

Appetite for disruption

How leading food companies are responding to the alternative protein boom



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About this report:

This report is an update on FAIRR's collaborative investor engagement on sustainable proteins, which is supported by 74 investors with \$5.3 trillion in combined assets.

Foreword



The fourth agriculture revolution is underway in the world of protein production.

This valuable report explains how global environmental and social risks and advancing technology are combining to reshape the food industry. It also provides industry-specific information on whether leading food retailers and manufacturers are keeping pace with the enormous disruptions in the sector.

It is becoming clear that a world of 10 billion people cannot meet rising protein demand by relying on intensive animal production systems. Factory farming is the largest user of freshwater resources in the world and is a primary cause of deforestation and growing antibiotic resistance. Livestock supply chains also account for 14.5% of global greenhouse gases, more than the transport sector. So we can't tackle climate change and fulfil the goals of the Paris Agreement unless food companies more rapidly diversify their protein portfolios away from animal agriculture.

Consumers worldwide are beginning to recognise these sustainability impacts and are choosing to eat less meat.

Action on the frontline

Large food retailers and manufacturers are on the front line of this transition. This report shows that many have now begun a journey to diversify the protein products away from being predominantly animal-based, and towards low carbon and less resource intensive sources that are plant-based. Almost 2 in 3 (64%) of the companies engaged by FAIRR used terms like “plant-based” and “vegan” in their annual reports or quarterly earnings calls in 2019, and all 16 major retailers engaged have expanded their alternative protein product portfolios in the last 12 months.

Yet despite this positive progress, the rate of change seems to be largely outpacing the speed at which big food is moving. Only two of the 25 firms have set a goal to increase their exposure to plant-based and alternative protein; and only four have undertaken a risk assessment to stress test the resilience of their protein supply chain.

That will concern investors. The market is already valued at \$19.5 billion globally.¹ From sausages to seafood, milk to mayonnaise, the plant-based market is expected to enjoy explosive growth and capture around 10% of the meat market within 15 years, according to the likes of Barclays and J.P. Morgan.

If food companies are to benefit from this they need to set strategic goals that are supported by relevant metrics to track and report on their protein exposure.

Twenty-first century technology has the ability to create protein substitutes that meet the taste, texture and flavour of meat, fish and dairy, without using the actual animal. For the first time since the green revolution 60 years ago, which created factory farming, food technology presents a viable path forward to meet global demand for proteins sustainably. Food companies should ensure they are part of the change or risk being left behind.

Jeremy Collier

Founder, FAIRR and Chief Investment Officer, Collier Capital



Introduction

The global food industry is currently undergoing enormous transformation led by rapidly evolving sector dynamics. Consumers are leading the charge, prioritising products and ingredients that are novel, nutritious, locally sourced and ethically produced.

Technology presents opportunities to improve product innovation and food safety but, equally, signals disruptive forces at work and amplifies risks that were once hidden by opaque supply chains. Hanging over this is the sector's unique vulnerability to climate change impacts, and the implications on agricultural sourcing in a 2°C-4°C warmer world.

Nowhere are these dynamics more intensely felt than in the world of protein. The sector has enjoyed unrivalled growth as meat production has increased by more than 372% since 1960.² A staggering 70 billion animals are slaughtered for food each year. The industry generates an economic value of more than \$1.3 trillion, a number that likely does not capture its full commercial value.³

However, the protein sector is under increasing scrutiny due to the impact of its scale on people and the planet. And consumers are paying attention. In the US, where per capita meat consumption is among the highest in the world, a Johns Hopkins study found that 66% of consumers are eating less of at least one type of meat.⁴ Similar trends in the UK and continental Europe have led to a gap in the market as consumers seek protein substitutes that meet the taste, texture and flavour of meat, fish and dairy, without all the health and environmental implications. This demand growth has coincided with a food technology revolution that can provide such substitutes without using the actual animal.

These developments have challenged the long-held thesis that the only way for the sector to grow (and feed a world of 10 billion people by 2050) is through the expansion of an intensive animal production system that prioritises cost efficiency over ethical, health and environmental concerns. For the first time since the advent of industrial animal agriculture nearly 60 years ago, alternative proteins – whether plant-based or cell-based – present a viable path forward to meet global demand for proteins sustainably.

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THE MAIN DRIVERS OF PROTEIN DIVERSIFICATION

Market Opportunity

Innovation Potential

ESG Impacts

Advocacy and Regulation

Protein diversification is a driver of business growth

Alternative proteins are now big business: plant-based foods are leading growth for the food sector. Milk alternatives have quickly grabbed market share and account for 13% of retail milk sales in the US.⁵ While meat alternatives still represent a small slice of total meat sales, they enjoy nearly 25% growth in annual sales, versus around 6% for the “fully cooked meat” category.⁶

It’s no wonder that terms like ‘plant-based’ and ‘vegan’ now regularly appear in company annual reports and quarterly earnings calls. In 2019, 64% of the 25 companies in FAIRR’s engagement refer to these terms in their annual reporting to investors and other stakeholders.

Figure 1
Companies are using plant-based products to drive sales growth (Source: FAIRR)

GREGGS

The UK’s leading food-on-the-go retailer announced a vegan sausage roll in February 2019. The company has said that total sales rose by 7.2% year-on-year in 2018 to £1.03 billion, compared with £960 million in the previous year.⁷ Since the launch, the company’s share price has enjoyed a record high, trading at £24 in July 2019 (vs. £10 same time last year). See our case study on Greggs on page 22.

DANONE

Danone’s first quarter earnings in April increased a modest 0.8%, but this was partly led by its plant-based segment. In May 2019, Danone’s CEO announced that he expects the company’s sales of its plant-based segment to match the yoghurt segment within 10 years.¹³ The company has made capital investments in two research centres focused on plant-based proteins in Denver, US and Ghent, Belgium.¹⁴

CONAGRA

The US-based packaged food company Conagra announced in March 2019 that the acquisition of Pinnacle Foods helped boost net sales by 35.7% to \$2.71 billion.⁸ The company’s share price enjoyed its best single-day gain since 1989. Pinnacle Foods gave Conagra access to key players in the plant-based space, including Birds Eye, a leading frozen foods brand and Gardein, which currently has around 11% of the meat alternatives market in the US.⁹ The company has said it sees the opportunity in plant-based alternatives in the range of \$30 billion.¹⁰

TESCO

In its presentation to investors and analysts in June 2019, UK’s biggest retailer announced plans to introduce a new line of plant-based food products, increasing its range to 300 from the 32 currently sold. Company shares increased by nearly 4% as “investors welcomed the ideas being discussed”.¹⁵

BURGER KING

Burger King’s parent company, Restaurant Brands International, reported slow sales growth in 2018.¹¹ Part of the company’s plan to increase store traffic is menu expansion. Burger King piloted the Impossible Burger (marketed as the Impossible Whopper) in its St Louis chain in April 2019. Sales surged by 28% and the number of unique customers rose by 15% in five weeks, prompting the burger chain to plan a national roll out.¹²

BEYOND MEAT

Beyond Meat’s newly-IPO’d stock has soared since it was first launched, but equally exciting is the increase in company annual revenues from \$16 million in 2016 to nearly \$88 million in 2018.¹⁶ In May 2019, the company told shareholders it expects to see revenues of \$210 million, and to report break-even earnings before interest, tax, depreciation and amortization (EBITDA) this year.¹⁷

Alternative proteins are a disruptive force for the food industry

The rapid rise of the plant-based market has producers, retailers and food brands playing catch-up. New entrants like Beyond Meat, Just and Impossible Foods have forced established players to innovate, invest and launch new products to tap into the growth opportunities provided by the market and avoid a complete disruption of their existing brands. A report by Deloitte found that expanding into the fast-growing plant-based market was a key driver of M&A activities in the food sector.¹⁸

It is worth noting that this disruption is happening with 1.0 versions of newly launched products, and will only increase as upstarts become established players, with more access to capital, improved technology and better economies of scale.

Analysts have begun to make predictions on the exact scale of this disruption. In May 2019, J.P. Morgan estimated that the total addressable market for plant-based meat will be worth \$100 billion in 15 years.¹⁹ Analysts at Barclays were more optimistic, predicting that the alternative meat market will reach \$140 billion in 10 years.²⁰ Both models predict that plant-based meat will capture around 10% of the meat market, replicating the market shift in dairy, and do not consider cultured meat in their analysis. In July 2019, UBS predicted that the market for plant-based foods would reach \$85 billion by 2030.²¹

US-based management consultancy AT Kearney considers both plant-based meat replacements and cultured meat in its new model. It expects conventional meat supply to drop by 33%, and for alternative proteins to capture 60% of the market share by 2040.²²

Figure 2

Global meat consumption (in billion US\$): By 2040, conventional meat supply will drop by more than 33% (Source: A.T. Kearney)

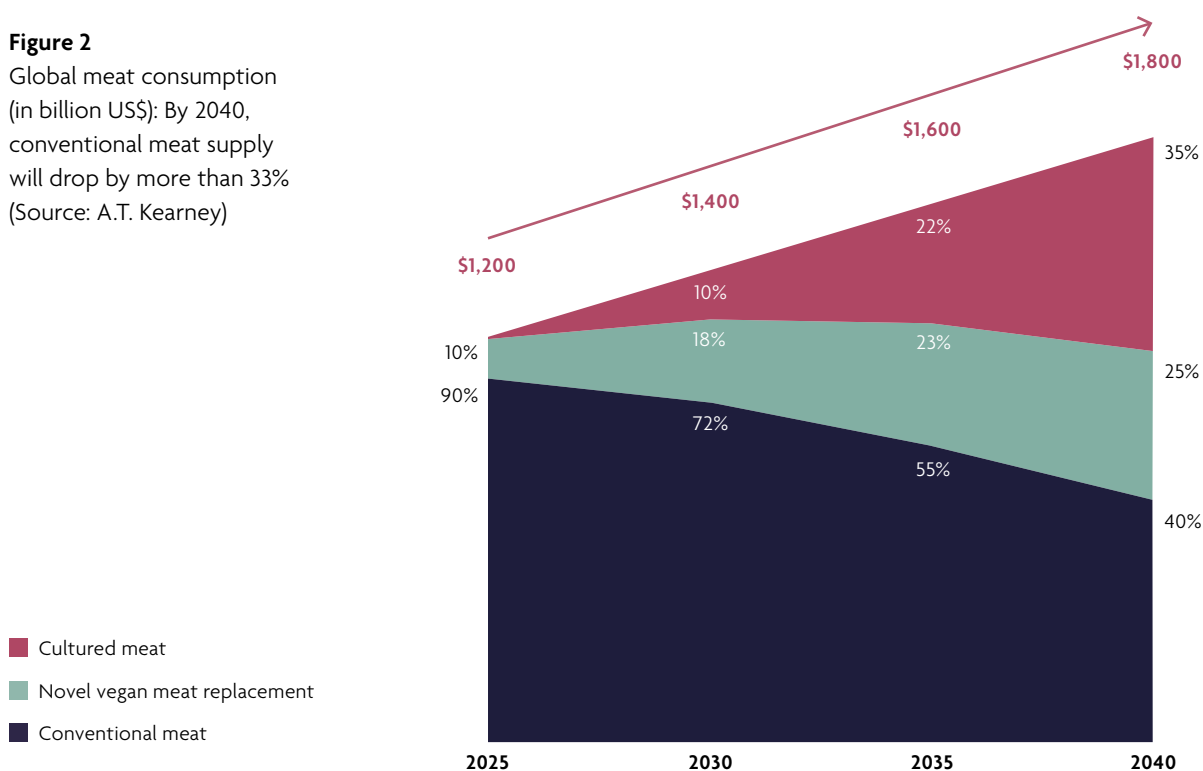
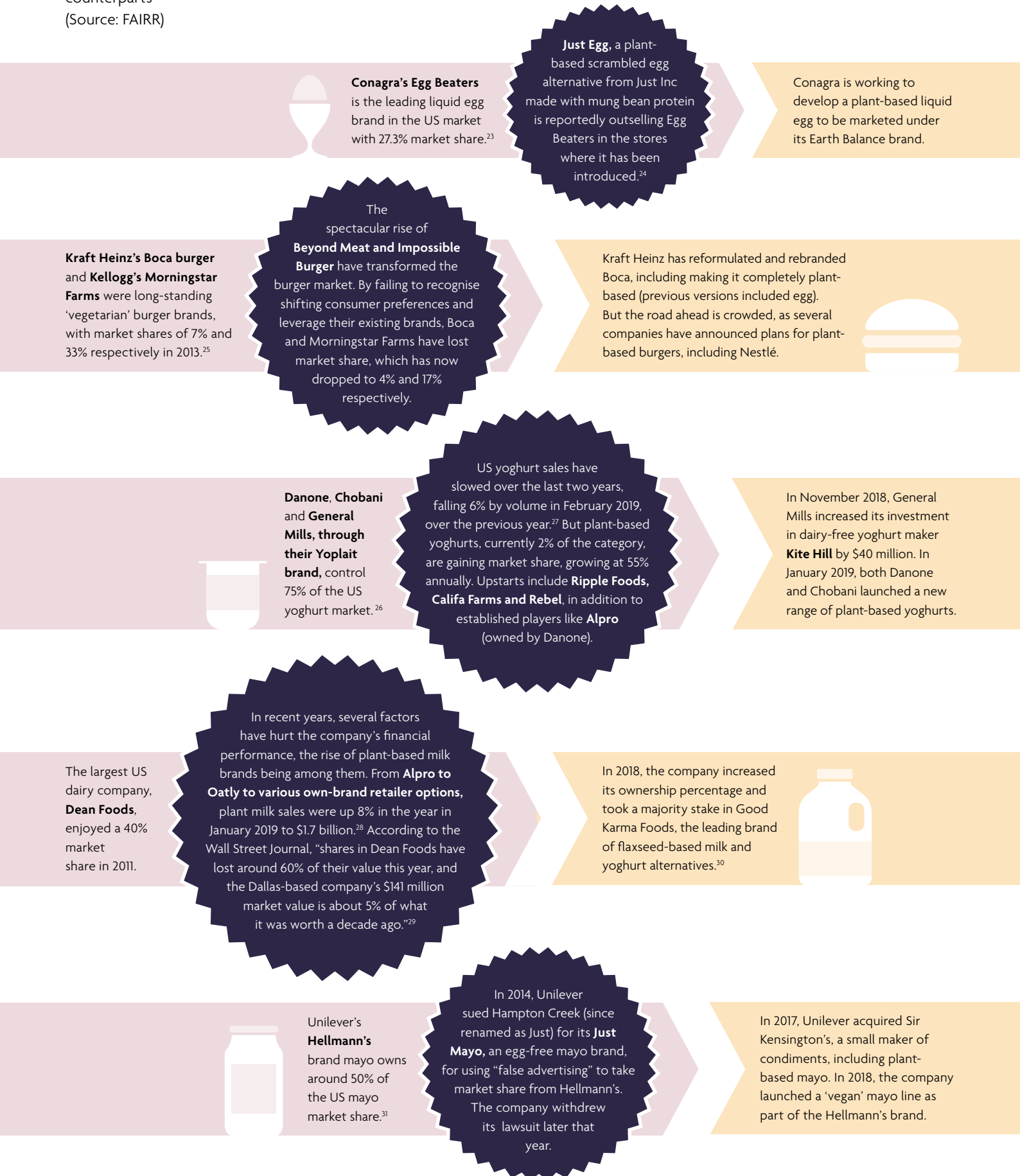


Figure 3

Traditional brands are being disrupted by their plant-based counterparts
(Source: FAIRR)

BRAND AT RISK → NEW ENTRANT → HOW THE COMPANY IS RESPONDING



Intensive animal agriculture presents growing ESG risks

Over the past 50 years, animal agriculture has transformed from a predominantly pastoral, family-owned farming system to a highly concentrated and industrialised system of livestock production. This method of production prioritises rapid weight gain, extensive drug use and close confinement to help companies breed, raise and process hundreds of thousands of animals each day in as short a time as possible. For example, WH Group, the world's largest pork company and owner of Smithfield Foods, processed nearly 60 million pigs in 2018, an additional three million pigs compared to the previous year.³²

This expansion has happened in the absence of fundamental regulatory safeguards that typically accompany industrialised facilities. In the US, meat companies still store thousands of tonnes of manure generated by these facilities in open pits called lagoons. This was standard practice for the country's largest pork producer, Smithfield Foods, until it was subject to 23 community nuisance lawsuits that resulted in penalties of around \$500 million.³³

At a macro level, livestock supply chains account for 14.5% of global greenhouse gases. According to the Food and Agricultural Organization (FAO), the sector is the largest user of freshwater resources, and grazing and feed production account for 80% of all agricultural land.³⁴ Over three-quarters of the world's soy supply goes towards feeding animals. Cattle, feed production and fish farming are the primary cause of deforestation, whether it is the forests of the Amazon, the savannahs of the Cerrado or mangrove forests in Asia.

One of the most serious impacts of intensive animal agriculture is its contribution to the growing risk of antibiotic resistance. In most countries, it is standard practice to routinely feed farm animals antibiotics to help them gain weight and survive close confinement. Reliance on antibiotics has been fundamental to the acceleration of industrialised livestock and fish production. It is only now, through sustained NGO advocacy and investor engagement (including an initiative led by FAIRR) that the largest brands have agreed to steward antibiotic use in their supply chains, but antibiotic use in emerging markets is continuing to grow.³⁵

Cattle, feed production and fish farming are the primary cause of deforestation, whether it is the forests of the Amazon, the savannahs of the Cerrado or mangrove forests in Asia.

On average, consumption of animal proteins is in excess of nutritional needs. Various studies have linked the overconsumption of animal protein, especially red and processed meat, to a variety of non-communicable diseases: a British Medical Journal study of half a million Americans found the risk of dying from cancer, heart disease, stroke, diabetes, infections, kidney disease, liver disease or lung disease all increased with the amount of meat consumed.³⁶

While this is predominantly a problem in Western markets, a diet heavy in processed animal proteins is increasingly an issue for emerging markets. For example, daily meat and dairy consumption in China averages at around 300 grams. Meanwhile, the country is facing rising obesity: within one generation, the percentage of Chinese children who are overweight or obese has risen from 5% to 20%.³⁷ For most global food companies, however, Asia and Africa present frontier markets for growth in meat and dairy production and consumption.

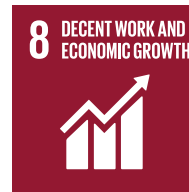
Finally, capital markets are now focusing on the sector's unique vulnerability to the impacts of climate change. Unpredictable weather events, floods and droughts are already devastating farm economies and have increased feed price volatility, from the American Midwest to New Zealand and Australia. In 2018, these regions suffered losses of over \$1 billion to their agriculture sector due to record floods and droughts.^{38,39}

A diversified protein portfolio is the most efficient and profitable path to meeting climate targets and the SDGs

For investors, it is clear that an expanding alternative protein portfolio is a lever for growth. More important, it is a fundamental and necessary component to manage a company's exposure to the most material ESG risks facing the food sector. A sole focus on supply chains that is isolated from portfolio composition will result in increasing capital investment to address risks as demand for meat, dairy and fish continues to grow.

- **Animal agriculture alone typically constitutes between 20%-30% of total value chain emissions** for a company whose product portfolio is significantly based on animal proteins.ⁱ To reduce emissions associated with their supply chains, global food companies will need to invest capital to support climate mitigation strategies such as feed additives (that reduce methane from enteric fermentation) and manure management systems to capture emissions and reduce their reliance on fertilisers to grow feed.
- **Food companies will need to devote resources to certification schemes and independent auditing systems** to eliminate deforestation from feed production and cattle grazing.
- **Tackling water scarcity, pollution and antibiotics overuse** will require companies to change farming practices (with higher costs) at multiple levels of their supply chains.
- **These initiatives will have to be balanced out with growing consumer and investor demand for better welfare practices**, including a system of production that emphasises responsible antibiotics use, slower growing breeds, no confinement and no routine mutilation, all of which will result in higher costs.
- **The impacts of climate change will also make some sourcing regions economically unfeasible due to extreme weather events and drought.** According to the recent Intergovernmental Panel on Climate Change (IPCC) report, 2°C of warming will result in a decline in livestock of 7–10%, with associated economic losses between \$9.7 and \$12.6 billion.⁴⁰

These factors will ultimately put pressure on an industry where net margins are small to begin with, averaging out at around 2-3%.⁴¹



There is no company that has yet been able to demonstrate measurable impact on any of these risks through its supply chain interventions. Many have not even begun the journey: of the 25 global manufacturers and retailers in FAIRR's sustainable protein engagement, only seven (or 28%) of companies have set targets to reduce supply chain emissions. The figure is even more dismal when it comes to their animal protein suppliers; FAIRR's analysis of 60 global protein producers shows that only 26% currently include some emissions from animal agriculture in their carbon reporting, and the majority of these companies, suppliers to the world's largest food companies, do not address risks such as water pollution, scarcity, antibiotics use or manure disposal. Despite years of working to curb deforestation from soy, most food companies will not be able to meet their target to halt deforestation by 2020.⁴²

To ensure sustainable growth, companies must complement their supply chain interventions with a systematic transition to ensure their protein portfolio results in better health outcomes and is in line with planetary boundaries. There is no better time to undertake such a transition, both to capitalise on shifting market trends and to leverage the innovation revolution in food technologies.

While there is empirical evidence of diet's impact on the environment, there are few examples of company case studies that show this link in the real world. But reducing exposure to a GHG-intensive commodity can have immediate benefits – in 2019, General Mills reported that the company decreased GHG emissions from agriculture by 17% versus its 2010 baseline, primarily due to reduced purchases of dairy.^{43,ii}

i Roughly estimated from company responses to FAIRR sustainable protein engagement.

ii Note: We do not know why the company reduced its dairy purchases, but this is not indicative of a strategic shift on portfolio. The company has just acquired Blue Buffalo, a petfood company, which increases its exposure to animal proteins significantly.



Comment:
The promise
of regenerative
agriculture

The idea of regenerative agriculture – a holistic system of farming that prioritises biodiversity, soil health, watersheds and ecosystems – has gained steam in recent years. Within the context of livestock farming, regenerative agriculture emphasises grass-fed animals, better welfare practices and the promise of carbon sequestration.

Global food companies are now beginning to adopt this approach. General Mills, for example, plans to expand regenerative agriculture practices on one million acres by 2030. The company released a lifecycle assessment with one of its animal suppliers (White Oak Pastures) that shows the net carbon benefit of farms that practise regenerative grazing (though academics have been less optimistic about the carbon sequestration benefits of pasture-fed farms.⁴⁴)

While regenerative farming holds promise, it is important to note that this type of farming is the antithesis of intensive livestock production systems, and thus is limited in its ability to scale. Even farmers agree that while regenerative farms should be replicated, they should not be scaled.

“There will never be a truly regenerative, humane, fair farm that will scale to a national level – much less multinational.”

Will Harris

Owner and rancher
White Oak Pastures⁴⁵

Protein diversification must be integrated into active stewardship strategies for the food sector

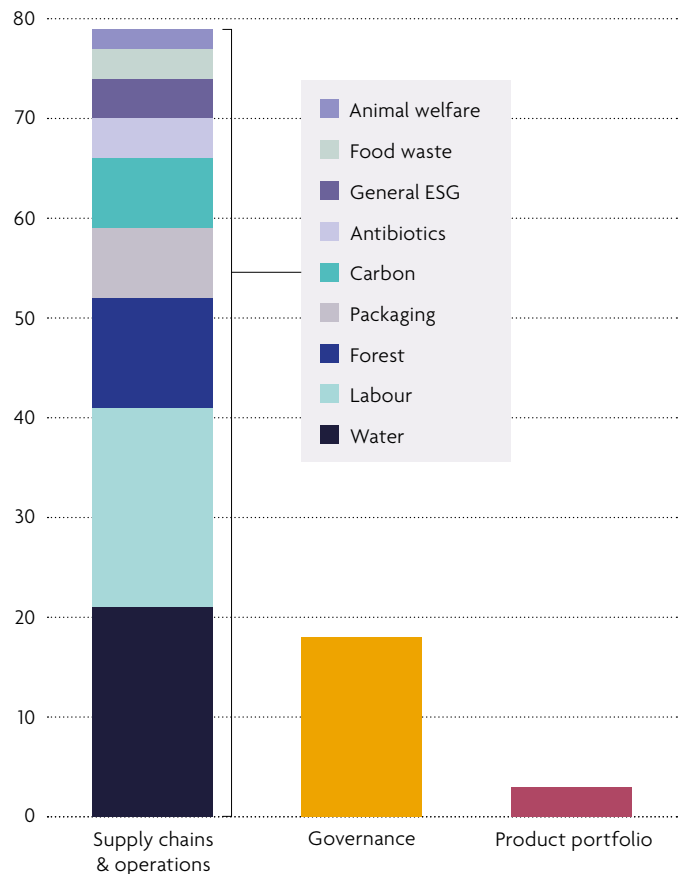
Protein diversification has the potential to transform a food company’s core business and value proposition: its growth, profitability, risk exposure and ability to compete and innovate.

Yet, an internal review of the Principles for Responsible Investment’s (PRI) collaborative investor platform shows that when it comes to collective engagements in the food sector, investors are predominantly focusing on supply chain issues. Only three (of 100) engagements/resolutions focus on company product portfolios, two of which focus on nutrition (the other is FAIRR’s own Sustainable Protein engagement).

While this does not capture individual investor engagements, it is an indication of investor priorities when it comes to stewarding their food equities. Clearly, there is an opportunity for investors to better engage companies on the composition of their product portfolios as a driver of growth and to manage growing business risks.

FAIRR’s Sustainable Protein Engagement is the only global collaborative engagement that measures how prepared food companies are when it comes to leveraging the shifting protein landscape. The engagement is supported by 74 investors with \$5.3 trillion in combined assets, and is working to encourage 25 global retailers and food manufacturers to develop a global, evidence-based approach to diversify protein sources away from an over-reliance on animal proteins.

Figure 4
Investor engagements in the food sector
 Investors are predominantly engaging companies on ESG risks in company supply chains and operations rather than on the composition of their product portfolios. (Source: FAIRR analysis based on PRI data.)



“There is a clear shift underway among consumers who are increasingly aware of, and concerned by, the climate impacts of the food they eat and how sustainably it is produced. Companies that don’t adapt risk falling behind and missing the growing market opportunity that is emerging. FAIRR’s research has been valuable in helping us to identify leaders and laggards. We will continue to engage with companies across the food industry to push them to ensure their practices are sustainable.”

Elly Irving

Head of Engagement
Schroders





INTERVIEW

Pat Brown

CEO, Impossible Foods

Impossible Foods was founded in 2011 by Stanford University Professor Pat Brown. Headquartered in Redwood City, California, the company develops plant-based versions of meat, fish and dairy products, replicating these products at the molecular level by selecting specific proteins and nutrients from plants. The company aims to give people the taste and nutritional benefits of meat without the negative health and environmental impacts associated with livestock production. Its flagship product, the Impossible Burger, was launched in 2016 and is now available in more than 9,000 restaurants in the US, Hong Kong, Macau and Singapore. To date, the company has raised more than \$750 million in disclosed financing.

What work has Impossible Foods done to estimate the resource intensity and environmental impact of its plant-based meat products compared to conventional meat products?

In 2016, Impossible Foods developed a lifecycle assessment audited by the third-party lifecycle assessment company Quantis. The assessment showed that, compared to a conventional burger from cows, an Impossible Burger uses: 95% less land, 87% fewer GHGs and 75% less water. The Impossible Burger 2.0, which debuted earlier this year at CES in Las Vegas, has an even smaller environmental footprint than the original recipe. It boasts 87% less water, 96% less land use and produces 89% less GHG emissions than beef from cows.

How do you expect that the market for your products will evolve? How do you plan to address issues such as recent challenges to labelling of plant-based products?

For thousands of years, people have enjoyed food that requires animals as the underlying production technology. In the same way, animals were the production technology underlying transportation for thousands of years.

But mechanised transportation (such as the train or car) has replaced the horse. Similarly, we now can replace the production technology for meat. Impossible Foods uses plants instead of animals to deliver all of the deliciousness, nutrition and convenience of animal-derived foods – without the cholesterol, hormones, antibiotics or enormous environmental footprint of animal-derived foods. In other words, you can make meat from animals, and you can make meat from plants.

We describe our flagship product, the Impossible Burger, as “plant-based meat” because the Burger’s key ingredient is the exact same ingredient found in animal-derived meat, in similar concentrations, with a similar nutritional profile, resulting in a similar experience for people who eat it – but our product contains no animals whatsoever.

The Impossible Burger is made through a simple combination of plant-based ingredients, including wheat protein, potato protein and coconut fat. The key ingredient is soy leghemoglobin. Soy leghemoglobin is a protein that carries heme, an iron-containing molecule that occurs naturally in every animal and plant. Heme is an essential molecular building block of life, one of nature’s most ubiquitous molecules. It is most familiar as the molecule that carries oxygen in your blood. Heme is super abundant in animal muscle. It’s the abundance of heme that makes meat uniquely delicious.

To satisfy the global demand for meat at a fraction of the environmental impact, Impossible Foods discovered a scalable, affordable way to make heme without animals. The company genetically engineers yeast and uses fermentation to produce soy leghemoglobin – the heme protein naturally found in plants. The heme in the Impossible Burger is identical to the heme humans have been consuming for hundreds of thousands of years in animal-derived meat – and while it delivers all the craveable depth of beef, it uses far fewer resources.

Consumers want and deserve transparency about the food they eat. That’s why Impossible Foods makes it crystal clear that our product contains no animals whatsoever. We would never want consumers to conflate the Impossible Burger with foods made from animals. Consumers are not at all confused about this. The fact that our product contains no animals is the driver of our market demand and our sales growth.

Bottom line: People love meat because it’s delicious, nutritious, versatile and affordable. People love meat not because it comes from animals, but in spite of the fact that it comes from animals. Until very recently, the only meats most people have ever known have been made using animals. Now we have a better way to make meat, and consumers clearly want it.

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To meet these challenges, we must embrace all of the technological tools at our disposal. We include our early, deepened understanding of the mechanics of healthy and the molecular level for each the interest in, and interest in, our food that allow us to really think in order to generate specific health goals, rather than waiting for them to be discovered by the natural world of nature.

The process of genetic modification has been central to progress in agriculture throughout history, including breeding of plants and animals (and other breeding). As a scientist who believes and works with modern research tools, I believe in this modified form to make our system efforts to address climate change, food security and the degradation of our food resources.

What is Impossible's strategy to make up, reduce costs and bring your products to price parity with conventional meat products?

Our mission is to transform the global food system to sustain and the opportunity is huge – so we are embracing on one of the most ambitious scale-ups of any company in the food industry. The entire goal of Impossible Foods is to make meat directly from plants that's better than meat from animals in every way that matters to consumers – primarily taste, nutrition, convenience and affordability. To get our plant-based burgers and other products of scale and achieve price parity



What are the challenges in bringing your product into a retail market? Is this something impossible is working towards?

We are excited to launch our product in retail in 2019. Demand for our product in restaurants has been strong and continues to grow, so our biggest challenge is ramping up production. In addition, we are working on retail packaging and placement. We have no additional information to announce at this time about our retail launch.

Do your products have the same shelf life, food safety

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or high temperature cooking, or common cooking methods like grilling or with a single shift of employees. That's enabled us to go from selling the Impossible Burger to all restaurants in 2018 restaurants in one year. We are now being a national roll-out through capacity to one million pounds of plant-based meat per month. That's enough to serve about one million quarter-pound Impossible Burgers per week. And we are also working with restaurant chains to explore the creation of a second plant

What are some of the potential applications for your company's products to be used in global food manufacturing and processing?

Our first product is the Impossible Burger, and we are also working on additional products including chicken, fish and dairy products. We have no additional information to announce at this time about subsequent launches.

The goal is to provide plant-based meat that doesn't require any special handling or storage instructions, restaurant and eventually retail employees and home chefs can use in the same way they use ground beef from cows. In general, you can keep ground beef from cows frozen for about three to six months, and once defrosted, you can keep it refrigerated from 1 to 4 days.

How is your company currently engaging with the conventional meat industry? Are there potential areas of collaboration?

We have productive conversations with representatives from the animal meat industry, as well as with food manufacturing executives from all types of categories. There's an extremely high awareness of Impossible Foods' flagship product in the food industry generally, so we have this robust network for meetings and discussions. In addition, we are an extremely transparent company. We've given tours and hosted food industry executives from around the world at our headquarters in California. We welcome outreach and feedback.



2019 market snapshot

The plant-based foods market maintained strong growth through 2018 and into 2019, with market analysis stating that “the shift towards flexitarian, vegetarian and vegan lifestyles is undeniable.”⁴⁶

New data showing market growth and opportunity for the plant-based sector is compelling, both on a global and regional level. A new Euromonitor four-year outlook released in February 2019 estimates that the global meat substitute market is currently worth \$19.5 billion globally.⁴⁷ For meat substitutes excluding tofu, current global market size is between \$4 and 5 billion.⁴⁸ In terms of growth estimates, forecasts for annual global growth vary between 6.8% and 9.4% CAGR to 2025.ⁱⁱⁱ

iii Market Research Future, April 2019: “meat substitutes market should touch 9.25B USD by 2023 at 9.4% CAGR during the forecast period”; Allied Market Research – increase from a value of \$4.175M in 2017 to \$7,549M in 2025, registering a CAGR of 7.7% from 2018 to 2025. https://www.researchandmarkets.com/research/3v9k3z/meat_substitutes?w=4. The meat substitutes market is estimated at \$4.63 billion in 2018 and is projected to reach \$6.3 billion by 2023. It is projected to grow at a CAGR of 6.8% during the study period.

US

New market analysis by GFI and the Plant Based Foods Association shows that between 2018 and 2019, retail sales of plant-based meat grew 11%, and reached \$4.5 billion in sales over this period.

This is mirrored across individual product categories such as milk, cheese, creamer and yoghurt, where plant-based foods are significantly outpacing the sales growth of animal-based foods, and animal-based yoghurt and milk are demonstrating declining sales (see graph below). In terms of sales, plant-based milk was the largest individual category, with retail sales of \$1.6 billion, constituting 13% of the total US retail milk market. Cow milk declined by 3% over the same period. The category has a household penetration of 37%, meaning a third of US households purchase plant-based milk.⁴⁹

On a country level, the US remains the largest market for meat substitutes. Barclays Research estimates the US market to be three times the size of the UK, which is the largest market for a European country (€1.2 billion vs. €0.4 billion).

Figure 5
Dollar sales growth (%) in plant-based categories compared to animal-based categories, year ending April 2019
(Source: Good Food Institute)

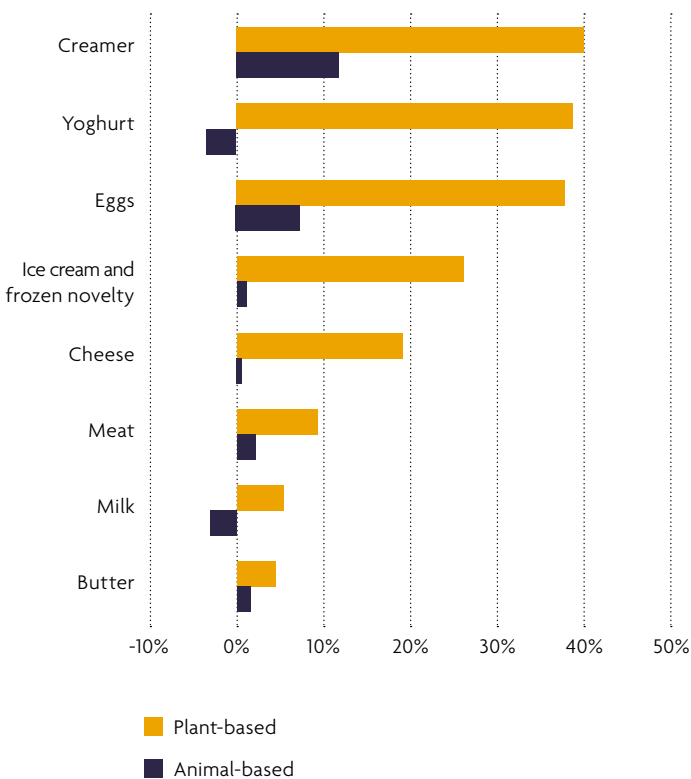
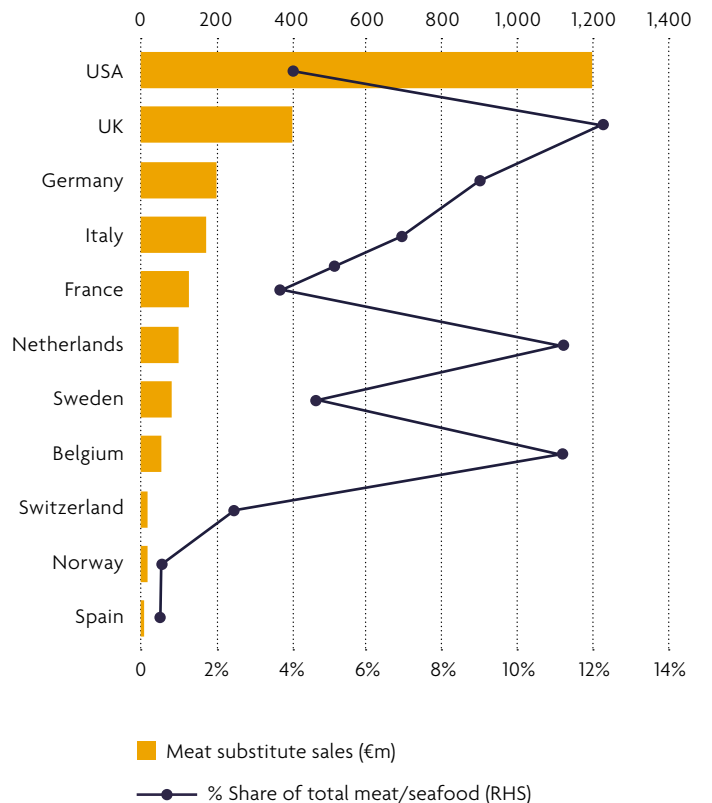


Figure 6
The US meat substitute market is far ahead of Europe and is three times larger than second placed UK
(Source: Barclays Research, Euromonitor)



Europe

Growth in Western Europe has remained relatively stable over the last three years with growth rates at around 10%, despite stable consumption for traditional meat products. A 2017 report from Rabobank suggested that alternative proteins could represent one third of total EU protein demand growth over the next five years.⁵⁰

In terms of market size, Europe is substantially smaller than the US. However, European countries typically have higher market penetration for alternative proteins. For example, market penetration in the UK is at 12%, which is three times that of the US, at 4%. Similarly, other major European markets including Germany and Italy show higher market penetration rates between 9-12% (see Barclays' graph above).⁵¹

Asia Pacific

Traditional diets in Asian countries commonly incorporate non-animal sources of protein – for example, plant-based proteins such as tofu are a standard part of Chinese and Japanese cuisine. Similar to Western markets, however, there has been a dramatic spike in meat and dairy consumption in recent years. In China, for example, dairy consumption per capita has gone up from nearly zero in the late 1980s to 30 kg per year today.⁵²

While Asia is the new frontier for meat and dairy consumption, it could just as well be the same for alternative proteins. Driven by health and food safety concerns, consumers are beginning to understand and respond to the benefits of switching to alternative proteins. For instance, Mintel research concluded that “Asia is a hot market for new alternative meat formats” and found that “over two in five urban Indonesians followed a plant-based/vegetarian/vegan diet in 2018, while three in five urban Thais cite avoiding red meat due to health reasons.”⁵³ In China, annual sales of plant-based meat have demonstrated consistent year-on-year growth rates of around 15% since 2014.⁵⁴

According to Allied Market Research, this region will show exponential growth in demand through 2025 with the highest CAGR of any region globally (9.4% in terms of value),⁵⁵ driven by rising disposable income, and reflecting a nascent shift in social attitudes, as consumers become increasingly aware that current levels of meat consumption are environmentally unsustainable and can damage human health.

10%

European growth rates for alternative proteins are at 10% for the last three years



Greggs' vegan sausage roll drives sales and attracts new customers

In May 2019, Greggs reported an “exceptional” 11% rise in like-for-like sales in the first 19 weeks of the year. Boosted by demand for the vegan version of its signature sausage roll, shares jumped more than 13% – a record high for Greggs.

Greggs, one of the UK's leading food-on-the-go retailers, said a strong start to 2019 had continued in recent weeks after it ramped up production of its vegan sausage roll, which is now available in all of Greggs' shops and is a top-five best-selling product.

In 2018, 20,000 people signed a petition calling for a vegan version of the sausage roll, Greggs' most iconic product, prompting Greggs to work closely with Quorn to develop a meat-free filling. Importantly, the taste is as close as possible to the nation's favourite meat sausage roll, using familiar herbs and spices and "wrapped in 96 layers of Greggs' own puff pastry".

The food-on-the-go retailer was surprised by the popularity of the vegan sausage roll when it was launched in January, which quickly sold out as it capitalised on 'Veganuary', the UK's growing demand for plant-based alternatives to meat, and an imaginative media campaign that hailed the product as the new generation of sausage roll technology, in a parody of the Apple iPhone campaigns.

The roll became Greggs' fastest-selling new product in the last five years. What was originally conceived as a limited edition product for January is now a permanent item on the menu, and is inspiring future product development.

Greggs' analysis shows that one in eight buyers of the product are new customers, and that since launch, awareness of the company's brand has reached its highest level since 2012 (up 13%), with YouGov BrandIndex showing customer perception and positive sentiment up by 8.2%.

Greggs continues to buck the wider trend on UK high streets, where some retailers are struggling to compete as sales shift online and the cost of running stores rises, and the popularity of the vegan sausage roll is an example of its ability to stay relevant in a changing market.

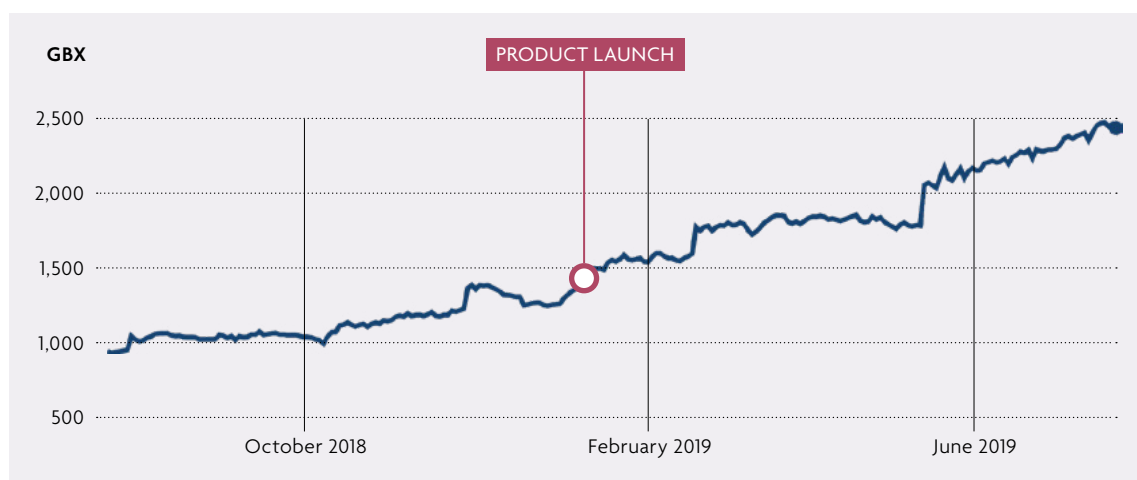


Figure 7

Greggs experienced an increase in valuation post vegan sausage launch (Source: Google Finance, 22 July 2019)



Technology and innovation overview

Food technology innovation picked up pace in 2018, with an explosion of activity from both start-ups and mainstream industry players. This innovation has been accelerated by an influx of investment into alternative proteins over 2018, with an estimated \$673 million invested in the plant-based food industry alone.⁵⁶

Although total capital invested in 2018 was lower compared to 2017, due to Danone’s \$12.5 billion acquisition of WhiteWave Foods in 2017, the number of investments in 2018 increased by 39% compared to the previous year to reach a total of 46 deals.⁵⁷

In addition to a growing number of angel investors, venture capitalists, and accelerators and incubators infusing cash into the space, there is an increasing amount of investment activity from strategic food industry investors, including corporate venture capital arms such as General Mills’ 301 Inc and Kraft Heinz’s Evolv Ventures, as well as direct investments from producers such as Mapleleaf Foods, Cargill and Danone.

Areas of innovation

Primary innovation in food technology can be categorised into three technology areas. While these areas are presented as discrete categories in this overview, it is important to remember that use cases for the technologies as they go to market could be products that sit on a spectrum and exist as hybrid products, utilising more than one of these technology approaches to create a final product.

Plant-based proteins

These constitute products that replicate animal proteins in texture, flavour and aroma through use of plant sources that can mimic the structure of animal proteins on a molecular level (e.g. mung bean, lupin, algae, mycoprotein) and/or through novel processing methods (e.g. extrusion, shear-cell technology). These products are helping to rethink ‘meat’ and ‘milk’ as products defined by their molecular structure and composition rather than their animal-based origin. Examples include:

- Soy or nut-based milks
- Mycoprotein-based mince
- Soy-based chicken nuggets
- Seitan-based sausages
- Pea protein-based burgers

2019 current status

As companies in the plant-based protein space have focused on the challenge of manufacturing animal protein to create products for the mainstream consumer rather than a niche audience of vegetarians and vegans, product quality has improved significantly. This has led to increased demand from mainstream consumers and a growing number of plant-based products in supermarkets, restaurants and food companies, increasing the potential for plant-based protein to achieve mainstream appeal.

In terms of specific product categories, plant-based burgers led the expansion in 2018. Two major producers of plant-based meat, Beyond Meat and Impossible Foods, made significant progress in scaling and brand awareness, with both having exceeded a market cap of \$1 billion in 2018.

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The plant-based meat market is expected to reach \$1.5 billion by 2025, up from \$1 billion in 2018. The market is expected to be led by Beyond Meat and Impossible Foods, with Beyond Meat expected to reach a market cap of \$1 billion by 2025. The market is also expected to be led by plant-based milk, with soy-based milk expected to reach a market cap of \$1 billion by 2025.

The plant-based milk market is expected to reach \$1.5 billion by 2025, up from \$1 billion in 2018. The market is expected to be led by soy-based milk, with soy-based milk expected to reach a market cap of \$1 billion by 2025. The market is also expected to be led by pea protein-based milk, with pea protein-based milk expected to reach a market cap of \$1 billion by 2025.

Following this success, others are following suit. Nestlé is launching its plant-based Incredible Burger into retail in Europe and the US, and the burger is being trialed by McDonald's in Germany and will also be sold in Israel.⁵⁹ JBS announced in May that it is launching its own plant-based burger in Brazil.⁶⁰ Whole Foods has just signed an exclusive US distribution deal with a British-based burger company, Meatless Farm.⁶¹ This prolific activity indicates that the plant-based burger offer is only going to grow as the category leverages industry players' product development expertise, distribution networks and production infrastructure.

Biotechnology approaches

Two new approaches to alternative proteins are creating real animal proteins without the animal, rather than replicating these proteins with plant ingredients. Both of these technology areas build on recent advances in biotechnology and hold immense promise for efficient and sustainable protein production in the future.

- **Fermentation technology** is already used for selected existing food applications, such as rennet in cheese, and also produces the heme used as a key ingredient in the Impossible Burger; it is poised to expand to broader product categories, such as dairy. Specific animal proteins such as caseins found in milk and ovalbumin in egg can be produced without the animal through a fermentation or brewing process where yeast organisms or another host are programmed to produce the proteins. These proteins are identical to proteins produced by an animal and can be combined with other ingredients to create identical protein products, such as milk, cheese or egg whites.
- **Cell culture technology** refers to the growing of meat cells in a nutrient-rich culture medium to create whole pieces of meat instead of harvesting meat from animals. The process involves many of the same tissue engineering techniques that were developed for regenerative medicine.

Fermentation technology

Specific animal proteins such as the caseins found in milk and ovalbumin in egg can be produced without the animal through a fermentation or brewing process where yeast organisms or another host are programmed to produce the proteins. These proteins are identical to proteins produced by an animal and can be combined with other ingredients to create identical protein products, such as milk, cheese or egg whites.

In the case of milk production, for example, a yeast organism is modified by inserting a gene carrying the blueprints for casein, a milk protein. Through this process, the yeast is programmed to produce casein identical to the casein produced by cows. The yeast culture is brewed using a sugar mixture as feed stock in the same process of fermentation that is used to produce other products such as beer and bread. The yeast, sugar and protein mixture is filtered to isolate the casein, which is removed from the mixture. The casein is combined with the other components of milk – water, minerals and fats – to create animal-free milk, which matches the nutritional profile of conventionally produced milk.

Individual proteins have been produced in this way since the late 1970s, when scientists created a process to brew insulin. Today most insulin is made by engineered yeast or bacteria. This production method has made insulin supply safer, more consistent and identical to the insulin humans produce.

There are also established food product applications. Rennet is traditionally extracted from the inner lining of calves' stomachs, but in 1990, the FDA approved a bacteria genetically engineered to produce rennet. The majority of cheesemaking uses rennet enzymes from genetically engineered bacteria, fungi or yeasts. Rennet harvested from cell cultures is purer, more consistent and less expensive than animal-derived rennet.

Products currently on the market that include proteins produced through fermentation technology include the Impossible Foods burger, which uses brewed heme as its 'secret ingredient' to create a realistic meaty taste. Additional applications in development include milk, egg and gelatine protein products and ingredients.

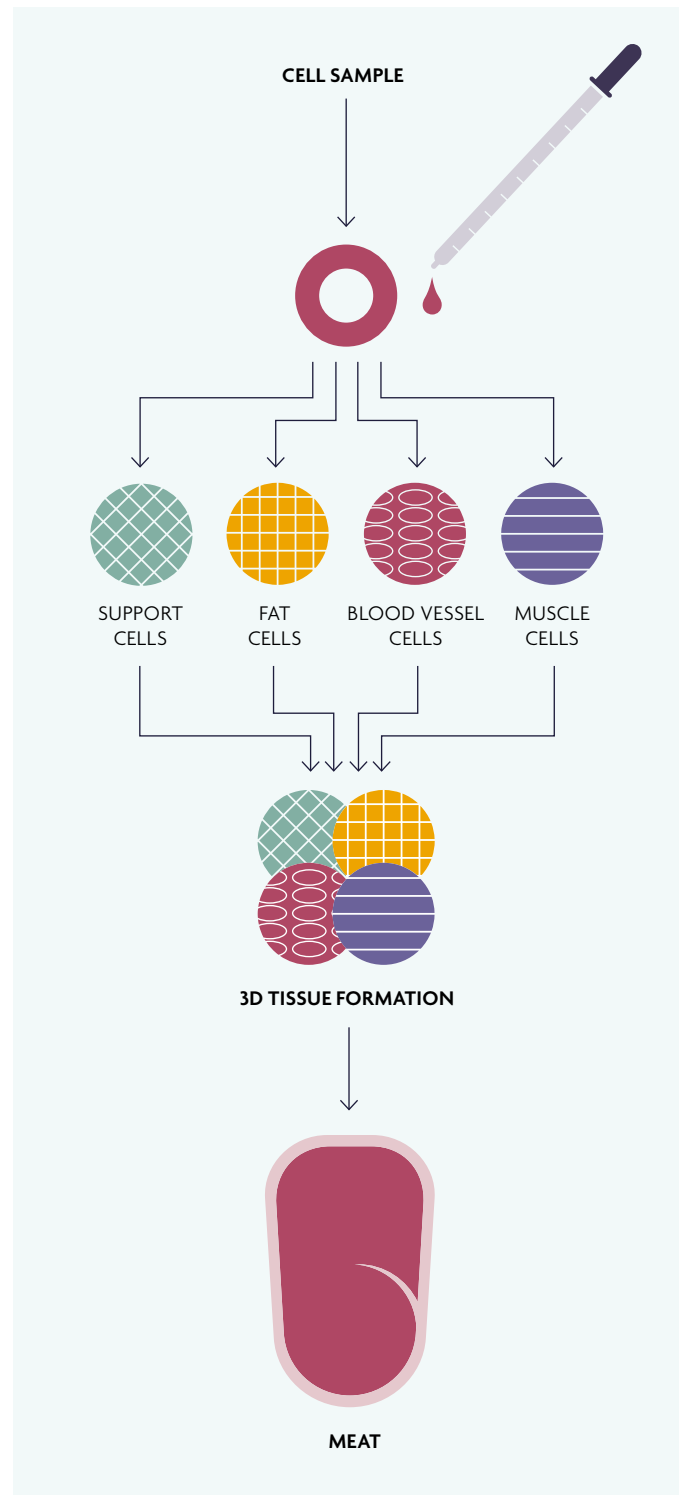
Cell culture technology

This technology refers to the growing of meat cells in a nutrient-rich culture medium to create whole pieces of meat instead of harvesting meat from animals.

The process involves many of the same tissue engineering techniques that were developed for regenerative medicine. Historically, these clinical applications have included growing skin for burn treatments, or organs for transplant, and the focus has been on achieving the biological function of the product.

For food applications, a small sample of cells is taken from the desired animal, e.g. a live cow. Stem cells, which can be differentiated into the different cells found in muscle, are isolated. Theoretically, just one starter stem cell can be used to grow an infinite amount of meat. The cells are fed a nutrient-rich media, which helps them to proliferate and differentiate into muscle cells. These muscle cells are then encouraged to grow together in strips and exercised to increase their size and protein content. The resulting tissue can then be harvested, cooked and consumed as boneless meat. By growing meat from cells instead of from a whole animal, it becomes possible to create high-quality cuts of meat using fewer resources and with less environmental impact. Compared to conventional beef, cell-based beef is estimated to reduce land use by more than 95%, climate change emissions by 74% to 87%, and nutrient pollution by 94%.⁶² Since cell-based meat is grown in a clean facility, it also reduces the risk of contamination by harmful pathogens and eliminates the need for antibiotics, thereby reducing the serious public health threats posed by foodborne illness and antibiotic resistance.

The first cultured hamburger was demonstrated in 2013 by Dr Mark Post from Maastricht University and since this proof of concept, focus by the growing number of companies in the space has been on cost reduction and efficient production at scale. These are the primary challenges for commercialisation; current medical applications are narrow, so costs have remained high at a small scale. However, the speed of development of scale-up and cost reduction for food applications indicates that production at scale should be a possibility in the medium term.



Cell culture technology

Source: Aleph Farm. Image recreated by FAIRR

2019 current status

Across both fermentation and cell culture, there has been an explosion of activity in recent years. According to the Food Product Institute, 27 cell-based companies made their first publicly known by the end of 2018, 14 of which were founded in 2017. The fermentation of meat has focused players entered the market during 2018/2019.

Several of these start-up companies are entering partnerships with key industry incumbents. For example, Tyson Foods and Tyson Ventures has to date invested in two cell-based meat companies Memphis Meats and Future Meat Technologies. And it's not just big food pharmaceutical companies are also using the opportunity for collaboration. At the end of the year, 10 of the world's top cell-based meat companies have filed a total of 10 patents in July 2018, with more coming that in addition to a financial investment. The companies plan to partner with Tyson Meats to use its existing expertise to address key challenges for the company, namely the development of cost-effective cell culture media and bioreactors.¹⁴

In fermentation, in 2018, Archer-Dan-Webb declined its partnership with DSM to scale up the production of its cow-free dairy, and in July 2018 it announced the sale of three cow-free Archer-Dan-Webb Dairy's coffee, milk, chocolate and vanilla coffee. High marks with its cow-free dairy.¹⁵ In February 2018, Coca-Cola Company (COC) announced participation in the financing round of World's Largest Food Competition, a food competition that




Although there is no clear timeline for cell-based meat companies to address price parity, as the majority of companies have advanced their scaling specific production, companies like Memphis Meats have demonstrated significantly reduced costs over the last few years. About from a high base, the company's original cost was estimated to cost \$20,000 a pound after a 2018 investment by world's largest food competition in 2018.

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Given its access to research technology, and partners to create consumer choice and help identify product portfolio for the start-ups. These partnerships give them access to their industry expertise and experience, manufacturing and production infrastructure, and distribution networks. This access will assist the start-ups in addressing the primary challenge for their ultimate success scaling up production and meeting a price point to enable mass production.¹⁶

While compared to meat producer incumbents, and that it stands to introduce choice and back into the market by 2020. Tyson Meats and COFCO Foods have also stated their intention to make their products available to consumers in 2020.¹⁷ However, we can expect the cell-based meat at a premium.



In 2018, Perfect Day disclosed its partnership with ADM to scale-up the production of its cow-free dairy, and in July 2019 it announced the sale of three ice-cream flavours (vanilla blackberry toffee, milky chocolate and vanilla salted fudge) made with its cow-free dairy.

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Advocacy and regulation

The acceleration of the alternative protein sector has kickstarted a new era of regulatory activity as governments try to keep pace with the proliferation in product development and innovation.

Overall, regulatory activity is favourable to the sector, with policymakers creating regulatory pathways to account for new production methods, technologies and ingredients while ensuring sufficient oversight on areas like food safety. Equally, however, regulation is being used as the new battleground by the traditional (and powerful) animal protein lobbies to push back on the alternative protein sector's explosive growth.

Regulation in the EU

The defining piece of regulation in the EU relevant to this sector is the Novel Food Legislation (Regulation EU 2015/2283). This was updated in 2018 to streamline the pre-market safety assessment and authorisation of 'novel' foods. However, it still requires extensive, case-by-case evaluation by the European Food Safety Authority (EFSA) for all new food products and ingredients. The regulation is applicable to any food and/or ingredient not used in the EU for human consumption prior to May 1997,⁷⁰ and covers a broad spectrum of novel ingredients, including products that are made from insects, to ingredients with modified molecular structures. It also explicitly includes cell culture under its mandate. In contrast to US regulation, which focuses on the end product rather than production process, the EU's framework examines the whole process and any novel production processes must be approved. Once approved, the products are listed in a 'Union list' and can be sold in EU markets (potentially with extra labelling requirements) as long as they comply with the conditions set out in the list.⁷¹

It is important to note that products like Beyond Meat have been able to enter the EU market without requiring pre-market authorisation under the Novel Food Regulation because their ingredients are already widely consumed and their production process does not require any genetic modification.⁷² The path to market for companies like Impossible Burger in the EU is more challenging; the company uses genetically engineered yeast to produce heme, which gives the burger its meaty flavour. In the US, the company has also started to use GM-soy in its burger to deal with supply constraints driven by lack of availability of non-GM soy. Any expansion strategy in the EU may have to be through non-GM soy, given the strict regulation of GMOs in the EU.⁷³

Regulation in the US

The regulatory pathway to approval in the US is murkier and depends on the product and final application. Similar to the EU, plant-based proteins that are made from previously consumed ingredients are already sold in retail markets and do not require specific pre-market authorisation. Before it brought its product to restaurants, Impossible Burger applied for and received sign off from the US Food and Drug Authority (FDA) because its products contain soy leghemoglobin, the protein that carries the never-before-consumed heme molecule.⁷⁴ The agency accepted and has since validated the company's third-party expert study that the product is Generally Recognised As Safe (GRAS). However, the FDA has notified the company that it will need pre-market authorisation to sell its uncooked burgers directly to consumers.⁷⁵

Regulation of cell-cultured products in the US is breaking new territory and has been the subject of an intense inter-agency dispute on who should regulate the industry. In 2018, the US Department of Agriculture (USDA) and the FDA agreed to a joint regulatory framework, providing cell-based meat with a clearer path to market. According to the framework, the FDA will oversee cell collection, cell banks, and cell growth and differentiation. Regulation will transition from FDA to USDA during the cell harvest stage, and will include the production and labelling of food products.⁷⁶ The joint FDA-USDA regulatory framework was lobbied for by the meat industry lobby as well as Memphis Meats, representing the views of the nascent cell-culture sector.⁷⁷

The battle over labelling

The dramatic rise of alternative proteins, and the resulting disruption of the traditional animal protein industry, has made regulation of product labelling the front line for meat and dairy industry lobbyists.

In the EU, there are restrictions on the use of dairy-related terms like ‘milk’ and ‘cheese’ for plant-based products, following a 2017 decision issued by the European Court of Justice. While there is no EU-wide legislation yet, France and Germany have recently passed legislation/guidance that restrict the use of terms like ‘ham’ and ‘sausage’ for meat substitutes.^v As part of the broader farm policy regulations, the European Parliament’s Agricultural Committee is also working to include amendments that would effectively ban the use of words like ‘steak’ and ‘burger’ on plant-based alternatives.⁷⁸

In the US, the biggest pushback is from the dairy industry, which is forecast to lose sales estimated at around \$16 billion by 2020.⁷⁹ Prompted by the industry, the FDA opened an inquiry on using names of dairy foods for plant-based products, and more than ten states are considering or have adopted legislation to limit labelling options for plant-based alternatives.⁸⁰

The meat industry is also vociferously lobbying at the state and federal level to restrict plant-based alternatives and cell-cultured meat from being labelled as ‘meat’.⁸¹ Some bills being proposed are so restrictive, they would make it a crime to sell cell-cultured meat.⁸² Mississippi has recently passed a law that bans terms like “veggie burger” for alternatives. Both industries have cited “consumer confusion” as the prompt for regulatory scrutiny; however, there is little evidence that consumers are confused by these products, and the main driver seems to be to protect their market share.⁸³

Lobbying and advocacy on alternative proteins

As the alternative protein sector has grown, the industry has organised to protect and advocate for its own interests. In 2016, 23 companies launched the Plant Based Foods Association (PBFA) in the US as a lobbying arm for the industry. Since then, membership has grown to 147 companies, and Kellogg’s Head of Government Relations sits on the association’s board. PBFA’s advocacy remit includes labelling, farm subsidies, dietary guidelines, child nutrition and push-back against restrictive laws that seek to limit animal activists from filming videos in factory farms.

Another key player is the Good Food Institute (GFI), founded in 2016, which has bulked up its regulatory affairs work at the federal and state level to advocate for a level playing-field for plant-based and cell-cultured products. GFI is also working to secure favourable regulation outside the US, including in Europe, China and India. In Europe, the European Plant Based Association, ENSA, also works to advance the policy interests of plant-based companies in Brussels.

While the scale of these organisations remains small relative to the dairy and meat industry, their lobbying clout and involvement with mainstream companies will continue to increase as the size of the industry grows. In 2017, Campbell Soup became the first major company to join the PBFA after it left the Grocery Manufacturers Association, one of the most powerful and long-standing trade associations in the food industry.⁸⁴

^v For an in-depth discussion on EU legislation on alternative proteins, see Chatham House’s report ‘Meat Analogues: Considerations for the EU’, available at <https://www.chathamhouse.org/sites/default/files/2019-02-18MeatAnalogues3.pdf>

Food tech start-ups are organised for mainstream success

Many alternative protein start-ups are also working with long-standing food industry veterans to help them navigate regulatory complexities and build and scale their go-to-market strategies.

Company	Industry link
Beyond Meat , publicly listed plant-based meat company.	Beyond Meat's board includes the former CEO of McDonald's, and its senior management includes corporate leaders from Coca-Cola and Nestlé.
Perfect Day , San Francisco-based cellular agriculture company making milk from cell culture.	Perfect Day's team includes hires from Glanbia, Chobani and Novozymes.
Just Inc. , maker of plant-based mayo and liquid egg replacement.	Just Inc.'s advisory board includes an egg industry veteran who has helped them partner with Eurovo Group, Europe's leading producer and distributor of packaged, pasteurised and dried eggs. ⁸⁵
BlueNalu , San Diego-based company specialising in cellular aquaculture.	BlueNalu's advisory board includes veterans from Campbell Soup Co, Pepsico, Nestlé and DSM.
Ripple Foods , maker of milk from pea proteins.	Ripple's advisory board includes the founder of Honest Tea, which was sold to Coca-Cola.
Memphis Meats , US cell-based meat producer	Memphis Meats' team includes a VP of Product and Regulation who was formerly a Federal policy maker at the FDA.
Motif Ingredients , a food ingredients company that uses biotechnology to brew proteins and nutrients	Their R&D team is led by a former VP at Pepsico.



Investors must be wary of proposals to constrain the labelling of alternative proteins

Similar to health, nutrition and sustainability issues, it is important that companies do not use their lobbying and financial support to constrain the growth of alternative proteins. This presents a potential arena for greater company engagement so investors can assess how global companies (and their trade associations) engage policymakers and governments in the sector.

Alternative proteins offer major opportunities for investors, while enabling a reduction in the externalities associated with intensive animal-based food production. Multiple studies, from the ground-breaking EAT Lancet report to research by Oxford scientists and the World Resources Institute, have emphasised the need for a dramatic reduction in meat and dairy consumption to stay within planetary boundaries. IPCC's most recent report stated that "dietary shifts could contribute one-fifth of the mitigation needed to hold warming below 2°C."

The legal basis for similar 'standards of identity' claims is limited, at least in the US, as previous court rulings have been sceptical of claims regarding consumer confusion.⁸⁶

There is considerable diversity in views even within the food industry on this issue. Meat companies, including Tyson, Cargill and Maple Leaf, which have made investments in plant-based and cell-culture technologies, have stayed silent. And wider industry groups such as the Grocery Manufacturers Association have come out against labelling restrictions.

Investors have been clear: regulation should not be misused to stifle innovation, consumer choice and climate action. The issue highlights some interesting parallels with other carbon-intensive industries, including oil and gas. In these cases, investors have pushed for companies to engage positively on climate change policy rather than oppose the development of alternative solutions.⁸⁷

Lobbying on labelling is not an effective use of company resources. In the EU, where the European Court of Justice has ruled that plant-based foods cannot be sold using terms such as milk, butter and cheese, brands have gotten around this by labelling themselves as 'mylk' or 'm*lk'.



Dr Uma Valeti Co-founder and CEO, Memphis Meats

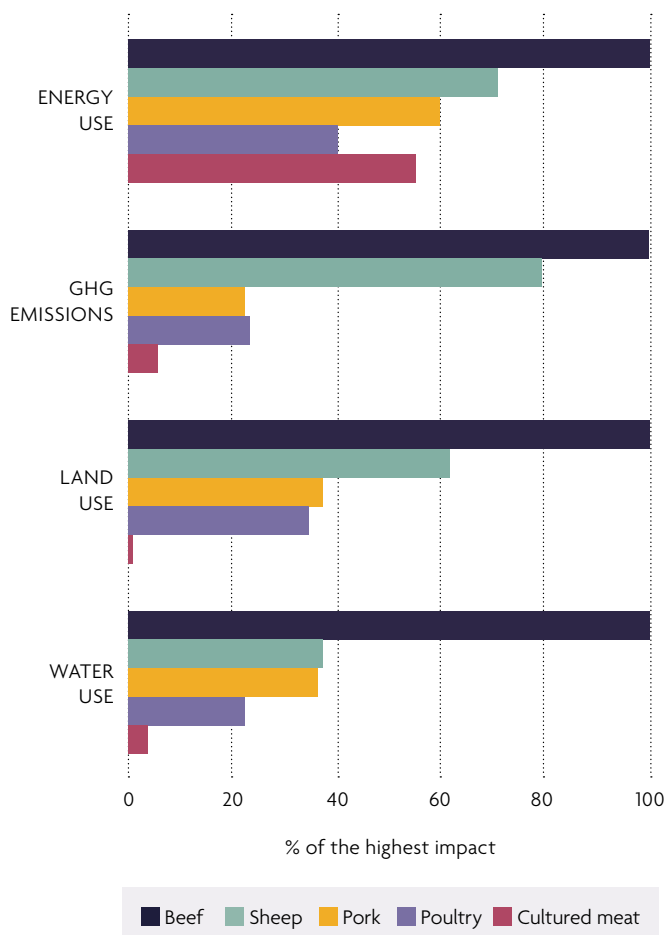
Memphis Meats is a Berkeley-headquartered food company developing cell-based meat. The company was founded in 2015 by two scientists, Uma Valeti, MD, a cardiologist, and Nicholas Genovese, PhD, a stem cell biologist. In March 2017, Memphis Meats demonstrated the world's first cell-based poultry, and the company is focused on building a platform to produce cell-based meat across species. It has raised more than \$22 million in disclosed funding, and investors include established meat industry giants Tyson and Cargill, as well as impact investors like Bill Gates and Richard Branson.

What work has Memphis Meats done to estimate the resource intensity and environmental impact of cell-based meat products vis-à-vis conventional meat products?

We expect our process, at scale, to require significantly fewer natural resource inputs compared to conventionally produced meat. To produce one calorie of beef from a cow requires around 34 calories of inputs of grain or other types of feed. Because we can focus all of our caloric inputs on only producing the meat that people eat, instead of having calories go towards growing inedible parts of the animal (e.g., bones or fur) or activities the animal does (e.g., giving birth), we believe we will need far fewer resource inputs at scale. This inherent efficiency can help us scale meat production to feed 10 billion people by 2050, while also preserving our natural resources and protecting the planet.

Environmental impact of different protein sources

Source: Tuomisto and Teixeira de Mattos 2011, Environmental Impacts of Cultured Meat Production



What is the regulatory pathway for cell-based meat approval for mass consumption across the US, Europe, Asian markets? How is your company/the industry working to anticipate and address regulatory challenges?

We are currently focused on the regulatory pathway in the United States. In August 2018, we co-signed a letter to President Trump along with the North American Meat Institute, the most powerful trade association representing the conventionally produced meat industry, advocating for both FDA and USDA to share oversight for cell-based meat products. We were pleased to see that the agencies formally announced this approach in March 2019. We continue to provide both agencies with information on our process to help them establish a clear regulatory path to market, and we are grateful for the speed that both agencies have demonstrated in the process.

What is Memphis Meats’ strategy to scale up, reduce costs and bring cell-based meat products to price parity with conventional meat?

We are creating an end-to-end multi-animal platform for cell-based meat production, with a focus on scalability and cost reduction. We believe that we are leading the charge down the cost curve, and we intend to continue our work on enabling scale and reducing costs through every element of this platform, including:

- cell procurement, isolation and screening;
- cell line development strategies;
- cell culture feed development;
- engineering of production environments (i.e. cultivators); and
- development and refinement of the cultivation regimen.

How do you expect that cell-based meat products will enter food retail and be used by manufacturers?

Cell-based meat products have the potential to enter all of the retail and foodservice channels that currently distribute conventional meat products. We believe our meat products can and will be featured at the centre of the plate, as well as an ingredient in processed foods, snacks and more. The timeline has not yet been determined and will depend on the regulatory framework.

How is the cell-based meat industry currently engaging with the conventional meat industry? Are there potential areas of collaboration?

Memphis Meats is currently building a 'big tent' – a diverse coalition of stakeholders and supporters, including leaders in the conventional industry. We are the first company to bring together major animal-welfare, environmental and animal advocacy groups with major meat companies and trade associations. Memphis Meats counts Cargill and Tyson as investors, and we have partnered with the North American Meat Institute – the largest trade association for meat and poultry processors – to advocate for a sensible and rational regulatory framework. We believe cell-based meat is a solution to the challenge of feeding the world that many diverse stakeholders can get behind.

Will cell-based meat products have the same shelf life? Food safety issues as conventional products? How do

you see your products are produced in a controlled environment that reduces contact with foodborne pathogens, we expect that our products will stay fresher for longer and reduce the risk of spoilage and waste. We conducted an experiment in which Memphis Meats poultry was placed alongside conventional and organic poultry in sealed dishes. After 48 hours, the dish that held Memphis Meats poultry showed significantly less bacterial growth compared to the others.

How is your company building out its scientific and regulatory team?

We have a world-leading team of 20 scientists, engineers, clinicians and business people from around the world. We prize diversity of thinking and experience. Our team includes scientists, meat eaters and passionate vegetarians working together. Every member of our team has worked in industry, academia or government. We come from multidisciplinary backgrounds, including large agricultural universities, top-tier engineering labs, Genentech, Merck and the CDC. Though our team is motivated by diverse causes, we have come together under the unshakable passion for our mission and drive to bring cell-based meat to the world. Our team is the largest and best funded in the cell-based meat industry.



Source: Memphis Meats.

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What is the future for the cell-based meat industry?

The anticipated efficiencies associated with cell-based meat production make us a compelling business opportunity for stakeholders throughout the food and agriculture system. For the reason – which has important implications on cost, stability and environmental impact – major meat companies and governments across the globe are getting involved in the cell-based meat industry. In the near future, cell-based meat will be sold alongside conventionally produced meat in grocery stores, restaurants and cafeterias around the world. What we most believe in is now an inevitability.

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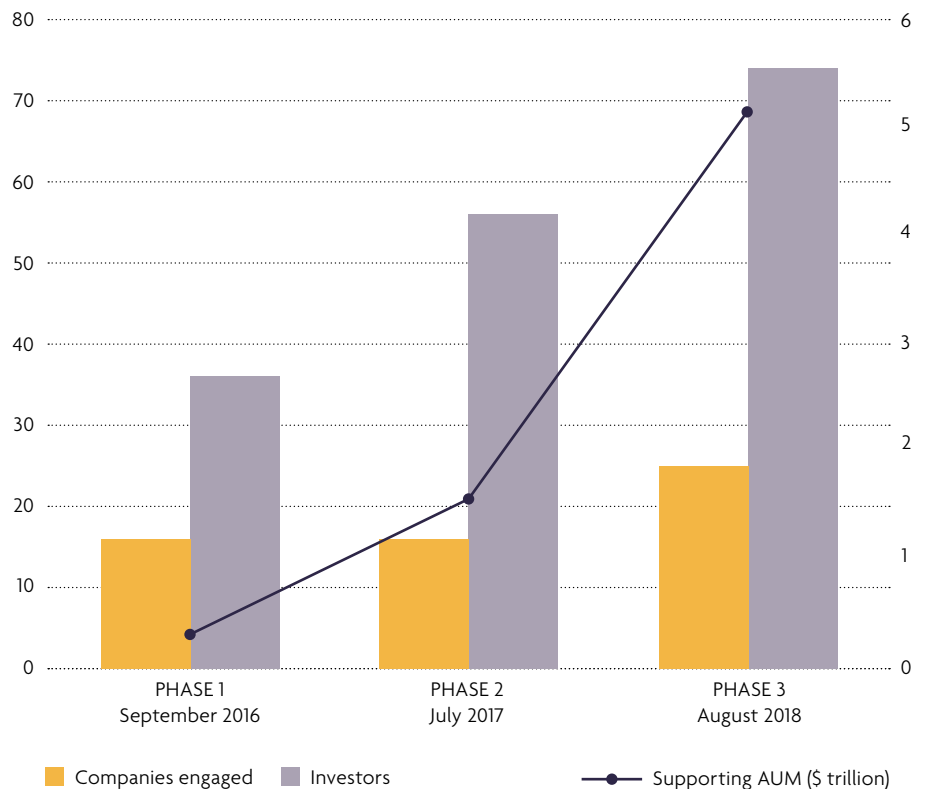
Investor engagement on protein diversification

FAIRR's sustainable protein engagement is the first global investor engagement to encourage the world's largest food companies to develop a global, evidence-based approach to diversify protein sources away from an over-reliance on animal proteins.



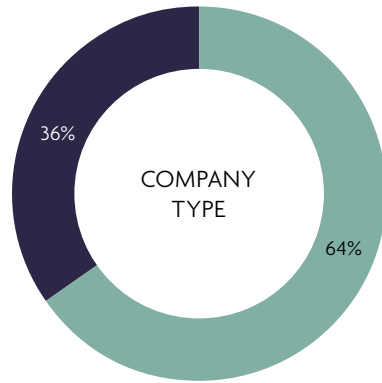
Phase 1 of the engagement was launched in September 2016 and focused on 16 food companies. In its first year, it was supported by 36 investors with a combined \$1.25 trillion of assets. This investor support has doubled at each round of the engagement since launch (coinciding with an increase in the company targets from 16 to 25). Currently in phase three, the engagement has 74 investors with combined assets of \$5.3 trillion in support. This illustrates the growing investor interest in the importance of sustainable protein, and understanding of it as a cross-cutting business issue, which is critical to long-term value creation and mitigating key risks, from climate risk, to resource scarcity and human health.

Figure 8
Investor support for FAIRR's sustainable proteins engagement has quadrupled since its launch

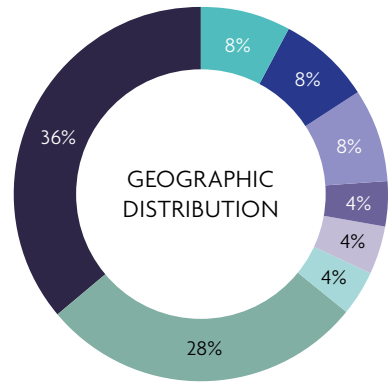


FAIRR'S SUSTAINABLE PROTEINS ENGAGEMENT

Company universe by type and geography



■ Retailer
■ Manufacturer



■ Australia ■ Sweden
■ Canada ■ Switzerland
■ France ■ UK
■ Netherlands ■ US



\$2.3

trillion
combined market
capitalisation



\$1.7

trillion
generated in revenue
in 2018/2019



22/25

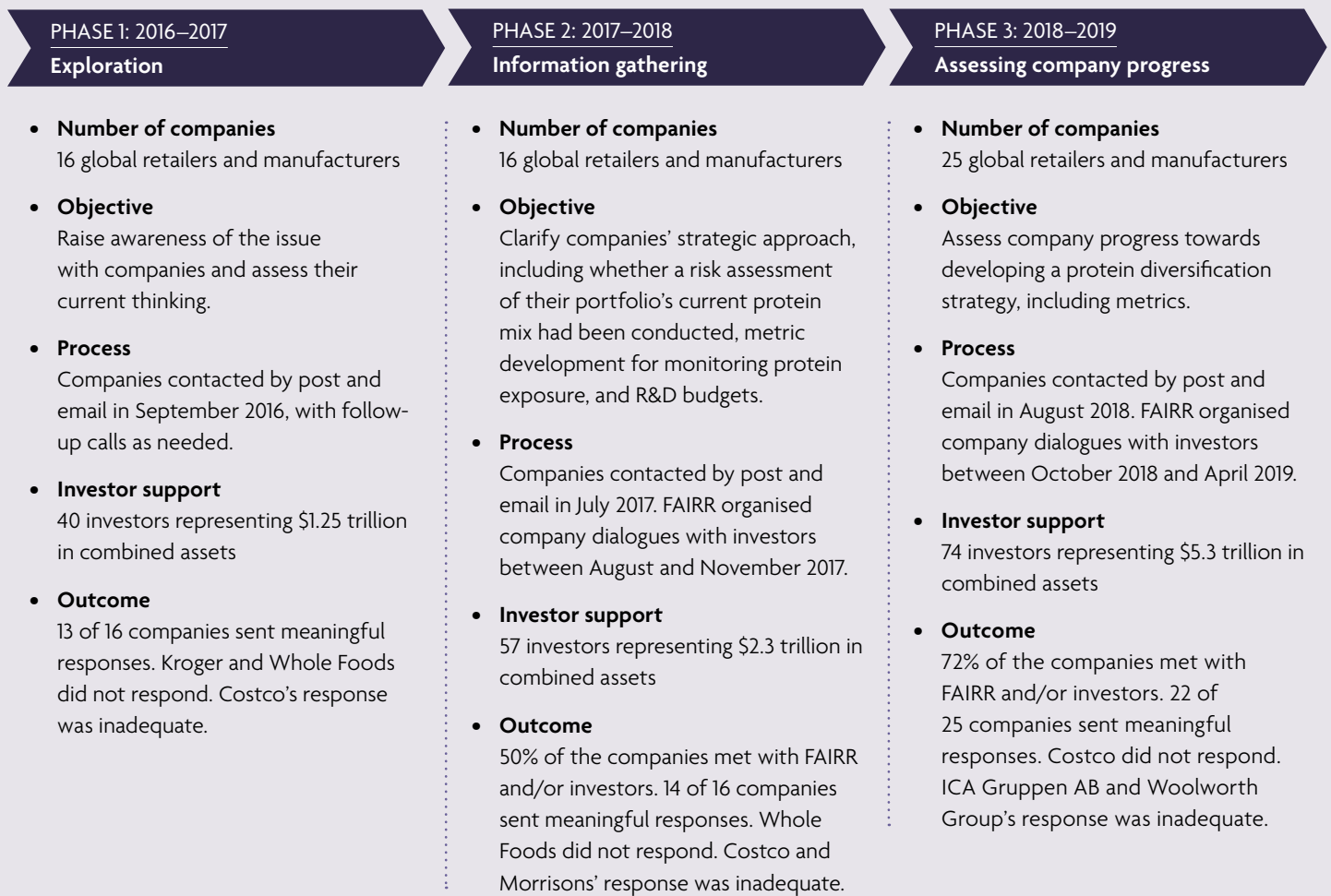
companies
sent formal
responses



18/25

entered into
dialogue with FAIRR
and/or investors

Company engagement with investors



What do we mean by protein diversification?

Any protein diversification strategy cannot simply focus on adding a few new alternative protein products to the current portfolio. It requires companies to develop a comprehensive strategy to expand product development and research, explore the applicability of new food technologies and acquisitions, leverage their marketing power to influence consumers to embrace new products and engage their supplier community to mitigate impacts on farmer livelihoods. To undertake such a transformation, companies must:

- **Evaluate** their current exposure to animal proteins and the risk profile of these supply chains.
- **Assess** the strategic implications of growth plans that are predicated on a higher reliance on animal proteins (through scenario analysis).
- **Commit** at the highest level to transitioning their global business model to less resource-intensive food products.
- **Develop** a cross-functional strategy (involving R&D, marketing, sustainable sourcing) to undertake a transition.
- **Set** clear goals and timelines to achieve a transition.
- **Report** on the right metrics to evaluate portfolio transition.

Evaluating company progress

FAIRR’s evaluation framework assesses companies on six assessment categories: Materiality, Strategy, Product Expansion, Consumer Engagement, Tracking & Reporting, and Investor Engagement. The assessment categories are designed to track company approach to mitigating supply chain risks in animal protein commodities, as well as their approach to expanding alternative protein portfolios through product development and consumer engagement.

The six assessment categories are each supported by five key performance indicators (KPIs), which have been customised for retailers and manufacturers. The detailed evaluation framework for retailers is available on page 42, and for manufacturers on page 44.

Companies are scored based on their performance against each of the six assessment categories. Five of the categories are equally weighted at 18%: Materiality, Strategy, Product Portfolio, Consumer Engagement and Tracking & Reporting. Company engagement with investors has a lower weighting at 10%. Final company scores are calculated as the total sum of scores for each assessment category. Companies can receive a maximum score of 100 points.

Company assessments were conducted between October 2018 and June 2019. All companies received a detailed qualitative assessment of their performance against the evaluation framework and were given the opportunity to provide feedback. We referred to company annual reports, sustainability reports, websites, CDP responses (if publicly available) and any other publicly available source, including news reports. We also incorporated information from company responses to the investor letter and notes from company/investor meetings, where available.

Figure 9

Overview of FAIRR’s six-part evaluation framework. (Source: FAIRR)

THE FULL FRAMEWORK WITH INDICATORS IS INCLUDED IN THE MEMBERS-ONLY REPORT.

MATERIALITY	STRATEGY	PRODUCT EXPANSION	CONSUMER ENGAGEMENT	TRACKING & REPORTING	INVESTOR ENGAGEMENT
<ul style="list-style-type: none"> Company acknowledges high animal protein exposure as material business risk and board level support for portfolio transition Company has completed scenario analysis, and has developed a clear understanding of climate risk impacts on protein sourcing 	<ul style="list-style-type: none"> Company has time-bound commitment(s) in place to transition multiple categories to more sustainable product choices Percentage based absolute emission or Science-based target on Scope 3 	<p>Company demonstrates evidence on:</p> <ul style="list-style-type: none"> Resourcing in R&D and/ or cross-sectoral collaborations Product reformulation across categories Expanded product portfolio 	<p>Company demonstrates evidence on:</p> <ul style="list-style-type: none"> Product promotions and marketing initiatives to encourage plant-based consumption Merchandising plant-based products adjacent to conventional categories 	<p>Company discloses formal metrics to track protein exposure and Scope 3 emissions in annual public reporting</p>	<p>Company engages with the investor coalition on this issue</p>

Given the complexity of this issue, many companies are only just beginning their transition to a sustainable protein model. In recognition of this journey, companies are categorised across five levels to indicate how prepared they are to undertake a protein diversification strategy.

Level	Score range	What this typically means
INACTIVE	0	The company shows no evidence that it is expanding its portfolio to alternative protein sources. Further, the company has not undertaken any supply chain initiatives to mitigate environmental impacts of its animal protein commodities.
REACTIVE	1-29	<p>The company is reacting to increased consumer demand for alternative and plant-based protein products. It has launched or added some products to meet this demand.</p> <p>The company has some healthy/nutrition goals to increase the consumption of whole grains and vegetables through its products.</p>
ACTIVE	30-51	<p>The company acknowledges the environmental and health impacts associated with diets heavy in animal proteins.</p> <p>The company is working actively to expand its alternative protein portfolio and has ad-hoc initiatives to engage consumers on the benefits of plant-based diets.</p> <p>On the supply chain side, the company has committed to setting science-based targets, including on its agricultural supply chain. It also has some initiatives in place to address the environmental impacts of its animal protein commodities.</p>
PROACTIVE	52-72	<p>The company explicitly acknowledges the environmental and health impacts associated with diets heavy in animal proteins and accepts the materiality of this issue for its business. However, it does not demonstrate explicit board-level support to undertake such a transition.</p> <p>The company has conducted some type of risk or scenario analysis to understand how its growth will be impacted by animal protein commodities.</p> <p>The company has an active R&D programme on alternative proteins. It demonstrates evidence of using multiple strategies to expand its product portfolio and engage consumers on the benefits of plant-based diets.</p> <p>The company has established internal metrics to track progress but does not share this externally.</p>
PIONEER	73-100	<p>The company has modelled the implications of growing animal protein consumption (in line with anticipated trends) on its business and sustainability strategy.</p> <p>The company demonstrates explicit board-level support to undertake a protein transition. This is supported by a publicly available quantitative target that provides the roadmap for how it will transition to a protein portfolio in line with sustainability and health considerations.</p> <p>The company has a sourcing programme in place to reduce the sustainability impacts of its animal protein sourcing, including through a science-based target to reduce emissions.</p> <p>The company has an active R&D programme on alternative proteins. It demonstrates evidence of using multiple strategies to expand its product portfolio and engage consumers on the benefits of plant-based diets. This is supported by a growing category share of alternative/plant-based foods and protein products across its business.</p> <p>The company establishes formal, standardised metrics to track its protein portfolio transition in line with its protein transition target.</p>

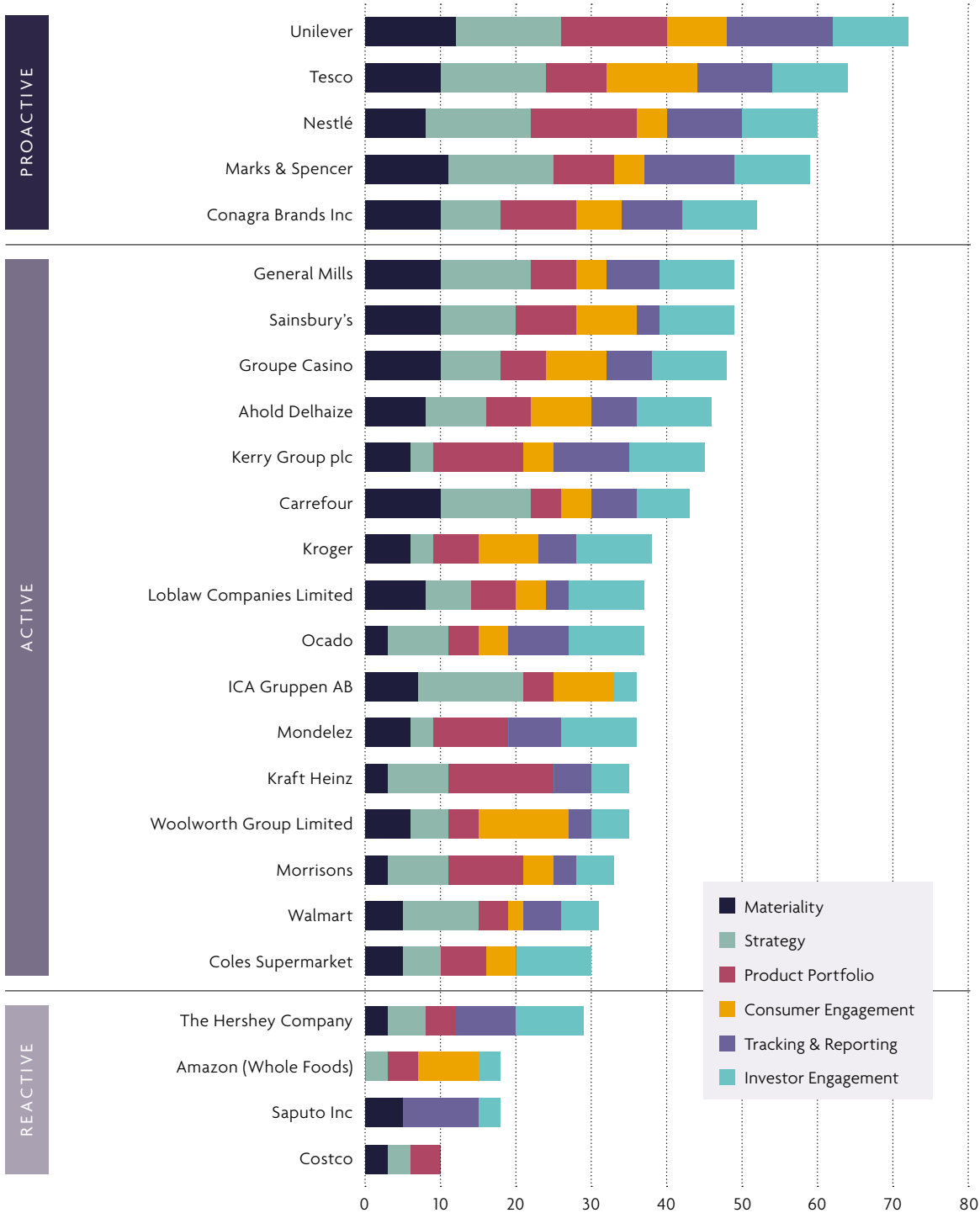


Benchmarking company progress

“Until very recently the only meats that people have known are those that come from animals. But we now have new ways to emulate the taste and texture of meat and to produce it in a way that is better for the planet. This implies a downside for traditional protein industries, while it provides an opportunity for new investment prospects. Food retailers and manufacturers cannot afford to simply respond to these changes. Rather, I believe they should show leadership, manage the risks and grab this market opportunity.”

Faryda Lindeman

Senior Responsible Investment Specialist
NN Investment Partners



DISCUSSION OF RESULTS

Materiality

The first step for global food companies to undertake a protein transition is to assess their exposure to animal proteins and model how this exposure will evolve as the business grows. Companies must develop a view on the business and sustainability risks of a growth model that is predicated on increasing exposure to animal proteins. Further, they must understand the potential effects of climate change on their agricultural sourcing, specifically their protein supply chains, through risk assessments and/or scenario-based analyses.

This work should help companies acknowledge the environmental and health impacts of a portfolio that is biased towards animal proteins and prioritise protein diversification as part of their growth strategy. We look for company statements that acknowledge high animal protein exposure as a material risk. Further, we assess if companies publicly recognise their role in supporting a protein transition, including demonstrating board-level support for a strategic approach to enabling sustainable diets.

Does the company agree that protein diversification is a material issue for its business?

Global food companies are beginning to acknowledge the materiality of protein diversification for their businesses. Twelve of 25 (48%) of the companies in FAIRR's sustainable protein engagement state that they recognise the high environmental impacts associated with animal agriculture; five of these companies go further and acknowledge that a product portfolio highly dependent on animal-based ingredients is a material risk to the business. However, as of writing, no company demonstrates a comprehensive strategic approach that includes board-level support to transition product portfolios to include low-carbon and less resource-intensive ingredients and products that enable consumers to adopt sustainable diets.

Figure 12

How do companies identify the materiality of protein diversification?
(Source: FAIRR)

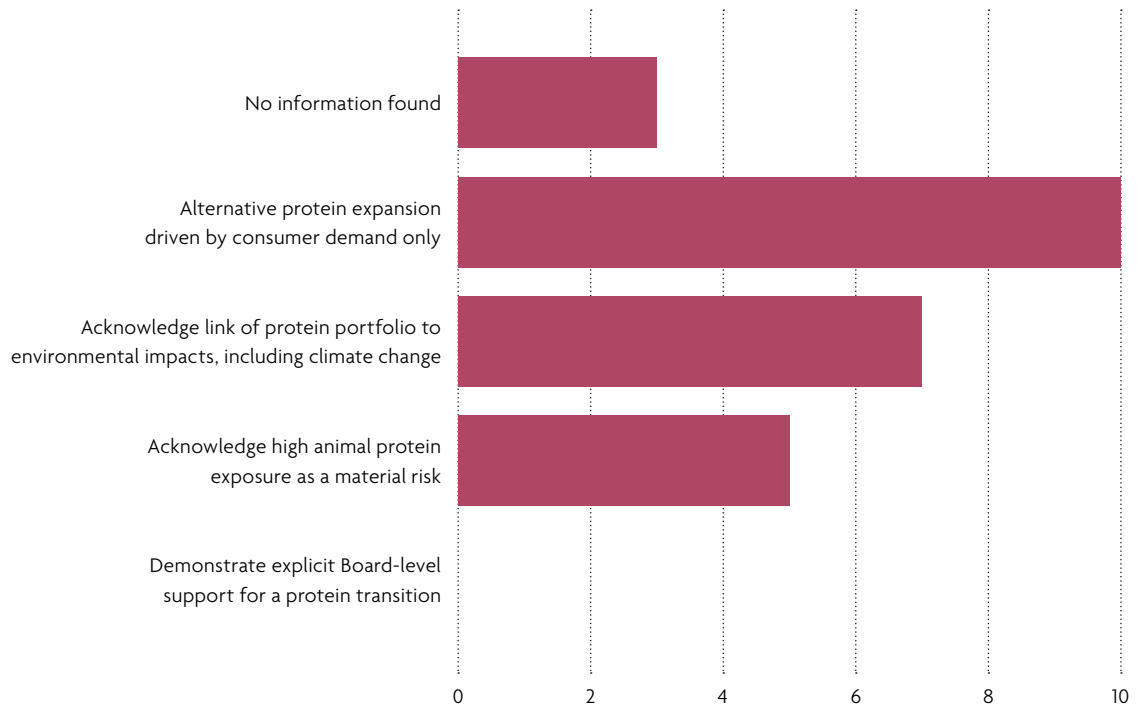
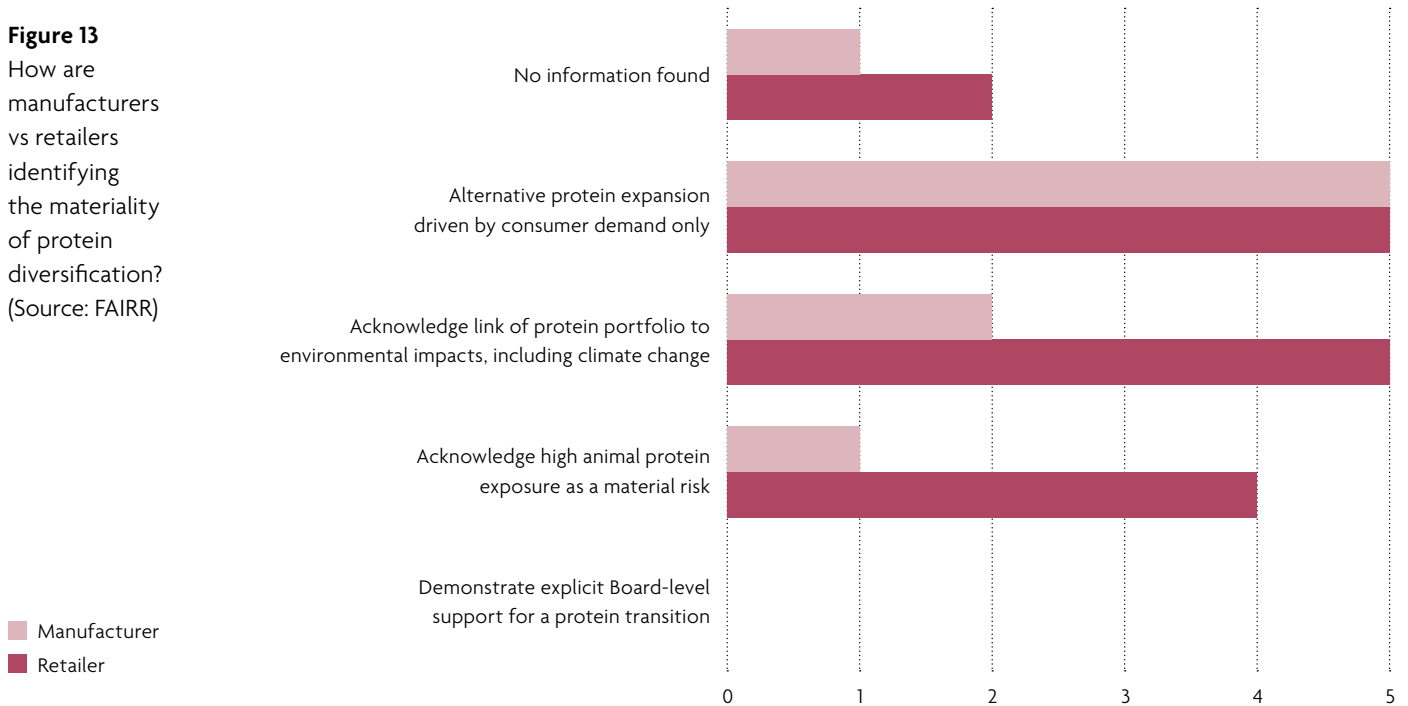


Figure 13
How are manufacturers vs retailers identifying the materiality of protein diversification?
(Source: FAIRR)



In response to an investor question on what were the drivers behind the growth of their alternative protein portfolios, 56% of manufacturers in the engagement said they were responding to consumer demand only. Unilever, Nestlé and General Mills were the only manufacturers to acknowledge the link between high animal protein exposure and health and environmental impacts.

In comparison, nine of 16 (56%) of retailers recognise the growing sustainability challenges associated with animal proteins. For example, Tesco, Sainsbury’s, Carrefour and ICA Gruppen all recognise the potential business risks of having a portfolio that is dependent on animal-based ingredients and products.

BEST PRACTICE



“In addition to consumer preference, we also know that increasing efficiency in protein production will not, on its own, be enough to meet our science-based climate change targets for our supply chain. There is a need for a shift in current levels of animal protein consumption.”

Multinational retailer

“We believe [our company] has a key role to play in helping consumers move towards healthy and sustainable dietary behaviour by offering preferred food choices that take into account both the impact on people’s health and the environment. Good quality diets with a higher proportion of plant-based ingredients, particularly plant-proteins, are not only healthier but also better for our planet protein consumption.”

Global manufacturer

Has the company undertaken scenario analysis to assess the resilience of its agricultural commodity sourcing strategy relative to alternative warming scenarios? How will climate-related scenarios affect the company’s protein sourcing?

The Task Force on Climate-Related Disclosures (TCFD) has said that scenario analysis is an important and useful tool for an organisation to use, both for understanding the strategic implications of climate-related risks and opportunities and for informing stakeholders about how the organisation is positioning itself in light of these risks and opportunities. For global food companies, it is important to undertake this analysis specifically in relation to their protein portfolios.

Companies are beginning to use scenario analysis to stress test the resilience of their agricultural sourcing. Ten of 25 (40%) companies are either planning to carry out scenario analysis or are already working to risk assess their soft commodity supply chains, including proteins.

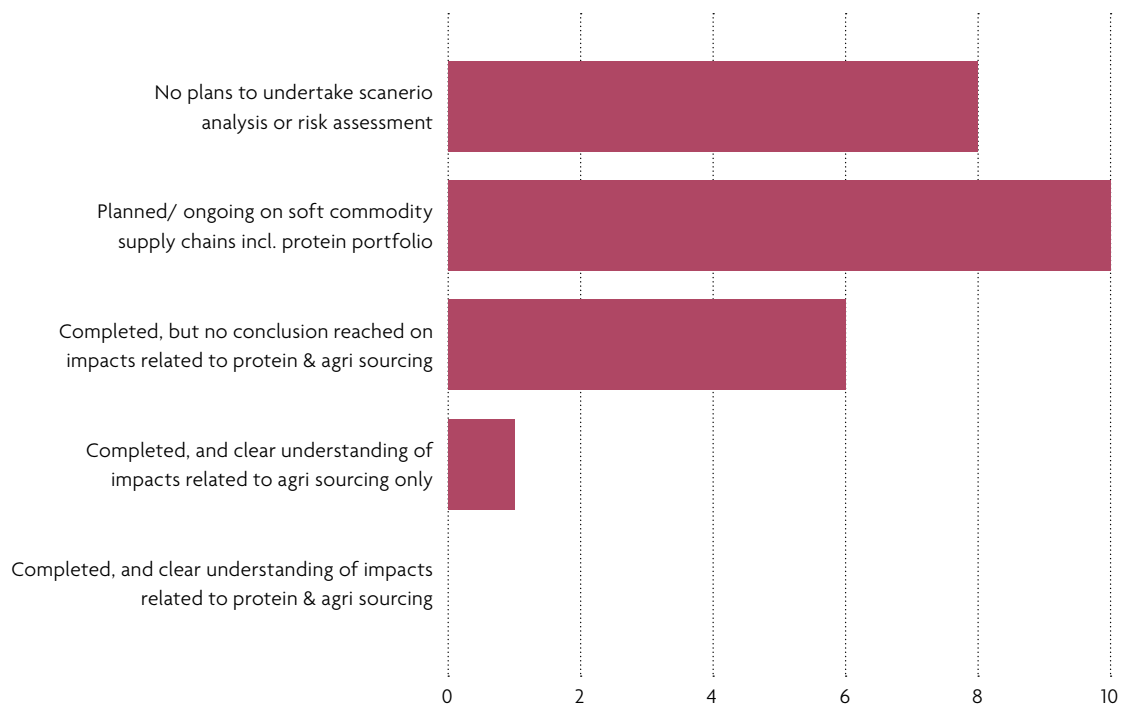
Three companies – Unilever, Walmart and Saputo – have reported publicly on completing a scenario analysis exercise, in line with TCFD guidance. None of these companies have discussed the results of this analysis for their protein supply chains, though Unilever does provide an in-depth discussion on how its model considered risks from climate change to soybean oil. Walmart and Saputo only provide limited discussion of their models.

Four companies – Marks & Spencer, Conagra Brands, General Mills and Groupe Casino – have undertaken some type of risk assessment specifically on their protein supply chains. Only two of these companies discussed the implications of these assessments for their protein-related sourcing with the investor coalition. While General Mills did not provide this level of discussion, the company has publicly reported the results of a life-cycle assessment conducted by a third-party research provider on one of its beef supplier farms.⁸⁸

For this year’s evaluation, we did not distinguish between a risk assessment and scenario analysis. Instead, our framework focuses on whether the scope of these assessments includes commodity sourcing and any implications for the company’s protein sourcing.

Figure 14

Are companies carrying out TCFD-linked scenario analysis?
(Source: FAIRR)





BEST PRACTICE



While Conagra Brands has not yet undertaken climate-related scenario analysis, its ESG risk assessment presents useful lessons because of the scope of the commodities and issues considered. The company also shared some clear conclusions with the investor coalition on the implications of this exercise for its sourcing and product development work.

In 2018, Conagra conducted an environmental, social and governance (ESG) risk analysis related to the commodities they source. This analysis considered:

- Climate change impacts of common cultivation/ procurement practices, such as deforestation.
- Climate resilience of ingredients (e.g. ability to be grown in multiple climates).
- Water scarcity threats to the regions where the item is sourced, using the WRI Aqueduct tool.
- Drought resilience of ingredients (e.g. growing cycles that are flexible based on access to water, species that are drought-tolerant).
- Extreme weather threats to procurement such as flooding and hurricanes, considering where an item is produced and major transportation routes to our facilities.
- Social threats such as ethical governance, labour issues, workforce health and safety, and community displacement.

This analysis guides several procurement and R&D priorities related to protein use in their portfolio: Conagra Brands has identified a list of priority ingredients and materials that is intended to guide greater oversight and governance of supply chain risks and opportunities related to sustainability. Animal products are well represented on this list and will be part of their ongoing sustainable sourcing strategy.

They have also identified ingredients that are 'sustainably advantaged' based on climate change resilience, drought tolerance, diverse sourcing geographies and climates, and social metrics. Several of these include plant-based protein sources such as nuts and legumes and are being pursued as contemporary attributes in new product designs.





COMPANIES AT RISK: COSTCO

The lowest performing companies in the engagement are Saputo, on the manufacturing side, and Costco, on the retail side.

Costco is the second-largest retailer in the US, and has a steadily growing international presence, including in Australia, Canada and most recently in China. Around 32% of their total revenues comes from food, sundries and fresh food.

We believe that Costco is at particular risk because of their exposure to meat products and their investments in the meat supply chain. In North America, Costco is one of the largest meat buyers. The company sells more than 90 million rotisserie chickens each year in the US, which according to news articles are a major traffic driver for instore purchases.^{89,90}

In 2018, the company began its own poultry processing business in Nebraska that processes around 100 million chickens annually. Part of the reason for choosing Nebraska is the availability of abundant (and cheap) corn and soy. Yet Nebraska is among several Midwestern states in the US that have experienced extreme events, which have resulted in \$400 million in losses for the state's livestock and feed industry.⁹¹ Corn and soy planting in these states have seen unprecedented delays due to continued wet weather, and corn prices have jumped to a three-year high.⁹²

Most climate models predict that climate change impacts will exacerbate extreme heat, heavy downpours, and flooding.⁹³ It's unclear if and how companies like Costco have factored rising feed price and volatility into their business models, if beef and poultry consumption continue to grow (as anticipated).

Despite its risks, Costco is the least engaged company on the issue of sustainable proteins. The company doesn't report on how it is working to reduce its risks in meat supply chains (beyond organic farming). There is no discussion on Scope 3 emissions (or water impacts) linked to its extensive meat and dairy footprint. The company has not committed to performing a scenario analysis.

Costco has expanded its external range of plant-based offerings in response to consumer demand;⁹⁴ unlike peers, however, we found limited innovation in its own brands. The company did not engage with the investor coalition or provide any responses to questions from investors.

We believe that given its exposure, Costco has a strong business case to broaden its sustainability focus on animal proteins and develop a more strategic plan to transition its product portfolio to ensure any exposure to animal proteins is in line with a low-carbon strategy.



THE FULL COMPANY BENCHMARK IS
AVAILABLE TO FAIRR INVESTOR MEMBERS.
LOGIN AT FAIRR.ORG TO ACCESS FULL REPORT.

Figure 15
How companies
score on
materiality
(max points 18)
Source: FAIRR

Strategy

To undertake a protein transition, companies must adopt a publicly-available commitment that is integrated into its core business strategy.

Within this assessment category, we looked for time-bound commitments to support a portfolio transition across relevant brands and product categories towards more sustainable product choices. Commitments must be part of a broader strategic approach that supports: the increased consumption of plant-based and/or alternative protein foods; moderates excess consumption of animal-based ingredients and products; and has comprehensive sustainable sourcing programmes in place to reduce the sustainability impacts of its animal protein sourcing, including a science-based target to reduce animal agriculture emissions.

Has the company adopted any commitments related to plant-based foods and/or proteins in its business or sustainability strategy?

We believe that addressing the impacts of animal protein production is only the first step towards building a protein diversification strategy. At a base level, our assessment considers whether companies have adopted sustainable sourcing commitments on key animal protein commodities. While we do not assess the quality and strength of these initiatives, we do look for programmes that address environmental issues (for example, deforestation risks, emissions, water use) rather than welfare or social issues.

Most companies have some type of sustainable sourcing programme in place for key animal protein commodities, though these vary widely in terms of scope and strength. Marks & Spencer stands out here as it has published specific environmental measures that it records for poultry, pigs, dairy and beef as part of its Farming for the Future programme.

Several retailers also have begun to adopt commitments to increase the range and affordability of their organic produce, including meat. For example, Carrefour, Groupe Casino, Amazon Whole Foods, and Kroger all emphasise organic farming as part of their sustainability programmes.

Building on sustainable sourcing, we look to understand how companies integrate this issue into their nutrition programmes. While several companies have nutrition-related programmes and commitments, most of the focus is on eliminating negatives (sugar, fat, salt) without a complementary approach to add positives (wholegrains and vegetables). Only seven of 25 (28%) companies, including Sainsbury's, Nestlé, Unilever and Coles Supermarket, explicitly include references to increasing the consumption of plant-based, wholegrain and/or vegetables as part of their nutrition programmes.

The highest scores are awarded to companies that have set some type of target to increase their exposure to plant-based and/or alternative protein products. Two companies, both retailers, have adopted goals on increasing their range of plant-based products. Carrefour has set a target to double the number of products in its vegetarian range, while Marks & Spencer has a commitment to a "range of vegetable-based protein convenient meal solutions and components for cooking by 2020". While these are not ideal commitments, they are a step in the right direction to help companies better integrate this issue into core business strategy.

No company in the engagement has set a time-bound commitment to transition multiple categories and/or brands in their portfolio towards more low-carbon and less resource intensive ingredients and products.

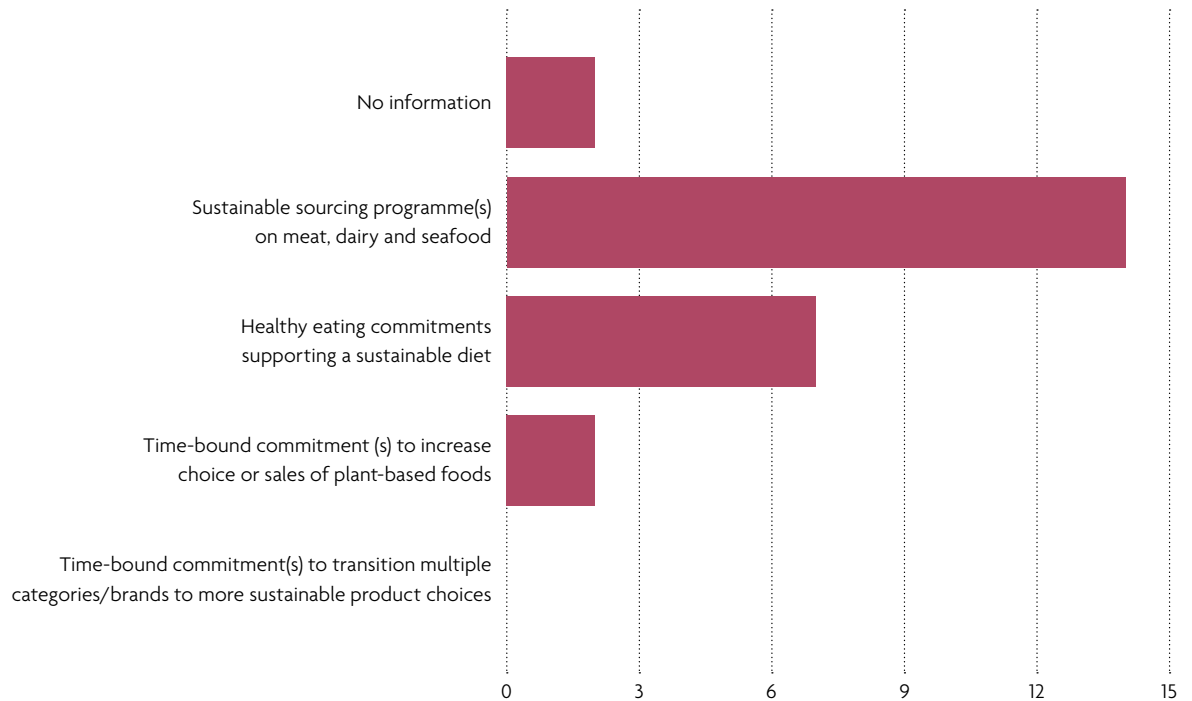
Interestingly, some manufacturers have begun to articulate business growth targets for their plant-based brands in response to the explosive demand from consumers. Nestlé has said that it expects its plant-based sales to reach \$1 billion in ten years.⁹⁵ Similarly, Conagra's CEO has said that he sees the plant-based and alternative protein market as a \$30 billion opportunity in the US.⁹⁶ We do not consider these as formal targets and companies have not been scored based on this information in our assessment.

Only two companies, Saputo and The Hershey Company, scored zero in this category. Neither company had any specific reference to sustainable sourcing programmes for their main animal protein commodity (dairy). Further, their nutrition programmes did not address positive attributes of increased plant-based consumption nor did they have any commitments on increasing their range of plant-based or alternative protein products.

Figure 16

Are companies setting strategic goals to shift towards diversified protein sources?

(Source: FAIRR)



A roadmap and framework towards plant-based proteins scale-up

The World Business Council for Sustainable Development (WBCSD) is a global, CEO-led organisation of more than 200 companies focused on sustainability issues. The organisation is working with its food business leadership on diets, and in particular, on proteins, because of their impact on the sustainability and healthiness of food systems.

WBCSD's project 'Food Reform for Sustainability and Health' (FReSH) is using a consensus-based and scientific process to co-design protein transformation pathways.

These pathways, which will be published in 2019, will set the ambition for food companies on a global protein transformation, with targets for 2030 and 2050 horizons.



In addition, FReSH is in the process of developing an ambitious roadmap for plant protein scale-up – both at consumption and production levels – with concrete business solutions for pre-competitive joint implementation in 2020.

BEST PRACTICE

In 2018, **Carrefour** launched Act to Food, its new sustainability initiative. In addition to actions on sourcing, the company has a target to **double the number of products** in its vegetarian range.



Carrefour

Has the company adopted targets to reduce Scope 3 emissions, including protein sourcing?

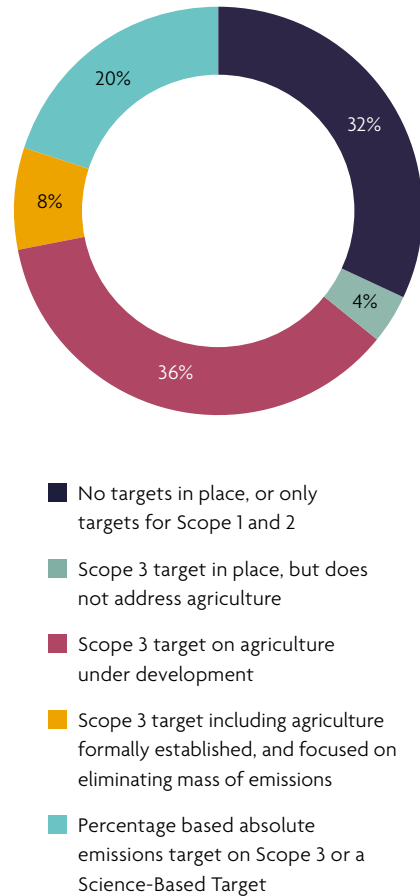
Another important building block on protein diversification is to commit to transition to a low-carbon business model in line with 1.5°C trajectory, which we believe will eventually trigger internal business discussions on carbon-intensive protein portfolios. We look for companies to ideally adopt science-based targets, which require companies to map their supply chain emissions and set a target to reduce Scope 3 emissions if these are more than 40% of their value chain emissions. Most food companies typically meet this criteria, given agricultural sourcing, specifically animal-based commodities, accounts for a significant portion of value-chain emissions.

More companies in the sector have either begun or are beginning to address emissions from their value-chains, and specifically their agriculture supply chain; Only eight of 25 (32%) companies have no Scope 3 targets in place, and have not publicly committed to adopting one. Five of these companies are retailers: Woolworth Group and Coles Supermarket in Australia; and Kroger, Amazon and Costco in the US. Three are global manufacturers: Kerry Group in Ireland, Mondelez in the US, and Canadian dairy manufacturer Saputo. However, several of these companies have indicated to the investor coalition that they are planning to develop a Scope 3 target in the future.

Seven of 25 (28%) companies were awarded higher scores based on official Scope 3 targets that explicitly referenced their efforts to reduce their supply chain emissions from agriculture (either by eliminating mass of emissions, absolute emissions or through science-based targets).

Figure 17

How many companies have Scope 3 targets that include agriculture? (Source: FAIRR)



BEST PRACTICE

Tesco is the first food company to adopt science-based targets in line with the 1.5°C trajectory of the Paris Climate Agreement.

Tesco has committed to reduce direct (Scope 1) and indirect (Scope 2) greenhouse gas (GHG) emissions by 60% by 2025, using a 2015 base-year. Tesco also commits to reduce its Scope 3 GHG emissions by 17% by 2030, using a 2015 base-year.



The emissions categories covered by the Scope 3 target are purchased goods and services (supply chain), fuel and energy related activities, upstream transportation and distribution, and waste generated in operations. The company has stated that emissions from agriculture represent around 70% of its supply chain emissions. It incorporated these projections into its model to set a separate reduction target for agricultural emissions from other Scope 3 contributors to recognise its unique challenge.

Source: Science Based Targets Initiative



Figure 18
How companies score on strategy (max points 18)
Source: FAIRR

New report will highlight plant-based product assortment and promotion at top U.S. retailers

The **Good Food Institute** (GFI) is launching a new initiative to evaluate the top 15 U.S. food retailers on their **assortment**, **marketing**, and **merchandising** of plant-based foods.

The Good Food Retail Report will identify:

- Which retailers have the broadest selection of plant-based meat, eggs, and dairy products
- Which retailers have implemented successful marketing efforts to promote plant-based eating
- Which retailers are leading the way in innovative merchandising solutions for plant-based products

The Report will highlight the most innovative approaches to selling plant-based products, along with case studies and industry insights. Retailers will be rated using a tier system to highlight excellence and opportunities in three areas:

AREA	% OF OVERALL SCORE	CONSIDERATIONS
Product assortment	60%	<ul style="list-style-type: none"> • Total number of SKUs of plant-based products by category • Total number of private-label plant-based products by category • Number of plant-based prepared food options
Merchandising	25%	<ul style="list-style-type: none"> • Adjacent shelf placement of plant-based and animal-based products • Aisle signage & shelf tags
Marketing	15%	<ul style="list-style-type: none"> • Cross-category promotions across marketing vehicles

Using these learnings, GFI will offer complimentary consulting services to retailers to help them increase plant-based product sales across categories.

The Good Food Institute is a global nonprofit that is focused on building a sustainable, healthy, and just food system. Their team of scientists, entrepreneurs, lawyers, and policy experts are harnessing the power of food innovation and markets to accelerate the transition of the world's food system to plant-based and cell-based meat, eggs, and dairy. Learn more at www.gfi.org.



How is the company expanding its portfolio of plant-based and alternative protein products?

Within this assessment category, we look for corporate actions that demonstrate companies are working to develop and expand their plant-based and/or alternative protein product portfolio. Companies are cumulatively scored based on the number of demonstrable actions.

Retailers

Our analysis identified that all 16 retailers in the engagement have expanded their plant-based and alternative protein product portfolios in the last 12 months, either through own-brand ranges and/or external brand product offerings.

All 16 companies now carry a wide selection of external plant-based brands. This includes Costco, which previously stated that it had no plans to increase its product offering. However, in 2018, the company included an explicit reference to plant-based on its website under the 'Protein' section which stated, "Costco is also growing its selection of plant-based proteins as an alternative protein offering to its members." Last year, Costco added a plant-based burger by popular US-brand Don Lee Farms that sold 1 million units in less than 60 days, making it a best-seller.⁹⁷ Other popular external brands carried by US retailers include JUST Egg and Sweet Earth. In Europe, Gardein and Vivera are carried by a number of retailers, while brands like Beyond Meat can be found globally.

For retailers, private-label own-brand ranges offer the biggest opportunity for growth. For example, in the UK, own-brand lines are growing at 5.5%.⁹⁸ Similarly, in the US, sales of private-label brands grew at 4.3% versus 1.2% for external brands.⁹⁹ While we do not assess private label as a separate criteria, we believe that own brands present an important opportunity for retailers to expand their selection of affordable plant-based options. Within our engagement, over 87% of retailers, with the exception of Costco and Walmart, demonstrate evidence of ramping up their own-brand plant-based products across categories to compete with external brands.

This growth is being supported through dedicated internal resourcing: eight of 16 (50%) of retailers have allocated resources to expand plant-based portfolios. For example, Sainsbury's now has a Meat-Free Product Development Manager and Tesco hired a Director of Plant-based Innovation in 2017. Sainsbury's has also said that it has more than ten product developers actively working on plant-based product development across food categories. Coles Supermarket, Groupe Casino, Morrisons, Kroger, Loblaws and Marks & Spencer have said that a specific plant-based/alternative proteins focus is explicitly integrated into teams dedicated to innovation and new product development.

In response to consumer health concerns, several global retailers have embarked on projects to reduce so called 'negative nutrients' (salt/sodium, trans-fat, saturated fat, added sugars/calories).¹⁰⁰ We believe this offers valuable lessons for companies to expand their reformulation work to increase plant-based content and decrease animal-based ingredients (beyond gelatine) within their own-brand products. Overall, we expect this exercise to be undertaken strategically to reduce the company's overall exposure to animal protein sourcing.

Only one retailer, Morrisons, demonstrated the existence of a project to increase vegetables in one of its labels aimed at young children.

In terms of cross-sectoral collaborations, UK-based retailers – Sainsbury's and Tesco – are participating in innovative partnerships. In 2018, Tesco announced a four-year partnership with WWF to halve the environmental impact of customer shopping baskets. Similarly, Sainsbury's is working with institutions like the World Resources Institute and Oxford University to identify consumer interventions to promote sustainable diets (see best practice).

BEST PRACTICE



Sainsbury's is partnering with Oxford University, the Wellcome Trust and LEAP (Livestock, Environment and People) on a research project to provide evidence and tools to promote healthy and sustainable diets. The focus of the collaboration includes:

- Testing messaging on promotional coupons to encourage customers to try meat free products.
- Trialling siting meat-free products in our meat, fish and poultry aisle with messaging to encourage customers to try meat alternatives.
- Testing meat-alternative names on Groceries Online e.g. "Try meat-free" or "Try plant-based" to see which attracts more customers:

Sainsbury's

Figure 19
What are retailers doing to expand their product portfolios?
(Source: FAIRR)

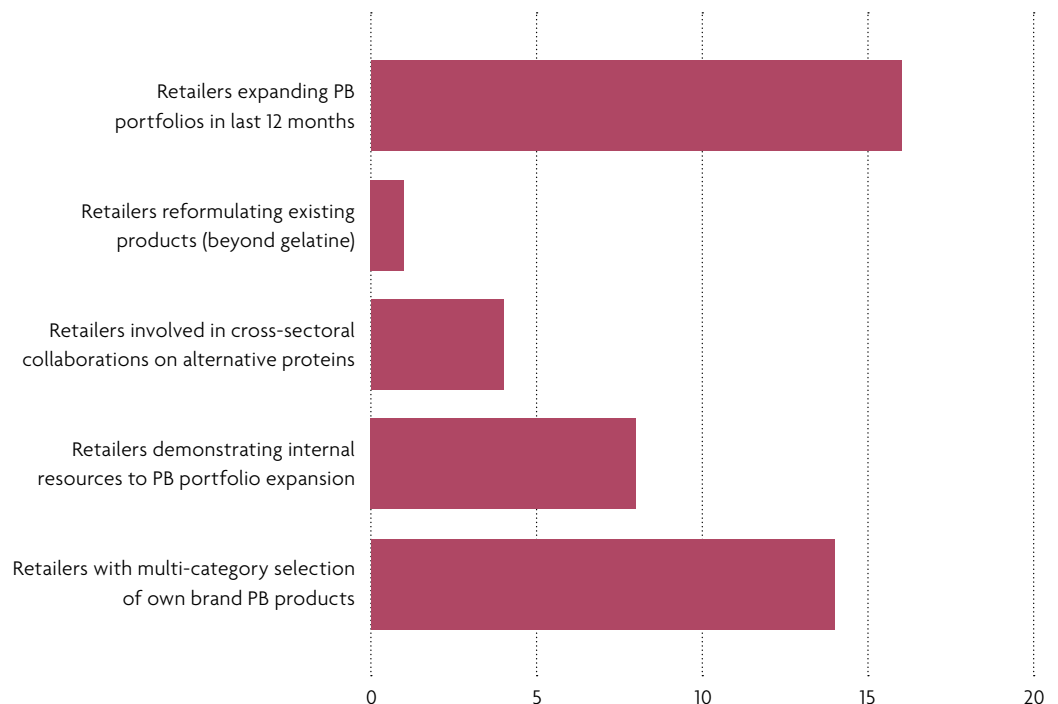


Figure 20

Retailers are ramping up their own-brand plant-based ranges

AHOLD DELHAIZE

Albet Heijn in Belgium and Netherlands offers plant-based products under the AH own range in milk, yoghurt, meat and ready to eat meals categories.

