

Changing Tastes *Invention & Innovation in Sustainable Food Substitutes*

Last month Oatly made its market debut on the Nasdaq. Trading now at 60% over the IPO price puts a US\$16 billion value on the company. So how does a decades old Swedish oat milk company transform itself into a high growth business and one of the hottest IPOs of 2021. Part of it is new leadership and rebranding, but really it's all about changing tastes.

Oatly was founded in the 1990s by two brothers who were looking for a milk alternative to cow's milk for people with lactose intolerance. While that remains a distinct advantage as a choice for the vast majority of the population with lactose intolerance, changing market dynamics are really at play. Dairy and meat alternatives are a material market growth opportunity, aligning firmly with more sustainable and environmentally responsible consumer choices. Plant based milk production needs less land usage, is less energy intensive and emits less greenhouse gasses than dairy milk on a same volume comparison. Oatly and other dairy milk alternative products are no longer just to be found in the hipster coffee shops of Brooklyn but have gone full mainstream as changing consumer tastes force structural change across the food and beverage industry.

Two of the better known leaders in the meat substitute space, Nasdaq listed Beyond Meats and California based Impossible Foods, have likewise been riding the wave of changing taste to more sustainable and eco-friendly choices. Plus, if you've tried their products, they're pretty good. This theme though extends far beyond just the likes of Oatly, Beyond Meats and Impossible Foods. All the major food and beverage companies are pivoting to catch up and this is supporting a wave of new investment across the supply chain.

In this, article we put a lens on the invention and innovation being made in three of the key sustainable food substitute areas, unpeeling the onion to identify who is doing what and where.

Dairy Substitutes: Includes milk and dairy product alternatives including butter, cheese, yoghurt and ice cream. Disruption of the existing market by nut, rice and soy-based products from companies including Oatly, Danone, Vitasoy international, Ripple Foods and many more.

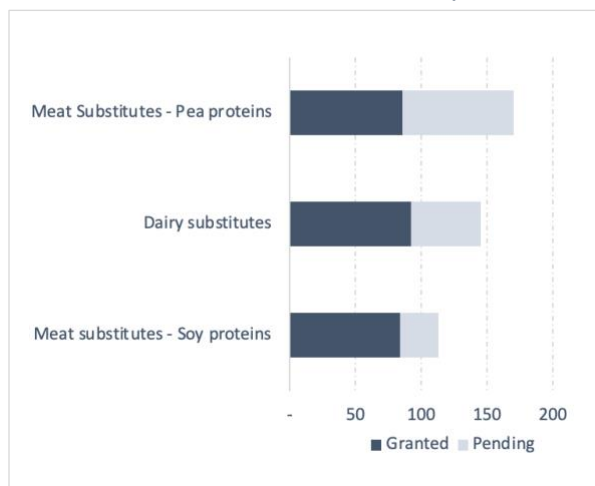
Meat Substitutes – Pea proteins: A great source of protein that forms the basis of many meat alternative products, favoured by many for building muscle mass and weight gain quickly. Key innovators in the space include Roquette Group, Nestle, Abbot Labs and Cargill.

Meat Substitutes – Soy proteins: A slightly higher source of protein than pea based, but soy has a bigger market share, choice is often down to taste preference for consumers. Key innovators in the space include Burcon Nutrascience, DuPont, Fuji Oil and Nestle.

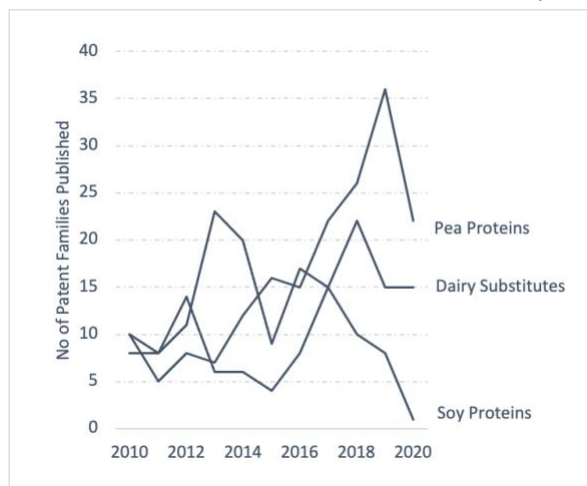
Pace of innovation in soy protein is lagging that in dairy and pea protein meat substitutes

