

## Mintec Insight Series

# Are plant-based products sold at (un)-justified premiums?

### Series 1 The Milk Comparison

This report aims to answer four key questions

- ① What are plant-based proteins, and how do they compare to each other?
- ② How and why does the cost structure of similar plant-based and non-plant-based products compare?
- ③ If there is a premium for producing plant-based products, is it justified?
- ④ How could this premium change over time?

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Mintec's proprietary prices, known as Mintec Benchmark Prices (MBP), have a strict methodology to ensure all published prices are representative of market value and bring unbiased transparency to the commodity world.

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# Are plant-based products sold at (un)-justified premiums?

We are starting this Mintec Insight Series in the shadow of the second COVID-19 wave and with Veganuary well underway. Since the Coronavirus pandemic hit the world in early 2020, almost everyone has had to adapt their lifestyle with one of the key adjustments being 'cooking at home'. Gone, at least for now, are the days when we bought a cappuccino and croissant on the way to the office, nipped out to the high street for a sandwich and met friends for a bite to eat after work.

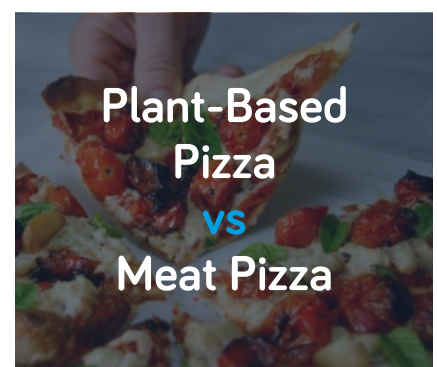
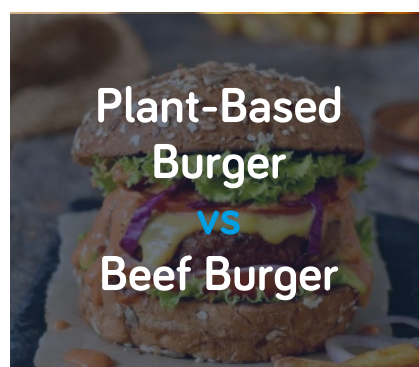
The current reality is that breakfast, lunch and dinner are largely prepared at home with the added dimension that some people are having a dry and vegan January. Some of us might have found this a cleansing start to the year; others might be tired of all the permutations of recipes made from the humble chickpea or are secretly looking forward to switching back to normal dairy milk. The cost of your groceries might also be on your mind. Have you found that a plant-based diet has increased your weekly food bill?

The cost of going vegan has already been written about extensively, and we don't intend to re-hash these arguments again. Where there has been less research conducted is understanding the true cost of producing plant-based foods vs their non-plant-based alternatives and answering the question "are plant-based products sold at (un)-justified premiums?".

Mintec has teamed up with Simon Frost, founder of Frost Procurement Adventurer, to explore this topic over a series of insights pieces, focusing on the following areas:

- 1 What are plant-based proteins, and how do they compare to each other?
- 2 How and why does the cost structure of similar plant-based and non-plant-based products compare?
- 3 If there is a premium for producing plant-based products, is it justified?
- 4 How could this premium change over time?

As there is an explosion of plant-based products, and the market is developing rapidly, the answers to these questions will, no doubt, change over time. Nevertheless, we aim to give you a sense of what's going on by looking at typical products consumed at breakfast, lunch and dinner. In this first article of the series, we will share with you our findings of dairy milk versus its plant-based alternatives.





## Plant-Based Proteins

While global plant-based protein production stands at well over 500 million mt, only 2.5 million mt is used as a protein ingredient for human food consumption – the remainder is used for animal feed. Of the 2.5 million mt there are, of course, many different types of plant-based proteins which all have different purposes. Let's look at this in more detail.

In the breakfast sector, the key dairy alternatives are nut (particularly almond), soya, oat or coconut-based while in the snacking, lunch and dinner segment the most common plant-based alternatives to meat are based on pea, soya, mycoprotein or mushroom.

Further to this, the way in which the products are made is also quite different. In the production of dairy-alternative drinks, the base material such as oats or soya is milled (sometimes with enzymatic treatment) and then it's mixed with water. Depending on the brand, one or more of the following is also added: stabilisers, emulsifiers, flavours, colours and sugar. Milk has an average protein content of 3.4 grams per 100ml which can be achieved by the described process with a couple of the plant materials.

This is different to the production of plant-based alternatives to the likes of beef, chicken or pork where the primary plant material (often pea or soya) is mixed with its supporting ingredients and then extruded to mimic the texture of real meat. Beef has an average protein content of around 30g per 100g which means the pea or soya used needs to undergo a concentration or isolation process to increase its protein content to get closer to the meat protein content. This process is more costly – keep this in mind for our next sessions!

