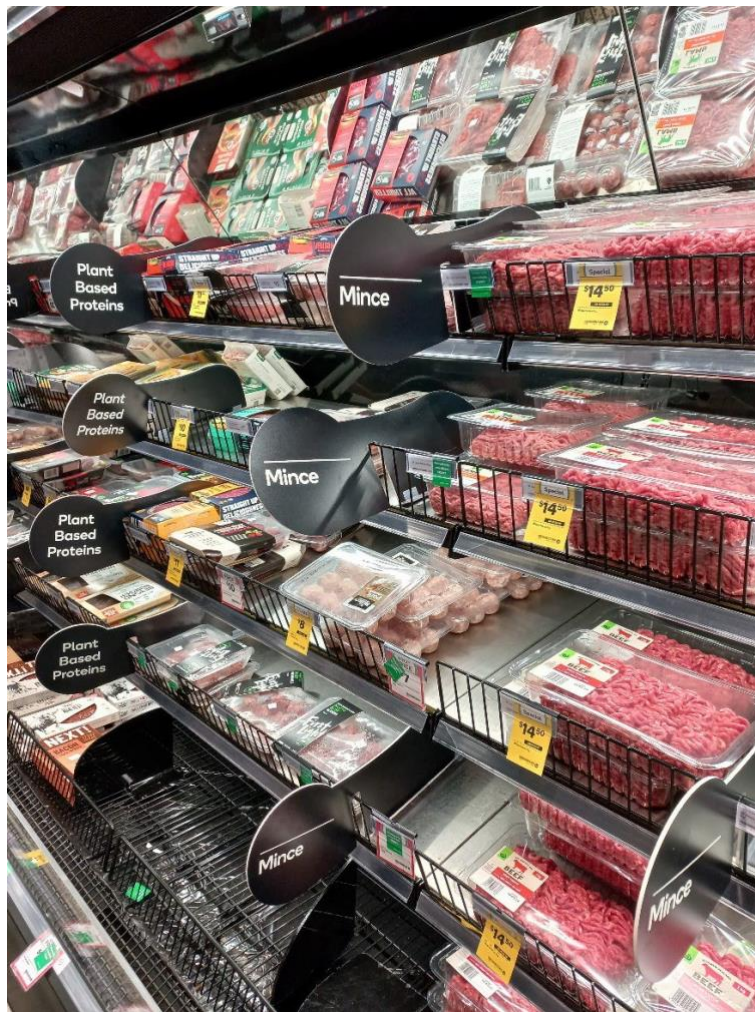




KELLOGG
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PROGRAMME



Plant & Three Veg?

Are plant-based proteins going to take a bite out of red meat market share?

Course 45 2021

Andy Wards

I wish to thank the Kellogg Programme Investing Partners
for their continued support.

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All the best to the cohort of Kellogg 45 and thanks to you guys for your share in making this a great network of people.

Sincerely,

Andy Wards, 6 March 2022

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Disclaimer

In submitting this report, the Kellogg Scholar has agreed to the publication of this material in its submitted form.

This report is a product of the learning journey taken by participants during the Kellogg Rural Leadership Programme, with the purpose of incorporating and developing tools and skills around research, critical analysis, network generation, synthesis and applying recommendations to a topic of their choice. The report also provides the background for a presentation made to colleagues and industry on the topic in the final phase of the Programme.

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Contents

Executive Summary	4
Objectives.....	5
Methodology.....	6
Introduction & Background.....	7
'Steak' of the Nation - NZ Red Meat Industry	8
What's Bean Happening? - NZ Plant Protein Industry.....	9
Findings & Discussion.....	13
'Pea' for Price	13
Soya Wanna be a Food Superstar?	15
Whatever Floats Your Oat	20
Conclusions	21
What's at Steak?	21
No Use Crying Over Spilt Almond Milk – It's Just Nuts!.....	23
Recommendations	24
References	25

Executive Summary

To feed a world population of over 9 billion in 2050 it is highly likely that we will need to see growth in all protein categories rather than the dominance of one over another.

This report reviews the current literature and media narrative around the subject of plant-based proteins and the position they have taken in the protein marketplace. It outlines the background and importance of the NZ Red Meat industry and why this continues to be a highly valuable sector.

It analyses recent research into amino acid profiles in red meat and discusses some of the points made around the health questions often formed in consumer minds. We now have a society made up of a range of lifestyle diets, where new words such as flexitarian have developed, and veganism is not so far from the mainstream.

Red meat will continue to be a vital source of nutrient dense protein. The Covid 19 pandemic has enhanced people's confidence in their home-cooking abilities, and they have sought out higher value premium red meat products to complement their menus. Red meat has symbolic qualities which makes it a key component for festive occasions and social celebrations.

Plant proteins will cement their place in the retail food cabinet as well as in the food service and ingredients sectors. They offer a genuine alternative to red meat protein and will be an essential contributor to overall protein requirements of a growing global population with a focus on human nutrition and environmental impacts.