Taking a look across the key US and Europe markets we see a similar size set of granted patents protecting inventions across the three technology areas, but with a higher number of patents pending in pea protein and dairy substitutes. This is reflected in the pace of invention over the last few years with soy protein innovation lagging and in decline since 2016.

Number of Inventions: US & Europe



Pace of Invention: Trendlines, US & Europe



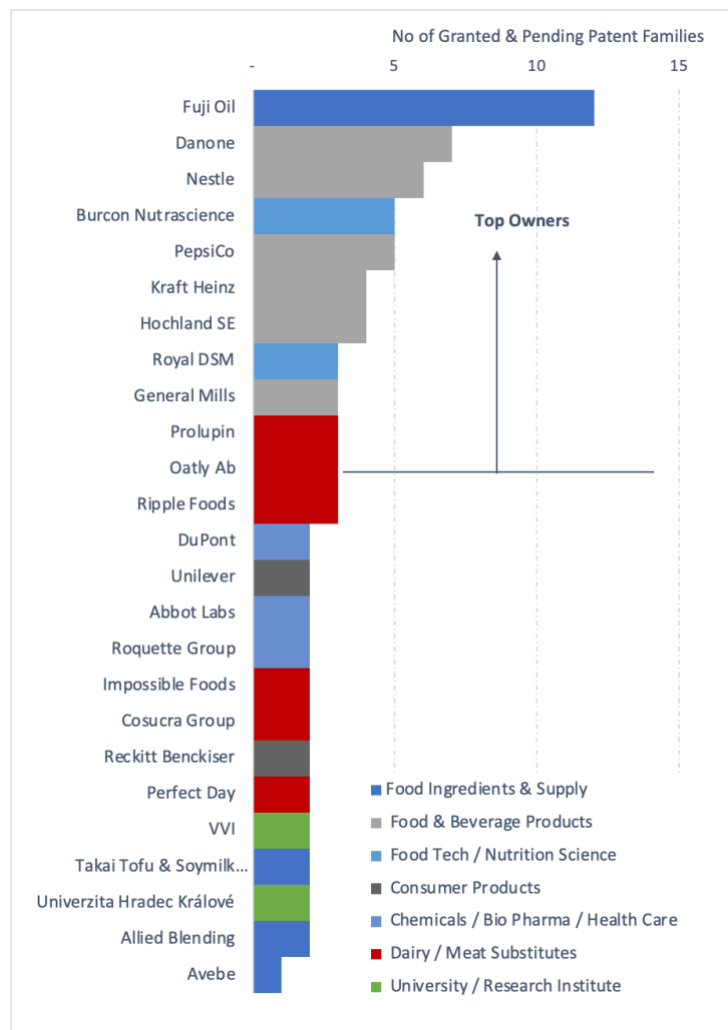
As measured by patent families either granted or pending

We looked at meat substitutes in detail in an article written last year “*Taking advantage during time of pandemic – Patents and innovation behind the boosting of the meat substitute sector – August 2020*”. This covered the rapid market growth and innovation particularly in cell-cultured meat. Also called clean meat, it is meat produced by growing muscles tissue in vitro using animal cell cultures. Companies mentioned as active in the space included Impossible Foods (with their ‘bleeding’ burgers) and Memphis Meats. The latest data highlights key leading innovators across both pea and soy-based meat alternatives including Burcon Nutrascience, DuPont, Fuji Oil, Nestle, Roquette Group, Abbott Labs and Cargill.

Focusing here in this piece on Dairy Substitutes we see many of the same names but also quite a few pure plays active.

