

# THE EVOLUTION OF PLANT PROTEIN

— ASSESSING CONSUMER RESPONSE —

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Ministry for Primary Industries  
Manatū Ahu Matua



Plant & Food  
**RESEARCH**

RANGAHAU AHUMĀRA KAI



# WHO ARE WE

This report was prepared in partnership by the Ministry for Primary Industries and Plant & Food Research. Plant & Food Research is a New Zealand-based Crown Research Institute providing research and development that adds value to fruit, vegetable, arable and seafood food products. The Ministry for Primary Industries, Economic Intelligence Unit, develops market intelligence for private and public sectors on the primary industries.

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# EXECUTIVE SUMMARY

New Zealand's social, environmental, and economic wellbeing is linked with our ability to supply the rest of the world with protein.

Animal-based protein production alone accounted for over 60% of our total 2016 / 2017 primary export revenue.

With global population set to increase to **8.1 billion by 2025**, protein demand is set to grow. Yet which protein source will benefit from this demand is dependent on consumer preferences and their purchasing power.

In some of our most important markets, like the United States, consumers and regulators are increasingly aware of the impact that animal-based production systems can have on the environment and are seeking to change behaviour accordingly.

While animal proteins continue to appeal to traditional consumer preferences, such as taste and functionality, a growing drive for more sustainable and healthier lifestyles is positioned to shift that emphasis to plant protein products. These products will need to meet the stringent expectations of consumers, that have been established through diets that include animal protein, in order to succeed.

8.1b

Global population 2025

protein demand set to increase



A new wave of innovative meat and dairy substitutes are being released which aim to reduce the reliance on animal-based production systems protein in global diets.



# EXECUTIVE SUMMARY CONT.

In order to assess where markets are likely to head in the near term (**next 5 years**), we have analysed consumer responses to plant based proteins currently released in the market in the US and consumer attitudes to proteins more generally, in China.

Our research has shown that wealthy western economies such as the US will require an innovative product that can meet all consumer needs in order to see widespread substitution of traditional animal products for plant protein.

***While good progress is being made these products are not quite hitting the mark yet***

Despite the rapid increase in product functionality, existing and newly released plant protein products are currently unable to meet all consumer expectations. A key product innovation in the US, the Impossible Burger, was researched and demonstrated that despite moving closer to replicating the attributes of meat, the taste and texture, price and convenience of preparation of this product still tends to disappoint. Despite this, consumers were motivated to try the product by the environmental credentials and media hype.

**Our research** in China suggests that one of the shifts in protein consumption in this market is likely to be towards higher quality animal proteins that meet more sustainable and healthy attributes. This is due to a strongly established eating tradition, where it is usual for meat and vegetables to be eaten together in order to obtain a balance of all the nutrients required for good health.



**Our key findings** show that despite plant based protein only providing minor immediate-term risk, there is a requirement for ongoing focus on the protection and growth of our primary industries.

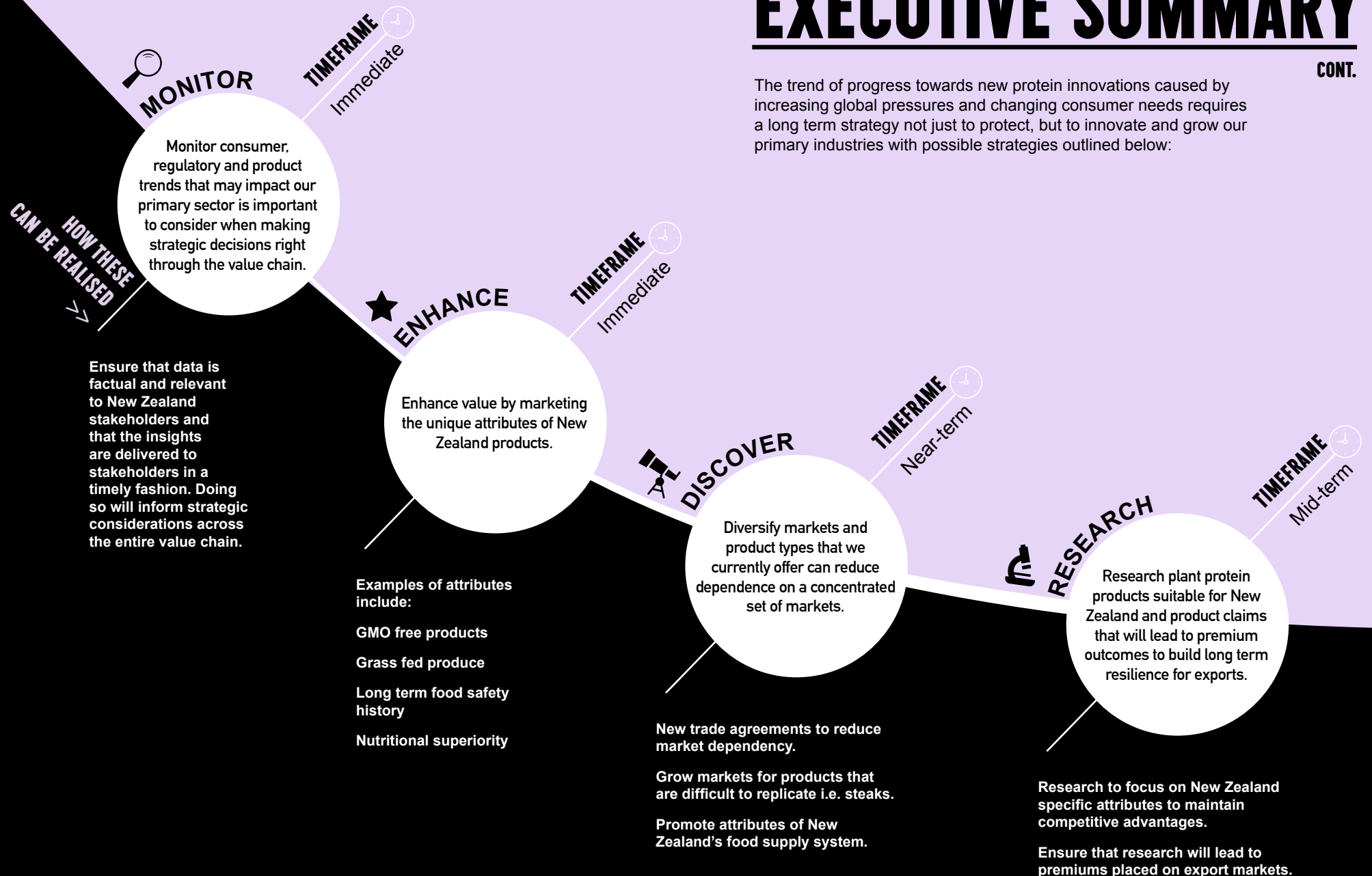




# EXECUTIVE SUMMARY

CONT.

The trend of progress towards new protein innovations caused by increasing global pressures and changing consumer needs requires a long term strategy not just to protect, but to innovate and grow our primary industries with possible strategies outlined below:



# Advances in new food products could impact New Zealand



**Consumer preferences** and awareness of the consequences of food production is creating a need for new products. The rise of plant protein products illustrates this trend. This poses a threat to food producers that have a small selection of products and narrow consumer segments. Taking note of this change is particularly relevant for countries like New Zealand, where the dairy and meat sector accounted for over 25% of 2016 exports. Many of these industries have a high dependency on a small selection of markets and product categories, such as New Zealand beef which is responsible for over 68% of New Zealand's meat and wool exports to the US.

25%

of total exports  
are from the  
dairy & meat  
sectors



**Dependency on a few markets and products creates risks.** In order to quantify these risks, they need to be properly articulated and assessed so that decision making on these issues is well informed.

As markets shift, awareness and assessment of consumer and market trends is evermore critical to ensure the long term success of the primary industries of New Zealand.

This report has explored developments in the plant protein market, trends and levels of uptake in our key trading markets (US and China). Providing research on upcoming protein sources is important to ensure decision makers across the country are well informed. This report is the first in a series that aims to identify and quantify consumer and product trends that may impact the New Zealand primary sector.

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## THE EVOLUTION OF PLANT PROTEIN

— ASSESSING CONSUMER RESPONSE —

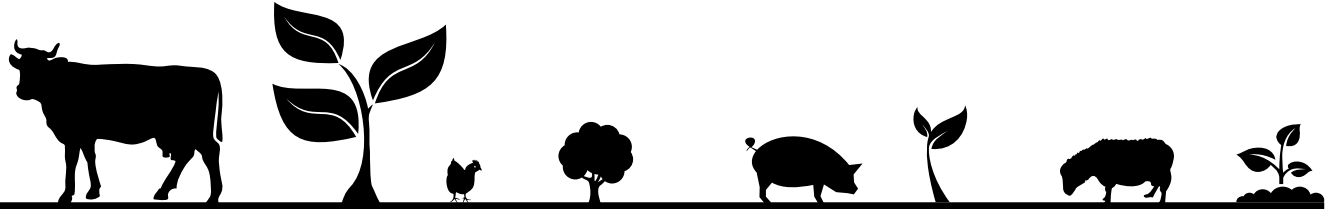


# PROTEIN TRENDS





# PROTEIN IS A COMPLEX FOOD GROUP



Carbohydrates, fat, and protein make up the three key macronutrients in our diet. Ensuring adequate consumption of each of these macronutrients is important for a fully functioning body.

## Protein is responsible for:

-  Growth
-  Maintenance & repair of body tissue
-  Providing energy
-  Forming antibodies & enzymes

Unlike fats and carbohydrates the body does not store protein, so it must be consumed regularly.

Protein sources can be found in both plant and animal-based food.

‘Complete’ proteins, contain each of the nine essential amino acids (i.e. those amino acids that the body cannot make on its own), they tend to be animal-based and include products such as meat, poultry, eggs, dairy, and fish. Most vegetables are sources of incomplete protein.

Undertaking a vegan or vegetarian lifestyle requires an understanding of the innate complexities of the different macronutrient sources and the body’s specific requirements in order to maintain optimum health.

**Protein** | **must be consumed regularly**

There are numerous and varied sources of plant protein; from the minimally processed, (as illustrated below), moderately processed, such as nut butters, tofu, nut milks to the highly engineered meat substitutes like the Impossible Burger.



# PROTEIN DEMAND IS INCREASING

World demand for animal-derived protein is expected to double by 2050 (FAO), driven primarily by:



**Increasing population**

an extra 2.5 billion people in 2050 from 2015 (UN, 2015)



**Economic growth**

by 2050, six of the seven largest economies will be from currently emerging markets (PWC, 2017); thus they will have more income with which to purchase animal protein.

Consumers attribute a diverse range of benefits to protein. As demonstrated in a 2017 survey of Chinese consumers.

## Plant and Food Research, 2017

Increased consumer awareness of the function of protein is driving innovation. Enticed by the promise of assistance with weight loss, strength and avoidance of age-related muscle loss; few ingredients have experienced protein's sustained rise in consumers minds.

**41%**

Helps children develop and grow

**29%**

Helps you feel fuller for longer

**41%**

Can help replace muscle

**23%**

Helps manage weight

**44%**

Gives sustained energy

**36%**

Helps me look and feel younger

**22%**

Helps you to snack less

**36%**

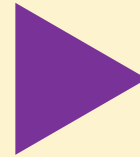
Aids recovery from exercise

**32%**

Assists with building muscle

**48%**

Gives you an energy burst



## CONSUMPTION IN PROTEIN IS EXPECTED TO GROW

History has shown that with increasing wealth comes increased demand for animal protein, at the expense of staple, starchy foods. The current projections for global population and affluence growth suggest an increasing strain on our natural resources if current methods are used to meet future demand. Source: FAO, 2017.



# AGRICULTURAL PRODUCTION WILL CONFRONT ENVIRONMENTAL LIMITS

Pressures caused by animal protein production in particular are changing how consumers, producers, and regulators think about the consumption and production of meat as a source of protein in the human diet.



## GROWING POPULATION

World population is expected to reach 9.7 billion by 2050, with most of the growth occurring in developing countries. As these populations grow, it will drive up total demand for protein.

**9.7** billion people expected by 2050



## INCREASING URBANISATION

Two thirds of the planet's population is expected to be living in urban areas by 2050. Non-agricultural work will dominate, creating food production challenges.

**2/3** people will live in urban areas by 2050



## GROWING AFFLUENCE, HIGHER CONSUMPTION

As incomes grow households shift away from basic starchy proteins, and towards more 'luxurious' proteins, such as meats. The production of such foods are significantly more resource intensive.

**Growing wealth** is increasing protein consumption



## WATER USAGE

Agriculture currently uses 70% of the world's drinkable water. Water shortages have been predicted as a result. With water demand expected to outstrip supply by 2030, it will be difficult for agriculture production to meet demand.

**Water** demand to exceed supply by 2030



## EMISSIONS TARGETS

Agriculture currently produces 13% of global greenhouse gas emissions. As the world is currently attempting to reduce overall greenhouse gas emissions, balancing this goal with the demand for protein is a major challenge.

**13%** of global emissions from agriculture



## ANIMAL ETHICS

Increasing agricultural production and intensity creates a growing ethical issue for consumers, and 23% of consumers now choose shopping destinations based on social impact attributes such as this.

**23%** of consumers ethically driven

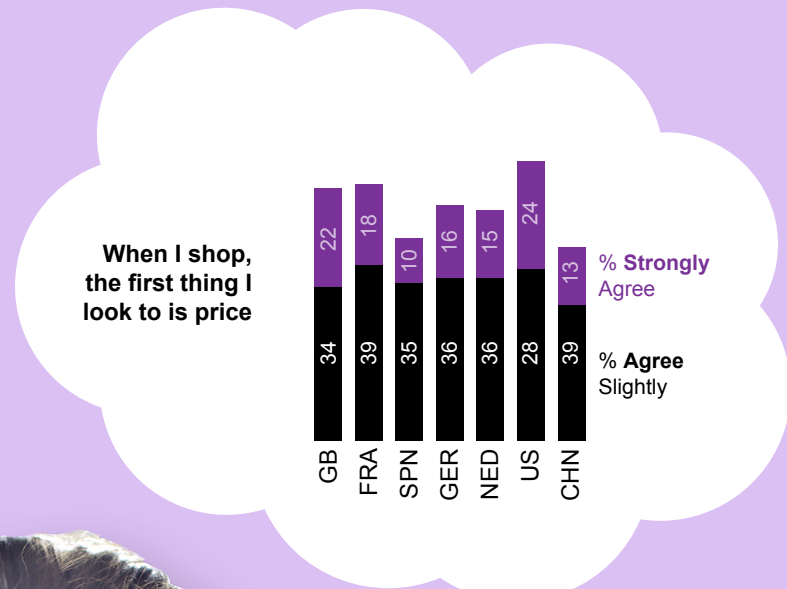
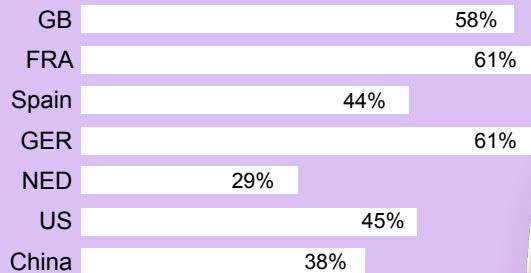
# **HISTORICALLY INDIVIDUALS HAVE PRIORITISED PRICE, TASTE, AND CONVENIENCE IN THE SELECTION OF FOOD PRODUCTS**

Consumers trade off price, taste and convenience for the foods they can afford. Preferences for a variety of plant and animal proteins vary across individuals, cultures, and demographic segments.

## **TASTE AND EXPERIENCE**

Consumers expect their food to taste good and want the experience to be satisfying. 83% of consumers consider taste to be important when purchasing food and beverages, the highest rated factor of all consumer needs (IFICF, 2015).

**I eat for enjoyment, not health (% agree)**



## **PRICE**

The importance of price varies by individual consumer. Affordability is important and consumers will substitute for expensive products.



## **CONVENIENCE**

Consumers want to spend less time and effort on food preparation.

**90%** of Americans purchase convenience foods

Nearly **20%** use more timesaving foods than in 2001 (Harris, 2008).





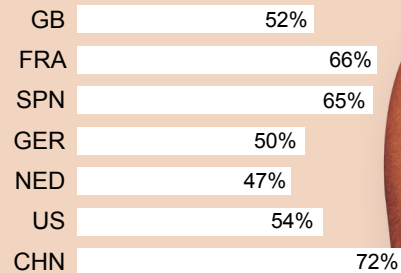
# EMERGING CONSUMER NEEDS ARE GAINING INFLUENCE NOW THAT TRADITIONAL CONSUMER NEEDS ARE SATISFIED

As consumers become more aware of the long term impacts of food production, they are placing greater importance on preferences more aligned with plant protein products, signalling impending change for traditional animal protein producers.

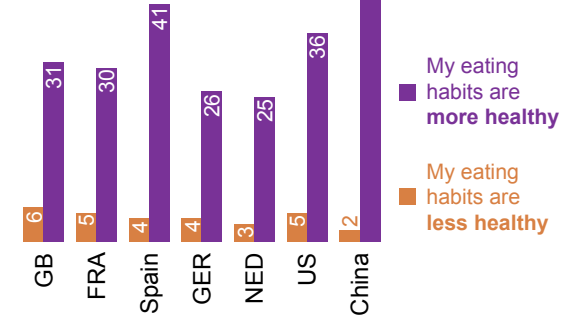
## ENVIRONMENTAL IMPACT AND SOCIAL VALUES

As protein demand growth causes global environmental and social pressures, consumers are placing more importance on the environmental, ethical and social impacts of the products that they purchase.

% who agree that they are more conscious of environmental issues in their choice of products



Changes in eating habits in the last 12 months



## HEALTH AND WELLNESS

Consumers want the food they eat to make them look and feel healthy.

## SAFETY

Consumers want to feel confident that products are safe to eat.



# PLANT AND ANIMAL PROTEINS SATISFY COMPLEX CONSUMER NEEDS IN VARIED WAYS

Consumer Preferences	Animal Based	Plant Based
<b>Taste/ experience</b>	Established preference in western cultures, evolving in some other cultures	Evolving in western cultures, while established in non-western cultures
<b>Convenience</b>	Familiar, greater choice of meal options (western cultures). Can be unfamiliar and less choice in some others	Familiar, greater choice of meal options in some cultures. Can be unfamiliar and less choice in western cultures
<b>Price</b>	Market dependant	Market dependant
<b>Health / Wellness</b>	Negative health credentials (saturated fats, cholesterol), complete protein source	Positive health credentials (vitamins, nutrients), few complete protein sources
<b>Environmental / Social</b>	Concerns over production methods; and environmental footprint and animal welfare	Less environmental impact from plant production methods
<b>Safety</b>	Risk of contamination and fraud	Unknown risk of contamination and fraud



Historical

Emerging

Disruptive plant-based products designed to address these shortcomings are under development, however they are capital and time intensive.

While **current plant protein products** appeal to evolving consumer preferences, they are **not consistently delivering successfully to the traditional preferences** of taste, price, and convenience in the mainstream marketplace.

Despite the increased importance of emerging preferences, meat consumption rates are expected to remain stagnant in high income countries.

Different cultures will place different values on product attributes. An example of this would be a consumer with significant experience in preparing tofu compared to beef. As a result, plant protein is seen as more convenient than animal protein. This applies to many of the consumer needs that are considered when purchasing protein.



# PROTEIN SOLUTIONS WILL DIFFER REGIONALLY DUE TO VARIED PROTEIN CONSUMPTION

The difference in affluence and established meal traditions between the US and China has resulted in a variation of protein eating patterns and the viability of future plant protein innovations in each market. In future this could change as China's economy develops.

The world population is set to increase to 8.1 billion by 2025, with 95% of the growth in developing countries, such as China, Brazil, and India. Increasing wealth in developing countries will increase consumption rates of meat by 7% and dairy by 20% (FAO / OECD, 2016).



## CHINA

Emerging economy, resource intensive, growth focussed

Established use of plant protein products (c.2000 years).

Highest pork consumption rate in the world.

Consumption of meat per person is expected to grow by 20% from 2013-2023. (USDA, 2013)

Meat consumption will be 66% of a US consumer while retaining dietary balance of plant and animal protein.



## UNITED STATES

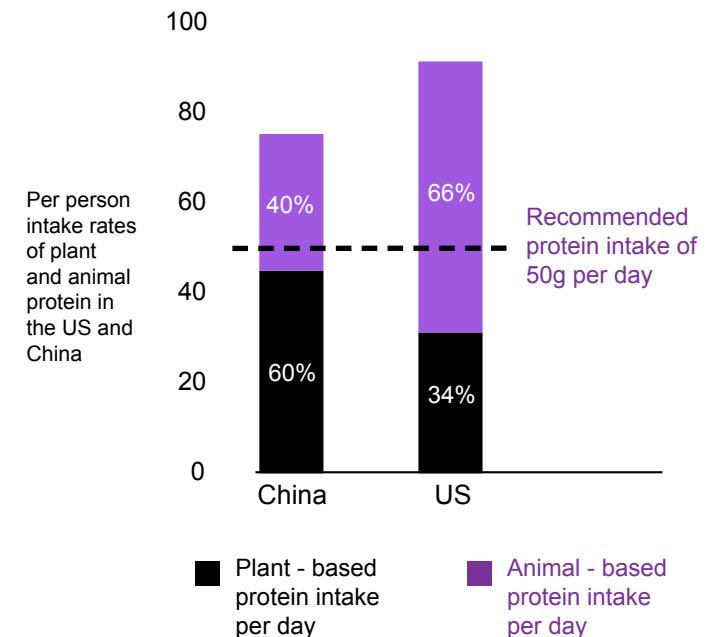
Developed economy, sophisticated and diversified

Highest rate of animal protein consumption.