Red meat farmers and processors should be confident in their industry's future and continue to invest in technology, people, minimising their environmental impact, and targeted consumer marketing.

Meat alternatives have an important place in the industry to further engage consumers in new and different ways. When it comes to animal protein vs plant protein it is an "AND" story, supported by growth in the entire protein category.

Objectives

The principle aim of this report is to identify the impact of the developing plant-based protein category on New Zealand red meat sales.

It is important for all NZ farmers, processors, and retailers to understand the trends that will influence consumer choices in this area. These stakeholders have significant investments in each of their own parts of the red meat supply chain. Substantial portions of our economy rely on the red meat sector succeeding for the current and future profitability of their businesses. Not to mention the rural families and their communities who depend on the red meat supply chain to enable them to provide for their children and be valuable contributors to our economy. These communities and companies have been able to grow and thrive over many generations thanks to the strong appetite that New Zealanders and the world alike have always had for red meat products.

It is important the stakeholders in the red meat supply chain continue to have confidence in their industry. Red meat producers especially, but all businesses with an investment in red meat protein. This is vital to inspire future investment in the industry as technology will create many opportunities - for both sides of the protein field.

I plan to investigate whether red meat protein has a positive outlook and can hold its position as the dominant source of protein on the supermarket shelves. However, if this is not the case then I aim to outline the trajectory for red meat sales and perhaps offer some opportunities to retain an acceptable market share.

I will outline the drivers behind plant-based proteins and what the protein mix may look like on our supermarket shelves in the future.

If you're not at the table, you're on the menu!

Are there enough seats at the dinner table for red meat protein AND plant protein? Or does one replace the other?

Methodology

This report uses critical analysis of a variety of literature to discuss how plant-based proteins are currently placed and where in the protein market they are likely to achieve consistent results. The report compares the narrative coming from both sides of the protein market and endeavors to maintain a balanced critique of each. As many of the media articles I researched often came from a certain angle on the topic, it was important to have a broad scope of the type of media and authors. Scientific literature was reviewed to attempt to justify the news media articles where possible. Scientific journals and industry website publications were consulted, and a literature review completed on relevant articles.

Statistics and background on the NZ context were primarily resourced from NZ producer websites and their relevant industry reports from 2020/2021.

2 semi-formal interviews were conducted in person in the later part of 2021 to gain a more personal insight into the current and future plant-based protein product scenarios. The common themes were used to form parts of my discussion and the key points were extracted as a basis for further research focus.

The report analyses the plant-based milk category and some of the effects that has had on consumer purchasing trends and traditional dairy milk sales in this country. This was a relevant comparison to make due to the similarities between the development of plant-based milks and their effect on the overall milk market, and the potential trajectory of plant-based proteins versus red meat. This component involved a brief review of why plant-based milk alternatives are becoming popular, and their current standing in the overall milk category.

It is noted that the research, data, and media narrative on this topic is being updated regularly, so I have attempted to limit research and observations in most cases as of December 2021. Continued research into this topic would no doubt discover further changes in trends and projections.

Introduction & Background

In this piece of research, I have focused specifically on plant-based proteins rather than the much broader category of alternative proteins. There is simply too much information to include in a report of this size, so I have opted to narrow my focus to plant-based, and specifically plant-based meat alternatives. Other types of alternative protein (cultured/cell grown, fermented and insect) are not yet widely available and do not present a consistently available protein option for purchase currently. Many of the alternative proteins are still being developed and the research is regularly updated. Further investigation into the effects on red meat sales by the other alternative protein categories will become more important over the next 2-3 years.

This report discusses plant-based proteins wherever possible within NZ to narrow the vast amount of information and to provide a useful document for NZ purposes. However, as NZ tends to be a follower of global food trends, it was essential to include the global context so therefore analysis is made based on overseas information, such as product mix on supermarket shelves and consumer diet preferences. There is more data currently available based on overseas insights than NZ. This does however give us an idea of where we are likely to head with our consumption choices as well as our perceptions on the environment.

For the benefit of this report red meat is defined as beef, lamb, and venison. The report focuses on these three animal proteins rather than including chicken and pork, although often the data presented on meat consumption includes all these categories. Chicken replica plant protein products especially are a large category on their own and an important growth area for plant-based products. Wherever possible I have focused on comparisons specifically with red meat as this will be of more benefit to NZ red meat farmers and processors.

Plant-based proteins have been launched into the nutritional spotlight only in the past 5-6 years but have seen rapid early-stage growth in uptake. They are gaining traction as a genuine mainstream food option due to the growth in product range and consumers' perceptions of health and environment impacts from consuming animal-based proteins. Of course, many of these perceptions are legitimate, but some are also based on clever narrative rather than complete fact.

The rate of uptake for plant-based meat products has been fast, albeit coming from a low base and benefiting from the novelty factor. However, this rate of growth has cooled over the past 12 months. The plant-based meat category is still a small component of the entire protein category with animal proteins making up around 95% of the market.

‘Steak’ of the Nation - NZ Red Meat Industry

Red Meat Processing

Since the first successful shipment of frozen mutton carcasses left Port Chalmers on board the *Dunedin* in 1882, red meat production in NZ has continued to progress and evolve. Despite downturns, upturns, mergers and closures, the red meat sector has carved out its position as a mainstay of the NZ economy. Now with over \$9 billion in sales and exporting to 108 countries around the world (Meat Industry Association, 2021) it is a vital provider of export receipts to help underpin our economy. Red meat also plays an important role in our domestic economy through butchereries, supermarkets, and online meat retail.

Table 1. Economic Contribution of the Red Meat Industry, New Zealand, 2017-18

	Employment	Industry value-added	Household Income
	FTE	NZ\$ million	NZ\$ million
Direct contribution	35,702	3,775	1,477
Flow-on contribution	56,719	8,197	3,124
Total contribution	92,421	11,973	4,601
As % of New Zealand	4.7%	4.2%	4%

Table 1. (Heilbron, 2020)

As illustrated in the table above, the red meat industry is a significant contributor to the NZ economy. These figures are even more pronounced when comparing the data at a regional level (Heilbron, 2020).

There are 56 meat processing plants in NZ, producing a combined total of 1.3 million tonnes of export volume (Meat Industry Association, 2021).

Red Meat Farming

The entire sector is supported by the 12,000 sheep, beef & deer farmers here who make efficient use of New Zealand's temperate climate to farm these animals all year round under a pasture-based system. Associated with this is the myriad of supporting industries such as rural accountants, engineering firms, fertiliser companies, and many others which operate in the NZ agricultural space and are essential for the growth and development of both provincial and urban communities.



Fig. 1 NZ Prime Lambs & Angus Beef

Farmed red meat animals currently stands at 26 million sheep, 3.9 million beef cattle, 0.8 million deer (Beef + Lamb New Zealand, 2021)

Over half of NZ's area is classified as mountainous. With the total area of NZ being 26.8 million hectares, this leaves approx. 13 million hectares for pastoral grazing (Beef + Lamb New Zealand, 2021). Much of this land is hill country which is unsuitable for tractor cultivation so therefore limits its arable or horticultural growing potential.

The vast majority (92%) of NZ sheep & beef farms are owner operated. This has been a successful model for the industry but can limit the capital available for reinvestment and diversification.

The dairy industry is an important contributor to red meat production, making up around 70% of the animals used. These come in the form of Friesian bulls, dairy-cross beef animals, cull cows, and bobby calves.

What's Bean Happening? - NZ Plant Protein Industry

Products

Plant proteins are becoming a popular alternative to traditional red meat as a way for consumers to enjoy food which has the appeal of a similar taste and texture to red meat along with similar nutritional components (Curtain & Grafenauer, 2019). Modern consumers are concerned about the perceived negative health impacts of eating red meat or too much

of it so are looking for an alternative product that fulfils their desire for the meat-eating experience while being kinder to their body and the environment (Hertzler et al., 2020).

Plant-based proteins are separated into two main categories:

- Ingredients sourced from plants are mixed to form an end-product (Beyond Burger)
- Protein molecules are extracted from plants and used to form a new product (Impossible Burger)

(France, 2020).

Currently plant-based food companies are concentrating on producing products which are easily interchangeable for a traditional meat-eating consumer. Its not a huge step for example for your average consumer wishing to purchase a red meat burger patty to replace the beef patty with a plant-based one. The taste and texture might be a bit different but because the patty is a component of a meal (i.e., the burger), it is somewhat lost in the mix of sauce, relish, cheese, and mayonnaise anyway.

Animal protein products such as steak, chops, roasts are not likely to be disrupted in the near future as any replication process is far more complicated and currently very costly. This is the area where cell grown meat will have influence rather than plant-based alternatives (personal communications, A Worker 2021). Products such as mince, sausages, meat balls, and burger patties lend themselves to be reproduced much more easily with a plant product mix. These are the types of products which new innovation from plant-based food companies are aiming to replace (Poinski, 2021).

New Zealand Context

Some farmers in NZ are beginning to take an interest in the production of plant proteins such as yellow peas and quinoa, to see where the potential may lie as an arable option. However, as reported by Burry (2021) NZ farmers are keen to look at plant proteins as a way of diversifying their income and production but are unsure what the process involves. Burry (2021) also suggests that NZ is missing a “coordinated approach” in developing the pool of people and technology required to advance this sector.

Leaft foods in Canterbury are making traction in this respect with several mixed arable and livestock farmers signing up to plant suitable protein crops for the 2022-23 season and beyond (S. Vreugdenhil, personal communication, 2021). Their focus is on the extraction of protein from plant leaves such as lucerne. This is a unique concept compared to most other plant protein which is a component of the seed.

Plant-based products have the advantage of being more automated/robotic compared to traditional meat processing sites e.g., manual boning of beef. Currently the red meat sector in NZ is facing significant staff challenges in the form of the available and willing labour pool. There are some robotic features, but it is made difficult and expensive due to variation in individual animals and therefore problematic maintaining a tight consistency. Labour issues can be mitigated with more automation in plant protein products.

Most of the ingredients are either imported and mixed here or the final product imported and distributed direct to retailers or food service outlets (Burry, 2021).

According to research by Colmar Brunton (2019), 60% of kiwis have tried or are interested in trying a plant-based meat alternative. On the other hand, Shoup (2022) reports that only half of US consumers who tried a meat alternative in 2021 made a repeat purchase. This suggests that the products can attract solid initial interest, but consumers are not necessarily sold on the experience yet.

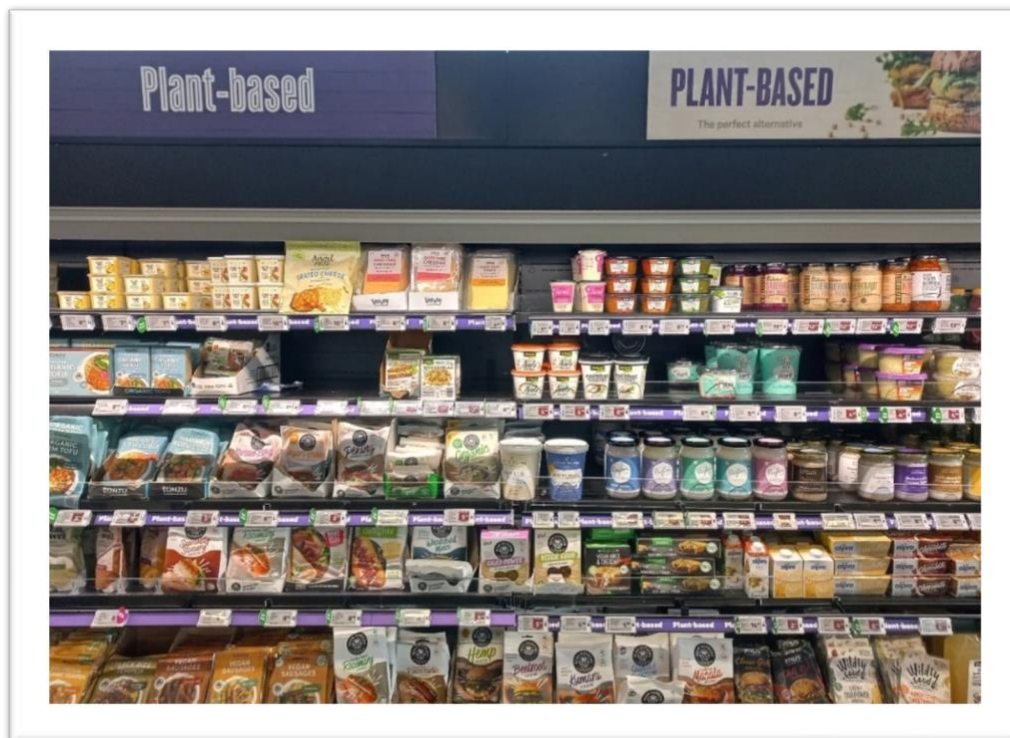


Fig. 2 Plant-based protein category in NZ supermarket shelf

Global Context

In the US, total retail sales of all plant-based foods grew 27% in 2020 to reach a market value of \$7 billion. Of this, plant-based meat managed to hit \$1.4 billion in sales. Some big numbers but to give them perspective, 2021 retail sales of traditional meat in the US were \$82 billion (Shoup, 2022).

There is a point to be discussed around the legalities of labelling alternative protein products “milk” and “meat”. To dive into this subject requires an entire report to itself so I will save that discussion for another day. In particular for meat substitutes, the naming of them creates an ethical dilemma and “may mislead consumers into assuming their nutritional profile mirrors animal-based meat” (Curtain & Grafenauer, 2019). For example, the Sunfed brand “Bull Free Beef” and “Raw Prime Mince” are being challenged on their labelling claims and legalities around this.

Alex Worker of Impossible Foods believes technology will take over the commodity market. He suggests that plant-based is the step to cell-based. In Alex’s words “Impossible & Beyond Meat are the Coke & Pepsi of the Plant-Based protein market”. Impossible’s aim is to target meat eaters as they are wanting the meaty taste. 10% of Americans have tried plant-based meat products, however as found by Shoup (2022), only half of these consumers who tried meat alternatives went on to make a repeat purchase in 2021.

Alex Worker notes that some countries are engaging directly with plant-based food companies. “We have the famers, you have the capital, what can we do to link?”

Findings & Discussion

‘Pea’ for Price

The Modern Protein Shopper

Proteins are the essential building blocks of life which allow us to grow, develop, and thrive. To achieve these things, we need to be able to extract protein from our diets one way or another. We are now in an age where the modern consumer has multiple options for incorporating essential proteins into their diets.

According to a report by Colmar Brunton in 2019, 1 in 3 New Zealanders are consciously limiting their meat intake. Meat reduction is being led by the baby boomers, while vegetarians and vegans are most likely to be millennials (Born 1981-1996). Not surprisingly (to this author at least) you are most likely to find a Vegan in Auckland and a vegetarian in Wellington (Colmar Brunton, 2019) The number of vegans and vegetarians in NZ and other developed countries is expected to increase, alongside the modern trend towards reducing meat intake known as the Flexitarian diet. People following this lifestyle trend still want to consume meat but are reducing their portion size and frequency of meals which include meat.

With women being the dominant sex responsible for consumer spending and most often the primary shoppers in their household (France, 2020), it stands to reason that they are going to have a significant effect on the eating habits of the household they are purchasing for. 42% of women are more likely to limit or reduce their meat intake, compared with 36% of men (France, 2020).

Consumers now have far more options for methods to purchase their protein supplies. Where once a humble butcher provided the main avenue for purchasing your animal protein requirements, there are now a diverse range of retail outlets. Online retail, specialty food markets, farmers markets, supermarkets, and still the local butcher are all possible purchasing points for the modern protein shopper looking for the right product to appeal to them and their families.

Many of the plant-based products are not targeting vegans with their marketing approach. Vegans and vegetarians are still a small percentage of the population. Targeting these groups only limits the customer pool of a food company, therefore in many cases these companies are focusing on the meat-eater. This is where their growth will come from. The consumer that wants all the attributes of meat but wants to reduce the proportion of their meat intake is a valuable customer to have.

The table below shows the results of two surveys completed by Curtain & Grafenauer (2019) of plant-based meat substitute products on supermarket shelves in Australia.

Table 2. Changes in product numbers and type of plant-based meat substitute product between 2015 and 2019 audits.



Category	2015 Total Products	2019 Total Products	Increase
Burgers	7	50	614%
Sausages	6	29	383%
Mince	5	10	100%
Chicken	4	24	500%

Table 2, (Curtain & Grafenauer, 2019)

Within the 4 years between 2015 - 2019 there was a significant leap in the range of meat-substitute products available on the supermarket shelf. This has helped to drive further sales growth in the category as consumers are now presented with a much broader range of product options (Poinski, 2021).

Price Comparisons

“Other characteristics of red meat are immaterial if the food consumer cannot afford to buy it” (Holloway & Wu, 2019).

Both plant-based and animal-based proteins are highly likely to face increasing inflationary pressure on costs of inputs and manufacturing. Not to mention the increasing costs of compliance that raw material producers especially must deal with when addressing environmental and animal welfare concerns. Uptake of plant-based products will be relatively elastic to price. This is much the same as beef is now as it can be substituted out of the weekly shop for chicken or pork instead.

When looking at a price per weight comparison, 1 pound of plant-based mince costs around US\$10-\$12 - compared to 1 pound of ground beef at US\$4-\$6. (A. Worker, personal communication, 2021).

Increasing demand for red meat from developing countries could put pressure on beef supply unless there are some major improvements made in production efficiency. And as demand increases so too does the price of red meat, which then makes it unaffordable for large populations based in these developing countries (Holloway & Wu, 2019).

Holloway & Wu (2019) also report that most countries have some form of subsidy in place for red meat production, primarily due to the production cycle being relatively long and the inevitable periods of undersupply and oversupply because of this. For example, the beef production cycle is 283-day gestation, lactation 200-240 days, and then growing and finishing of the animal 300 plus days. Therefore, decisions which finish with a beef meat product on a retail shelf are made at least 26 months in advance.

Soya Wanna be a Food Superstar?

Red Meat Protein

Holloway & Wu (2019) describe the human digestive system as having a well-developed small intestine which is consistent with omnivore species and suggests we have adapted to a nutritionally dense and varied diet.

Red meat is a nutrient dense food, meaning it is an excellent source of protein, minerals, and vitamins. It is an important source of Vitamin B12, zinc, and iron.

Red meat protein is highly digestible by humans, scoring 0.92 on the Protein Digestibility-Corrected Amino Acid Scores (PDCAAS). This is in comparison to the highest, egg whites and casein (1.00) and plant proteins such as lentils, peas and chickpeas scoring from 0.57 – 0.71 (Holloway & Wu, 2019)



The amino acid Taurine is a dietary requirement of humans. However, we cannot convert it efficiently from its precursors methionine and cysteine. It is almost exclusively found in animal products. Taurine is vital to several important biological functions in the human body and because of its antioxidant and anti-inflammatory properties, it can prevent cardiovascular disease (Holloway & Wu, 2019)

Holloway & Wu (2019) argue that there are a number of biases that have cropped up in scientific literature about the negative impacts of saturated fats (from dairy, eggs and meat).

