

The Lab of Milk and Honey: Discourses in Aotearoa New Zealand Media that Envisage a Synthetic Protein Future

Centre for Sustainability Discussion Paper
No. 6

February 2022

Prepared by:
Angus Sinclair-Thompson



Centre for Sustainability:

Centre for Sustainability Director:
Associate Professor Caroline Orchiston

University of Otago
PO Box 56, Dunedin 9054
New Zealand.
ph. +64 3 479 5220
email: centre-sustainability@otago.ac.nz

The Centre for Sustainability is an interdisciplinary research centre working on local and global sustainability challenges. Hosted by the School of Geography in the Division of Humanities we work on local and global sustainability challenges through our research, teaching and partnerships. We draw from different knowledge systems including social and physical sciences, mātauranga and local knowledge.

For further information see:

<https://www.otago.ac.nz/centre-sustainability/index.html>

Publications

A number of recent publications are available on the CSAFE website at: <https://www.otago.ac.nz/centre-sustainability/publications/>

For further information, or to obtain a copy of a publication, please contact CSAFE using the contact details above.

Discussion Papers

McLeod, C., Grice, J., Campbell, H. and Herlith, T. *Super Salmon: The Industrialisation of Fish Farming and the Drive Towards GM Technologies in Salmon Production*. CSAFE Discussion Paper No. 5 (2006).

Kaye-Blake, B., Campbell, H., Plummer, C., Kitto, L., Polson, C., McKay, W., Fitzgerald, R., and Saunders, C. *The GM Food market: A Current analysis*. CSAFE Discussion Paper No. 4. December (2003).

Plummer, C., Kitto L., Polson C., and McKay, W. *Co-existence of GM and Non-GM crops: A Review of International Evidence*. CSAFE Discussion Paper No. 3. July (2003).

Manhire, J., Campbell, H. and Fairweather, J. *Pathways Towards Sustainability: Comparing Production Systems Across Four Sectors of New Zealand Agriculture*. CSAFE Discussion Paper No. 2. February (2003).

Campbell, H., Fitzgerald, R., Saunders, C. and Sivak, L. *Strategic Issues for GMOs in Primary Production: Key Economic Drivers and Emerging Issues*. CSAFE Discussion Paper No. 1. October (2000).

Research Reports

Cooper M, Campbell H, Manhire J, Moller H, Rosin C, Norton S & Hunt L (2009) *New Zealand Organic Sector Report*. CSAFE Research Report No. 5, October 2009 commissioned by Organics Aotearoa New Zealand Organics (OANZ).

Grice, J., Cooper, M., Manhire, J. and Campbell, H. (2007). *The State of the Organic Sector in New Zealand, 2007*. CSAFE Research Report No 4. University of Otago: Dunedin.

Grice, J., McLeod, C. and Campbell, H. *Evaluating the Social and Cultural Implications of GM Technologies in New Zealand Primary Production: A Case Study of Salmon and Other Aquaculture Applications*. CSAFE Research Report No. 3. June 2007

Stuart, A. and Campbell, H. *Technology Conflicts in New Zealand Agriculture: Comparing Contemporary and Historical Crises between Publics, Government, Business, and Science*. CSAFE Research Report No. 2. December (2004).

Campbell, H. and Ritchie, M. *The Organic Food Market in New Zealand*. CSAFE Research Report No. 1. June (2002).

Acknowledgements

This report was made possible by funding from the Norwegian Research Council which funded the *Protein 2.0: The biosynthetic protein transition: assessing impacts, outcomes and opportunities for Norway's post-animal bioeconomy* Programme based at Ruralis: Institute for Rural and Regional Research, Trondheim, Norway.

<https://ruralis.no/en/projects/protein2-0-overgangen-til-biosyntetisk-protein-evaluerer-av-effekter-utfall-og-muligheter-for-norges-post-animalske-bioekonomi/>

Table of Contents

1. Introduction:	4
2. The Protein 2.0 Project and Methods	5
3. Synthetic Proteins in Aotearoa New Zealand: A Timeline	6
4. Synthetic Proteins in Aotearoa New Zealand: Environmental Discourses	8
4.1. Promissory Discourse 1: A Nation of Premium Meat and Dairy in a Bifurcated Market	8
‘Real’ as Inherent	8
Farming Stories	13
Re-Organising the National Farming Strategy	16
4.2. Promissory Discourse 2: Disruption in the Farmverse	19
The Natural-scape: Organic, Regenerative, Endemic	20
The Multi-scape: Growing for Other Industries	21
The Stem-scape: Constructing a Biotech Infrastructure	23
The Eco-scape: Environmental Restoration	25
4.3. Destructive Silences	27
What Happens to Farming Identities?	27
What Happens to Rural Towns and Communities?	30
What Happens to Animal Agriculture?	31
4.4. Creative Silences	32
Creating a Premium Food Regime?	32
Creating a Biotech Food Regime?	35
Creating a Bi-Cultural Food Regime?	40
6. Conclusion	41
References	43

1. Introduction:

This Discussion Paper represents one thread in a tapestry of publications seeking to explore responses from sectors within the primary industries to the emergence of ‘disruptive’ technologies as part of the Protein 2.0 project. In particular, this paper’s contribution is to consider the potential impacts of synthetic protein technologies cast in imagined future agri-scapes.