We will be breaking these costs and products down into much more detail over the coming sessions benefiting from Mintec's proprietary Benchmark Prices in the plant-based ingredient and nut sectors.

## Plant-Based Proteins

Plant proteins are increasingly used across a range of food products as a meat-alternative. How do these changes in ingredients impact your product costs?

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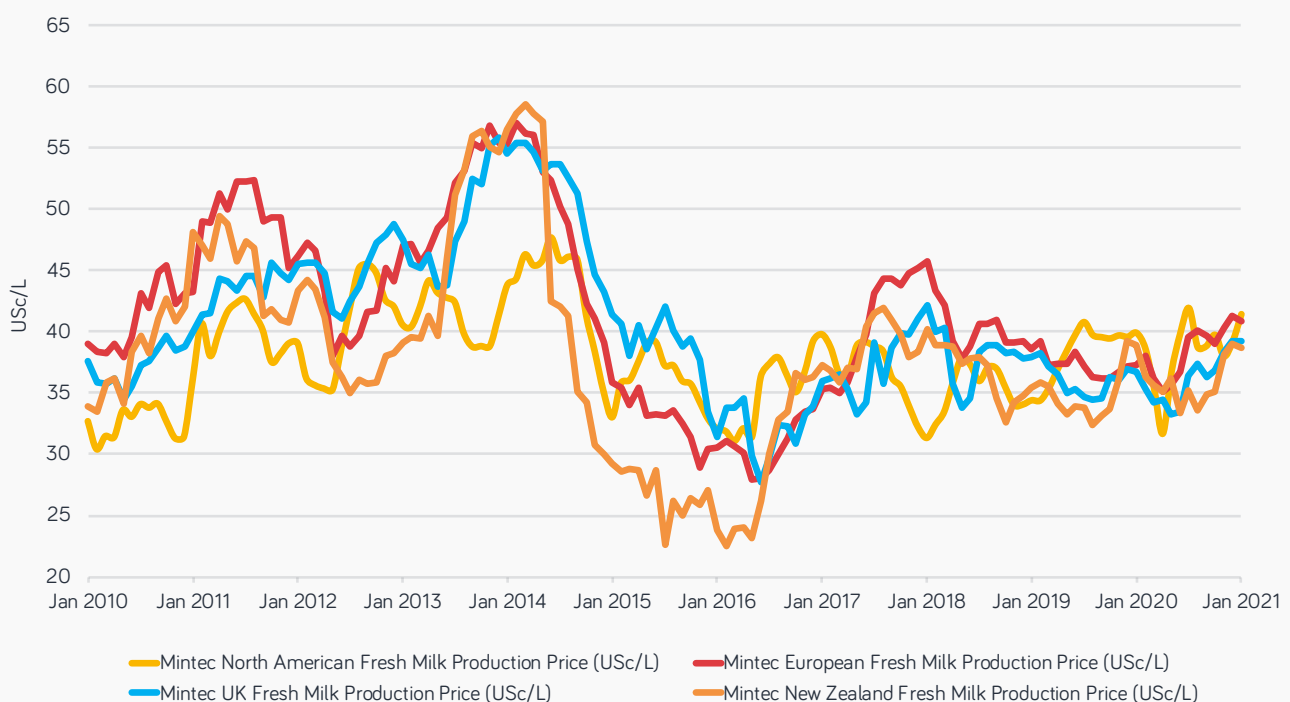
Bread	£0.37
Onion	£0.04
Tomato	£0.08
Cheese	£0.20
Meat Free Patty	£1.86
Lettuce	£0.15

## Milk and Plant-Based Drinks: Production Costs

Dairy milk is incredibly cheap for the consumer globally, and farmers are understandably vocal about just how tough it is to run a viable dairy business. Farmers with sufficiently large herds and economies of scale can make the numbers add up, but a dry summer, higher feed costs or a dip in the milk price can leave farmers in a precarious place. While there are differences globally in how dairy herds are managed, and exceptions always exist, increasing the size of herds and automated milking systems are some of the initiatives to make dairy farming more viable.

As can be seen from the Mintec data below, production prices for fresh milk tend to move in tandem globally and within a narrow band of each other. In the US, cattle are largely kept indoors, which results in higher feeding cost compared to Europe and New Zealand where cows are largely kept outside where they can graze off grass. Unsurprisingly, this is reflected in North American fresh milk production prices which tend to be on the more expensive end. The UK and New Zealand, by comparison, tend to sit at the lower end of the milk production cost curve. Indeed, even though milk is a true commodity, a majority of dairy market participants would be most unhappy to see prices drop back to the levels seen between 2015 and 2016. Farmers would be struggling to survive, which could threaten the security of supply and likely lead to further subsidies and government spending. There are pricing mechanisms in place with farmers and retailers that reduce the chance of this happening, but dynamics like Covid-19 can put a strain on these mechanisms.