(Dunkley, 2021) reports that in two separate studies of total meat consumption, one done in 2016 and another in 2018, compared Kiwis eating 67.5kg/person/year and 74.8kg/person/year respectively. This suggests that even if there are some discrepancies in the different data, kiwi meat consumption was relatively steady for those 2 years and placed us in the top 10 meat-eating countries globally. Our neighbours across the Tasman come in runners up at 94.8kg pp/yr and not surprisingly, the champion carnivores are the US where an almighty 97.1kg of meat is consumed per person each year (Dunkley, 2021).

However, breaking this data down into the red meat component reveals some not so flattering stats for red meat consumption. According to the same article by Dunkley (2021), kiwis beef consumption fell 31% in the 10 years between 2007-17 and our lamb consumption dropped by 23% over the same period. Therefore, at least until recently, reductions in red meat consumption have been replaced by other meat proteins, specifically chicken.

It can be argued that red meat is not an efficient use of resources and ruminant animals are inefficient converters of feed inputs to protein. However, in many pasture production systems such as NZ, ruminants are converting a low quality, fibrous carbohydrate in the form of grass and tussocks into a tasty and digestible protein for humans.

Typical 'manufactured' red meat products such as mince, burger patties, and sausages are the low hanging fruit to be targeted when plant-based food companies are producing alternative protein options to animal protein. Curtin & Grafenauer (2019) explain that "many mimic meat products directly, with 'bleeding' burgers and other products designed to exhibit 'meaty' characteristics".

This suggests that red meat proteins have the attributes of great taste, texture, and visual appeal which a consumer is looking for, but the extrinsic concerns of customers around animal welfare and environment have opened a gap in the market which plant-based proteins are endeavoring to fill.

It is not hard to find a report, article or scientific literature that deplores red meat as a contributor to cancer, heart disease, and gut irritation. But Leroy (2019) suggests that in

many cases red meat is being used as the scapegoat for lifestyles that are unhealthy anyway.

Interestingly the global pandemic has inspired consumers to diversify their red meat purchasing, with more families cooking at home and willing to purchase a larger range of cuts to utilize in their meals. In the US, lamb sales are consistently growing month to month. This seems to be attributed to Americans becoming more confident with their cooking and treating red meat as a premium eating experience (Shoup, 2022)

Plant Protein

Pea protein is the predominantly used form of plant protein. The proteins are extracted then weaved together using a combination of heating, cooling and pressure with water and steam. The woven protein is used as the base and then flavourings and other ingredients are added to this to create the final product. The most commonly used protein bases are Canadian, European, and North American Yellow Peas.

Plant-based 'meats' are a manufactured product. They include a number of different ingredients which combine together to make a final meat-like product. Because of their plant origin, plant-based products are higher in carbohydrates, dietary fibre, and sugars. According to data collected by Curtain & Grafenauer (2019), plant-based mince contained six times more sodium than meat mince, although this figure was reversed for the sausages that were tested. Therefore, the nutritional makeup of plant-based products can be quite different depending on the final taste and texture that is to be achieved.

The two photos on the following page illustrate the extra ingredients required in a plant-based patty formulation compared to a beef patty. Interestingly, protein and fat levels per serving are roughly the same for each option but the beef burger has about 1.5 times as much sodium. Carbohydrates are 7g per serving in the Beyond Burger compared with less than 1.5 in the SFF patty.

Figures 3. & 4. (below) compare the information on reverse of packaging between a plant-based *Beyond Burger* (Fig. 1) and a *Silver Fern Farms* beef burger patty (Fig. 2).

Saturated Fat Comparison for 4 oz (raw)
80/20 ground beef 8g
Beyond Burger 5g

Nutrition Facts			
2 servings per container		1 Patty (113g)	
Serving size		Per serving	Per container
Calories		230	450
		% DV*	% DV*
Total Fat	14g	18%	28g
Saturated Fat	5g	25%	10g
Trans Fat	0g		0g
Polyunsaturated Fat	3g		5g
Monounsaturated Fat	6g		11g
Cholesterol	0mg	0%	0mg
Sodium	390mg	17%	780mg
Total Carb.	7g	3%	14g
Dietary Fiber	2g	7%	4g
Total Sugars	0g		<1g
Incl. Added Sugars	0g	0%	0g
Protein	20g	40%	40g
Vitamin D	0mcg	0%	0mcg
Calcium	100mg	8%	200mg
Iron	4mg	20%	8.1mg
Potassium	330mg	6%	650mg
Niacin	4.7mg NE	30%	9.4mg NE
Vitamin B6	0.3mg	15%	0.6mg
Vitamin B12	2.4mcg	100%	4.8mcg
Pantothenic Acid	0.5mg	10%	1mg
Zinc	4.6mg	40%	9.2mg

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

INGREDIENTS: Water, Pea Protein, Expeller-Pressed Canola Oil, Refined Coconut Oil, Rice Protein, Natural Flavors, Dried Yeast, Cocoa Butter, Methylcellulose, Contains 1% or less: Potato Starch, Salt, Potassium Chloride, Beet Juice Color, Apple Extract, Pomegranate Concentrate, Sunflower Lecithin, Vinegar, Lemon Juice Concentrate, Vitamins and Minerals (zinc sulfate, niacinamide [vitamin B3], pyridoxine hydrochloride [vitamin B6], cyanocobalamin [vitamin B12], calcium pantothenate).

