

FIRST LOOK

NOVEMBER 2022

FoodBytes!
by Rabobank

NEW WAYS OF WORKING

Reimagining the Way We Work

**Four Technologies and Solutions
to Create More From Less**

Challenging the way we look at the food and agriculture value chain and providing actionable solutions to the pressing need to create a more sustainable global food system.



The World is Getting Hot, Fast – and the Labor Market Has Gone Cold

The alarming climate crisis, supply chain disruptions and ongoing labor shortages are propelling the food system into an era of rapid innovation. As industry leaders, our shared perspective should reward critical thinking and champion a comprehensive strategy predicated on impact.

We must find new, smarter and less extractive ways of producing and distributing food from field to plate. We need to prioritize adoption of a wide set of technologies that will contribute to lowered agricultural emissions. If embraced at scale, these technologies will become the toolkit of an increasingly automated workforce.

Rather than focus on finding more people, our industry needs to expedite the shift towards increased automation. With supply side constraints and inflationary pressure continuing to push costs up, Fortune 50 food and agriculture players must radically improve supply chain efficiency and resiliency in order to maintain margin and reduce emissions.

This quarter’s First Look report will explore four critical ‘New Ways of Working.’ We’ll dive into exemplary industry collaborations to inspire fresh thinking and share predictions for the automated, resilient and flexible food system of the future.



Anne Greven
Global Head, F&A Innovation, Rabobank

New Ways of Working

ALUMNI FUNDRAISING STATISTICS

Of more than 400 FoodBytes! program alumni, roughly

100

are aligned with the New Ways of Working theme



Funding exploded in 2021, reaching

\$750M

compared to \$200M in 2020 and \$140M in 2019



So far in 2022, these companies have raised nearly

\$300M

behind 2021 numbers but still impressive in the current environment

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New Food Distribution

Achieving more efficiency in global supply chains is critical for global food system resilience amidst war's impacts and climate issues driving the need to reduce emissions.



What do we mean by new food distribution?

Concepts that shorten supply chains and answer the consumer demand for greater transparency and nutrition in the foods that they eat. While these technologies have the ability to optimize operations, they functionally reduce environmental impacts.

WHAT'S DRIVING INNOVATION IN FOOD DISTRIBUTION?

Supply chain breakdowns leading to empty shelves

The early stages of the pandemic were a boon for big CPG companies, which saw record profits in 2020 as consumers flocked to the middle of the aisle where familiar, legacy brands reside. As the pandemic progressed, for retailers especially, it was a different story: According to [NielsenIQ](#), retailers witnessed a \$82B constriction in CPG sales in 2021 due to depressed on-shelf availability attributed to supply chain disruptions.

Inflation's impact on already razor-thin margins

Grocery costs to consumers are up to 16% higher this year compared to 2021. Margins that widened for Fortune 50 food and beverage companies (before the winds of recession started blowing) are now being squeezed due to supply side constraints and inflationary pressure throughout the value chain. While retailers have a singular goal of reducing costs year-over-year, food manufacturers have seen their cost of goods go up 20% to 30% over the last 18 months, and it's now at its peak.

Leaps in technology improvement

The rise of direct to consumer grocery during the shutdown propelled companies to focus on their distribution mechanisms, from inputs and packaging to inventory management and last-mile distribution. Mission-based food distribution startups are developing stronger collaborations with retailers to scale technologies that also optimize operations and profitability. Peddling mature, proven technologies, they have become the superheroes of the food distribution puzzle. FoodBytes! alum Afresh has gained notice for their operating system that helps grocers reduce fresh food waste through inventory transparency and predictive forecasting. Their highly demanded food waste solution earned them \$115M in a Series B round earlier this year. Afresh operates in more than 3,000 stores across 40 states, reportedly helping grocers reduce waste by 25% or more. Beyond their sustainability impact, Afresh enables their customers to improve profitability - proving to be essential, especially in times of inflating food costs.