US consumers eat almost double the daily recommended average protein intake for an individual (50g per day).

These levels are expected to remain relatively stagnant in the future. (FAO, 2011, 2015)

Per person intake rates of plant and animal protein in the US and China



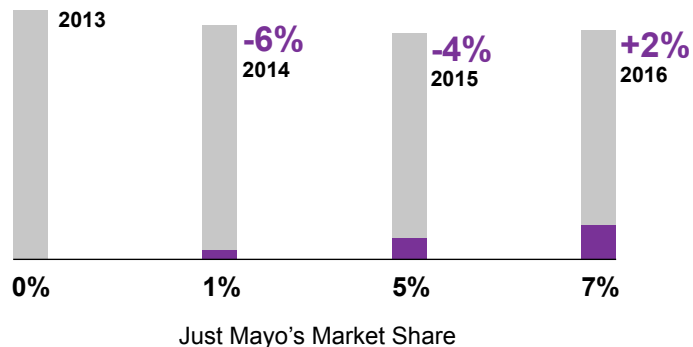


# IN SOME MARKETS, PROTEIN SOLUTIONS WILL SUCCEED WHEN THEY SUCCESSFULLY SUBSTITUTE OR SURPASS EXISTING PRODUCT OFFERINGS

When plant protein products meet all the functionalities of their animal equivalent, expect major market transformation in the US.

In products where animal protein does not contribute to the traditional purchasing needs such as taste and experience there is significant market change. The product Just Mayo uses machine learning to successfully create mayonnaise without animal products.

Total US Mayonnaise Retail Sales



## US Dairy market undergoing change

10%

The market value of milk alternative products has increased by from 2011 to 2016.

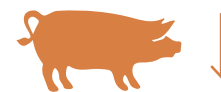
2%

The loss of market value (US\$1 billion) of traditional products over the same timeframe.

As milk alternative products such as soy milk have increased in matching the traditional functionalities of dairy products like taste, texture and price, consumers have moved rapidly to these products.

## Product substitution within existing food categories can also occur as consumer preferences change.

As consumers gain access to more food options by factors such as increased purchasing power, they will optimise their consumer needs, which can also result in product substitution.



Sales of pork in China have fallen for the past three years, despite predictions for growth until 2026.



This reduction in pork is being offset with other meats and by substituting vegetables into foods such as dumplings where the meat is not a feature food.



# USA FOCUS



# MAINSTREAM PLANT BASED FOODS ARE 'NOT GOOD ENOUGH'

In order for the consumer market for plant protein products to grow in the US, the 'total product experience' needs to improve. The product must deliver to both emerging and traditional consumer preferences. This currently is not being achieved by existing plant based protein products in most food categories, which is why animal protein consumption is expected to increase.

Current meat substitute products that have been released have struggled to move significant quantities of people away from animal proteins. They have been unable to meet traditional consumer preferences such as taste (at an affordable price).

**37%**

of US consumers consider taste, then texture, to be the most important factor when purchasing meat substitutes.

**20%**

of people who had tried the Impossible Burger, a plant protein burger, did not like it. 40% did not expect to purchase it again, despite it meeting many emerging preferences.

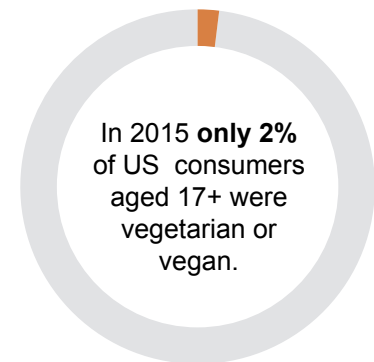
**Despite purchasing preferences towards traditional needs, consumers want products that appeal to health, wellness, and social impact.**

Nielsen identified 72% of respondents in a 2015 survey, who were willing to pay more for products and services from companies committed to positive social and environmental impact.

82% are looking for more transparency on the conditions under which the farm animals are kept.



The market share for established plant protein products is not growing



There are **more than 5x**

the number of former vegetarians than current vegetarians in the United States.

The most common reason for abandoning the vegetarian diet is dissatisfaction food (Faunalytics, 2014).

- Historical
  - Taste,
  - Convenience,
- Emerging
  - Motivation and social integration

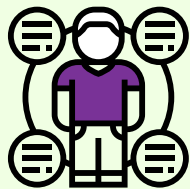
were the main attributes plant protein products would need to acquire for a former vegetarian or vegan to resume the diet.



**USA FOCUS**

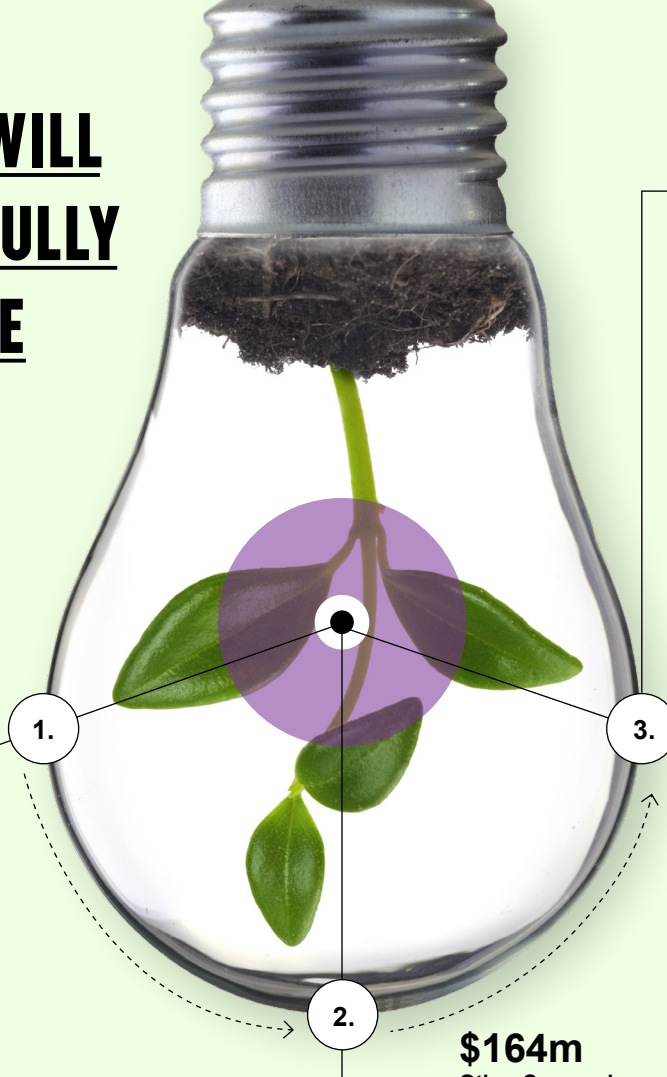
# SIGNIFICANT INNOVATION WILL BE REQUIRED TO SUCCESSFULLY CREATE PRODUCTS THAT ARE DIFFICULT TO SUBSTITUTE

The increasing demand for protein, the effect of emerging consumer needs and regional eating preferences may result in a disruption to the protein market. In order for plant protein products to be successful in the US, they need to be desirable. Such innovations in food require significant capital to replace products like beef.



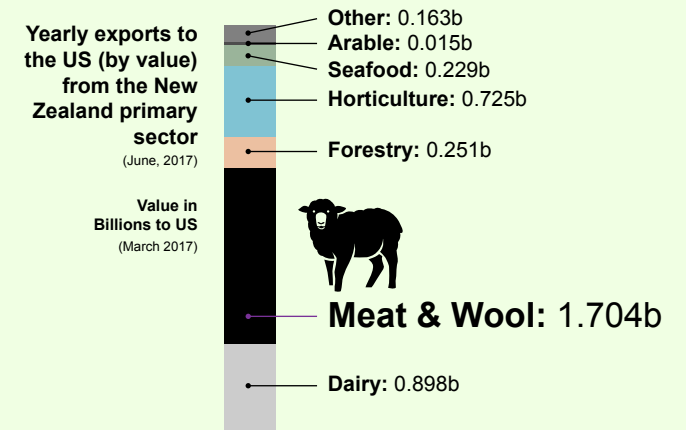
Creating products that meet all consumer preferences requires an understanding of the consumer and advances in technology to meet those consumer demands.

Examples of these new innovations include incorporating machine learning to rapidly prototype and select new food ingredients that consumers may enjoy, these are then put forward for testing – reducing research and development time in creating products.

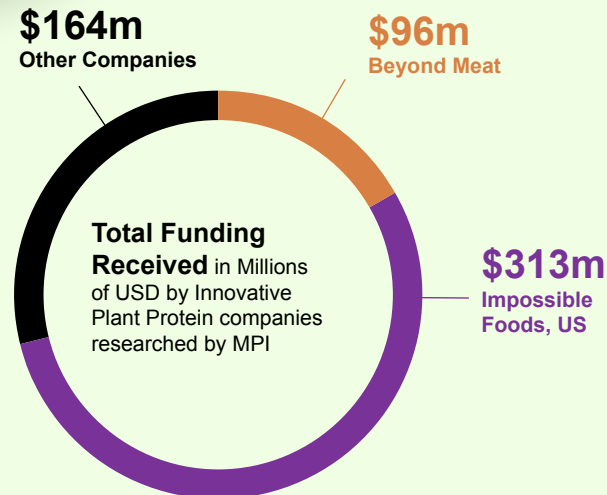


## 29%

of New Zealand's primary exports to the US are made up of grass fed beef for products such as burger patties, the same category as products receiving large capital investment (MPI 2017). These products were investigated further.



Large amounts of capital are being invested to create alternative products across the globe, this creates more innovation than what we have previously experienced. Of those funds, two plant-based beef companies in the US are attracting significant capital investment which indicates the cost required to innovate in this category.