AMAZON (WHOLE FOODS)

Whole Foods' 365 Everyday Value range includes a wide selection of plant-based alternatives in the meat, cheese, ice cream and dessert, and dairy categories.

CARREFOUR

Carrefour Veggie own line offers ready to eat meals, salads, desserts and patties in the refrigerated and frozen categories. Carrefour Bio, its French organic range, also has a line of plant-based beverages.

COSTCO

Costco's Kirkland Signature brand has a limited selection of own-brand plant-based products. We only found some products in the dairy category. The company has recently introduced some plant-based options in its in-store restaurants.

COLES SUPERMARKET

Coles launched its own-brand frozen vegan ready meals line in 2018. It also offers a few plant-based milks and yoghurts and recently launched a Vegan Chicken Style Stock.

GROUPE CASINO

Groupe Casino has introduced its own-brand Casino Veggie range, which has plant-based yoghurts, ready to eat meals and patties. Casino's other store formats, such as Monoprix and Franprix, have their own plant-based product lines patties, ready to eat meals and nuggets.

ICA GRUPPEN AB

ICA own-brand and ICA Gott Liv (Good Life) range offers plant-based patties, spreads and meat alternatives in the frozen and refrigerated aisles.

KROGER

Kroger Simple Truth's own range includes a wide range of meatless patties, plant-based beverages and frozen meals. The company has announced that it is launching more products in 2019.

LOBLAW COMPANIES LIMITED

President's Choice plant-based products include veggie and meatless patties, frozen meals and desserts, dips and pea-protein powder.

MARKS & SPENCER

M&S has a plant-based range called Plant Kitchen that offers products across categories: ready to eat meals, salads, meatless patties, desserts, dips, sandwiches and dairy-free milk.

MORRISONS

Morrisons launched a vegan range 'V Taste' that includes ready to eat and frozen meals, patties, cupcakes and mozzarella sticks. It also has a line of vegetarian patties called Morrisons veggie. Morrisons' free from line has flavoured soy beverages.

OCADO

Ocado's own range offers plant-based frozen patties, meals and its free from line has vegan cheeses.

SAINSBURY'S

Sainsbury's Love your VEG! ranges include ready to eat meals and a variety of meatless products. In the frozen category, there are plant-based patties and meals under the line "Vegetarian made with soya". By Sainsbury's free from line offers plant-based cheese, bakery and ready to eat meals.

TESCO

Tesco launched its own range of ready to eat meals, Wicked Kitchen, in 2017. In 2019, the company announced 300 new products under the newly-created Plant Chef range. The company has also unveiled a plant-based sausage roll to compete with Gregg's version (which has proven to be extremely successful).

WALMART

Walmart's Great Value range offers almond, coconut and flavoured soy beverages. We did not find products in any other category.

WOOLWORTH GROUP LIMITED

Woolworth Macro own brand includes plant-based spreads, patties and beverages. The company also launched a plant-based loaf in December 2018 for Christmas.

Source: FAIRR

Manufacturers

Similar to the retailers, the majority of global food manufacturers are actively working to develop and expand their exposure to the plant-based and alternative protein market.

Four companies – Conagra, Nestlé, Kraft Heinz and Unilever – now have dedicated plant-based/alternative protein brands, primarily through acquisitions. Other companies such as General Mills, Mondelez and Kerry Group have launched or are planning to launch plant-based options within existing brands. For example, Kerry Group has announced that it is planning a range of plant-based options as part of its Richmond brand.

Making early stage minority investments into start-ups allows the corporate access and exposure to innovation across a broad range of technologies and to tap into evolving consumer trends, as an alternative to making a larger commitment to strategic acquisition (the more traditional M&A route). Companies can also identify and exploit synergies to the benefit of both the corporate and the start-up, which could lead to a longer-term partnership and the potential for enhanced profitability on both sides (and ultimately returns for the corporate venture capital arm).

In 2018, two companies, Mondelez and Kraft Heinz, announced venture arms that include plant-based and alternative protein startups as part of their remit.

Nearly 78% of the companies have said they have dedicated internal resources to support innovation, new technology and product development. In terms of reformulation, Kraft Heinz is the only manufacturing company to reformulate an existing product within its iconic Boca brand. The company made its Boca burgers fully plant-based (from vegetarian) to enable them to compete with new entrants such as Impossible and Beyond Meat.

The only manufacturer in the engagement with no exposure to plant-based and alternative protein products is Canadian-dairy company Saputo. The company, however, has publicly recognised the growing demand for plant-based products, but has yet to enter the market.

Figure 21
What are manufacturers doing to expand their product portfolios?
(Source: FAIRR)

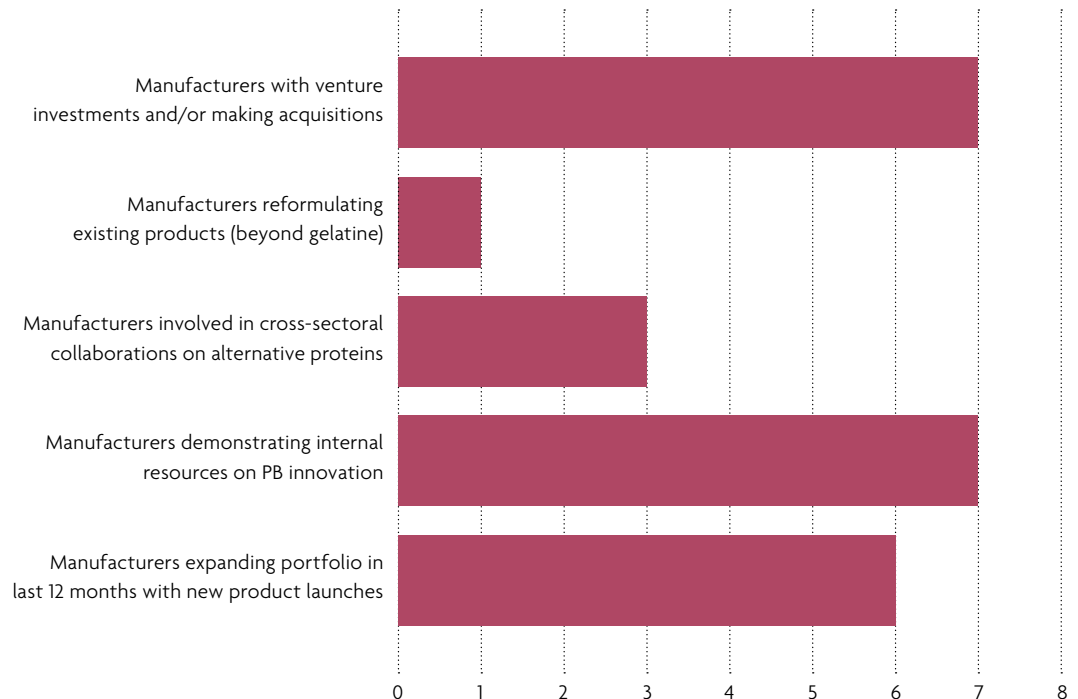















Figure 22 Company activity to support product portfolio expansion

 ACQUISITIONS  VENTURE/ DIRECT INVESTMENTS  NEW PRODUCT LAUNCHES  COLLABORATION/ INNOVATION	CONAGRA BRANDS	 <p>Acquired Pinnacle Foods, which includes the plant-based brands Birds Eye and Gardein in 2018.</p>	 <p>Launched new range of frozen plant-based options in its Healthy Choice brand.</p>	
	GENERAL MILLS	 <p>Launched venture arm 301 Inc in 2015 to invest in plant-based start-ups, including Beyond Meat, No Cow and Kite Hill.</p>	 <p>New plant-based products in: Annie's, Lärabar, and Food Should Taste Good brands. Yoplait also launched its first plant-based product under the Panier range in France.</p>	
	KERRY GROUP	 <p>In 2019, announced plans to develop range of plant-based products under its Richmond brand.</p>	 <p>In 2018, announced a joint venture with Ojah, the producer of Plenti, a plant-based meat alternative.</p>	
	KRAFT HEINZ	 <p>In 2018, acquired Primal Nutrition, the producer of Primal Kitchen, which has some plant-based products.</p>	 <p>In 2018, launched the Springboard platform that is supporting five start-ups: lupine-bean snack brand BRAMI; cold-pressed almond juice brand Origin Almond; vegan protein bar brands Blakes's Seed Based; coconut-based yoghurt brand Tiny Giants; and vegan dairy-free Cheddar Ka-Pop. In 2018 also announced launch of Evolv Ventures, a \$100 million venture fund to invest in early stage technology companies disrupting the food industry, including protein alternatives.</p>	 <p>Reformulated an existing product within its iconic Boca brand. The company made its Boca burgers fully plant-based (from vegetarian) to enable them to compete with new entrants such as Impossible and Beyond Meat.</p>

Source: FAIRR

MONDELEZ



In 2018, launched SnackFutures, an innovation platform, through which company it has a minority stake in Uplift Foods, which produces prebiotic functional foods using plant-based ingredients. Mondelez has also announced a minority stake with Hu, a vegan-friendly and paleo-friendly chocolate product.



In April 2019, entered into a partnership with The Kitchen, an Israel-based food-tech incubator with a portfolio of 12 companies, including cell-based meat and plant-based companies such as Aleph Farms, Zero Egg and Yofix Probiotics. The company has also launched an open innovation portal, which is led by its Research, Development, Quality & Innovation (RDQI) team and one of the criteria is to ensure that any new ingredients and snacks are suitable for vegetarians.

NESTLÉ



Acquired plant-based brands Sweet Earth in 2017 and Terrafertil in 2018.



Part of the Terra Food and Agriculture Accelerator that is supporting three plant-based food start-ups: Jackson's Honest, Miyoko's and Here.



Launched the Awesome Burger, from Sweet Earth brand in the US, and the Incredible Burger from Garden Gourmet in Europe. Has also launched new products under the HäagenDazs, Nesfit and Carnation brands.



Announced the launch of the Future Food Initiative, a research programme in collaboration with Swiss academics, universities and industrial partners like Givaudan focused on sustainable food and nutrition.

UNILEVER



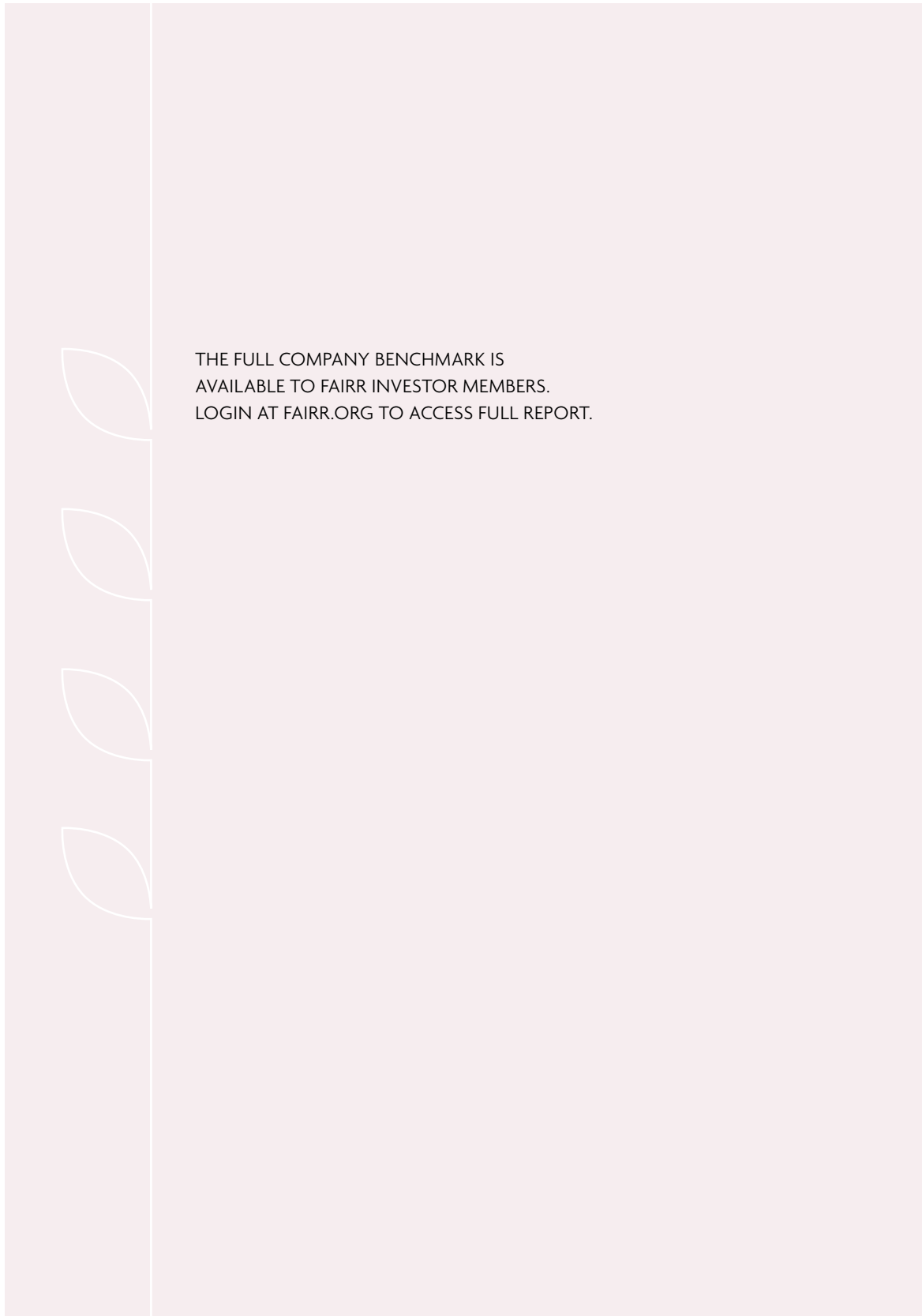
Acquired the Vegetarian Butcher, a producer of meat alternatives, and Graze, a plant-based snack brand in 2018.



Has launched a number of new products since 2017 under the Knorr brand and new vegan ice cream flavours under Ben and Jerry's, Magnum, Breyers Delights and Walls (Solero).



Building a new global foods innovation centre at the campus of Wageningen University & Research in the Netherlands that will focus on healthy and sustainable food innovation, including alternative proteins.



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Figure 23
How companies
score on
product portfolio
(max points 18)
Source: FAIRR

How is the company using its branding, marketing and merchandising power to engage consumers to promote plant-based and alternative foods and protein products?

Within this assessment category, we looked for corporate actions that demonstrate companies are using a wide range of interventions to improve consumer engagement, understanding and acceptance of the need for a dietary transition away from predominantly animal-based ingredients and products. We note that this category is hard to assess as there is no clear methodology to measure consumer engagement. However, we believe that any protein diversification strategy must include a cross-functional programme involving marketing, branding, product development and sustainability to increase the category share of plant-based/alternative protein products within companies.

Retailers

The large majority of retailers in the engagement have been involved in some sort of product promotions, communication and/or organised marketing events to support the sale of plant-based and/or alternative protein products in the last 12 months. However, this has been in an ad-hoc manner to support individual product or brand launches, rather than as part of a comprehensive, company-wide approach to encourage consumers to make sustainable product purchases as part of a broader dietary transition that includes plant-based foods.

Some retailers have made the link between increased plant-based food consumption and healthier diets. For example, Amazon (driven by its Whole Foods brand) has launched a new website called 'Plant-astic and Plant-Based Plan' that offers a range of recipes, weekly meal plans and recommendations for ingredients to support and encourage consumers to eat more plant-based as part of a healthier diet. This consumer interface, however appears to be limited to the US. Tesco's efforts to engage consumers and stakeholders on the benefits of plant-based diets have been predominantly through the development of new products through its Wicked Kitchen brand, and through its partnership with celebrity chef Jamie Oliver to encourage 'little swaps' to create healthier and affordable meals such as a smokin' chilli 'non' carne soup. ICA Gruppen AB has taken another approach, which has been to link food purchases with environmental impacts. The company has launched 'my climate target', which is a tool that enables consumers to monitor the climate impact of their food purchases.

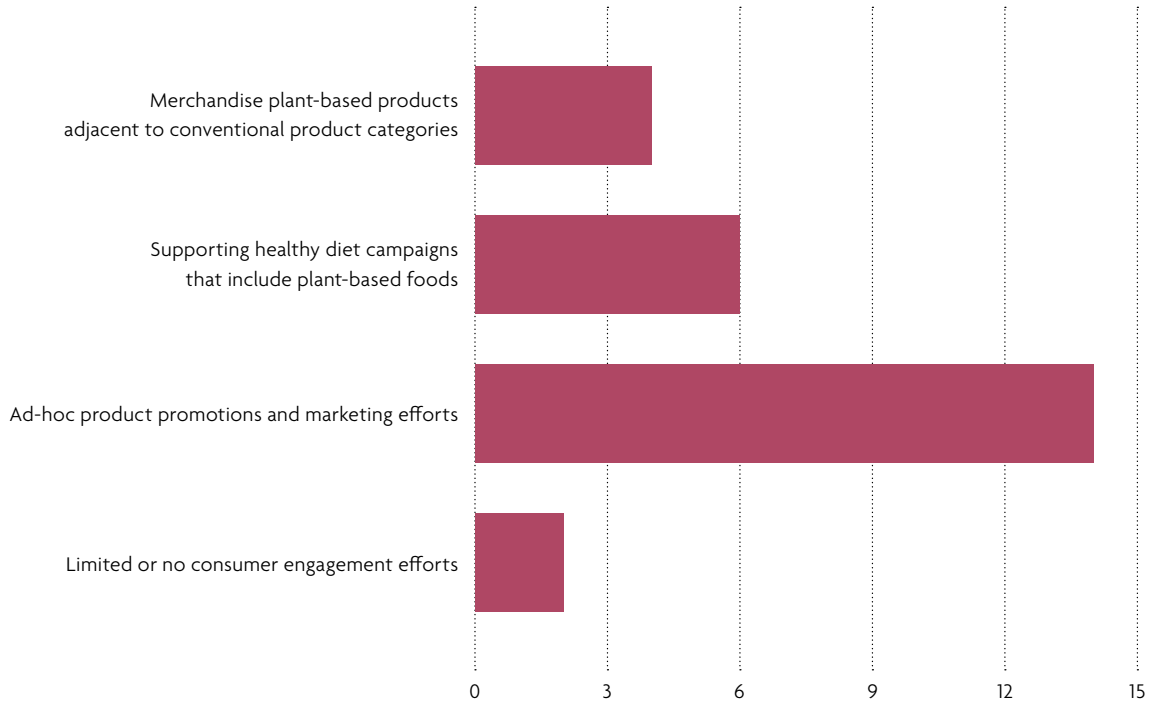
Only four of 16 (25%) retailers have stated that they are merchandising (or trialling) plant-based and alternative protein products alongside or adjacent to more traditional product categories. In the UK, both Sainsbury's and Tesco have announced that they will sell these products in the meat aisle to improve product visibility and choice. In the US, Kroger was one of the first companies to retail the Beyond Meat burger alongside other meat products in the traditional meat aisle. In Australia, Woolworth Group has also begun to merchandise meat-free mince in the meat aisles of some of its stores.

Costco and Walmart are the only retailers in the engagement that have yet to demonstrably engage with consumers on the benefits of increasing plant-based and alternative protein foods.

Figure 24

How are retailers engaging with consumers to support a dietary transition?

(Source: FAIRR)



Manufacturers

Manufacturing companies in the engagement have been less active on consumer engagement compared to retailers. Conagra Brands and Unilever are the only companies involved in both individual product promotions and marketing efforts, as well as wider campaigns that emphasise the need to consume more plant-based foods. Through its Gardein and Birds Eye brands, Conagra Brands has been actively promoting vegetable consumption and highlighting the associated health and climate benefits.^{101,102} Unilever, through its Knorr brand, launched a global food sustainability campaign (in partnership with WWF) to get people to consume a greater variety of vegetables, more plant-based protein instead of meat and increase the variety of grains, away from monocrops like rice and wheat.

We have yet to see evidence of manufacturing companies actively working with retailers to merchandise products adjacent to comparable conventional product categories and creatively market products and brands to a broad range of consumers using terminology such as 'plant-based' or 'plant-protein'.