Regional distribution models going mainstream

FoodBytes! Global Head Anne Greven predicted that food supply chains would see a massive shift towards regionalization as a result of the pandemic, back in 2020. Her prediction has come to fruition. A late 2021 report on US manufacturers by supply chain platform supplier Thomas showed that 83% of manufacturers either have interest or strongly prefer moving their sourcing to more regional locations. This represents a significant increase from 54% in March 2020. Cost increases for freight and cold storage, ongoing instability in global supply chains and growing consumer concerns around environmental impact reduction have created massive headwinds for regional food distribution models. Even in the current inflationary environment, where we have previously seen shoppers swap to lower cost items, a recent report from [Business Insider](#) found that this year, shoppers are showing more commitment to their sustainability-minded lifestyles. This trend, driven by Generation Z shoppers, shows the resilience of buying organic. Outside of the home, "about four in 10 consumers who order takeout are still willing to spend more on sustainable to-go options."

INVESTMENT IN NEW FOOD DISTRIBUTION

On average, food wastage in the fresh food value chain is **20-30%**. And because wasted food requires the same amount of resources to produce as consumed food, there is big upside to optimizing the amount of fresh food consumed. The industry certainly has significant work ahead to make food distribution more efficient, but the good news is that large food and ag players are adding adaptation and resilience measures to their investment plans amid the growing economic impact of climate change, according to the [S&P Global 2022 report](#).

Both strategic and financial investment in distribution innovation catapulted from \$2.5B in 2020 to **\$4.9B** in 2021, with a cooldown as we moved towards global recession in 2022 with \$2.8B to date. FoodBytes! alumni [Imperfect Foods](#) recently announced their acquisition (merger) by Misfits Market. These waste-reducing, budget-conscious DTC grocery subscriptions have a **\$1B market cap** and will combine their complementary strengths to compete against first-mover DTC grocery players like Instacart, which reported **\$1.8B in sales** in 2021, perhaps pushing a new sustainability paradigm across the ecosystem.

On the M&A front more broadly, acquisitions of sustainability-focused early stage startups may heat up in 2023. According to Rabobank’s recent Corporate Finance Food & Agribusiness Newsletter, “As ESG leadership becomes one of the key market-recognized value drivers, deal makers are expected to build ESG-linked KPIs into their M&A strategies.”

‘New Food Distribution’ startups represent a small but mighty contingent of our FoodBytes! alumni at about 5%. Yet investment in these alumni, including [Imperfect Foods](#), [Farther Farms](#), [Smallhold](#), [Oddbox](#) and [Farmstand](#) set a new record in 2021, with **\$180M raised** across all alumni in the category, a 25% increase from 2020.

Farther Farms is a big-thinking startup that believes “the answer to the current capacity shortage in the cold chain isn’t to build more cooling infrastructure, it’s to bypass the need for it,” according to Co-Founder, Mike Annunziata. The company makes shelf-stable versions of traditionally refrigerated and frozen food products, and the team is collaborating with food manufacturers to scale their impact swiftly and globally.

In the U.K., Farmstand is collaborating with massive foodservice players to provide fresh, affordable and personalized meal delivery service for office and home consumption with a net zero carbon impact.



Innovation in Action

Not all corporate and startup collaborations make a big public splash about their collective sustainability impact. In fact, some of the most powerful collaborations are happening behind the scenes. FoodBytes! member R.D. Offutt (RDO), the largest potato grower in the United States, has been a supporter of Farther Farms cold chain-replacement technology since seeing its founders pitch at FoodBytes!, barely out of lab stage, back in 2017. With a long and successful history in potato growing and processing, RDO understood the impact that a shelf-stable french fry product could have for the food industry – and the benefits it could bring to a growing population.

Beyond financial investment in Farther Farms, RDO has connected the company to experts in potato processing, safety, and raw sourcing. These resources significantly accelerated the company’s pilot development stage, likely taking years off the rigorous process. With

RDO’s support, Farther Farms is working on the final stages of tech development in anticipation of large-scale manufacturing implementation. RDO’s long-term strategy is to build sustainable business value through strong partnerships, and the partnership with Farther Farms fits right into that prospect.

