

OUR LAND  
AND WATER

Toitū te Whenua,  
Toiora te Wai

# Future Proteins

## Risk or Opportunity?



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## What is the future of protein?

Protein Futures is a research programme that is being conducted and led by The Agribusiness Group in conjunction with key stakeholders, to investigate the potential impacts of a global shift toward alternative proteins.

Agriculture is woven into Aotearoa New Zealand's national identity. A future that embraces alternative methods of accessing proteins has the potential for significant disruption at all levels of our society however this also brings with it unique opportunities.

The two key questions we will look at are:

- What are the opportunities from a shift to any of the viable options for alternative proteins, to address social, environmental, cultural, and economic issues associated with ruminant-based agriculture systems for New Zealand?
- What is the implication of such a shift in food production for Māori (producers and consumers) and how does this fit within Te Ao Māori?

According to Global Market Insights, the global alternative protein market is worth US\$60.45 billion.

The market is predicted to experience an 18.5% growth (CAGR) between the years 2021–2028 with an increase to US\$193.75 billion.

### Key Points

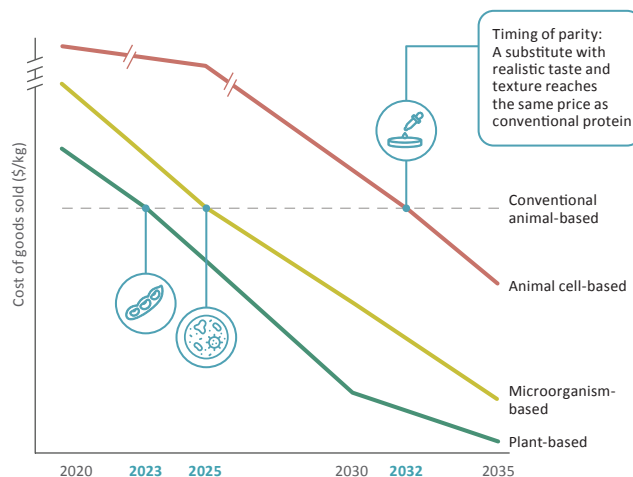
- Alternative foods are already here – take a moment to think of common alternative foods that are common within our supermarkets – what are some of these?
- Alternative protein technology is rapidly advancing – pilot factories and facilities are in development and many are already up and running.
- For Aotearoa New Zealand, there are significant risks and opportunities – let's explore these further.

### Key Facts

- Half of the world's habitable land is dedicated to agriculture.
- 28% of the earth's surface covered by livestock farming.
- Emissions from livestock farming account for at least 16.5% of the planet's greenhouse gases. Over half of the fertile land on Earth is now farmland.
- Meat production and demand is projected to double by 2050.
- NZ's gross greenhouse emissions increased by 21% between the years 1990 and 2020.
- Dairy cattle numbers grew by 82% – from 3.4 million to 6.3 million over same period.

### Product parity

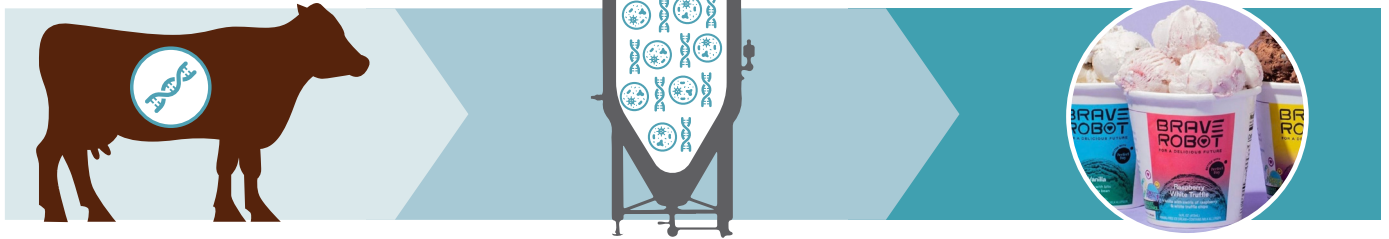
Alternative proteins will reach parity with animal-based protein between the early 2020s–2030s depending on the protein source.



Source: The Good Food Institute. Reducing the price of alternative proteins (2020)

# Current alternative protein technologies

## Precision Fermentation (Dairy)

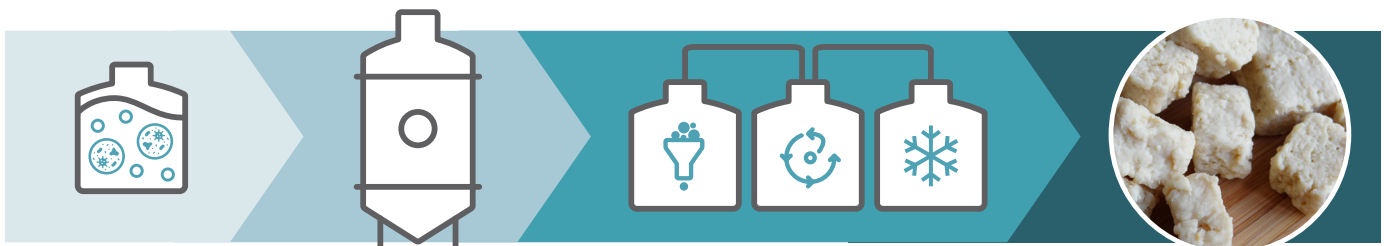


Cells from the mammary gland of a dairy cow are mixed with a yeast formula.

The mixture is placed in a bio reactor with water, sugar and nutrients. The cells and yeast multiply and produce dairy proteins.