# FOLLOWING THE CAPITAL FLOWS, PLANT BASED BEEF IS A KEY AREA FOR INNOVATION

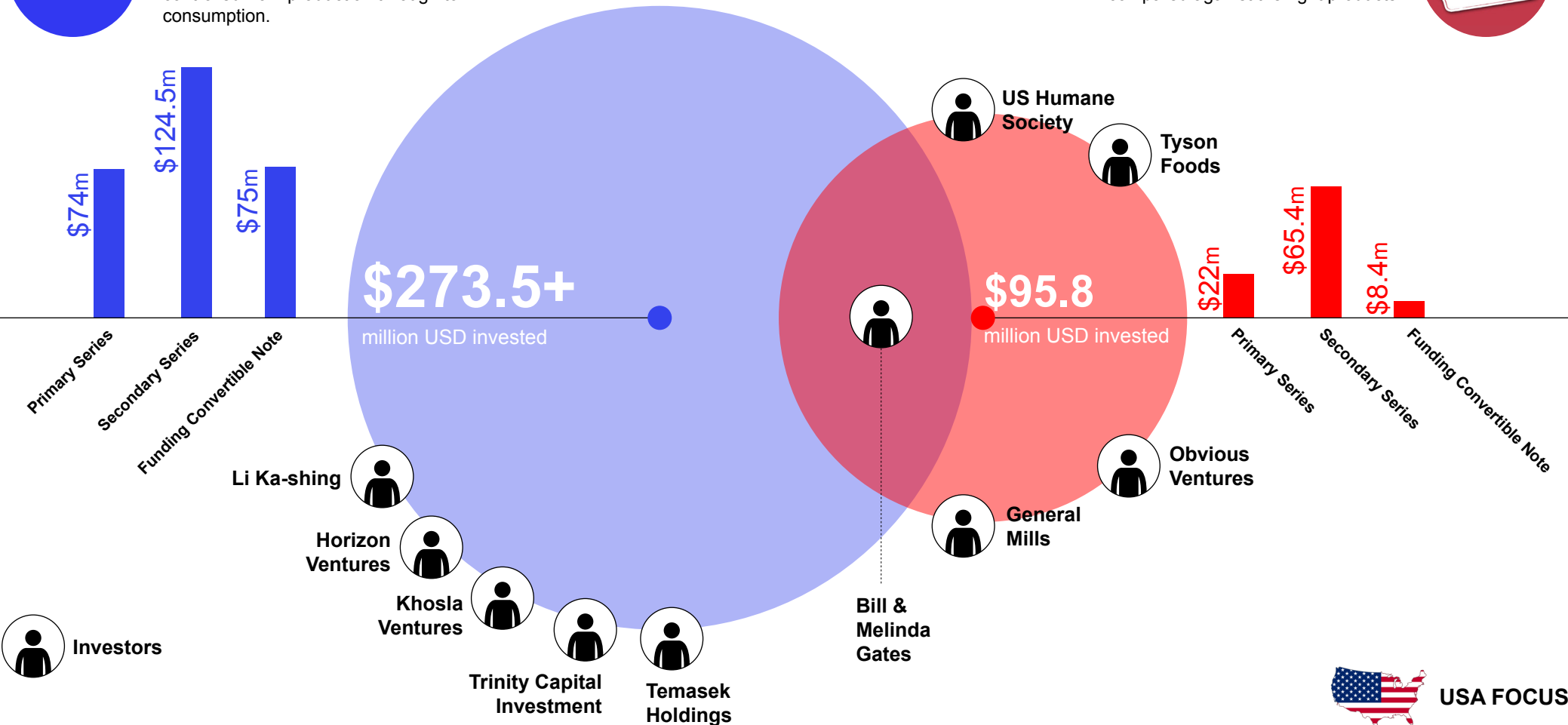
The majority of funding is going into the development of plant based beef substitutes. Two US case studies were explored to illustrate the large scale of capital investment required to create innovative plant-based products; Impossible Foods and Beyond Meat. (Funding information obtained October 2017)



Distribute product to consumers via restaurants so that the quality and experience of the product can be controlled from production through to consumption.



Distribute via supermarkets with a focus on locating the product by the meat section so that they are compared against the right products.

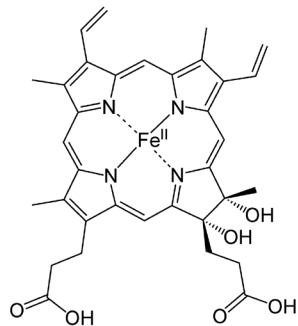




# THE LATEST BEEF INNOVATION IS THE IMPOSSIBLE BURGER

The Impossible Burger is one of the new generation products that attempts to overcome the consumer taste and experience barrier to conventional meat substitutes.

Founded in 2011, it has received over \$US 271 million in funding to support its development and commercialisation, targeting restaurants to assure quality preparation.

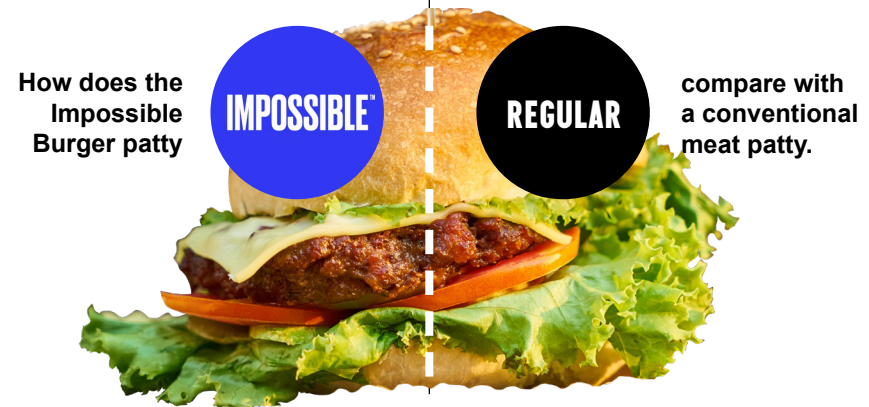
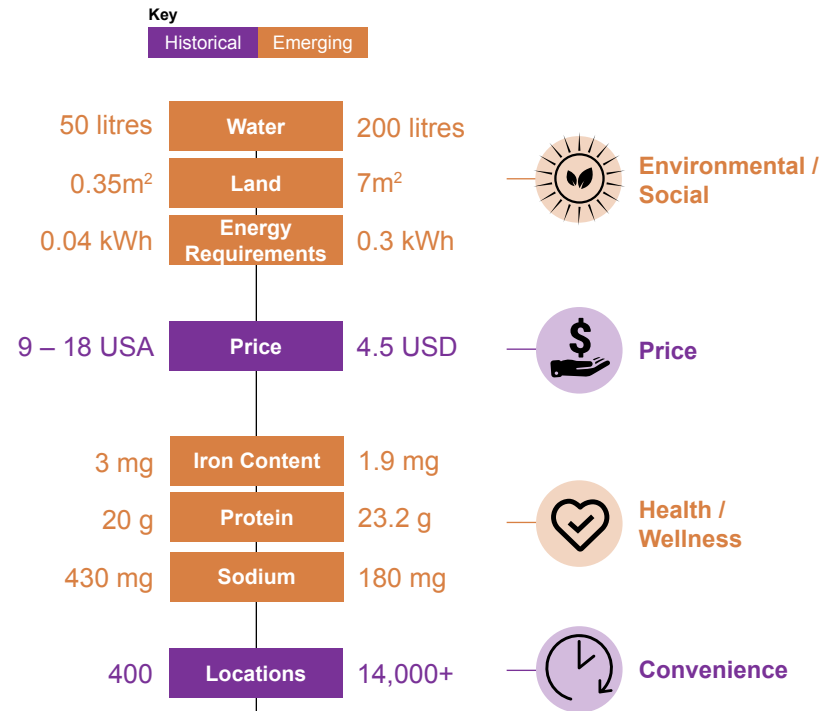


The patty includes ingredients such as:

- Wheat protein
- Potato protein
- Coconut oil
- Heme

Making plants bleed, the role of heme:

Heme has the taste, aroma and "bleeding" properties of meat, while still being a plant product. A fermentation process that involves genetically engineering yeast to produce plant-based heme gives the Impossible Burger the meat flavour and texture its known for.



Final Thoughts

Strong environmental credentials VS More affordable and accessible but has high environmental costs.

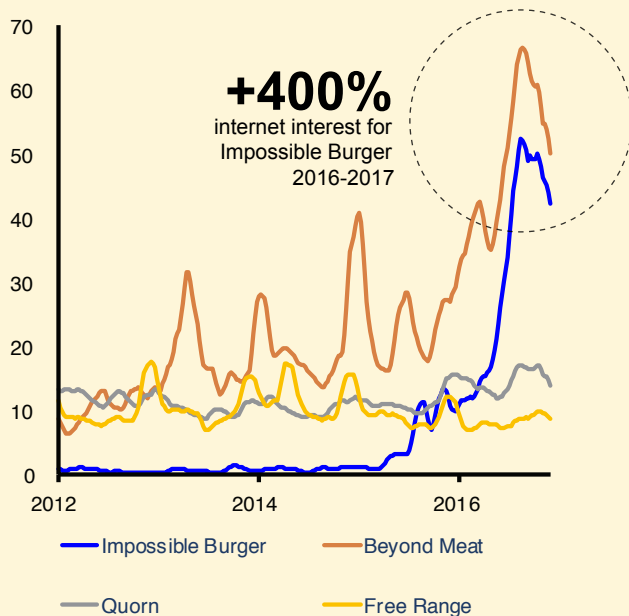


# IT'S SUCCESS WILL BE JUDGED BY CONSUMERS

Whether a plant protein can be used as a successful meat substitute will be determined by the response it receives from its consumers, and not those who produce it.

## 1. Consumer interest peaked

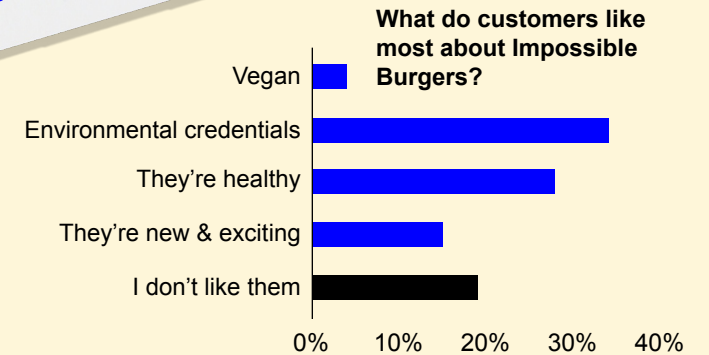
United States internet interest Indexed 2012 - 2017



## 2. Positive consumer response to claims

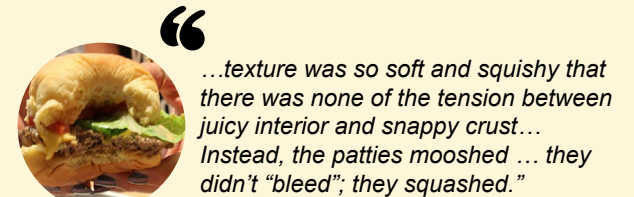


Consumers who would buy it again say they would do so primarily for its environmental and health credentials.