BEST PRACTICE



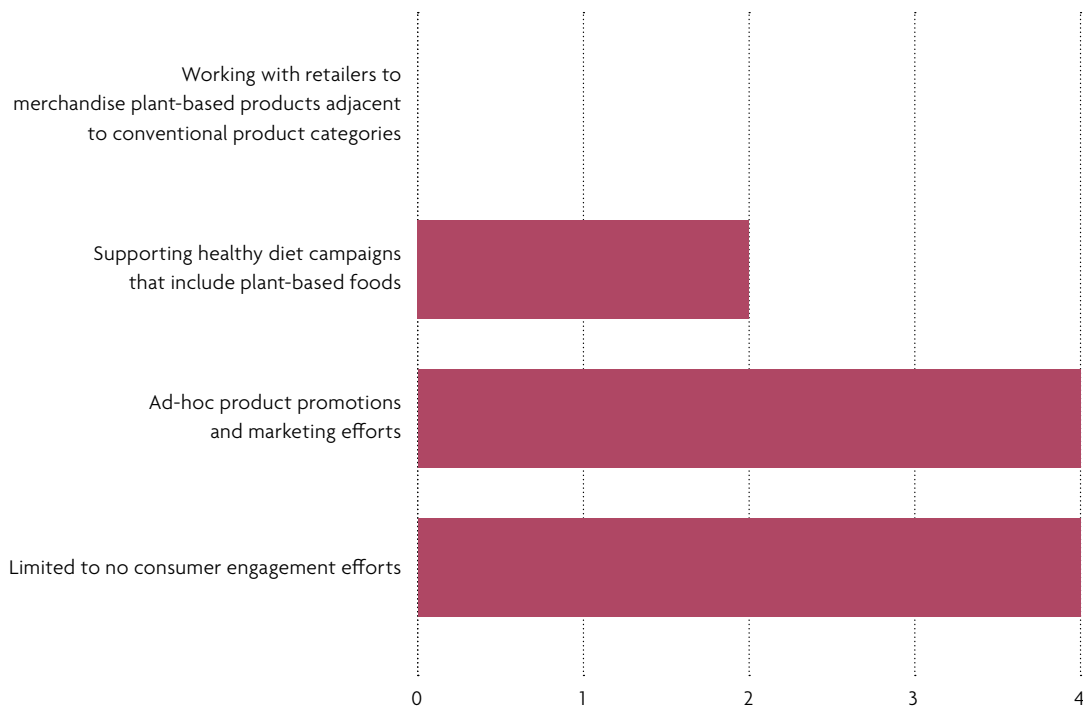
Unilever, through its Knorr brand, has partnered with WWF to launch a global campaign focused on highlighting 50 plant-based foods that are less well known, but have high nutritional value and lower environmental impacts.

Knorr is using its global brand power to make these foods accessible to consumers across the world by working with retailers, experimenting with new ingredients and recipes, and through a range of product promotions and programmes.

“Unless we change the foods we eat and the way we grow them, it will be challenging to have enough food to feed us all well,” says Knorr Global Vice President April Redmond.¹⁰³

Image source: Unilever

Figure 25
How are manufacturers engaging with consumers to support a dietary transition?
(Source: FAIRR)





What research says about labelling alternative protein products

In a national online survey of 1,163 US adults conducted by Mattson last summer, respondents were asked to select either '100% plant-based' or 'vegan' to a series of questions. Plant-based significantly came out on top for consumers (see right).

- This is backed up by multiple studies, including from the World Resources Institute (WRI). In a recent paper by WRI, the organisation summarised current research on how language can advance sustainable diets:
- Putting plant-based dishes in the vegetarian section of a menu can reduce consumer ordering by 56%.
- Calling a dish 'healthy' – a typical term used for plant-based food – can suppress perceptions of taste (Raghunathan et al. 2006) and how filling a food will be.
- Research by Stanford University found that changing the names of vegetables to sound more indulgent (e.g., "slow-roasted caramelised zucchini bites") increased the number of diners choosing them by 25% versus basic labelling (e.g., "zucchini") and by up to 41% versus healthy labelling (e.g., "lighter choice zucchini" or "nutritious green zucchini").

Source: *How language can advance sustainable diets*, World Resources Institute

MATTSON SURVEY

Where does the future lie?

100% plant-based 83%
Vegan 17%

Which is more flexible?

100% plant-based 79%
Vegan 21%

Which offers more for me?

100% plant-based 76%
Vegan 24%

Which tastes better?

100% plant-based 73%
Vegan 27%

Which is healthier?

100% plant-based 68%
Vegan 32%



Figure 26
How companies score on consumer engagement (max points 18)
Source: FAIRR

“The transition to a more sustainable model to meet the world’s growing protein demand is complex, and companies are only just beginning their journey towards protein diversification. But given the risks to climate and public health, and given the pace at which technology is moving, investors expect large supermarkets and food producers to put in place a strategy to manage the transition and to adopt targets and metrics to measure progress.”

Robbie Miles

ESG Analyst, Allianz Global Investors



How is the company tracking and reporting its progress on protein diversification?

In this assessment category, we look at how companies are measuring and tracking metrics in two main areas: 1) portfolio transition; 2) emissions linked to animal agriculture.

Tracking a portfolio transition

Overall, there is a lack of understanding on how best to measure and track company progress on undertaking a protein portfolio transition. We believe that establishing standardised metrics is critical to track company exposure over time to different types of proteins across relevant categories and/or brands. This will enable investors and companies to measure progress towards building a portfolio that supports a dietary transition away from being predominantly dependent on animal-based ingredients and towards more plant-based and alternative protein sources..

One of the key barriers has been the absence of infrastructure that can help companies gather and consolidate ingredient-level data across categories, brands and geographies. Another is the lack of formal definition for terms such as plant-based protein, and what product groups and/or categories have the biggest opportunity for transition.

Nearly half of the companies in the engagement have no tracking systems in place to collect relevant data. Out of the nine companies that are collecting and tracking some data, five are manufacturers and four are retailers. Due to a lack of consensus on the best metrics for tracking a portfolio transition, companies are adopting a wide-range of approaches.

On the manufacturing side, companies such as Nestlé and Conagra Brands have shared data on their exposure at the sourcing level, i.e., the percentage split between animal and plant-based sources. Unilever is tracking the percentage of products within its portfolio that are suitable for vegans and vegetarians. Hershey’s and Saputo shared the percentage of revenues that are dependent on the main animal protein commodity (dairy).

We believe retailers should be monitoring their exposure at the category level to assess product portfolio composition changes over time. Retailers such as Kroger and Ocado have shared data on the percentage of products that are plant-based and/or animal-based within relevant categories. Marks & Spencer, with a predominantly own-brand portfolio, is looking at the percentage of raw material purchased that is animal-based, while Tesco tracks the number and percentage of products suitable for vegans. While no company has formally established metrics on this issue, we have seen progress over time as more companies have shared data in this phase of the engagement. Further, several companies have also shared plans to establish metrics and tracking systems to enable better measurement. Continued investor engagement on this issue is critical to encouraging companies to establish and report the right metrics.

Figure 27
How are companies tracking and reporting their protein exposure?
(Source: FAIRR)

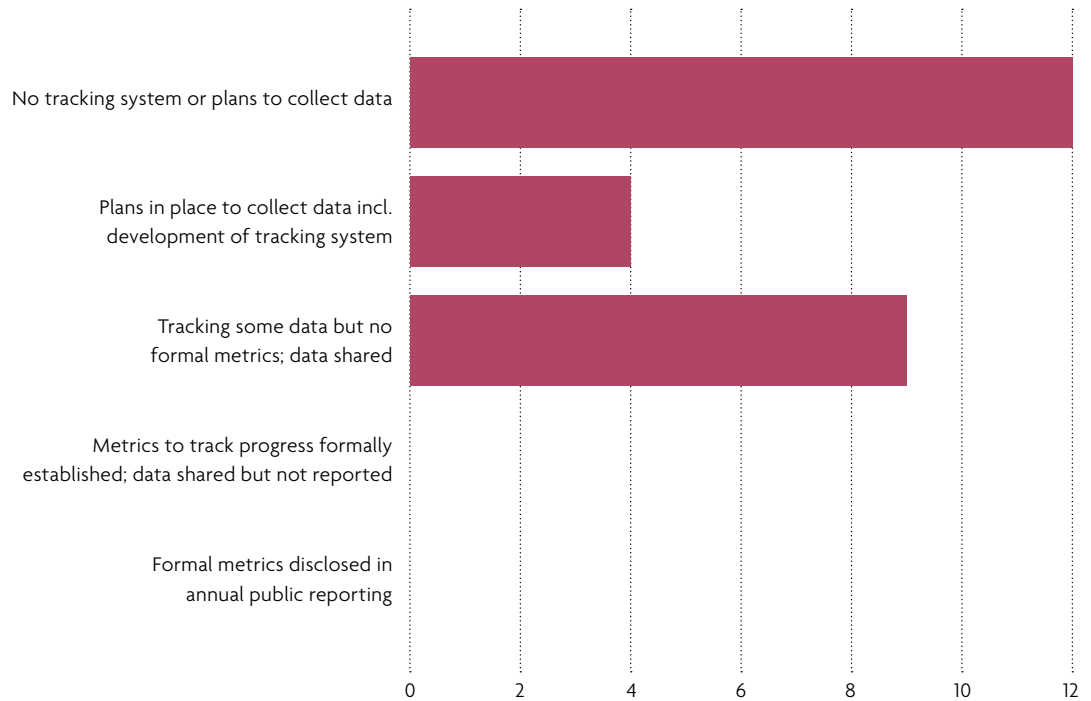


Figure 28
Are companies tracking and reporting on their Scope 3 emissions linked to animal agriculture?
(Source: FAIRR)

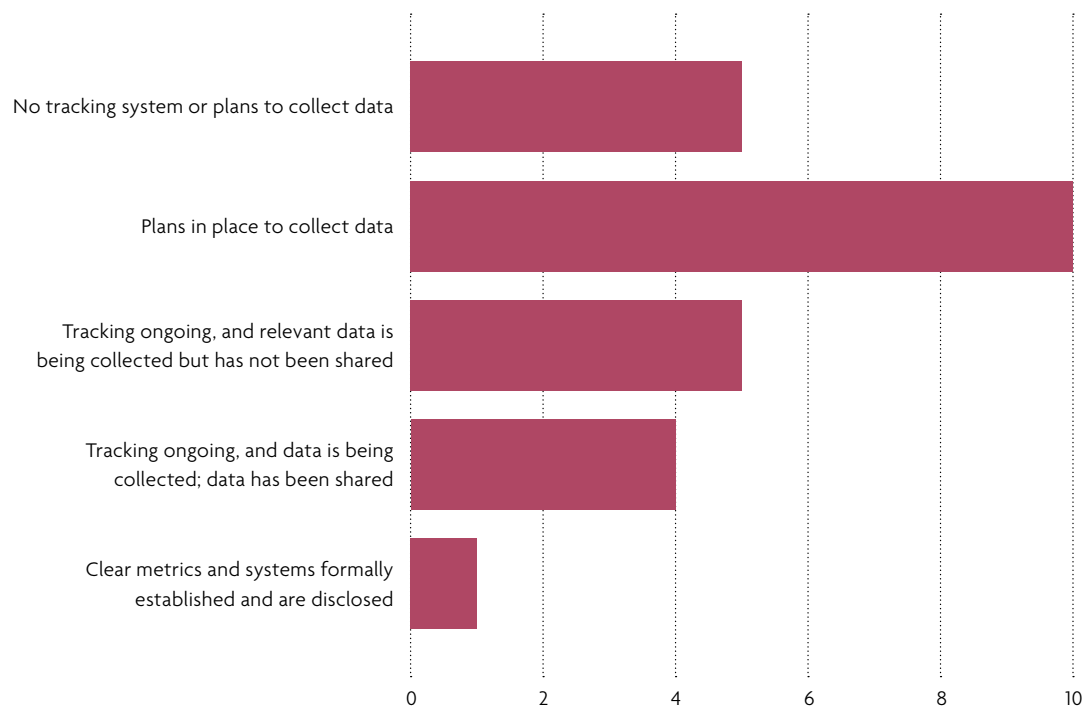
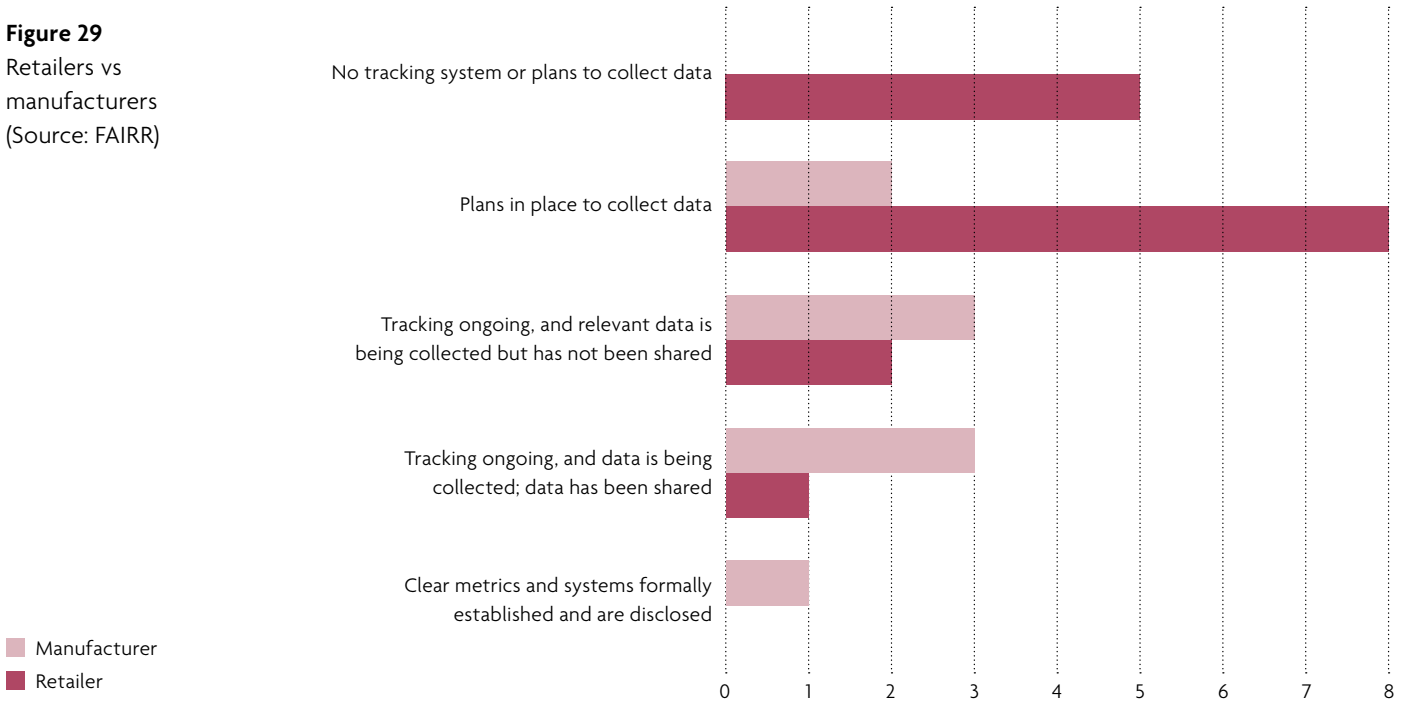


Figure 29
Retailers vs
manufacturers
(Source: FAIRR)



Scope 3 data

The majority of companies in the engagement appear to have limited understanding of how their exposure to animal-based ingredients and products impact their value-chain emissions.

Fifteen of 25 (60%) companies have either no systems in place to collect relevant data, or have indicated that they are planning to carry out an assessment and collect data in the future. Unilever is the only company that tracks and publicly reports on its Scope 3 emissions linked to animal agriculture. Marks & Spencer, General Mills, Kerry Group and Mondelez are tracking relevant data, which they shared with the investor coalition. Based on the information received, Unilever appears to have the lowest exposure to emissions from animal agriculture, while General Mills has the highest exposure within this cohort of food manufacturers.

Overall, manufacturers appear to be ahead in terms of monitoring and collecting Scope 3 data linked to animal agriculture. Marks & Spencer was the only retailer to share specific information on emissions from animal agriculture.

Interestingly, two of the three manufacturers that shared relevant Scope 3 data with the investor coalition (Kerry Group and Mondelez) do not yet have Scope 3 targets in place. This is perhaps indicative of their intention to set Scope 3 targets that include agriculture.

BEST PRACTICE

On the retailer side, Kroger was able to show progress in one category through its data:

“Plant-based protein alternatives are a growing part of Kroger’s business. Among national brands in our stores, we saw an XX% increase in sales in plant-based products in the most relevant categories (refrigerated, frozen and grocery) over the previous year. These products are also making up a growing percentage of the relevant product category **sales, increasing from XX% to XX% from the previous year** across refrigerated, frozen and grocery.”





Figure 30
How companies score on tracking and reporting (max point 18)
Source: FAIRR



INTERVIEW

**Ryan Pandya &
Perumal Gandhi**
Co-founders, Perfect Day

Founded in 2014, Perfect Day is a food innovation company focused on the production of animal-free dairy. Leveraging the time-honored art and science of fermentation, Perfect Day produces dairy proteins with the same high-quality nutritional profile and unparalleled food functionality of the proteins found in cows' milk, without the downsides of animal-based milk protein production. The company recently announced a partnership with Archer Daniels Midland (ADM), a \$60 billion ingredients company, to produce large volumes in the coming years.

What work has Perfect Day done to estimate the resource intensity and environmental impact of fermentation produced dairy products vis-à-vis conventional dairy products?

Our original life cycle analysis was performed in 2015 and compared the production of a gallon of milk from cows versus microflora. Based on this analysis, Perfect Day's products could save more than 90% of the land and water, 84% of the greenhouse gas emissions, and 65% of the energy compared to dairy cows. We're working on re-doing this analysis to 1) reflect the fact that we're making more than just milk; 2) input our latest understanding of where and how our production will take place; and 3) ensure that any literature from the past three years about dairy cow resource utilisation is included in our analysis.

What is the regulatory pathway for approval of fermentation produced dairy for mass consumption across the US, Europe and Asian markets? How is your company/the industry working to anticipate and address regulatory challenges?

In the United States, we're following the industry standard GRAS pathway (and equivalents abroad). We're making a protein that has been consumed in large quantities by humans for 10,000 years, and we're using industry standard production methods that are used today to make everyday components like vitamins, amino acids, enzymes and probiotics.

What is the company/industry's strategy to scale up, reduce costs and bring fermentation produced dairy products to price parity with conventional dairy?

How do you expect that fermentation produced dairy products/ingredients will enter food retail and be used by manufacturers?

What are the biggest barriers to achieving scale for fermentation produced dairy products?

Do you expect that fermentation produced dairy products/ingredients will enter food retail and be used by manufacturers?

Will your products/ingredients have the same shelf life/food safety issues as conventional products? How do these products fit into current corporate strategies to reduce food waste?

Do dairy proteins still perform the same as conventionally produced when protein is added to milk and creamers. Do food safety concerns impact your products or performance substantially better than conventional dairy proteins, or are proteins a free from contaminants found in bovine feed and waste, and scaled production takes place in a clean, controlled environment.

How is your company building out its scientific and regulatory teams? How do you assess your strategic approach and priorities in terms of external partnering?

How working with experts who have decades of experience commercializing ingredients made using microflora. Our team includes PhD scientists and scale-up engineers, though we're not expanding the non-technical parts of the team.

What is your current understanding of how consumer acceptance will evolve regarding your products?

The market research has shown that most consumers have favorable attitudes about Perfect Day when they first learn about it. Consumers have a strong interest in trying Perfect Day's products, especially younger people and the sports nutrition segment.

How is your current industry currently engaging with the existing industry? Are there potential areas of collaboration?

How do you envision long-term collaboration with animal

THE FULL INTERVIEW IS AVAILABLE TO FAIRR INVESTOR MEMBERS. LOGIN AT FAIRR.ORG TO ACCESS FULL REPORT.

INVESTOR RESOURCE

Engagement questions for food companies

Strategy

1. Is increasing alternative protein offering a priority over the next five years? Are efforts driven by consumer demand, competitive pressure, market opportunities, alignment to environmental goals or another factor?

Tracking and reporting

1. What percentage of products by SKU or any other meaningful measure in the food segment has animal protein quality footprint data being reported in a key segment?

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2. How is your company increasing alternative protein offering? Please provide examples of specific interventions, including:
 - Goals related to proteins in your business or sustainability strategy
 - New product development in new brand products, B2B and/or collaborations in alternative proteins
 - Acquisitions, investments and expanded internal brand offering to increase alternative protein portfolio
 - Consumer marketing and education, pricing and promotions on products that incorporate alternative proteins

2. Please provide details on how you track and report on Scope 1 emissions. What percentage of your current emissions data (also then and Scope 2) are a result of animal agriculture (including feed production)?

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Established by the Jeremy Collier Foundation, the FAIRR Initiative is a collaborative investor network that raises awareness of the material ESG risks and opportunities caused by intensive animal production. FAIRR helps investors to identify and prioritise these factors through cutting-edge research that investors can then integrate into their investment decision-making and active stewardship processes. FAIRR also runs collaborative investor engagements with global food companies to improve performance on selected ESG issues in intensive animal production.

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