These dairy proteins (casein, whey etc) can then be used to make a range of dairy products.

## Precision Fermentation (Plant-based)



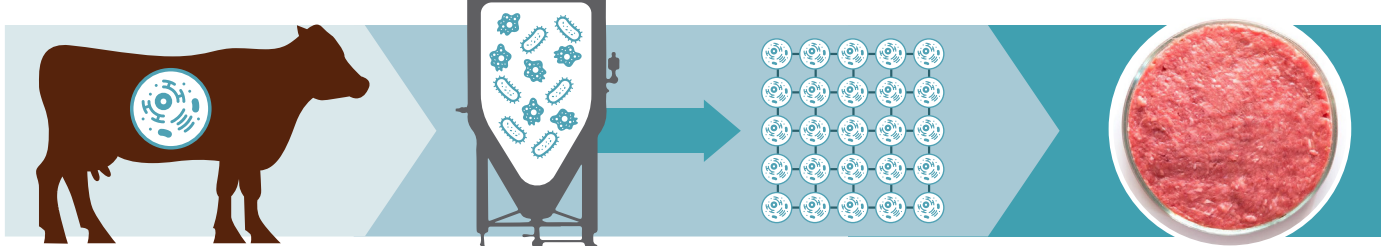
Raw materials consisting of glucose, water and nutrients are mixed and added to a bioreactor with ammonia, oxygen, and a microfungus (*fusarium venenatum*) that has a high protein content.

The mixture is added to a bioreactor which grows the fungus.

- Once fermentation is complete, RNA reduction is required – making it safe to consume.
- The liquid and solids are then separated in a centrifuge.
- The remaining solids are chilled and harvested as a paste.

The paste is used to create fungal plant protein – mycoprotein – which is found in many meat alternatives such as Quorn.

## Cellular Method



Cells are taken from an animal (can be meat of any type) and placed in a bioreactor.

The cells are fed a nutrient serum (amino acids, glucose, vitamins etc) which causes the cells to multiply and grow.

The cells attach to a scaffold within the bioreactor and form into the meat that the cells were harvested from.

Once harvested, the meat can best formed a number of ways – note the meat contains fats, muscles and connective tissues like any other meat.

## Plant Proteins

Plants offer a much more traditional alternative source of protein – many of the plants pictured here have been diversified into protein and food alternatives.

Many plant based protein options exist in our supermarkets today – most of these have a pea, soy or chickpea base.

More and more plant-based protein food are commercially available. These are some current examples.



## Current Māori agribusiness situation

- As of 2020, Māori own and operate about 3,900 agriculture-based businesses.
- According to Our Land and Water, Māori own roughly \$13 billion of primary sector assets.
- Māori agribusiness's own and operate 30% of all beef and lamb production.
- Māori owned horticulture production has grown 300% over the past 12 years.
- As of 2018 roughly 25,000 Māori are employed in the agriculture sector — a majority of which work in the dairy industry.
- According to Statistics NZ, as of 2020 the total value of Māori authority exports was roughly \$755 million – a majority of which came from agriculture (various kaimoana, cheese, milk powder, butter).

### Risk to Māori Agribusiness Collectives (MACs)

#### Risks

- If bio-fermented dairy products can be scaled up and costs reduced, then this could result in falling process and economic pressure on traditional farming.
- Alternative proteins may result in falling prices for red meat and put pressure on the economics of sheep and beef farming.
- Precision fermentation poses a large threat to our dairy industry! Dairy is the largest agricultural employer of Māori.
- Advances in seafood production place our seafood industry at risk — particularly kōura and paua.

#### Opportunities

- There are opportunities for MACs to become engaged in alternative protein production especially those involving the production of plant proteins.
- There may be other specialist opportunities such as the production of feedstock (precision serum) for cellular meat production.
- Indigenous knowledge and traditional fermentation practices are currently untapped.

### Ngā Hua Pūtea — economic opportunities

- Tino Rangatiratanga — Māori agribusiness and investment in emerging proteins allows for the planning, creation, production and distribution of alternative proteins. This provides an opportunity for Māori to champion change for not just Māori but all of Aotearoa.
- The economic opportunity and potential for the future is vast. Investment in the emerging protein sector is growing at a rapid rate.
- The alternative protein sector rose from \$5M to \$5B between 2010–2021 despite restrictions in laws and licenses.
- Passive income from retired land in carbon and biodiversity credits.
- Māori can capitalise on potential investments in emerging proteins.



### Ngā Hua Taiao – environmental benefits

Although there are significant risks to MACs there are potential broader environmental benefits that align with Māori values and approaches (e.g. kaitiakitanga):

- Reduction on land use presents an opportunity for rewilding through reconstructed native ecosystems.
- Using land to produce alternative high-value crops and specialised products (e.g. rongoā) with low environmental impact.
- Researched modelling for future scenarios embracing alternative proteins shows significant decreases in greenhouse gases, phosphate loss and nutrient losses from farms.
- Fits within increasing focus on traditional cultural practices that have low to no environmental impact – hunting, fishing etc.
- Māori have long been innovative in areas of new opportunity.

### Ngā Hua Tikanga – cultural benefits

- Increasing food security through lowering of food prices for whānau:
  - As of 2015, one in five Māori children will experience food insecurity.
  - As of 2015, roughly 68,000 Māori live in food insecurity.
- Rebirth of traditional practices such as fermentation, preserving and discovering modern application.
- Becoming leaders in alternative protein production.
- Potential to produce alternative versions of traditional kai which is under utilised in present day.