## 3. Consumer experience - mixed

Online reviews range from very positive to very negative. A high number of glowing paid for reviews contrast with many smaller publications and bloggers indicating that the product is not so perfect.



# THE IMPOSSIBLE BURGER STILL HAS TO OVERCOME ISSUES TO BECOME A DISRUPTOR



- Not a beef burger
- Great appearance
- Texture is different
- GMO
- Positive reviews



## No product is a silver bullet.

Most reviewers are positive about the taste of the burger, but nobody claims it is indistinguishable from real beef.

In general, reviewers are more impressed by the appearance than the taste. The product still has a long way to go to completely replace beef burgers.

The GMO status of heme shows that the burger may end up sacrificing some emerging preferences to gain others.



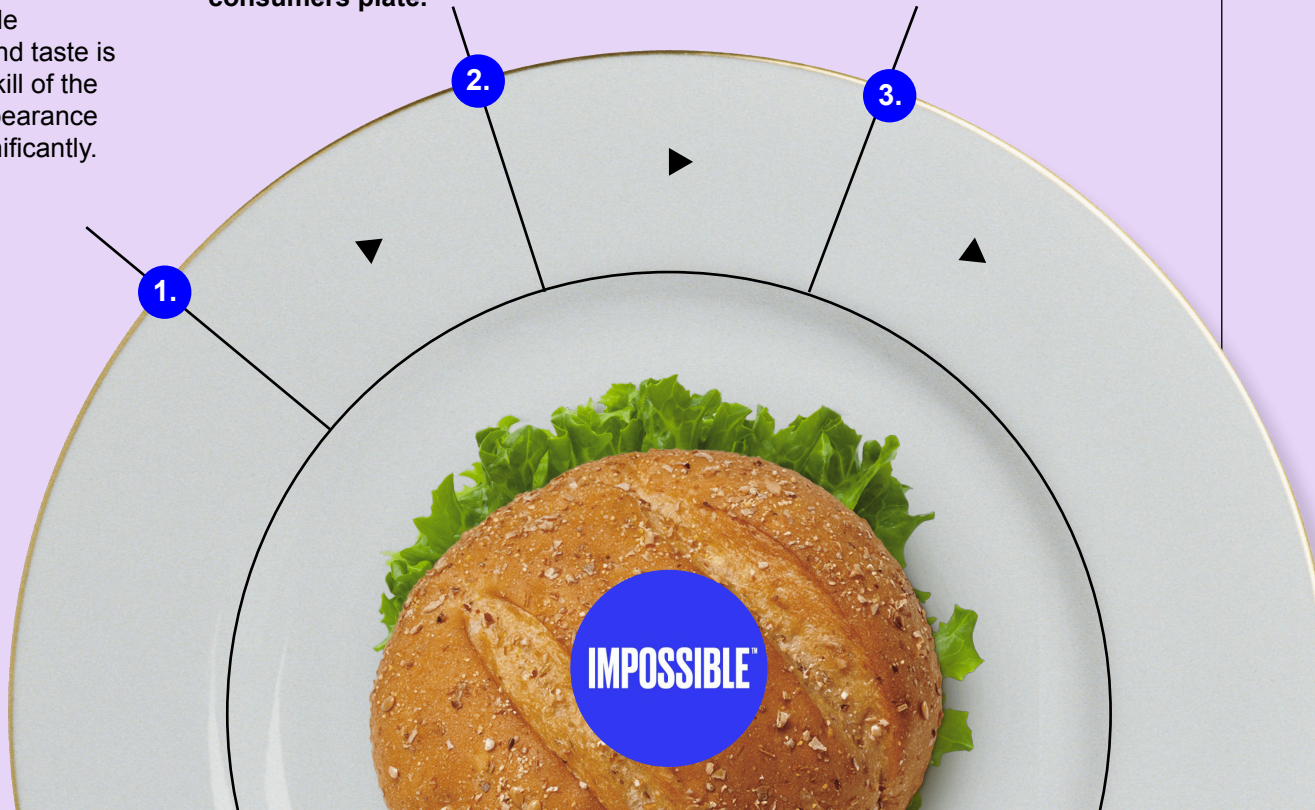
As the company grows the number of restaurants Impossible Foods sells to will increase. This will constrain their current model to ensure quality.



Impossible Foods increases the control on quality by choosing restaurants that can prepare the burger. This results in a high standard **product delivered onto the consumers plate.**



Our research has shown that the Impossible Burgers quality and taste is sensitive to the skill of the cook, with an appearance that can vary significantly.

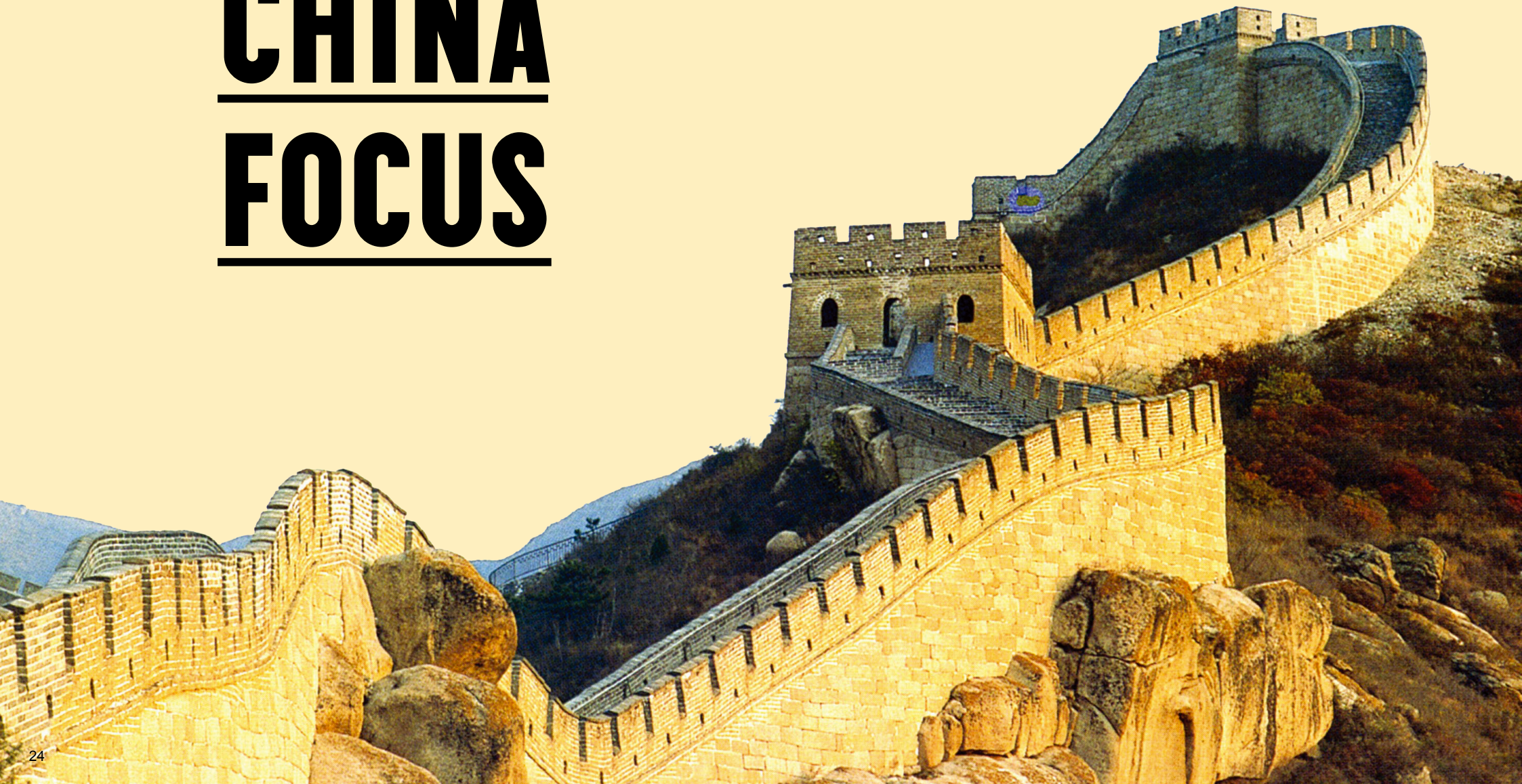


USA FOCUS



# CHINA

# FOCUS





# THE CHINESE DIET ALREADY HAS A STRONG BALANCE BETWEEN PLANT AND ANIMAL PROTEIN

## Significant shift to plants unlikely in China.

Plant-based protein products (bean curd, etc) are a long established meal component, and have been consumed widely for around 2000 years.

**60%** of Chinese daily protein intake is from plant sources.

China consumes less meat in total than more developed countries, yet it has the highest consumption rate of pork, though this is showing decline.

There is a strongly established eating culture; plant (Su Cai) and animal (Hun Cai) based dishes are considered the basic elements of any meal. They do not substitute for each other; they are complimentary. As a consequence, vegetarianism and veganism is still very rare in this culture.

## The Chinese consumer knows that protein is important, also that not all proteins are created equal

Fish and seafood dominate the view of a healthy meat protein, with very few negative health attributes.

Dairy contributes calcium and aids immunity with few health negatives compared to other animal proteins.

Pork, while a good source of protein is associated with the negatives: saturated fat, calories and cholesterol.

Beef, lamb and mutton have fewer saturated fat and cholesterol associations than pork.

Bean curd and legumes have very positive health credentials but deliver less on sensory experience.

There is wide spread intent to eat more fruit and vegetables as part of a healthier lifestyle but an understanding that these deliver very little protein.



# CONSUMER PRIORITIES ARE SHIFTING IN CHINA

**80%** hope to achieve a healthier diet in the next 12 months

**50%** indicate an intention to cook more at home in order to gain greater control of their health through diet.

**36%** intend to reduce their meat consumption in their pursuit of a healthier diet, mainly pork and poultry.

**27%** plan to increase their level of fish and seafood consumption.

The two most common reasons given for reducing animal protein consumption in China were:

Weight management

Eating too much is bad for my health

While health credentials are key, there are other important priorities for consumers in China.



Fears around food safety are high. Over a third of consumers are reducing their meat intake because of concerns over food authenticity. 'Organic' claims appear to signal overall food safety in this market.



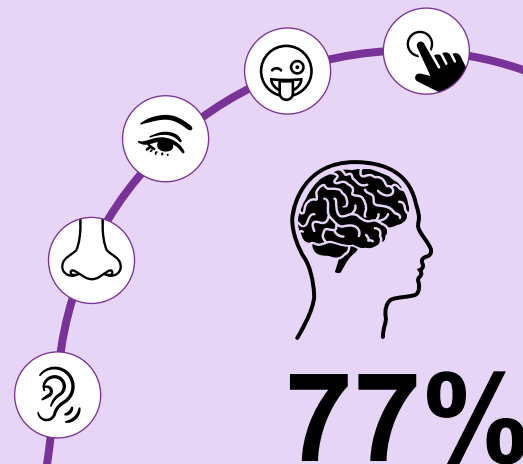
There is rising concern about the environment with 42% seeking products that are better for the environment.



There is rapidly increasing affluence amongst Chinese people bringing with it access to choices not previously available, many are choosing to trade up to healthier eating options.



People in China are open to experimentation in their diet – though insects as a new protein source was not met positively.



Health and wellness is a key driver of choice, but there is a paradox with sensory experience.

**77%**

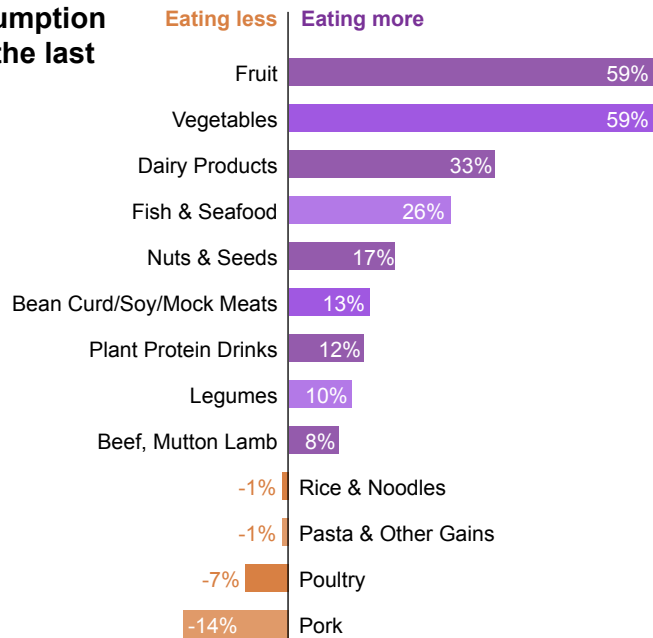
of Chinese respondents said that 'in making healthy food choices, nutritional content is more important to me than flavour'. However, contrary to this, while consumers regarded legumes and bean curd to have similarly positive nutritional profiles to fish and dairy products, there showed less intent to eat more of these plant-based products compared to the animal-based options.



CHINA FOCUS

# CONSUMER PRIORITIES ARE SHIFTING IN CHINA

Reported net change in consumption over the last year



Increasing affluence will allow Chinese consumers to trade up to proteins that are perceived as healthier and higher quality than their current staples.



## Fruit and vegetables

are the leader for health credentials but there is a clear recognition that they provide very little protein thus need animal sources for balance (Hun Cai/Su Cai).



## Dairy

is viewed as having fewer negative health associations than meats (excluding fish), with added benefits of calcium and good immune boosting properties.



## Fish and seafood

are perceived as the healthiest meat protein. Thought to be lighter and more nutritious than other meats, provides calcium, vitamins and minerals. Supports immunity and younger looking skin.



## Bean Curd & Legumes

Despite having similarly positive health credentials as fish, seafood, and dairy, only around half as many are intending to eat more bean curd and legumes, owing to the less desirable eating experience.



## Pork

the most prevalently eaten meat currently, is seen as a good source of protein BUT has the highest association with calories, cholesterol and saturated fat, thus interest is waning.



## Red Meat

8% intend to eat more red meats; they had less association with saturated fat and cholesterol than pork, the most commonly consumed meat in China.

Beef is now the most commonly asked for meat choice when eating out, and is widely considered to be of premium quality. (Menu Insights, 2015).



# AN OPPORTUNITY FOR HIGH VALUE PROTEIN FROM NEW ZEALAND

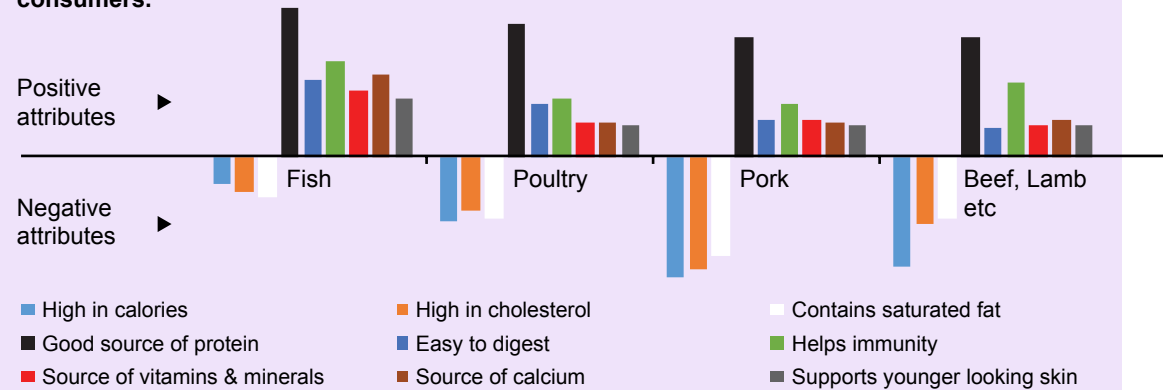
## Fish and seafood dominate the Chinese view of healthy meat protein

Almost half of those surveyed were increasing the amount of fish and seafood that they ate compared to 12 months ago, likely to be at the expense of pork and poultry.

This is a future opportunity for growth; China is already New Zealand's biggest recipient of fish and seafood, receiving over 31% of our NZ\$1.7 billion seafood exports.

This category is ranked highest for perceived protein delivery, associations with improving immunity and other health benefits. Compared to other red and white meats, fish and seafood is deemed tastier, lighter and more nutritious. There was little association of fish and seafood with negative health attributes.

Perceived attributes of different food groups by Chinese consumers.



### Messaging matters

In order to maintain and grow New Zealand protein exports amongst Chinese consumers, relevant and clear messaging to reiterate the health benefits, quality, standards in safety, and eco-credentials must accompany high quality product.

In a country where food safety is a key concern, counterfeit proofing measures should be considered.

**Organic** production measures and credentials are a very strong signal of **food safety** amongst these consumers.

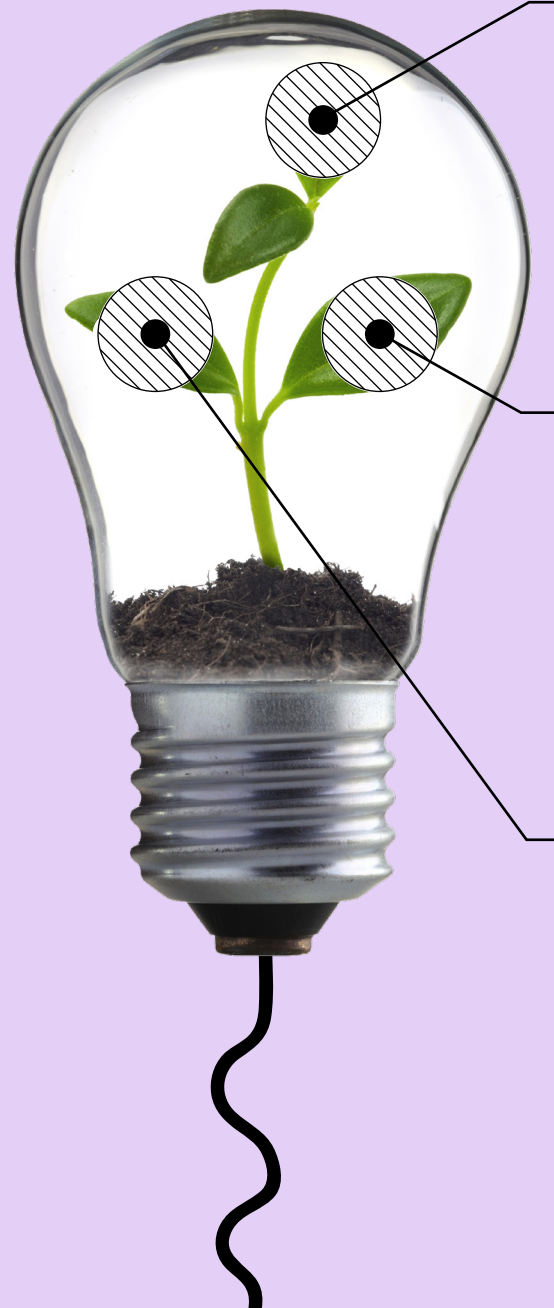




# CONCLUSIONS



# FURTHER INNOVATION WILL BE REQUIRED— BUT PROGRESS IS HAPPENING



## **Consumer preferences are shifting, but still anchored in tradition.**

- In China, established traditions around healthy eating are entrenched through the generations. With increasing wealth, they are likely to trade up to higher quality and integrity options.
- The US and other western markets require new innovations to meet their established western dietary needs as well as to deliver on emerging preferences. The impact of these innovations will differ over regions.



## **New products seeking to close the gap have made progress, but not enough to materially threaten animal protein just yet.**

- Current innovations in plant-based beef such as the Impossible Burger were assessed to be a significant improvement compared to other plant-based products.
- However the products inability to meet all the traditional product functionalities of a traditional mince burger, and issues around its GMO status, make it unlikely to be a true disruptor yet – though continued investment could see this change in the future.



## **Environmental concerns are beginning to drive accelerated changes in consumer preferences.**

- Given the environmental benefits of plant protein, regulatory changes that aim to mitigate negative externalities of protein production will disproportionately affect animal protein.
- Current consumer preferences for environmental mitigation are not mainstream enough to cause a significant change in purchasing decisions. This may change in the future.

# OPPORTUNITIES





# CONSIDERATIONS FOR NEW ZEALAND

## Maintain and build our reputation as a producer of high-value natural foods

New Zealand will need to develop short and long term strategies to mitigate the risks that innovation may present to our exporters.

## Promote New Zealand validation of products

- Reliable food safety;
- Transparent supply chains; and
- Environmental monitoring and animal welfare regulations.