For Farther Farms Mike Annunziata, the partnership is just the beginning. The company plans to begin with shelf-stable potato products before expanding the category to fruit, vegetable, dairy, protein, and plant-based applications. “Our focus is to develop the underlying tech platforms upon which Fortune 500 food companies can build shelf-stable portfolios for a global supply chain.” Farther Farms measures its impact through emissions reduction, cost reduction, and accessibility expansion, all made possible by converting food products from the cold chain to the dry supply chain.

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Novel Food Processing

Newer, cleaner ingredients can extend shelf-life and improve nutrition.



What is novel food processing?

Creating more nutritious, sustainable and accessible food through new processing methods.

WHAT'S CATALYZING THE FOOD PROCESSING BOOM?

Desire for cleaner food

In addition to taste, texture and cost concerns, consumers are seeking out products with shorter ingredient panels comprised of whole food ingredients. Manufacturers are working to meet that demand by limiting their use of ultra-processed ingredients. Niche markets that promise higher margins are of strong interest, most notably in the 'clean' alternative protein space, to supply novel plant proteins, vegetable oils, and other ingredients to the sector. The projected market for alternative protein stands at a whopping \$290B in 2035, representing about 10% of the overall protein market.

Cost-driven reformulation

Reaching price parity will be a key driver for growth in alternative proteins. Blue Horizon and BCG estimate the cost of goods sold for realistic plant-based alternative proteins is still about two times the cost of conventional animal proteins and sometimes even three times for precision fermentation (and cell ag products are still far from comparable to animal proteins). Innovations ranging from better extraction technologies, larger scale texturing processes and eventually optimizing cell ag formulations will continue to drive prices down. B2B platforms like Brightseed's Forager AI platform utilize myriad data around sourcing, taste, texture, nutritional makeup to help corporates formulate better products while reducing ingredient costs. Startups like Allozymes unlock customized enzyme production capabilities for large corporates by offering cost-effective technology that creates clean, non-GMO additives designed to enhance taste, texture and nutritional profile.

Expanding beyond commodity crops

The majority of ingredient food processing utilizes commodity crops, specifically in the plant protein space, where the majority of alternative products rely on oilseeds and pulses like pea and soy. Yet there is a high risk of soil nutrient loss due to monocrop agriculture as these few alternative base ingredients continue to grow in demand. Both large food manufacturers and upstart brands are diversifying their primary plant-based ingredients beyond traditional commodities, using mung beans, lupins, mycelium, kelp and others to enhance texture, flavor and overall sustainability. The challenge remains scaling protein production to reach cost parity with animal proteins. This is something Impossible Foods explored in its early days before settling on the abundant (at the time) pea protein. But now, a decade later, startups like FoodBytes! alumni Eighth Day Foods and the Leaf Protein Company are much closer to commercially scaling protein processing for biodiverse ingredients like lupins and RuBisCo.

INVESTMENT IN NOVEL FOOD PROCESSING

Overall VC activity in the space has grown to **\$1.8B** in 2021 from \$860M in 2020, according to Pitchbook data. We expect to see acquisitions ramp as VC money becomes harder to access. Brand consolidation in the alternative protein space may also create more opportunity for JVs between next generation processing startups and traditional legacy players, who are struggling with their own plant based portfolios due to price premiums.

FoodBytes! alumni in Novel Food Processing saw a **2000%+ increase** year-over-year from 2020 to 2021 and set a new record for annual investment raising a combined \$471M. Cellular chicken company Future Meat raised \$350M, mycelium ingredient pioneer MycoTechnology closed a **\$48M** Series D, and clean processing waste reduction tech Nanoguard Technologies closed a \$3.25M Series A1 round.

In a shining example of corporate-startup collaboration, Orbillion Bio recently announced a partnership with Luiten Food (a European leader in premium meats) that will speed up Orbillion's regulatory approval process and propel the market penetration of their lab-grown Wagyu Beef to more than **1,200 distribution channels**. Together, they aim to bring cell-cultured meat to 35 countries in Europe.

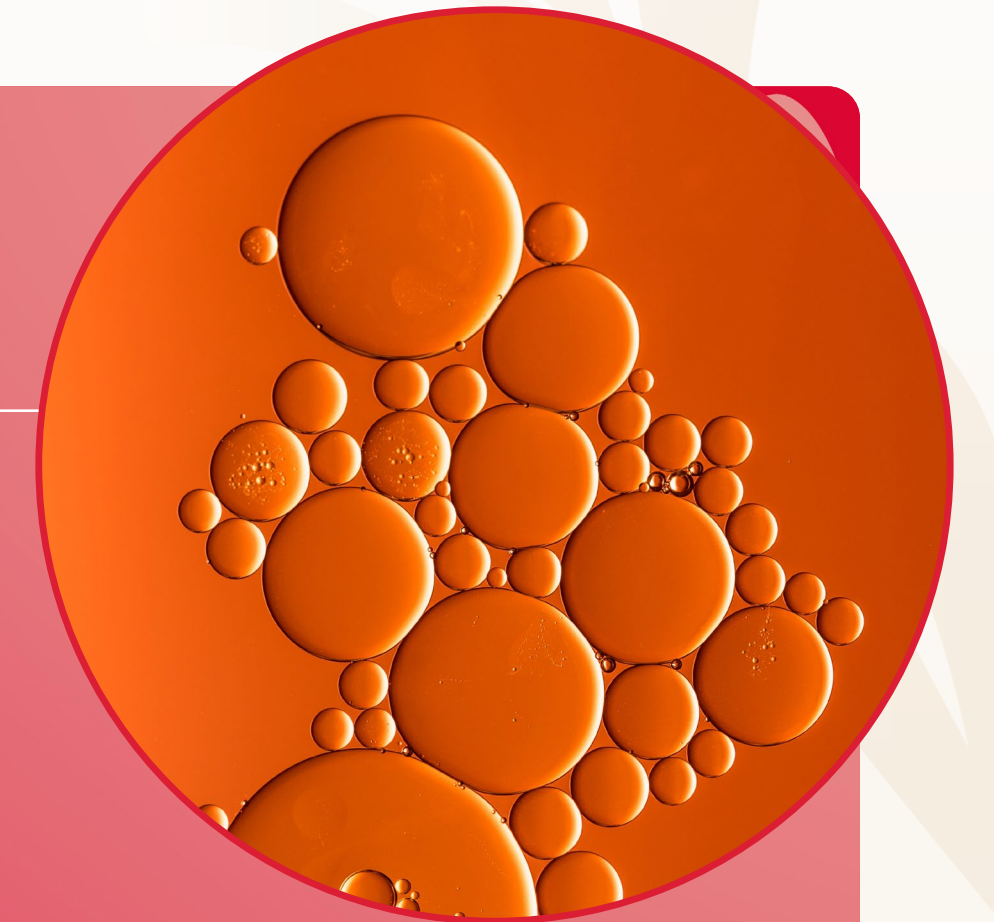
Another 2022 alumni, Celf Nutrition, has a patented and proprietary fermentation process for producing whole cell proteins at industrial scale. This process allows foodservice buyers to pay less for their ground beef amidst rising commodity costs while enhancing sustainability and nutrient density. The startup is collaborating with Cream Co. to grow their market share and reduce price by blending Celf's protein with traditional ground beef, creating an indistinguishable "beef" burger that is affordable, clean and nutritious. As sales of plant-based burgers have slowed due to price premiums, taste and clean label concerns, this collaboration provides a scalable solution that allow conscious consumers to feel better about eating beef.



Innovation in Action

Ginkgo Bioworks, a FoodBytes! member, runs a biotechnology platform that enables the discovery and programming of bio-based solutions, from food and agriculture, to industrial chemicals, to pharmaceuticals. Ginkgo works prolifically with early-stage biotech startups to help them expand their product portfolio and market-leading position. Earlier this year, Ginkgo partnered with FoodBytes! alum Phytolon, a natural food colorant pioneer specializing in red, pink and yellow hues through the fermentation of baker's yeast. For Ginkgo, enabling early stage companies like Phytolon to scale and succeed is part of their mission to make biology easier to engineer. For Phytolon, a partnership with Ginkgo enables them to expand their product portfolio and reach the scale and productivity they need to succeed in the market.

Ginkgo Bioworks' Senior Director of Business Development, Mervyn de Souza, said that the business utilizes their capabilities to remove the trade-offs when it comes to sustainable food choices. This is what he calls the "and" solution – making nutritious and delicious, sustainable and affordable food possible. Continuously exploring new pathways to do so is essential to their core business, according to de Souza, whether that is developed in-house or through partnership or acquisition of a smaller company. By constantly integrating the best technologies for cell programming, Ginkgo's customers can flexibly use what they need, when they need it to achieve their goals.



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Robotics And Automation

Automation robotics can lower labor costs, standardize production output, and protect employee health.

What constitutes robotics and automation?

Utilizing technology to mechanize labor-intensive processes, reducing risk and loss in manufacturing, operations and delivery.

WHAT'S DRIVING INTEREST IN ROBOTICS & AUTOMATION?

Labor shortage

The pandemic exacerbated labor shortages already felt in the industry, especially in foodservice. According to a 2021 report by [QSR magazine](#), 84% of operators said staffing levels are lower than normal, and 47% said they were more than 20% below pre-virus marks. Robotic solutions that work collaboratively with food workers to make their labor more efficient and sustainable represent one solution to this challenge. The other critical layer is data-driven process automation throughout the value chain, from waste calculation to menu planning and ingredient compliance.

Margin squeezing

In an industry with already razor thin margins, ingredient cost increases as a result of supply chain disruptions and ongoing geopolitical struggles are significantly affecting the foodservice sector. According to [RaboResearch's 2022 Foodservice Outlook](#), one major challenge for foodservice is deciding when to take on price increases and when to hold, absorbing prices in the form of reduced or margins in the hope of maintaining revenue growth and market share. We expect these factors to accelerate adoption of robotic interventions that have become an essential part of corporate growth.

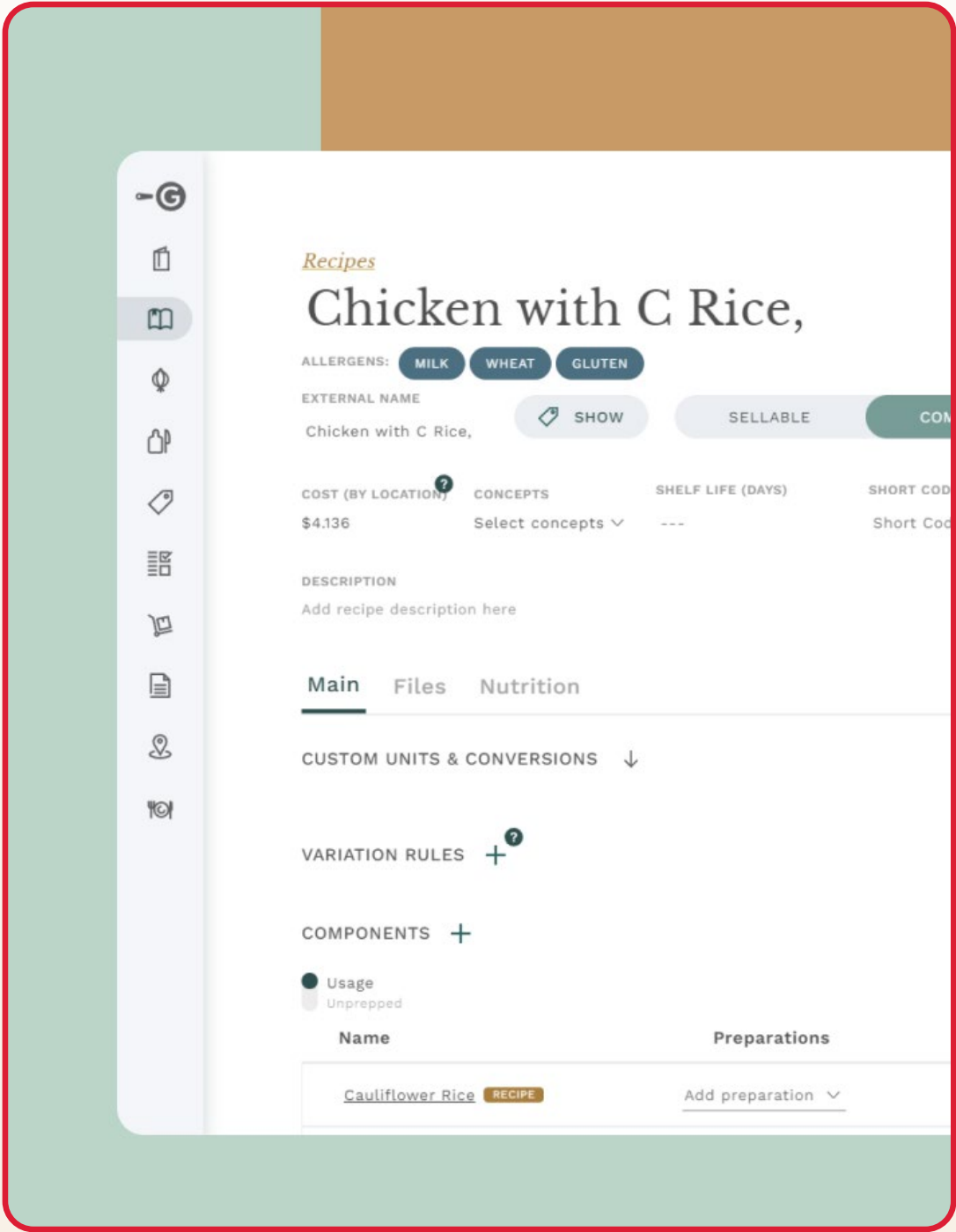
ESG reporting

Propelled by consumer demand and rising costs, the foodservice sector has been pioneering innovative emission reduction methods. According to another recent [RaboResearch report](#), the number of foodservice companies in the U.S. setting SBTi targets measures 20% of the sector by revenue. They are exploring menu reformulation to lower emission ingredients and incorporate more plant-based and locally produced ingredients.

INVESTMENT IN FOODSERVICE ROBOTICS & AUTOMATION

Investment into labor and automation startups in the food and agriculture space has increased steadily from 2019 to **\$456M** in 2022. Of startups in our FoodBytes! database working in New Ways of Working, **38%** are tackling robotics and automation. Investment in these alumni set a new record in 2021, with **\$84M raised**, representing a **180% increase** year-over-year from 2020. FoodBytes! alumni like [Kafoodle](#) and [Galley Solutions](#) are optimizing foodservice operations through menu planning automation, while alumni like [Dexai Robotics](#) and [Winnow](#) are utilizing hardware and software to make food production more efficient.

Winnow has been shrinking foodservice waste for nearly a decade and has evolved from a food waste reduction scale to a hardware/software play with computer vision and predictive analytics capabilities to reduce food loss and waste. The company’s tech has scaled prolifically across IKEA stores in 30 countries after being named the food waste technology partner to the global retailer in 2020. In August 2022, Ingka Group, the largest IKEA retailer, announced that it had cut food waste by **54%**, via its partnership with Winnow. In fact, IKEA is the first major corporation to meet the [Sustainable Development Goal](#) to halve food loss and waste by 2030.