Synthetic protein technologies encompass a series of innovative methods for the in vitro based production of recognisable commodity protein products such as meat, dairy, fish, eggs etc. The aim of synthetic proteins is to replicate, and so substitute, the growth of protein products in animal, and with it the processes by which animal proteins are grown and harvested. To elaborate on the technologies, Burton (2019) outlines two ways in which synthetic proteins are concocted, these either being cell culturing, for meat, or fermentation, for dairy. Cell culturing involves feeding a serum (usually foetal bovine) to host tissue taken from a donor animal using either a non-lethal extraction, or a previously harvested cell line which has been ‘immortalised’. Fermentation, on the other hand, involves the conversion of sugar into the desired dairy product through the use of yeast or bacteria (Burton, 2019).

Stephens, Sexton, and Driessen (2019) situate synthetic proteins in their socio-historical context, identifying 2013 as the beginning of what they refer to as the ‘second wave’ in the history of synthetic protein technologies. The moment of significance being the unveiling of the world’s first synthetic burger by Maastricht University researchers at a press conference in which Google co-founder Sergey Brin was revealed as the principal backer. Prior to the event synthetic proteins had been the reserve of academic study and science fiction, however, since the first foray of venture capital into the community, the technology has become the domain of the start-up company, replete with mission statements and marketing drives (Stephens, Sexton, and Driessen, 2019). As of 2021 there were 50 start-up companies in the field of cellular agriculture, a term used to collate both technologies involved in the manufacture of synthetic proteins and the infrastructure around them (Helliwell and Burton, 2021).

A brief review of the literature shows attempts to situate synthetic proteins historically, in terms of relating their potential as a disruptive force (Burton 2019, Klerx and Rose, 2020), or as a continuity of industrialisation (Guthman, 2022). To add to which there has been significant interest in how the sociotechnical relationship of synthetic proteins and their advocates form imaginaries (Jönsson, 2016), from which arise promissory narratives (Sexton, Garnett, and Lorimer, 2019), as well as sites of contestation with established agri-food industry (Sexton, 2018).

There is, however, little description in the literature of how synthetic proteins will impact the agri-sectors of particular nation states, a requisite for envisaging socio-technical change at the scale by which it will operate. The aim of this paper, therefore, is to engage with the imaginaries of the Aotearoa New Zealand agri-food sector, by way of establishing potential efforts of adaptation, contestation, or embrace in response to the

hypothetical rise of synthetic protein technologies. The resulting examination will then be incorporated into the wider purview of the Protein 2.0 project.

2. The Protein 2.0 Project and Methods

Based out of the interdisciplinary rural studies centre Ruralis, at the University Centre Dragvoll in Trondheim, the Protein 2.0 project aims to assess the “impacts, outcomes, and opportunities for Norway’s post-animal bioeconomy” (Ruralis, 2022). Within the context of this objective, international case studies serve to provide insights into the dynamics of the global food system, while also filling a gap in the literature. The findings of the Protein 2.0 project will then be used in scenario modelling to provide recommendations in the process of responding to synthetic proteins (Ruralis, 2022).

To situate the analysis of Aotearoa New Zealand’s narrative visions of a synthetic future, this discussion paper aims to answer the question,

How is pastoral farming in Aotearoa New Zealand responding (or not) to the potential impacts of synthetic proteins?

So as to develop an answer, this paper is both methodologically and theoretically premised on the work of Helliwell and Burton (2021).

Laying the theoretical foundations for Protein 2.0, Helliwell and Burton (2021) assess the promissory narratives generated by the synthetic protein industry and proximal media sphere, specifically as they pertain to future environments and rural landscapes, as well as resultant sites of contestation and narrative silences. Helliwell and Burton (2021) ground their analysis in the historical paradigm of creation-destruction, serving to recognise that technological developments do not occur in a linear fashion, but rather through their creation enact the destruction of other models of technological or historical development.

Data for this paper consists of traditional, sectoral, and alternative news outlets’ articles discussing synthetic proteins with reference, implicitly or explicitly, to imagined futures for the Aotearoa New Zealand pastoral landscape. Articles were collected using a Google search of publications made in Aotearoa New Zealand from 2011 to 2021 using the search terms, Artificial, Cellular Agriculture, Clean, Cultivated, Cultured, In-vitro, Lab-based, Lab-grown, or Synthetic, Meat, Dairy, or Animal Protein. This process yielded 129 applicable articles and reports.

Data was assessed via a textual analysis, represented by a close reading of the relevant sections that addressed expected changes in the future of the Aotearoa New Zealand pastoral landscape, as a consequence, wholly or in part, to the emergence of synthetic proteins. Data was then coded in three ways. Firstly, with regards to the narrative futures that the article anticipated, for example, whether the article contended that Aotearoa New Zealand should employ various strategies to adapt to the rise of synthetic proteins, or embrace the technology and engage in land use change. Secondly,

in terms of sites of contestation or underarticulated aspects of the world synthetic proteins were envisaged to create and the components that would purportedly be destroyed. Thirdly, with regards to the standpoint of the article, being either positive, believing that synthetic proteins will have a significant role in shaping future agri-food systems, with a plan for Aotearoa New Zealand in this future, supportive, believing that synthetic proteins will have a significant role in shaping future agri-food systems, though uncertain of the role Aotearoa New Zealand will play in this future, sceptical, uncertain of whether synthetic proteins will shape the future agri-food systems, or negative, believing synthetic proteins will only play a niche or marginal role in future agri-food systems.

3. