of venture-backed or growth stage providers in each segment. Companies listed have received venture capital or other notable investment during the review period.

Key drivers of industry growth

- 1) Sizable vegetarian market and growing interest in alternative diets: Consumers are becoming more informed about their food, leading to more thoughtful and healthier eating decisions. Vegetarianism, veganism, and flexitarianism (reducing meat consumption in favor of fresh produce) are increasing in popularity for both health and environmental reasons. One study indicated that the number of vegans in the US had grown to 9.7 million in 2019, up from 290,000 in 2004
- 2) Health benefits of meat alternatives: Overconsumption of certain types of meat has been linked to several health issues, including cardiovascular disease and colorectal cancer. According to a University of Oxford study, reducing meat consumption to established global dietary guidelines could help reduce the cost of public and environmental health issues by \$1.5 trillion globally by 2050
- 3) Environmental awareness and concerns about traditional food production: A recent study confirmed public perception of the environmental benefits of vegetarian and vegan diets, indicating that, compared with omnivore diets, vegan and vegetarian diets provide significant reductions in land-use impacts, water use, and greenhouse gas emissions (GHGs).3 Interest in improving the environment through the reduction of meat consumption is gaining traction among consumers and many prominent social activist investors
- 4) Advances in biofood sciences enabling more efficient production of bio-engineered foods: Food science innovations have allowed plant-based producers to create more realistic alternatives to meat & dairy products



Key attributes of early winners

Companies in the bio-engineered foods segment produce ingredients and consumer packaged goods food products. Providers sell primarily CPGs such as plant-based meats to consumers through restaurants and grocery stores. These companies tend to have high lab-based research & development (R&D) expenses. Novel ingredient providers sell primarily to food manufacturers, which use the products as an input.

Common industry key performance indicators (KPIs) for bio-engineered food companies include:

- Monthly recurring revenue and growth
- Revenue and client churn
- Customer acquisition costs and customer acquisition costs/lifetime value
- Return on research capital

In 2021, we witnessed the culmination of key milestones, including:

- The maturation of the plant-based sector and an extensive list of companies seeking late-stage VC funding
- Successful demonstrations of the benefits of fermented proteins in CPG, leading to new startups, product introductions, and VC funding
- Commercialization of the first cultivated protein product by Eat Just in late-2020 and early 2021

Case Study #1: Nobell Foods



Headquarters: San Francisco, CA Founded: 2016 Employees: 48 Funding Raised: \$75 M Description: Nobell Foods is creating cheese and other dairy products from plant-derived dairy proteins for the 99% of people who are unwilling to compromise on taste and price. Process: Mixes casein protein made through PMF with plant ingredients to create plantderived cheese that match the stretchiness, meltiness, and taste of animal-derived cheese.

Protein highway

Key Activities of the Protein Highway:

- Constructing an innovation focal point that expedites collaboration among prominent researchers to develop novel, value-added products from regional protein crops;
- Connecting ideas with entrepreneurs;
- Enabling companies for scale-up; and
- Showcasing regional opportunities to premier investors in agricultural innovation.

What Happened in 2021?

Launch of New NPC Fund

Natural Products Canada (NPC) is a \$50m earlystage fund that is launched to provide capital for startups in early stages of commercialization. The company has previously invested in 12 startups and successfully exited 2 portfolio companies.

First Production of Animal-Free Bioidentical Collagen

Geltor has completed its first commercial run of the animal-free collagen product, PrimaColl. The vegan collagen was produced in partnership with Arxada, over a five-month period that ended in late 2021. The company claims to have increased its capacity from 10,000 liters to millions between 2019 and 2021.

ADM & InnovaFeed's Insect Protein Partnership

The Paris-based startup will supply its black soldier fly protein to ADM's pet foods division in order to create "high-quality nutritional" products with "a significantly lower carbon footprint and land requirement" than conventional livestock protein.

Alt Protein Investments in Minnesota

New bills have been introduced to stimulate local investments into plant-based food industry as well as a \$2 million of funding to support research. General Mills, Land O'Lakes, Cargill and research institutions are actively seeking commercialization opportunities.