Top innovators in dairy substitutes include the big names within ingredients supply and products, but also a rising tide of new pure plays

The Companies: *Number of Inventions Owned Dairy Substitutes US & Europe*



Keeping our lens on the owners of inventions protected in the US & Europe we see the big names sitting at the top of the list. Osaka-based Fuji Oil is major supplier of ingredients derived from plant-based oils and fats, soy and other raw materials to many of the world's largest food and beverage companies and it's no surprise to see it at the top of the list, although we have no publications registered to Fuji Oil since 2019. This is slowdown in pace is seeing the likes of Danone, Nestle and Burcon Nutrascience catching up.

DSM (aka Royal DSM) is also worth mentioning. The Dutch company has its roots in mining but has shape-shifted into a technology company specializing in solutions for Nutrition, Health & Sustainable Living. DSM products include specialty dairy ingredients, and the supply of a wide range of cultures, enzymes, cheese ripening & bio-preservation solutions to produce cheese, fermented milk products and (lactose-free) milk.

The food substitute pure plays are particularly interesting. These are companies that have staked their mission on either or both meat and dairy substitutes. Prolupin is a German based provider of food ingredients specifically

derived from lupine seeds. The lupine is a perennial plant that produces beans and can be grown in poor quality sandy soil. Ripple Foods is a California based company best known for its pea-based milk, but its product line also includes half & half (for coffee), protein shakes and frozen desert.

On top of Oatly and Impossible Foods, others in the pure play category include Belgium based Cosucra and Perfect Day Foods based out of Berkeley, California.

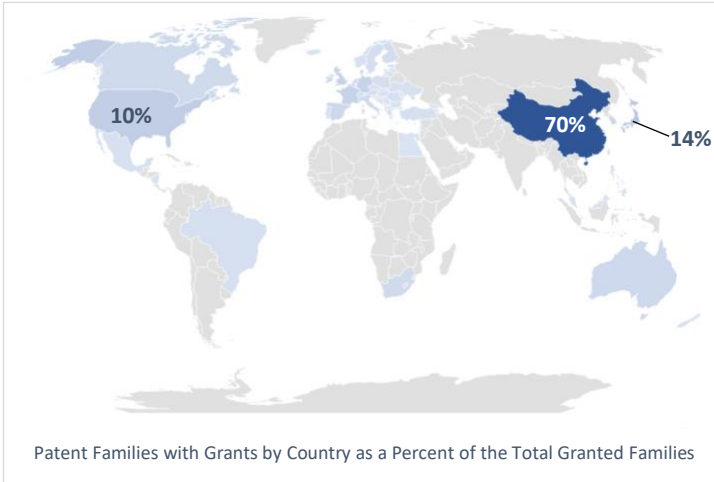
For reference & attached: Innovation Lens Snapshots

- *Technology Screening: Food Substitutes*
- *Company Screening: Dairy Substitutes*
- *Company Snapshot: Burcon Nutrascience*

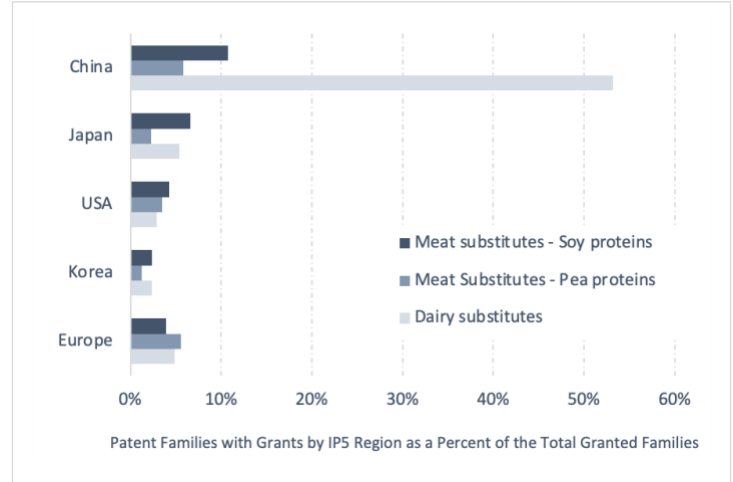
Technology Screening: Food Substitutes

Technology Areas:
 Dairy Substitutes
 Meat Substitutes – Pea proteins
 Meat Substitutes – Soy proteins

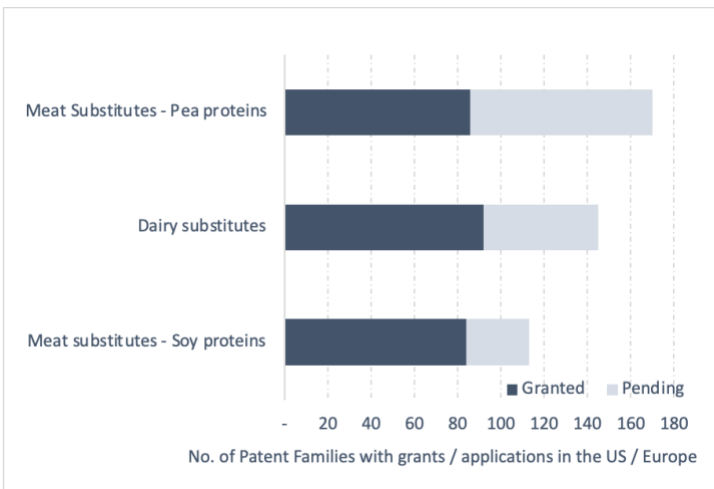
Geographies Protected: *By Country across all 3 Tech Areas*



Geographies Protected: *By Key Region / Countries*



Number of Inventions: *US & Europe*

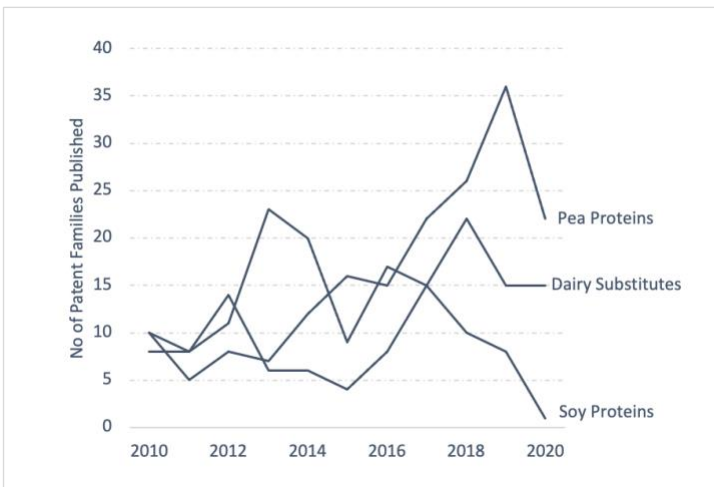


Companies: *Top ranked by Inventions owned, US & Europe*

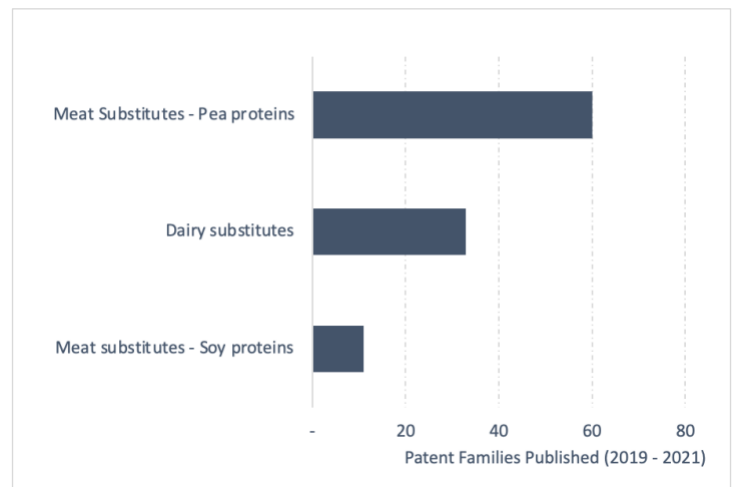
Rank	Meat Sub. Soy proteins	Meat Sub. Pea proteins	Dairy Substitutes
1	Burcon Nutrascience	Roquette Group	Fuji Oil
2	DuPont	Nestle	Danone
3	Fuji Oil	Abbot Labs	Nestle
4	Nestle	Cargill	Burcon Nutrascience
5	Unilever	Mycotechnology	PepsiCo
6	Cargill	Burcon Nutrascience	Kraft Heinz
7	Royal DSM	Danone	Hochland SE
8	Land O'Lakes	Impossible Foods	Royal DSM
9	Kraft Heinz	Syral Belgium	General Mills
10	PepsiCo	Cosucra Group	Prolupin
11	Bayer AG	Solvay	Oatly Ab
12	Hamlet Protein	Hamlet Protein	Ripple Foods
13	Sudzucker AG	Fuji Oil	DuPont
14	Danone	DuPont	Unilever
15	CSIR	Royal DSM	Abbot Labs

Top Owners of Patent Families with grants / applications in the US / Europe

Pace of Invention: *Trendlines, US & Europe*



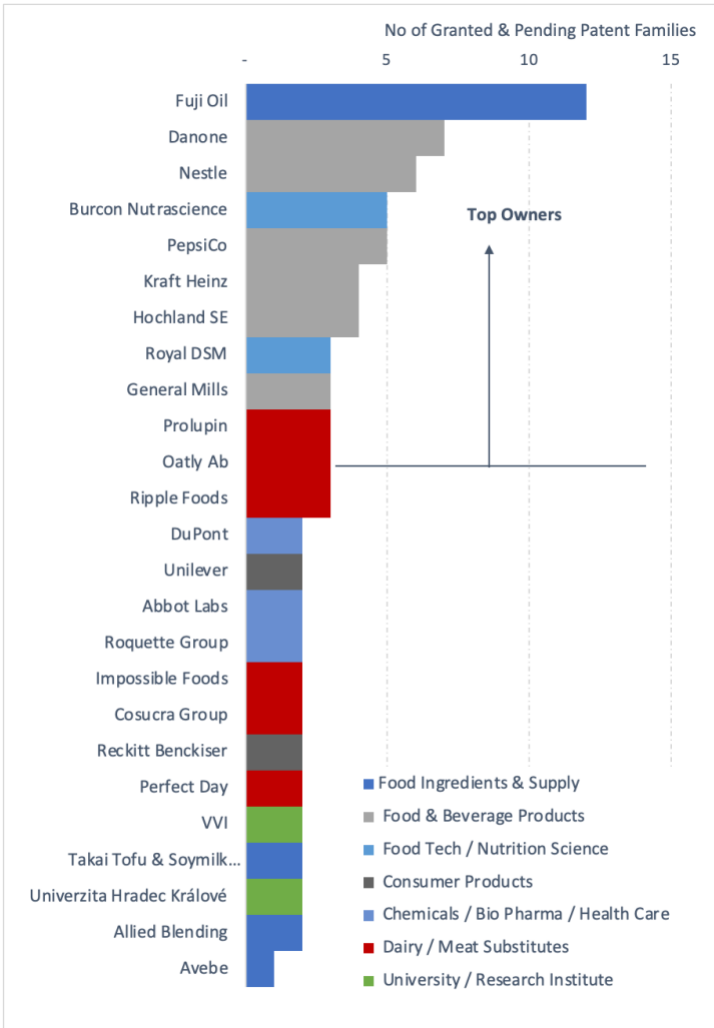
Pace of Invention: *Publications 2019-2021, US & Europe*