## Targeted marketing campaigns to show desirable credentials of New Zealand products



Low Sodium



Trusted Producer



GMO Free



Organic



100% Grass Fed



Natural

## Identify opportunities for all protein types with targeted research and monitoring

New Zealand should develop products that maintain and grow our advantage in an increasingly competitive landscape.



Possible steps to achieve this include:

1.

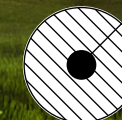
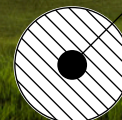
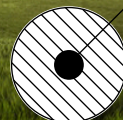
Monitoring of long term consumer and regulatory trends to identify changes in plant and animal protein outlooks.

2.

Conducting targeted research on selected innovations and trends so that product strategic research and development can be undertaken.

3.

Relaying information across New Zealand to successfully inform strategic considerations right across the food value chain.





# HOW TO ENHANCE LEGACY EXPORTS

## Protect animal protein products from disruption

The current product substitution risk, short term, is for mince meat in the US. Short term value enhancing strategies should focus on protecting this market by targeting product attributes that are unable to be met by plant protein innovations. Possible strategies include:



New Zealand, or New Zealand companies, could leverage and promote the GMO free status of its products. The reliance of new generation plant protein products on GMO components remains a key barrier to widespread adoption due to negative consumer sentiment on the issue.



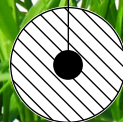
41% of customers surveyed by a 2015 Deloitte study said "Low Sodium" was a key claim consumers sought. Some beef products have an advantage in this space. Promoting this difference could assist in the promotion of animal protein products over plant equivalents.



Promoting the inherent advantages New Zealand animal products is critical to balance and counter the claims by marketers of innovative plant protein products.

## TK Lamb enters Wholefoods as a premium grass fed product

TK meats from New Zealand has recently expanded its offering to sell into 49 Wholefoods supermarkets in the US. Its strong assurance program ensures the consumer can trust the product is 100% grass fed, free range, and free from GMO, gluten, antibiotics and hormones.



# HOW TO DISCOVER NEW OPPORTUNITIES FOR LEGACY EXPORTS

## Create alternative opportunities for animal protein products.

Targeted research, both private and public, should focus on identifying products that New Zealand could produce which would extract high levels of value.

- Focus on premiumisation of products that are difficult to replicate with plant proteins, such as steaks.
- Diversify and augment income with high value specialty products which are not readily displaced, such as medical products.

Identifying and gaining access to more markets will reduce the dependency on current export markets.

New Zealand products already meet many emerging preferences such as a safe, transparent supply chain and good government regulation on environmental and social issues. Promoting these attributes in a way that can be readily trusted will allow access to high value consumers.

In the future, only 40% of the value of a fish may come from fillets. Here are some examples of where the rest of the value may come from.



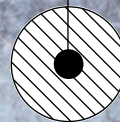
### Frames

Fish frames can be used to make supplements (calcium) or stocks.



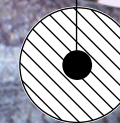
### Guts

Enzymes in fish guts may be used in cosmetic and nutraceutical products.



### Skin

Collagen from fish skin could be used for the development of biomaterial nanofibers which can be used as filters for home ventilation systems.

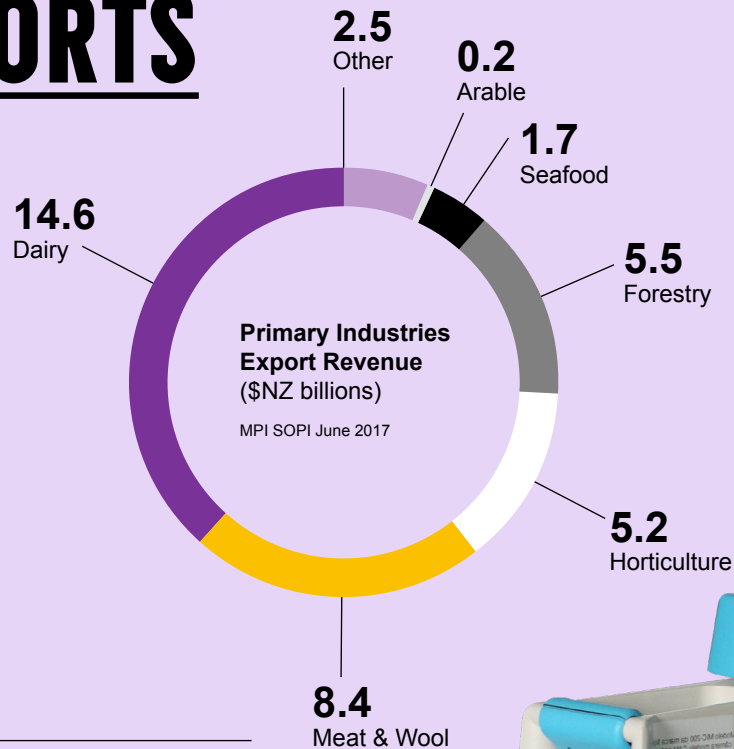


# RESEARCH IS REQUIRED TO GROW ALL OUR PROTEIN EXPORTS

## Create resilience

Improving the resilience of New Zealand's agrifood industry will require us to decrease our reliance on animal-based production by accomplishing an increase in the variety of products derived and broadening our participation in other non-traditional protein value chains. New Zealand already has an international reputation as a provider of high-value plant-based foods, which are supported by innovative technical and scientific capability. As a rough estimate, New Zealand has almost 2 million ha of land suitable for growing plant protein crops. This is more than ten times the land area which currently contributes over NZ\$5 billion through horticultural exports and a further NZ\$3 billion through the domestic sales.

The opportunity for New Zealand is in manufacturing high-value plant protein foods and sourcing ingredient streams from sustainable and diversified primary production systems. New Zealand's food industry, together with the established research partners, can contribute to this space through expertise in new product development (NPD) in food and beverage, availability of scale-up equipment, application of novel protein chemistry in the formation of food protein structure, and evaluation of the sensory quality of manufactured food structures, as well as in the development of new processes to manufacture these foods and beverages.

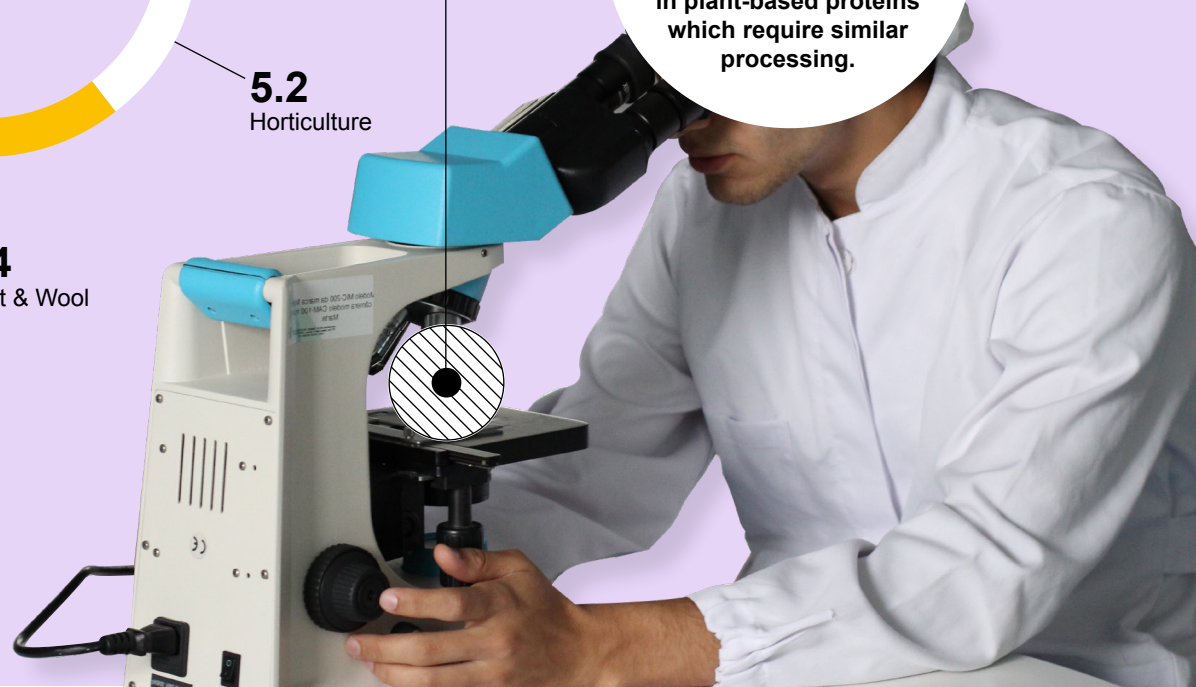


## Research opportunities for plant based proteins

Several plants show significant potential as sources of protein for ingredient and food production in New Zealand, we need to know more about the feasibility of growing these crops:

- Alfalfa (Lucerne)
- Amaranth
- Cereal (ie. barley, wheat, rye, oats)
- Kiwifruit seeds (by-product of juicing/pulping second-grade fruit)
- Oilseeds (eg canola, linseed)

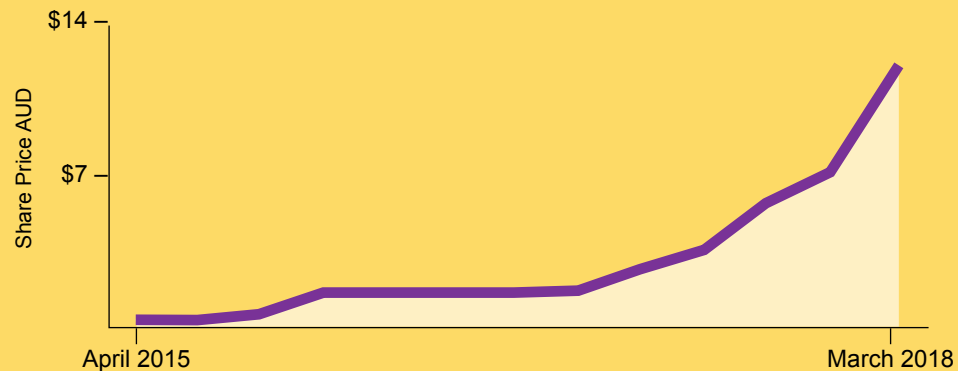
**Research into leveraging engineering and manufacturing expertise from our dairy industry to develop new opportunities in plant-based proteins which require similar processing.**





# EXAMPLE OF RESEARCH AND INNOVATION GROWING OUR PROTEIN EXPORTS

Upon the discovery of two different milk types, A1 and A2 and the benefits of A2 milk was realised, the A2 Milk Company was established. The A2 Milk Company was able to capitalise upon the A2 product and has since become New Zealand's biggest listed company, valued at \$NZ8.47 billion in 2018. A2 milk is an example of how research and innovation into a primary industry alternative, combined with a high value strategy can yield successful results.