### Global Fresh Milk Production Prices

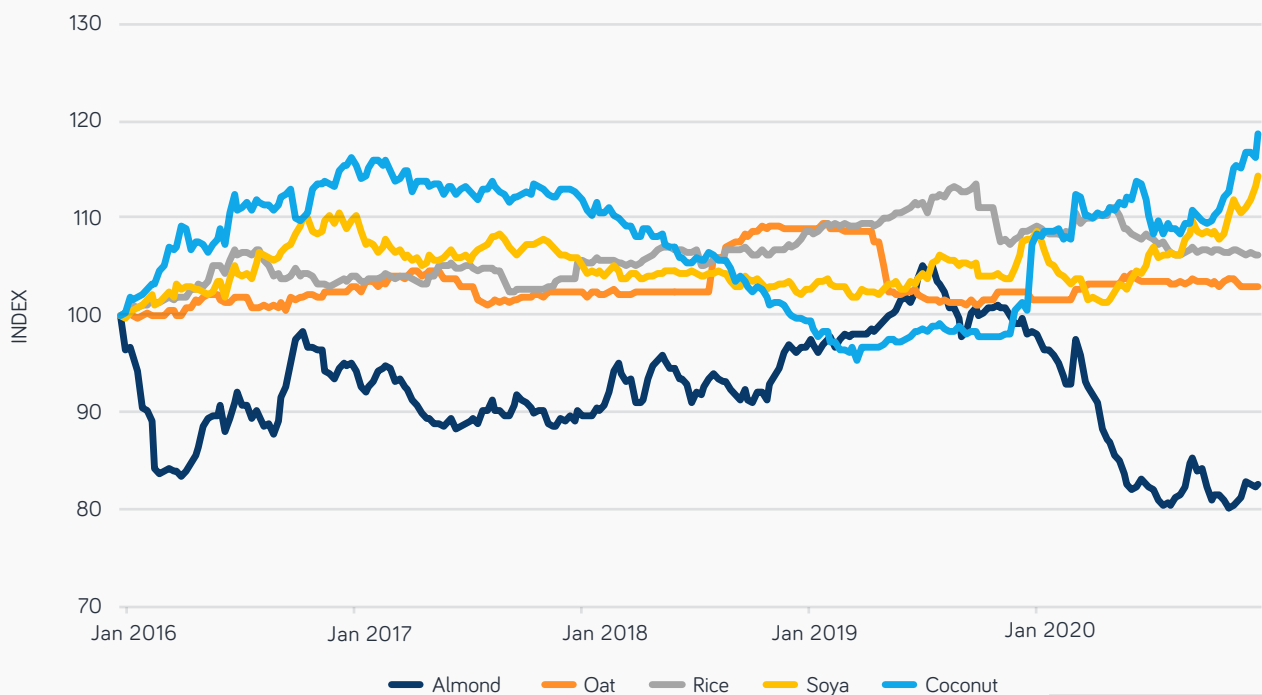


Source Mintec Analytics

On the other side of this, of course, sit the plant-based drinks where plant products such as nuts, soya, coconut, oat or several other plant-based products are used to create a drink that is meant to be similar in nutrition and colour but with a better sustainability story. We will look into the nutritional facts and recipes of plant-based drinks, later on, so for now, knowing that milk production prices have traded in a fairly narrow range for the last five years, let's examine how this compares to the plant-based ingredients using Mintec's wealth of proprietary data.

## Plant-Based Drink: Raw Material Price Evolution 2016 -2021

(Jan 2016 = 100)



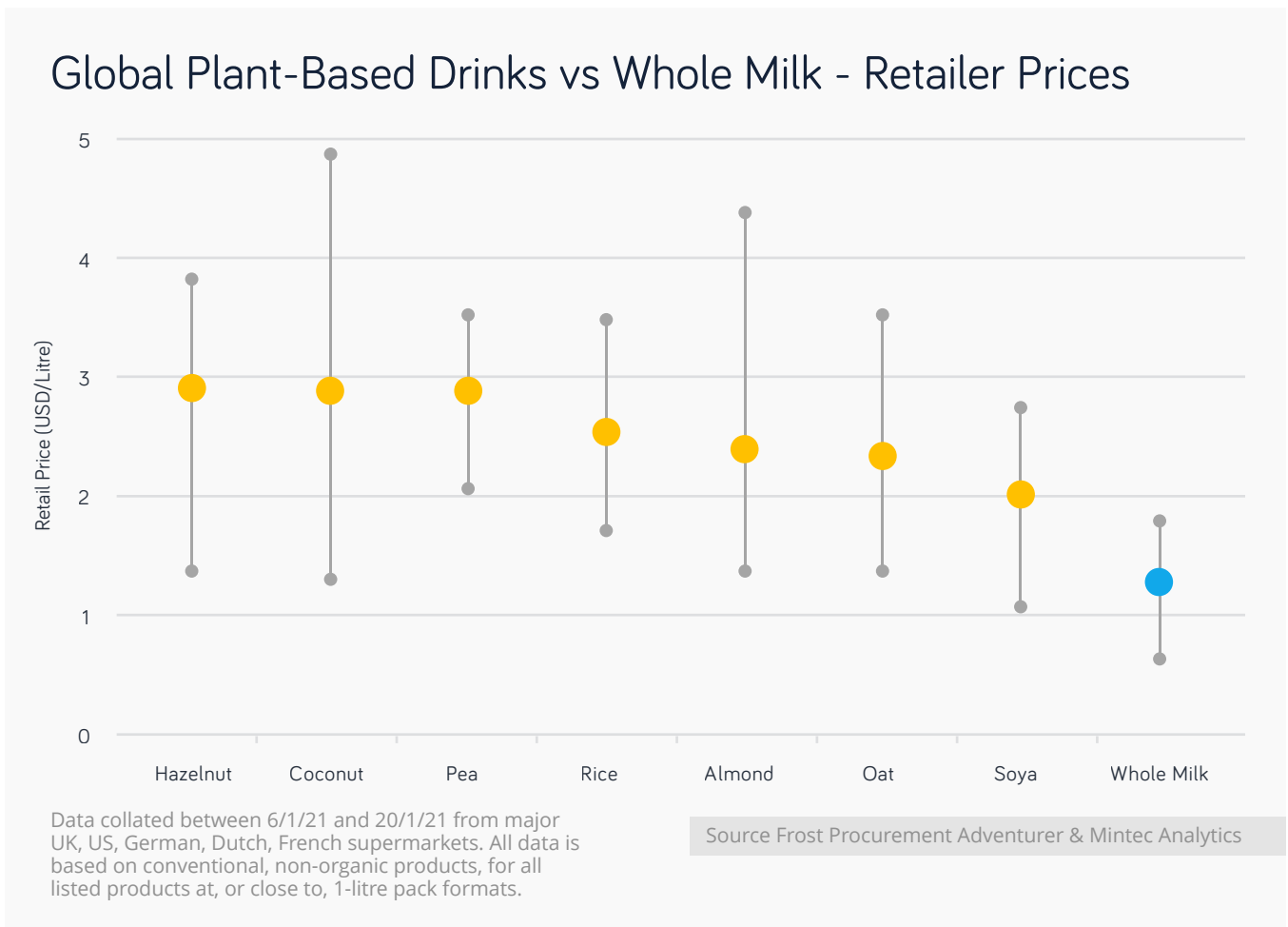
Source Mintec Analytics

Of particular interest is the precipitous fall in almond prices over the last two years, led in large part by successive record crops in California. The Mintec Benchmark Prices for 23/25 NPS Almonds on a FAS US basis, for instance, dropped from \$7,495/mt at the start of 2016 to as low as \$4,630/mt during the latter half of 2020. These low prices have boosted demand, incentivising higher inclusions of almonds in products, often substituting for more expensive nuts such as hazelnuts. However, for many almond growers, current prices are under the cost of production, meaning that longer-term this may not be sustainable.

On the other end of the spectrum are coconut prices where the Philippines, one of the world's largest exporters, was hit particularly hard by several typhoons limiting availability. At the same time, impacts and restrictions from Covid-19 caused staff shortages and slowdowns in both factories and ports, which further tightened supplies. One could use the Mintec Benchmark Prices for Desiccated Coconuts FOB Philippines as a proxy for Coconuts used in Coconut milk and see that prices have risen by nearly a fifth over the past four years as the Mintec Benchmark Prices were assessed \$420/mt higher at \$2,580/mt in December 2020 compared to 2016.

## Milk and Plant-Based Drinks: Retail Prices

Having examined the production and input costs for milk and plant-based drinks, let's focus our attention on the prices that customers actually see: the retail prices.



One can clearly see from the graph that plant-based retail prices are around twice that of conventional milk. To understand where this difference is coming from, we need to compare the characteristics of the dairy and plant-based drinks industries which are totally different and depicted in the following table:

Element	Dairy	Plant-Based
Market Size	Huge. Total World Market 700M mt p.a. \$250BN of raw milk. > \$600BN total dairy industry.	Relatively Small. Total World Market ~\$16BN. ~4-6% of the milk market.
Age of Industry	Long Heritage > 100 years.	Younger – 3-30 years. Taking off in earnest in the last 5 years.
Supplier Landscape	Varies significantly by country. Larger, more developed countries have consolidated dairies - some large global players have revenue \$10-20BN p.a.	A few global players with sales up to \$200M p.a. A growing number of smaller startups in the \$5-50M range.



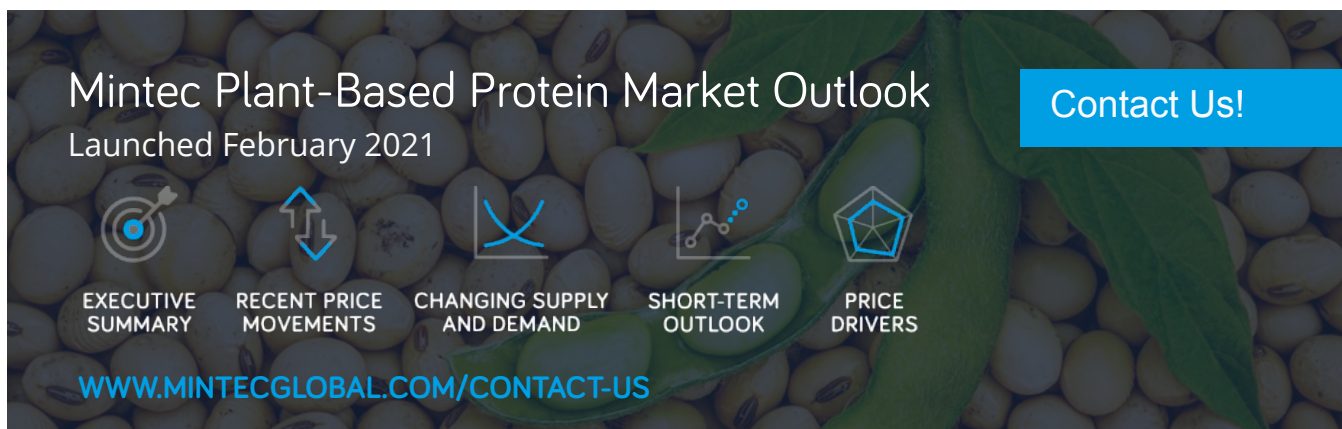
Supplier Ownership	Often co-operative.	Privately owned, private equity-backed and publicly listed.
Production	On-farm milking + central bottling by dairies.	More established players have their own production. Startups use co-man.
Sector Growth	Broadly flat.	Sector growing 15-20% p.a. (some brands up 90%). Huge growth opportunity-driven in particular by two-thirds of the global population who are lactose intolerant.
Innovation	Was stagnant for a long time although products like lactose-free have added some value.	Significant innovation requiring costly R&D.
Marketing	Very Low.	High – to attract new consumers.

Currently, the characteristics of the plant-based sector result in a more expensive cost model compared to dairy. As time goes on, economies of scale, less requirement to invest in R&D, marketing and capital expenditure and increased competition are likely to mean the cost structure for plant-based drinks becomes more competitive.

## Plant-Based Drink Recipes

Recipes fall into 3 categories: nut-based (almond, hazelnut), cereal/legume-based (oat, rice, soya, pea) or coconut. Recipes are 90-95% water with only 2-6% coming from their named ingredient. Other materials added include stabilisers, emulsifiers, flavours, colours and sometimes sugar.

Most plant-based brands try to mimic their dairy competitors with the equivalent of skimmed, semi-skimmed and whole fat as well as speciality products like 'barista' style targeted at coffee chains. Naturally, the dairy industry doesn't like being mimicked, and plant-based products in Europe can't be compared to dairy products in the future after an



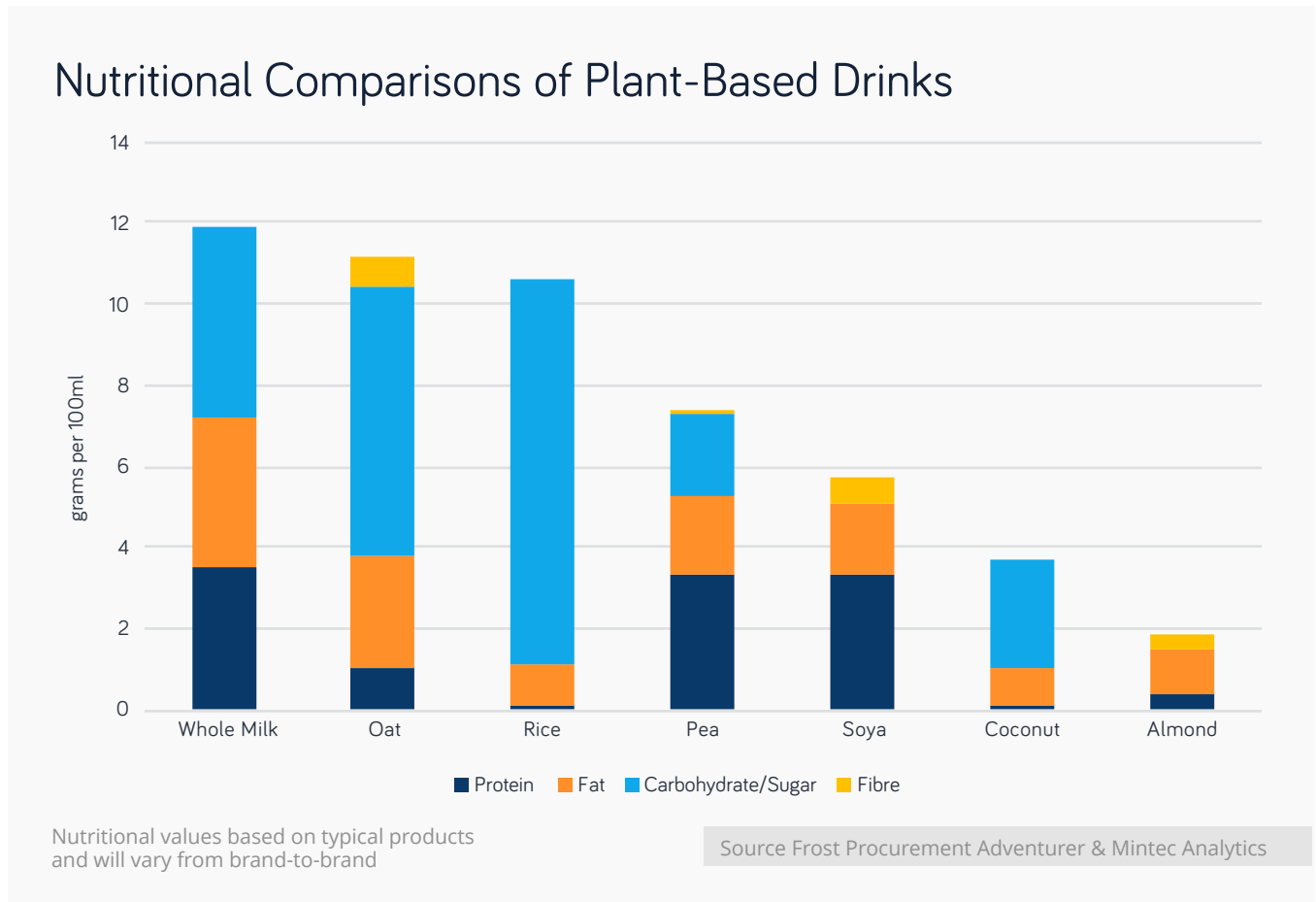
**Mintec Plant-Based Protein Market Outlook**  
Launched February 2021

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- EXECUTIVE SUMMARY
- RECENT PRICE MOVEMENTS
- CHANGING SUPPLY AND DEMAND
- SHORT-TERM OUTLOOK
- PRICE DRIVERS

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EU ruling in 2020. This is different in the US; however, where the word 'milk' can still be used in association with a plant-based drink. In any case, the reality is that plant-based drinks have quite different nutritional profiles from dairy milk with the below graph showing that only pea and oat drinks have a similar level of protein as whole milk. Overall a pea-based drink has the most similar (but lower) nutritional balance to milk. Products like almond drink are quite different from dairy milk:

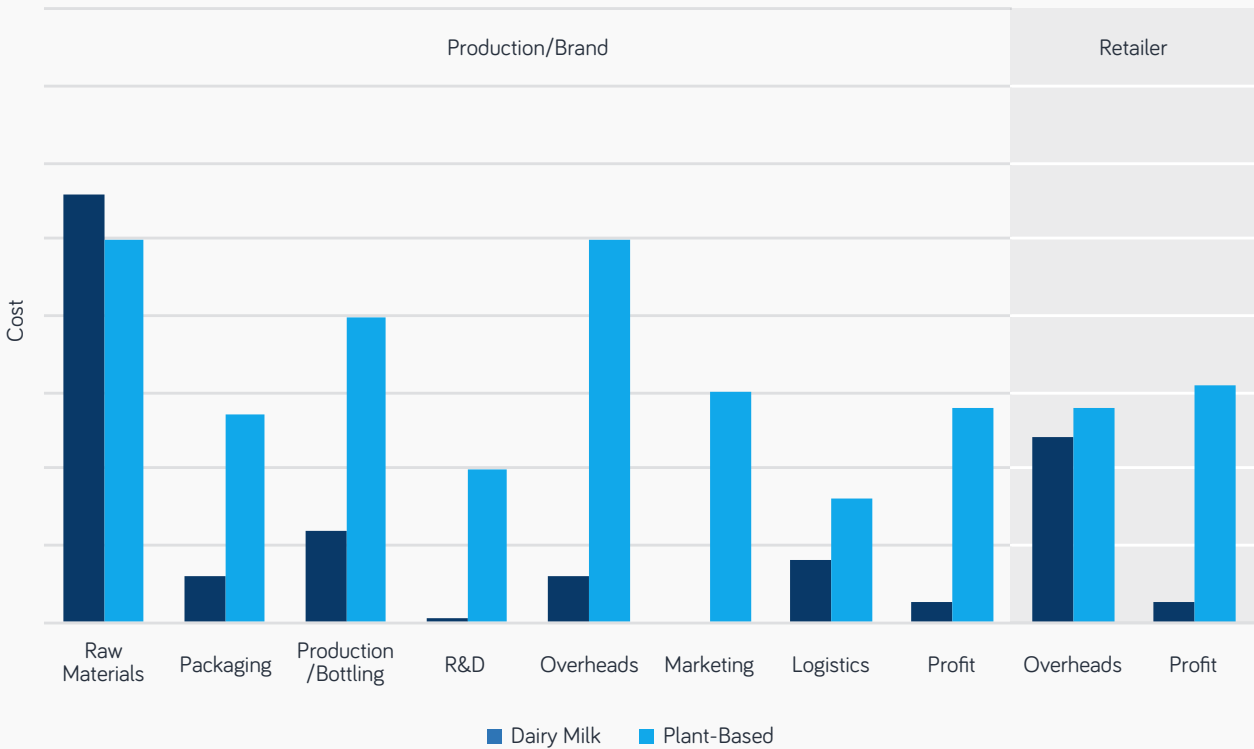


## Cost Model Comparison

Dairy is a tight cost model. Whether in the US at \$0.40/litre, the UK at £0.29/litre or Europe at €0.33/litre, it doesn't leave much headroom for all the other costs associated with getting the product on the shelf at the retailer. Regional differences tend to be around packaging design and product format - as an example, most milk in the UK and the US is sold as chilled fresh in very simple HDPE packaging. The French market is still more biased to ambient long-life milk in multipacks, whereas the German market is largely centred around chilled, fresh milk sold in Tetra Pack packaging with a plastic pouring lid. Regardless of the market, milk requires highly streamlined logistics from dairy to retailer to remain competitive. Allocation for R&D and overheads is very slim.

Plant-based recipe costs are marginally cheaper than whole milk. Given that global retail prices for plant-based products are often double that of dairy, the plant-based manufacturer and retailer can both spend more on overheads and marketing of the product. Resulting profits are higher for plant-based drinks.

# Comparison of Dairy Milk vs Plant-Based Drink

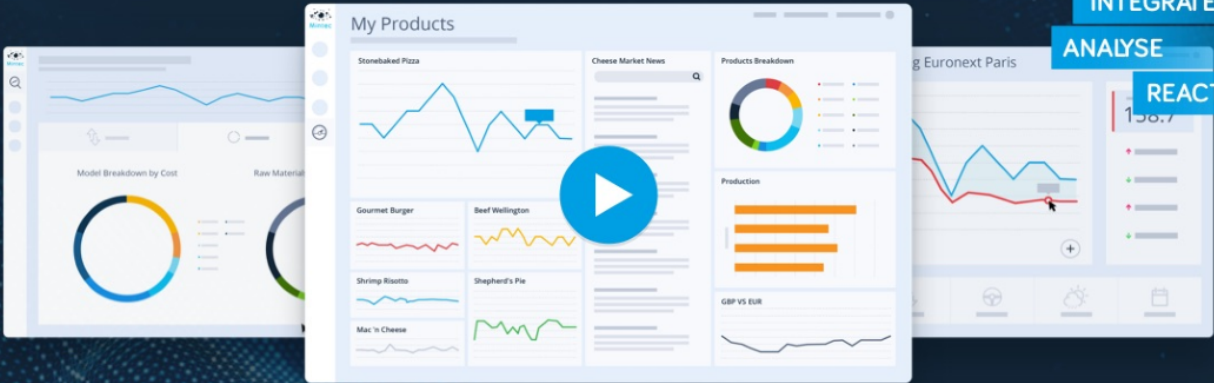


Source Frost Procurement Adventurer & Mintec Analytics

All costs are directional estimates not based on anyone company. There will be considerable differences from company to company due to factors like specific recipe design, pack format, location of factory production, the country product being sold, size of the business and how they decide to invest in R&D, overheads and marketing. Some companies may choose to invest all their profit back into driving further growth. Costs will change over time.

# Mintec Analytics

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## Now checking through the key cost elements:

Cost Element	Dairy	Plant-Based
BY BRAND		
Raw Materials	<p>The global milk prices are closely correlated, Mintec Analytics shows:</p> <p>UK ~29 pence/litre. US ~40 cents/litre. Europe ~33 cents/litre.</p> <p>Overall milk is a very cheap product and great value for the consumer.</p>	<p>The overall recipe cost is cheap, given 85-90% is water. Some of the named materials like almonds are expensive (The Mintec Benchmark Prices for Californian Almonds delivered to Europe stand at \$2.60/lb on Friday 22nd January); others like oats are much cheaper (Mintec Price for US oats is \$0.11/lb), but at only 2-5% inclusion don't add too much to the recipe cost. Addition of vegetable oil adds a little cost. Flavours, colour, vitamins and minerals are expensive but only in tiny inclusions.</p>
Packaging	<p>Varies by country.</p> <p>UK/US: Simple in-line blowing using HDPE which is very cheap.</p> <p>Europe: For fresh milk fresh use simple Tetra Pak; For long life simple plastic bottle.</p>	<p>More expensive/premium Tetra Pak.</p>
Production	<p>The production step of pasteurisation and bottling is very simple and streamlined.</p>	<p>Most plant-based brands will use co-manufacturers – less streamlined and hence requiring higher retail prices than the dairies. Brands who own production facilities will require considerable capex investment.</p>
R&D	<p>Typically low.</p>	<p>Developing new products requires higher R&amp;D investment.</p>
Overheads	<p>Low.</p>	<p>Higher headcount and marketing required to get brand developed and spread over much lower quantities than dairy.</p>
Marketing	<p>Minimal.</p>	<p>Plant-based must invest considerable funds for consumer acquisition and retention. Private Equity-backed brands are hungry for growth.</p>
Logistics	<p>Streamlined direct from dairies to retailers on dollies.</p>	<p>Less streamlined – may well have to go in/out of intermediary storage and end-to-end chains likely to be longer.</p>
Profit	<p>Dairies quote ~3% net profit, which on a cheap product like milk is low on a per litre basis. High quantities are a must to generate a meaningful total profit.</p>	<p>Gross profit could be &gt;40% but will, after much higher overheads, R&amp;D and marketing, result in a net profit &lt;15%. Much of this will be ploughed back into the brand to generate further growth and companies might well choose to operate close to 0% net profit.</p>
BY RETAILER		
Overheads	<p>Likely to have a minimum allocation of company overheads.</p>	<p>Likely slightly higher for plant-based as smaller brands often need more support.</p>
Profit	<p>Gross profit at 20-30% but on a low-cost product like milk the per litre it's very low. Net profit ~3% after accounting for overheads.</p>	<p>While profit percentages are similar to that of dairy milk, due to plant-based drinks being retailed at a higher price, the amount of profit per unit sold is higher.</p>

## Conclusion

Milk is an incredible bargain for the consumer globally, cheaper in fact than some bottled water. On a per litre basis, it generates a low profit for the farmer, the dairy and the retailer. From this point of view, dairies must be looking across to plant-based drinks with a degree of envy – some are already launching their own dairy-free drinks. Retailers need to strike a balance between supporting the dairy industry, which globally is still 95% of the dairy/plant-based market, while also catering to the other 5% and being ready to accommodate this part of the market as it grows over the coming years.

Being a younger 'challenger', non-commodity industry with only 5% of the total milk market, it's not surprising that plant-based drinks are more expensive and generate higher profits throughout the end-to-end supply chain. Plant-based drinks are ripe for innovation and with their environmental benefits are highly attractive to investors as can be seen by the big investments being made in R&D and Capex with eye-watering valuations of some brands. Except for almonds, the base materials for plant-based ingredients are plentiful, and the availability of materials shouldn't be a limiting factor in plant-based expansion. It will remain an interesting market to watch for years to come.

### 1 How does the cost structure of similar dairy and plant-based products compare?

Currently, plant-based drinks are more expensive to produce than dairy milk. This difference is largely a result of more expensive packaging and less streamlined bottling and blending costs for plant-based drinks. The cost of materials is broadly the same for both.

### 2 If there is a premium for producing plant-based products, is it justified?

Broadly speaking the premium for plant-based drinks is justified as milk is (too) cheap in comparison and the nascent plant-based industry doesn't have the economies of scale that dairy has but has higher costs for overheads, R&D, marketing and logistics to underpin consumer acquisition, growth and global expansion.

### 3 How could this premium change over time?

As the plant-based drinks sector matures and gains a greater market share from dairy, the plant-based drinks price premium should reduce.

In practice, retailers will probably try to maintain higher price points for plant-based drinks to continue delivering higher profits than their highly commoditised dairy alternatives that deliver very thin returns.



## Food for thought...

What will happen to the prices of dairy milk and plant-based drinks as the plant-based drinks continue to gain share from milk? Are plant-based prices poised to get cheaper to gain an ever great share, or will the dairy industry be able to benefit from the higher plant-based price point?

If prices are to change, at what level of plant-based drink market share would you expect these price changes to occur? When plant-based drinks have a share of 10%, 20%, 30% of the total milk market?

How will the dairy industry respond to the plant-based drinks hunger for market share?

In the breakfast sector, dairy-alternative products are currently leading the plant-based revolution. Which breakfast items do you think are next?

In the next Mintec Insight Series edition we will be analysing meat-based burgers vs their plant-based rivals. Stay tuned!

More in-depth analysis and information on this Mintec Insight is available by contacting the email addresses below. You can also reach out to us to discuss this Insight and share your thoughts with us.



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