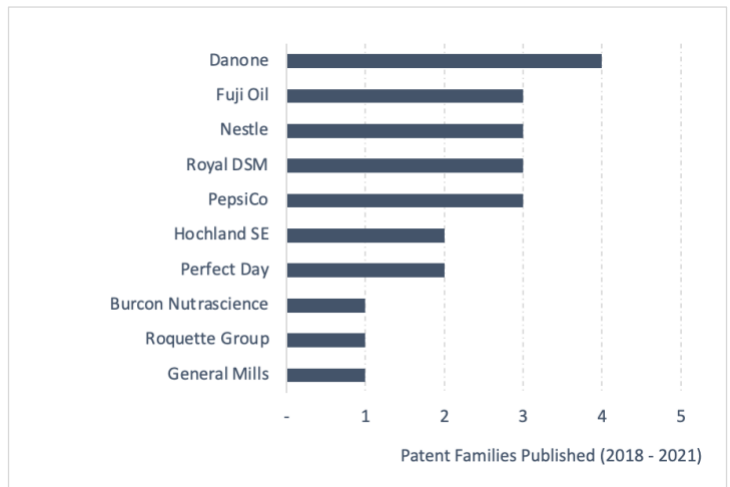
Company Screening: Dairy Substitutes

Technology Area: Dairy Substitutes
Region: US & Europe *granted/pending patent families (inventions)*

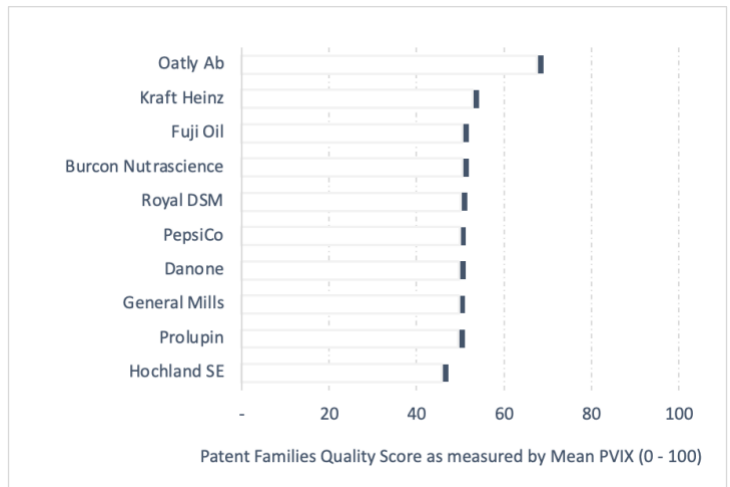
Companies: *No of Inventions Owned, Dairy Substitutes*



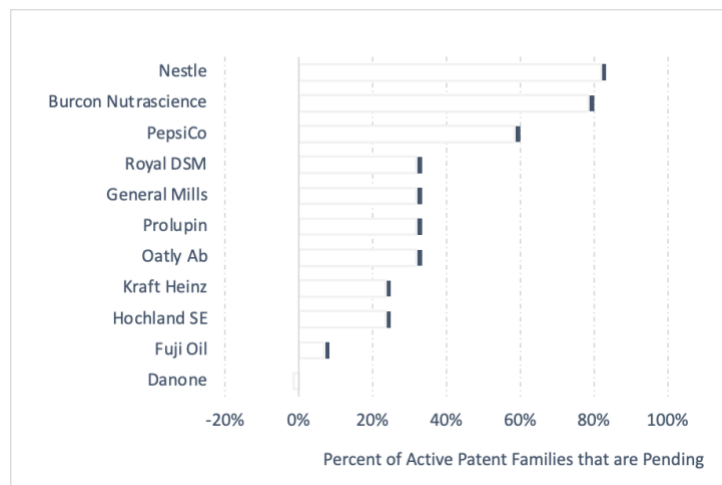
Pace of Invention: *2018-2021 Publications, Top Ten by activity*



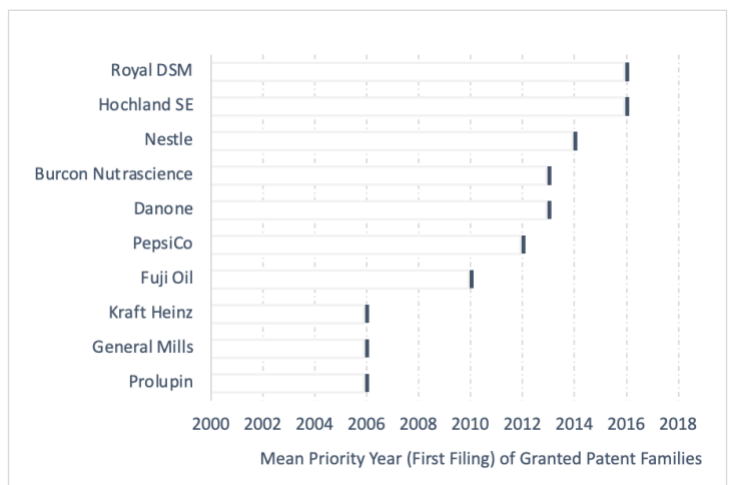
Quality of Invention: *Top Owners, Dairy Substitutes*



Invention Pipeline: *Top Owners, Dairy Substitutes*



Invention Age: *Top Owners (First Filing Date)*

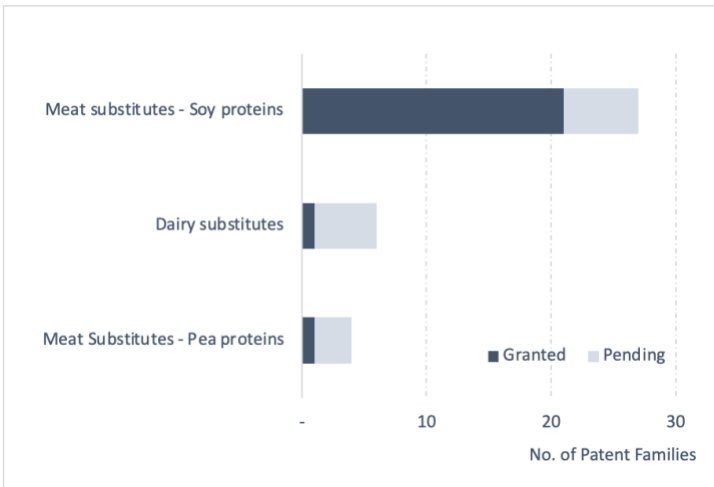


Company Snapshot: Burcon Nutrascience

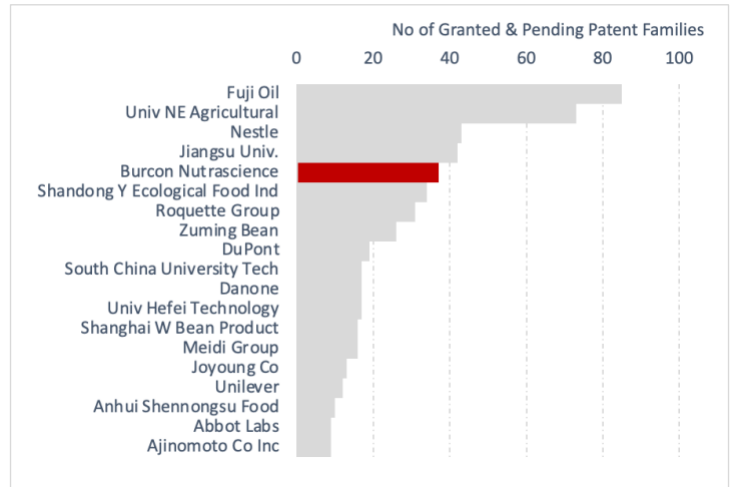
Technology Areas: Dairy Substitutes
 Meat Substitutes – Pea proteins
 Meat Substitutes – Soy proteins

Region: Global all granted/pending patent families (inventions)

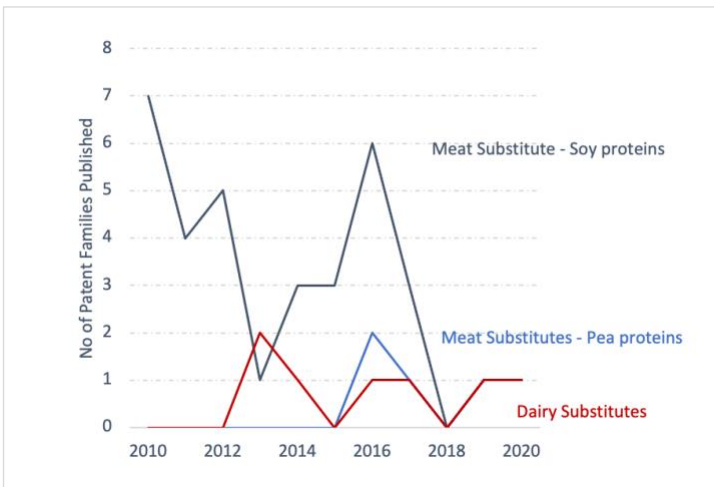
Number of Inventions: *Burcon Nutrascience*



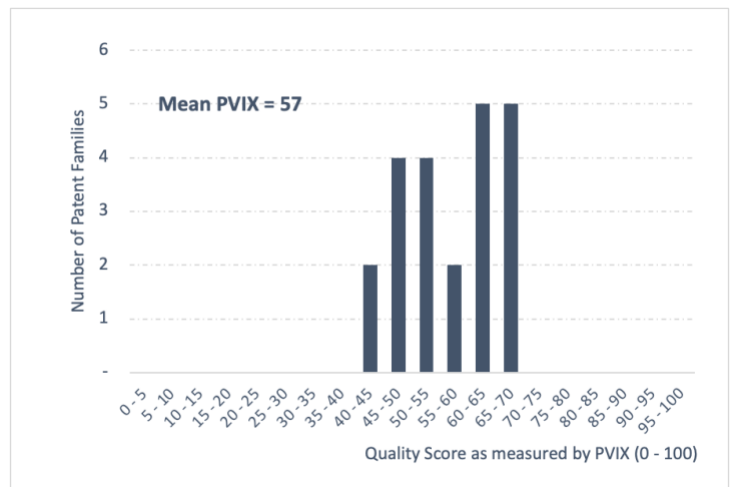
Companies: *Number of Inventions Owned*



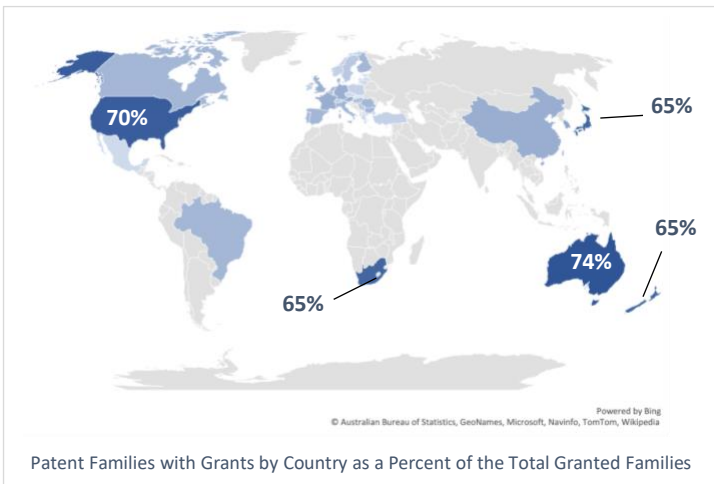
Pace of Invention: *Burcon Nutrascience*



Quality of the Inventions: *Burcon Nutrascience*



Geographies Protected: *Burcon Nutrascience*



Invention Age: *Burcon Nutrascience (Expiry Date)*