Innovation in Action

FoodBytes! member [Astanor Ventures](#) recently invested in menu optimization startup (and FoodBytes! alum) [Galley's](#) Series A. As one of the leading impact investors in the space, Astanor strongly believes Galley's technology is one that can help restaurants be sustainable from both environmental and cost perspectives. Galley's "measurable reduction in food waste not only reduces costs for food service providers but also leads to a reduction of GHG emissions, water use and positive impact on biodiversity," said George Powlick, partner at Astanor.

Macroeconomic trends continue to expose the fragility in the

foodservice sector: operators facing price increases, supply chain disruption and continued labor challenges. In this environment, Astanor believes technologies like Galley's are critical to ensuring a regenerative agri-food system. "Galley is a unique solution that enables foodservice operators to make sustainable choices without raising costs, helping form the future food system that puts health and nature first."



04 Upcycling

Mitigating emissions from food waste can also recover costs for producers.

WHAT'S ACCELERATING INNOVATION IN UPCYCLING?

Climate pressure

According to [Project Drawdown](#), the global leader in ranking climate solutions, food waste is the single most effective solution to prevent global warming of more than two degrees Celsius. While many food companies have experimented with regional food rescue partnerships, corporates are increasingly looking all along their supply chains to identify high-impact opportunities to reduce the amount of waste entering the food system. For example, Ben & Jerry's has partnered with FoodBytes! alumni [Wheyward Spirit](#) to create a circular solution to waste at local dairy farms. Wheyward's award-winning spirit, derived from the liquid whey by-product of cheese processing, is a star ingredient in Ben and Jerry's [reformulated Dublin Mudslide](#) ice cream flavor. According to the release, Wheyward's "focus on environmental sustainability and local dairy farms makes it a natural, values-led sourcing partner for Ben & Jerry's."

Rising costs

Upcycling isn't just a marketing play. For players throughout the value chain it's synonymous with creating higher value products from legacy waste streams. Consumer understanding of the sustainable benefits of upcycling coupled with the aforementioned cost challenges is pushing companies from the farmgate, to the processor, to the retailer to rethink operations with circularity top of mind. The [ReFED Roadmap](#) to 2030 outlines that a key action area to address by-products and production line waste is to "maximize product utilization." Properly implementing upcycling measures could have a \$2.7B net financial benefit and create 2,800 jobs in the U.S. food system by diverting \$1.9M tons of waste. And that only touches one part of the world – the FAO estimates the economic, environmental, and social costs of food waste at USD \$2.6 trillion. This is equivalent to twice the annual food expenditure in the U.S. In a recent [RaboResearch deep dive](#) into the food waste landscape in Asia, it was noted that the APAC region is the source of over 50% of global food waste, and there are increasingly unified efforts to reduce those rates.

More standardization in the industry

The [Upcycled Food Association \(UFA\)](#) pioneered the world's first upcycling certification "to empower consumers to prevent food waste with the products they buy." Upcycled products are certainly on the rise: [according to FoodPrint](#), upcycled foods could be found in 9,000 supermarkets in 10 countries as of 2020. Several FoodBytes! alumni are actively part of the UFA, including upcycled pet treat startup [Shameless Pets](#) and pulp-based snack company [Seconds](#).

What is upcycling?

Creating value-added materials or ingredients from waste streams or food byproducts.



INVESTMENT IN UPCYCLING

All of the aforementioned factors combined have led to a concerted effort to invest more into upcycling technologies. Two of the aforementioned organizations, ReFED and UFA, recently launched the Food Waste Funder Circle to “empower capital providers to close the food waste funding gap.”

Upcycling comprises **8%** of ‘New Ways of Working’ startups in our database. Of the category subsectors, upcycling has the highest rate of selection from applicant to alumni – this is because it is a growing category for corporates and investors interested in sustainability-aligned and value-added applications. Investment in these alumni set a new record in 2021, with **\$20M raised**, a **106% increase** year-over-year.

One of our most successful upcycling alums, Outcast Foods, developed a proprietary food upcycling technology that can extend the shelf life of produce by processing ugly produce into powders while retaining nutritional value. Not only does this mitigate emissions from food waste and recoup costs, it also enables more access to nutrition. Outcast raised **\$10M of venture funding** in a deal led by District Ventures Capital in early 2021.



Innovation in Action

FoodBytes! member Thai Wah is a vertically integrated tapioca company with three main business prongs: B2B ingredient solutions, B2C noodle solutions and bioplastics. As part of their operations, factories produce pulp waste that, over the last five years, has been converted into biogas to fuel factories, and converted into feedstock for biofertilizers, soil improvers, and animal feed for the surrounding cattle farm communities. Thai Wah’s next-generation innovations double down on their path toward a circular economy - including upcycling the pulp into commercially viable sustainable packaging.

Thai Wah met emerging packaging company and FoodBytes! alumni Great Wrap, which pioneered a technology to create home-compostable cling wrap from potato peel waste. Thai Wah saw the apparent synergy and a path forward of joint development for home and industrial cling film, together catalyzing solutions for using

biodegradable and compostable plastics. Thai Wah’s investment arm, Thai Wah Ventures, participated in Great Wrap’s AUD \$24 million Series A round in July 2022.

Thai Wah’s investment strategy is based in the reality that the agri-food industry contributes over 20% of the world’s carbon emission – in their perspective, “linking the whole value chain to create innovation and sustainability from farm to shelf is the only way to move the needle on climate change and sustainability for our planet.”



Takeaways to Consider

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Takeaways to Consider and to Drive Action

'New Ways of Working' is about addressing a rapidly changing landscape. Utilizing new distribution methods, novel food processing, automation and upcycling, companies can mitigate risk, meet ESG goals, and improve margins. Corporate pioneers like the ones we've highlighted in this report are proving that 'doing well by doing good' is both actionable and profitable. Larry Fink propelled a shift in climate investing with his 2020 Letter to CEOs. Patagonia founder Yvon Chouinard has pioneered climate capitalism with the recent transfer of ownership of his outdoor gear company. Shareholders in Fortune 500 companies need to follow suit and reset their values.

F&A has been a margin business for the last century and margins have been consistently slim, with volume as the key growth metric. If every innovation gets green-lit or squashed based purely on economics alone (or the industry waits for regulation to catch up), it will be too late. It's time to change the volume paradigm to one of efficiency and resiliency.

To keep up with global food demand, we are eradicating our natural resources at an alarming rate. A 'business-as-usual' food system will not be able to feed 10B people by 2050. A major step in addressing this crisis would be to properly account for the true costs of food production. Traditional business economics are not inclusive of the increased resources it will take to grow food five, ten and 15 years into the future.

If leading food companies disrupt their businesses today by investing in new ways of working, they will ensure longevity and become the leaders of tomorrow. It's going to take commitment and partnership up and down the food value chain, but it is possible. FoodBytes! firmly believes that innovation is collaborative, and together we can re-imagine a food system that prioritizes planet, people and profit equally.



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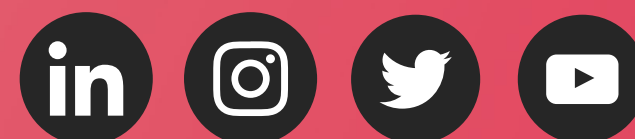
FoodBytes! accelerates collaboration between forward-thinking corporates, investors and disruptive startups in food and agriculture.

Our ever-evolving program has fueled numerous collaborations, including including those showcased in this report. In 2023, we plan to reach more corporates and investors and propel even more startups than ever before.

As part of this mission, FoodBytes! has built a digital connection platform to scale our impact. Global food and ag innovators across the value chain are now empowered to find the right investment and partnership opportunities with the tools available through the FoodBytes! digital platform.

Take action and join the future of FoodBytes! at www.foodbytesdigital.com

And don't forget to follow and engage with our social media channels:



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