Peas are legumes. People with severe allergies to legumes like peanuts should be cautious when introducing pea protein into their diet because of the possibility of a pea allergy. Contains no peanuts or tree nuts.

2 - 1/4 LB PATTIES - NET WT. 80Z (226g)

Fig. 3

NUTRITIONAL INFORMATION			INGREDIENTS
Servings per pack: 4	Avg Qty per serve	Avg Qty per 100g	
Energy	774kJ (185Cal)	619kJ (148Cal)	Beef (97%), Salt, Horopito, Vinegar Powder, Pepper, Beetroot Powder, Vitamin C, Herb Extract.
Protein	21.4g	17.1g	
Fat, Total	10.9g	8.7g	Made in New Zealand from local and imported ingredients.
- Saturated	5.5g	4.4g	
Carbohydrate	<1.5g	<1.5g	Gluten Free. Keep refrigerated at or below 4°C.
- Sugars	<0.1g	<0.5g	
Sodium	638mg	510mg	  <p>Please recycle the carton. Please dispose of inside wrap and separating paper thoughtfully.</p>
Gluten	Not detected	Not detected	





Silver Fern Farms Limited,
283 Princes Street,
Dunedin, New Zealand.

Fig. 4

Environmental

New Zealand sheep and beef farms contain 25% of the total native vegetation in NZ, approximately 2.8 million ha (Beef + Lamb New Zealand, 2021). This provides a significant amount of on-farm sequestration. Greenhouse gas emissions are now at the forefront of agricultural discussions and will continue to be an important basis on which consumers judge red meat farming. Methane production from ruminants is a large contributor to GHGs, and NZ is under pressure to mitigate and offset our livestock emissions (Meat Industry Association, 2021).

Hertzler et al (2020) state that the production of 1kg of high-quality animal protein requires feeding 6kg of plant protein to livestock, which puts pressure on land and water resources along with potential increases in greenhouse gas emissions. Leroy (2019) counters this statement with the calculation that beef cattle can turn 0.6kg of plant protein from their feed into 1kg of animal protein. Therefore they are effectively “net protein producers” – the livestock version of upcycling. This is a case of narrative vs fact. Feeding livestock high quality grain feeds is likely an inefficient way to produce protein, but grazing cattle on fibrous pasture which humans can't digest is an efficient way of converting plants into protein.

Plants from the family known as Pulses (e.g., yellow peas) are N fixers, P scavengers, and have a minimal water footprint (Colmar Brunton, 2019). This places plant-based foods well in the context of looking after water resources.

Whatever Floats Your Oat

Analysing the plant-based milk market provides a good comparison for red meat products. Dairy milk has been a staple in everyday diets for thousands of years. It faces very similar challenges to what red meat does as we now have a stronger focus on the environment and our health. Plant-based milks have made big strides in their market share of milk sales, however Allan (2021) reports that they make up just 4% of the overall milk market, leaving dairy milk to still have a 96% share in 2019.

Allan (2021) goes on to state that health and concern for the environment from the impact of cows were the main reasons for over a third of young adults reducing cow's milk consumption.

The trick with this type of product is, you are not having to dramatically change your eating habits to be able to consume it. It is a simple swap of like for like. Instead of white liquid dairy milk being added to your hot tea or coffee, it is a nearly white liquid extracted from plants and added to your hot drink. At the end of the day, both products mainly constitute water anyway.

The situation is similar for plant-based meat replicas. The consumer is not disrupting their eating habits dramatically. They still hold a burger in two hands and have the general taste of a burger that drips out sauces and shredded lettuce onto your lap but have consumed zero animal meat in the process.

Conclusions

What's at Steak?

To feed a world population of 9.7 billion in 2050, food production needs to increase by 70%. In order for this increase to have a beneficial nutrient component, both animal and plant proteins will need to be a significant part of this increase (France, 2020).

What are the qualities of red meat that will enable it to stay relevant?

There is no doubt that plant-based proteins are growing in popularity and will continue to do so. However, the impressive growth figures in sales we are seeing is from a relatively low base with a product range that is only 5-6 years old. It is highly likely that the novelty factor of plant proteins will wane and while growth in the category will still occur it will be at a much slower rate and likely in line with similar % growth in animal proteins.