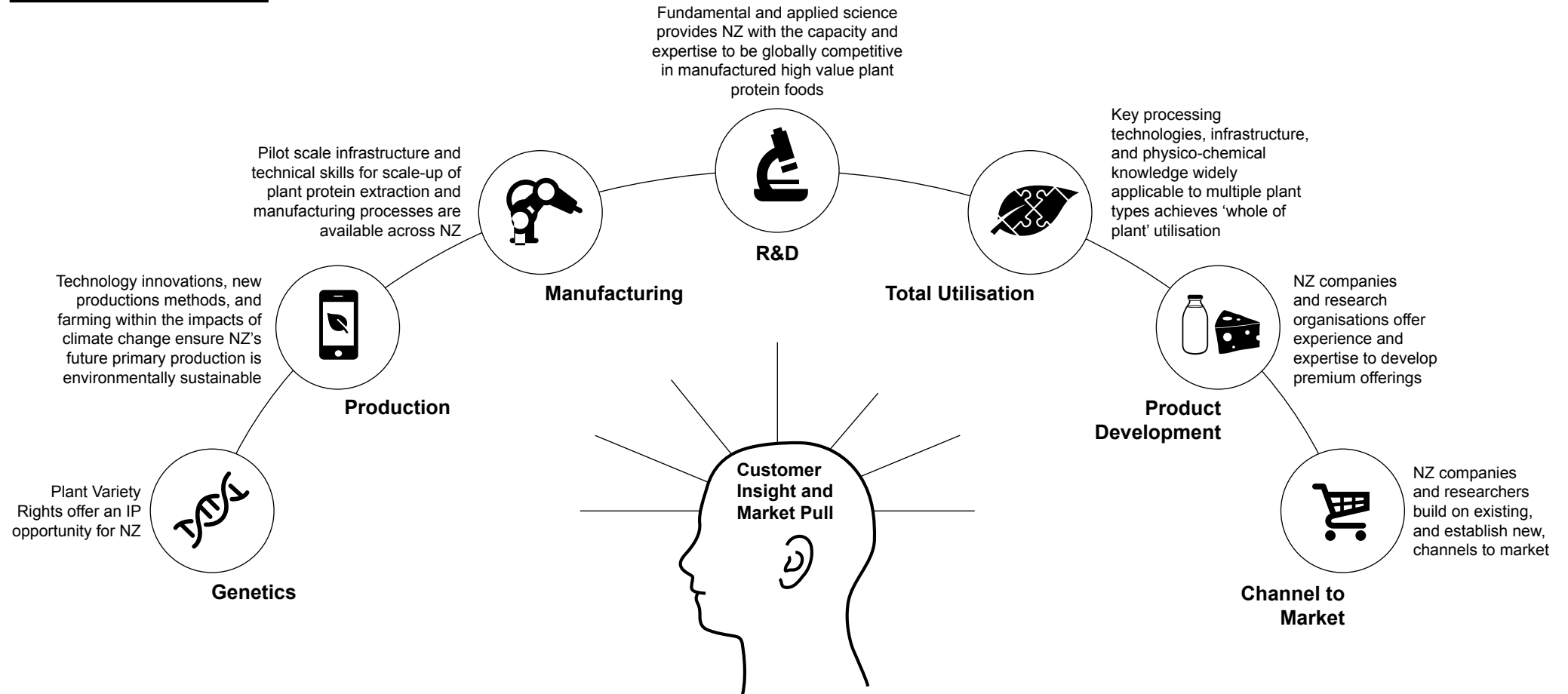
## Research opportunities for animal based proteins

- Research “reduced impact” or “improved health benefit” products to mitigate negative attributes and enhance positive features, such as A2 milk.
- Research markets and consumer segments to match New Zealand products with the consumers who most value their attributes.
- Research claims and production technologies which could lead to premium outcomes in export markets.





# THE PATH TO THE PREMIUM PLANT PROTEIN FOOD MARKET



# MONITORING OF TRENDS ENSURES PROPER DIRECTION

## Monitoring of consumer, regulatory, and product trends to inform strategic decisions in the primary sector

Continuous monitoring of trends that could impact our primary sector is important when making strategic decisions right through the value chain.



By monitoring particular metrics, we could identify changing product segments and consumer sentiment which could be close to creating a large disruption.



Once these signals are identified and considered relevant to sectors of the New Zealand primary sector, targeted research could be undertaken.



The result of this research would quantify if the innovation would have an impact on the incumbent product segment and the magnitude of that effect. It would also recommend solutions and strategies to mitigate this impact where possible.



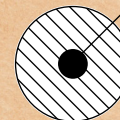
Relaying the findings to interested parties to ensure this research could inform strategic considerations across the entire food production value chain of New Zealand should be a priority.



## MPI's monitoring of grass fed butter in the US

Kerrygold's grass-fed butter experienced a 50% growth in value between 2010 and 2015, 5 times more than butter on average over the same period?

Kerrygold was able to identify the increased preference towards grass-fed butter and label their products accordingly and create an online marketing strategy to present this to customers. Companies that also used grass fed butter but did not market that attribute, failed to capture this growth.



# BIBLIOGRAPHY

---

**Bord Bia Insight Centre. (2017).** PERIScope 2017 – Multi Country Consumers and their Food – June 2017. Dublin, Ireland.

Retrieved from: <https://www.bordbia.ie/industry/manufacturers/insight/publications/bbreports/PERIScope6/PERIScope2017/Bord%20Bia%20Periscope%202017%20-%20Multicountry%20Full%20Report.pdf>

**Crew. B. (2014).** New Study Reveals 84% of Vegetarians Return to Meat.

Retrieved from: <https://www.sciencealert.com/new-study-reveals-84-of-vegetarians-return-to-meat>

**Deloitte Consulting LLP (Deloitte). (2017)** Capitalizing on the shifting consumer food value equation. USA: Deloitte LLP is association with The Food Marketing Institute (FMI) and the Grocery Manufacturers Association (GMA).

Retrieved from: <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/consumer-business/us-fmi-gma-report.pdf>

**Faunalytics. (2016).** A Summary of Faunalytics' Study of Current And Former Vegetarians and Vegans.

Retrieved from: <https://faunalytics.org/a-summary-of-faunalytics-study-of-current-and-former-vegetarians-and-vegans/>

**Food and Agriculture Organization of the United Nations (FAO). (2017).** The future of food and agriculture – Trends and Challenges. Rome, Italy: FAO

**Harris, J.M & Shiptsove, R. (2008).** Consumer Demand for Convenience Foods: Demographics and Expenditures. The Journal of Food Distribution Research 38(3)

**Impossible Foods. (2017).** Impossible Foods 2017 Sustainability Report – Sustainability is our main Ingredient. San Francisco, USA.

Retrieved from: [http://www.ift.org/~media/Food%20Technology/Weekly/IF\\_SustainabilityReport2017.pdf](http://www.ift.org/~media/Food%20Technology/Weekly/IF_SustainabilityReport2017.pdf)

**International Food Information Council Foundation (IFICF). (2015).** 2014 Food and Health Survey. Washington DC, United States of America.

Retrieved from: <https://www.foodinsight.org/articles/2014-food-and-health-survey>

**Just Mayo. (Sep 27 2017).** Presentation to at Bridge2Food, September 27 2017. Jasmin Hume – Director of Food Chemistry.

**OECD / FAO. (2016).** OECD – FAO Agricultural Outlook 2016 – 2025 – Special Focus: Sub-Saharan Africa. Paris, France.

Retrieved from: <http://www.fao.org/3/a-i5778e.pdf>

**Ministry for Primary Industries of New Zealand (MPI). (2017).** Situation and Outlook for Primary Industries – June 2017. Wellington, New Zealand.

**Nielson. (2015).** Consumer-Goods' Brands that demonstrate commitment to sustainability outperform those that don't. New York, USA.

Retrieved from: <http://www.nielsen.com/nz/en/press-room/2015/consumer-goods-brands-that-demonstrate-commitment-to-sustainability-outperform.html>

**PWC. (2017).** The Long View: How will the global economic order change by 2050? London, United Kingdom.

Retrieved from: <https://www.pwc.com/gx/en/world-2050/assets/pwc-the-world-in-2050-full-report-feb-2017.pdf>

**Reuters. (2017).** Chinas pork demand hits a peak, shocking producer, as diets get healthier. Patton D.

Retrieved from: <https://www.reuters.com/article/us-china-meat-demand-insight/chinas-pork-demand-hits-a-peak-shocking-producers-as-diets-get-healthier-idUSKBN19A31C>

**USDA. (2013).** USDA Production, Supply and Distribution database and projections. Washington, United States of America.

**United Nations Department of Economic and Social Affairs (UN). (2014).** World Urbanisation Prospectus – the 2014 edition. New York, United States of America.

Retrieved from: <https://esa.un.org/unpd/wup/Publications/Files/WUP2014-Report.pdf>

**United Nations Department of Economic and Social Affairs. (UN). (2015).** World population projected to reach 9.7 billion by 2050. New York, United States of America.

Retrieved from: <http://www.un.org/en/development/desa/news/population/2015-report.html>

**The World Bank. (2017).** Chart: Globally, 70% of freshwater is Used for Agriculture. Tariq Khokhar.

Retrieved from: <https://blogs.worldbank.org/opendata/chart-globally-70-freshwater-used-agriculture>

**World Health Organisation (WHO). (2016).** Food Consumption – Chapter 3 Global and regional consumption patterns and trends – Availability and changes in consumption of animal products. Geneva, Switzerland.

Retrieved from: [http://www.who.int/nutrition/topics/3\\_foodconsumption/en/index4.html](http://www.who.int/nutrition/topics/3_foodconsumption/en/index4.html)

**World Resources Institute. (2017).** CAIT 2014 historical emissions by country and category.

Retrieved from: [http://cait.wri.org/historical/Country%20GHG%20Emissions?indicator\[\]=Total%20GHG%20Emissions%20Excluding%20Land-Use%20Change%20and%20Forestry&indicator\[\]=Total%20GHG%20Emissions%20Including%20Land-Use%20Change%20and%20Forestry&year\[\]=2014&sortIdx=NaN&chartType=geo](http://cait.wri.org/historical/Country%20GHG%20Emissions?indicator[]=Total%20GHG%20Emissions%20Excluding%20Land-Use%20Change%20and%20Forestry&indicator[]=Total%20GHG%20Emissions%20Including%20Land-Use%20Change%20and%20Forestry&year[]=2014&sortIdx=NaN&chartType=geo)