Opportunities

Plant-based and fermented meat and fish: The popularity of Beyond Meat and Impossible Foods has validated the market for plant-based meat & dairy. Although a slew of incumbent CPG companies such as Boca and MorningStar Farms have been selling fake chicken products for years, we believe today's providers are tapping into a different consumer base—one that is more focused on the health, environmental, and ecological impacts of the traditional meat industry. As plant-based proteins continue to increase in sophistication and ability to imitate animal-based meats, fermentation technology has emerged as an innovative tool, lending key sensory characteristics such as meaty taste and texture, in addition to superior digestibility and nutrition profiles. A prime example of these benefits can be found with Meati, a fermented protein provider developing whole cuts of meat analogs such as chicken breasts, steak, and jerky from mycelium. The company piloted its mycelium steak at restaurants in Boulder, Colorado, and is planning its first product launch in 2022. Other key fermented protein providers include bacon from Atlast Food Co. and animal-free

Dairy alternatives: Animal-free dairy products are experiencing rapid growth, leading to an increasingly diverse and crowded marketplace. Well-known providers include Silk and Soy Delicious, which sell single-ingredient dairy products made from soy, peas, oats, or nuts. Incumbents are increasingly disrupted by startups including Lavva, Kite Hill, and Forager Project, which are producing new animal-free dairy products that seek to better mimic dairy by improving the sensory characteristics. Some providers are using precision fermentation to produce real dairy without animals. Precision fermentation uses microorganisms as micro-production factories that produce substances identical to animal proteins, fats, and enzymes that can then be used as ingredients. The Urgent Company uses precision fermentation to produce milk proteins, from which it has developed a growing list of animal-free dairy products using fermentation include Superbrewed Food, ENOUGH Food, and Nature's Fynd. , whole-cut fish from Aqua Cultured Foods.

Case Study #2: Meati Foods



Headquarters: Boulder, CO Founded: 2016 Employees: 96 Funding Raised: \$128.4 M Description: Meati Foods aims to provide nutritious, clean, and satisfying all natural, whole muscle meat alternatives to everyone. Process: Focused on using proprietary, clean technologies to provide nutritious, fungi-based protein that everyone can enjoy and feel good about eating every day.

Opportunities (cont'd)

Cultivated proteins: Animal meat and dairy manufactured without animals and traditional animal agriculture remains the holy grail of alt-proteins due to the potential health, environmental, ethical, and food security benefits. However, significant challenges stand in the way of mass adoption including regulatory hurdles, production costs, and technological barriers to scaling production and producing a desired end product. Although Eat Just achieved a major milestone in 2020 as the first provider to sell a cultivated meat product after receiving regulatory approval in Singapore, there have been few regulatory advances since then. There remains no clear path to regulatory approval in the US or any other country— Singapore included. However, other cultivated meat companies, including Shiok Meats and Avant Meats, have established facilities in Singapore in anticipation of a friendlier regulatory environment. Other key providers include Future Meat, Upside Foods, and BlueNalu.

Tissue engineering suppliers: Approaches to producing cultivated agriculture are based mainly on existing medical technologies that rely on traditional laboratory equipment and technology. We believe several of these suppliers are significantly exposed to the cultivated agriculture opportunity, including:

- OSPN GmbH: develops modular molecular bioreactors to propagate animal cells
- Culture Biosciences: third-party "biomanufacturing-as-a-service," including lab testing facilities and a digital biomanufacturing platform
- Robur Health: genome-level metabolic modeling
- CELLINK: bioprinting technologies
- 3D Cultures: economic tools for biofabrication and tissue engineering

Novel ingredients and a rising protein imperative: The global population is growing rapidly and is expected to reach 9.7 billion by 2050, according to the United Nations.¹ To feed the increasing number of people, new sources of food must be identified, and existing raw materials expanded where feasible. Insects and fungi are two food sources that are less expensive and faster to produce than industrial meat. Investors are funding startups developing production techniques that can scale to meet the growing demand.

Case Study #3: Eat Just



Headquarters: San Francisco, CA Founded: 2011 Employees: 280 Funding Raised: \$464.5 M Description: Eat Just offers a plant-based egg substitute intended to provide healthy and nutritional food alternatives. Process: IApplies cutting-edge science and technology to create healthier, more sustainable foods and the key ingredient is protein from the mung bean and it is cholesterol-free, non-GMO, and packed with as much protein as many animal proteins and while it cooks and tastes like eggs.

Challenges & considerations

- 1) Regulation, politics, and social backlash: Incumbent animal meat producers are competing with the alternative meat industry across numerous avenues. For example, Missouri prohibited the use of the word "meat" to define food products "not derived from harvested production livestock or poultry." This would make it illegal to label plant-based meat alternatives as "meat" for marketing or packing purposes without qualifiers that explain the product is plant-based. Additionally, animal meat advocacy groups such as the Missouri Cattlemen's Association are lobbying to create more regulation of plant-based meat producers
- 2) Alternative meat development requires significant R&D: R&D represents a considerable barrier to entry for startups, given the high degree of technology needed to develop, produce, and refine plant-based meat. This will keep the pressure on margins, at least in the short term. While scale could increase margins, the industry likely faces commoditization over the long run
- 3) Expensive production process: Cultivated agriculture technology is based on tools and techniques initially developed in a lab for medical and biotech purposes. As such, the production process is currently performed in tiny batches at great expense. As the technology and production process have matured, costs have plummeted. Several startups are convinced that the price will continue to decline to less than \$5 per pound within the next two years, compared to \$3 to \$4 for regular beef. Despite advancements, scaling for mass production is complicated and may require the advent of new technologies, which will put mass production at least a few years away
- 4) Sales channel risk: The two largest plant-based meat companies, Beyond Meat and Impossible, initially pursued very different sales strategies. Beyond Meat focused on grocery stores with product placement in the meat section alongside animal meat products. The company has since expanded to restaurants, focusing primarily on fast food. Impossible initially focused on high-end restaurants, partnering with celebrity chefs to showcase the product. The company then expanded into lower-end fast-food restaurants and launched a growing list of CPG products including animal-free beef burgers, meatballs, and chicken nuggets. Targeting high-end restaurants allows companies to achieve greater margins and position their brand as a luxury good. Grocery sales allow access to a larger pool of potential customers, although at higher expense, which may be implausible for early-stage businesses. Restaurant sales have struggled during the pandemic, thus creating additional headwinds for this channel.
- 5) Consumers have an uncertain perception of lab-grown meat: Various studies on consumer perceptions of cultivated agriculture indicate that, despite interest in reducing health risks, environmental harm, and animal welfare issues, concerns for product taste, price, safety, and "naturalness" may pose significant barriers to adoption. Cultivated agriculture advocates must be careful to manage public perception of cultured meat and work to educate consumers on the benefits and considerations of cultivated agriculture versus industrial agriculture

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Appendix

Key Bio-Engineered Foods VC Deals, Exits, Companies and Incumbents

Key bio-engineered foods VC deals in 2021

COMPANY	CLOSE DATE	SUBSEGMENT	STAGE	DEAL SIZE (\$M)	LEAD INVESTOR(S)	VALUATION STEP-UP
Impossible Foods	November 23, 2021	Plant-based protein	Late-stage VC	\$500.0	Mirae Asset Global Investments	N/A
Nature's FYND	July 19, 2021	Fermented protein	Series C	\$350.0	SoftBank Investment Advisers	3.7x
Perfect Day	September 29, 2021	Fermented protein	Series D1	\$350.0	Canada Pension Plan Investment Board, Temasek Holdings	1.5x
Future Meat	December 19, 2021	Cultivated protein	Series B	\$347.0	ADM Ventures	N/A
Eat Just	September 20, 2021	Cultivated protein, plant-based protein	Series F	\$267.0	N/A	N/A
Bolt Threads	September 1, 2021	Plant-based protein	Series E	\$253.0	N/A	1.2x
NotCo	July 26, 2021	Plant-based protein	Series D	\$235.0	Tiger Global Management	N/A
Motif	June 16, 2021	Fermented protein	Series B	\$226.0	BlackRock, Ontario Teachers' Pension Plan	3.1x
Eat Just	March 23, 2021	Cultivated protein, plant-based protein	Series F	\$200.0	Qatar Investment Authority	N/A
The EVERY Company	December 7, 2021	Cultivated protein, fermented protein	Series C	\$175.0	McWin, Rage Capital	3.4x

Source: PitchBook Emerging Tech Research | Geography: Global | *As of December 31, 2021

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Key bio-engineered foods VC exits in 2021

COMPANY	CLOSE DATE	SUBSEGMENT	EXIT SIZE (\$M)	EXIT TYPE	ACQUIRER(S)/INDEX
Ginkgo Bioworks Holdings	September 17, 2021	Novel ingredients	\$14,225.0	Public listing	Soaring Eagle Acquisition
Laurus Bio	January 20, 2021	Fermented protein	\$33.6	Acquisition	Laurus Labs
NextFerm	January 26, 2021	Fermented protein	\$26.4	Public listing	Tel Aviv Stock Exchange
Peace of Meat	February 10, 2021	Cultivated protein	\$18.6	Acquisition	MeaTech
Protifarm	April 13, 2021	Novel ingredients	Undisclosed	Acquisition	Ynsect
Gaia Foods	August 9, 2021	Cultivated protein	Undisclosed	Acquisition	Shiok Meats
New Barn Organics	June 3, 2021	Plant-based protein	Undisclosed	Acquisition	Nestfresh Eggs
Sol Cuisine	May 19, 2021	Plant-based protein	Undisclosed	Public listing	Platform 9 Capital
Zoglo's Incredible Food	July 26, 2021	Plant-based protein	Undisclosed	Public listing	Canadian National Stock Exchange
Bugfoundation	September 22, 2021	Novel ingredients	Undisclosed	Acquisition	Hans Kupfer & Sohn

Source: PitchBook Emerging Tech Research | Geography: Global | *As of December 31, 2021

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Key bio-engineered foods VC-Backed companies in 2021

COMPANY	SUBSEGMENT	VC RAISED TO DATE (\$M)	POST-MONEY VALUATION (\$M)	MOST RECENT VC STAGE
Impossible Foods	Plant-based protein	\$1,862.5	N/A	Late-stage VC
Perfect Day	Fermented protein	\$711.5	\$1,585.3	Series D1
Nature's FYND	Fermented protein	\$463.0	\$1,750.0	Series C
Noblegen	Fermented protein	\$27.6	N/A	Series B
NotCo	Plant-based protein	\$363.0	\$1,500.0	Series D
Motif	Fermented protein	\$343.5	\$1,226.0	Series B
The EVERY Company	Cultivated protein, fermented protein	\$246.9	\$605.0	Series C
Ripple Foods	Plant-based protein	\$221.7	\$357.3	Series E
MycoTechnology	Fermented protein	\$198.2	\$521.8	Series E
Calysta	Fermented protein	\$172.8	\$284.0	Series D1

Source: PitchBook Emerging Tech Research | Geography: Global | *As of December 31, 2021

Key bio-engineered foods incumbents in 2021

COMPANY	HOLDING STATUS	CATEGORY	KEY PRODUCTS	EV/TRAILING REVENUE
Danone	PAR: BN	Plant-based & fermented protein	Silk & So Delicious plant-based beverages and dairy alternatives	1.9x
Tyson Foods	NYSE: TSN	Plant-based & fermented protein	Raised & Rooted plant-based meat	0.8x
Beyond Meat	NASDAQ: BYND	Plant-based protein	Plant-based burgers and sausages	8.3x
Oatly	FRA: 9ZX	Plant-based protein	Oat milks and dairy alternatives	5.3x
Nestlé	SWX: NESN	Plant-based protein	Garden Gourmet burgers & sausages, Wunda plant-based milks	4.2x

Key attributes of most common sources

Protein	Protein Concentration	PDCAAS	Allergen Risk	Commercial Stage	Flavor	Functionality	Cost (/kg protein)	Global Crop Volume (MMT)
Soy								
Pea								
Wheat	•		•					
Canola			•					
Chickpea			•					
Fava Bean			•					
Lentil			•					
Lupin	•		•					
Mung Bean			•					•
Navy Bean				•				•
Peanut			•	•				
Sunflower								
Almond				•				•
Corn		•				•		•
Oat	•			•				•
Potato	•							•
Quinoa	•							
Rice	•							
Sorghum	•			•				

Source: State of the Industry Report | Plant-Based Meat, Eggs, and Dairy (2020)

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