Steak cuts, roasting cuts, and bone-in products such as ribs retain a unique character that plant-based does not yet replicate. Cell cultured may be the steppingstone to reach some version of a replication. But it is the natural and non-altered properties of red meat that will maintain its relevancy as a premium food. It is still a product that retains a natural image. Grass-fed meat particularly is a food with no additives and unless it is a part of a flavoured sausage or value-added product red meat contains just one ingredient – meat!

This attribute can compete strongly with plant-based foods where the product ingredients list is long and can often include GMO foods (e.g., Impossible use GMO soy) and this will put off some consumers uncomfortable with GMO.

With NZ red meat exports to China last year reaching mouthwatering figures of just over 3.6 billion NZ\$ (Hinton, 2021), there is good reason to predict what the future meat consumption patterns of the Chinese will look like. Being a relative newcomer to the ways of western protein consumption, they are grabbing red meat with both hands and eating more and more each year.

What does the kiwi dinner plate of 2030 look like?

Since plant-based meat is made from a group of ingredients, there can be much more versatility in terms of health and function than conventional meat. For example, various vitamins, minerals or flavourings can be added depending on consumer preference and nutritional requirements.

There is potential that if we want to keep certain types of red meat on the dinner plate for the average consumer, we could blend a cheaper plant-based protein in with red meat so that people still get the experience and the nutritional benefits without having to pay the full future red meat price tag.

Fast food outlets creating plant-based burger menus is likely to increase the rate of sales of plant-based meat products, especially to new consumers or late adopters. Fast food creates a level of convenience with the key driver being taste rather than nutritional aspects which may be the case with supermarket purchases (Curtain & Grafenauer, 2019).

Plant-based products allow people to continue to interact in the familiar social context that surrounds traditional red meat. People wanting to follow a meat-free diet can engage in the family BBQ or the work function and be comfortable with their plant sausage-in-bread in hand.

The symbolic nature of meat is not as easy to replicate as the taste, texture appearance might be. Hence why plant-based companies have not tried to channel their own unique cultural symbolism. Of course, compared to red meat, plant-based protein products are only in their infancy as a consumer food and the engrained cultural perceptions and traditions of red meat have been built up over thousands of years.



Fig 5. Beyond Burger retail packaging in NZ

No Use Crying Over Spilt Almond Milk – It's Just Nuts!

It is likely that various food products in the future will contain meat and plant-based blends.

Meat, Plant and three veg!

An important outlet for plant-based proteins will be ingredients in the food service sector. For example, mince pies. It is often hard to tell if it is real meat in a mince pie anyway!

When it comes to traditional meat companies investing and contributing to their plant “competitor” it is not inconceivable that companies from either side could in fact market plant and meat products under the same banner. Take the example of fuel companies in the UK putting in electric car charging stations in their forecourts.

Several traditional animal-based protein companies e.g., Tyson Foods and WH group al have already established their own brands of plant-based products which compete directly with the likes of Beyond Burger. These large and well-established multinational food companies have the resources to bring new products to market quickly and efficiently.

There is no denying that with a growing global population and an increasing demand for protein from developing nations the need to provide more protein is real. However, it is unlikely that red meat production can be the only contributor, due to constraints in the forms of environmental impact, labour, and price.

It is clear that there is huge potential for growth in the plant-based protein category. Plant proteins achieve many of the goals that consumer set out to achieve when making purchasing decisions around sustainability, healthy diets, and animal welfare. As the price of red meat protein increases and the scaling up of plant protein production reduces its cost to consumers, the pricing is likely to become competitive and be a neutral factor for purchasing decisions.

At the end of the day this discussion may all be in vain anyway if the landscape is covered in pine trees for carbon off-setting.

Pine needles on bark toast anyone??

Recommendations

- There is a bright future for red meat producers providing they can evolve to be modern food producers who focus on environmental sustainability and biodiversity. They must also continue to have animal welfare as a top priority in their farming systems. The nutrient dense qualities of red meat will enable it to be viewed as a healthy choice as part of a balanced diet.
- Uptake new technologies as they arrive, especially tools like methane inhibitors and other developments which help to limit the production of GHGs.
- Plant based products have some advantages in being an ingredients product in that they can tweak formulations to improve attributes and expand product ranges. It will be important for the red meat industry to keep working on small improvements in their products.
- Start on-farm with genetics and feed types which can shape the meat's flavour and tenderness profile. Through to final stages in meat processing such as electric current for tenderising and dry-aging times in chillers. The investments in technology around these practices must be substantial and continuous. Certainly, the plant-based companies see investment in their technology and development a key priority for the future success of their industry.
- Lab grown or clean meat - an animal protein product cultivated from animal cells, could be the next big disrupter in the alternative meat game. The red meat industry will need to keep up to date with these developments and maintain a strong focus on marketing a natural product which sustains communities and economies.

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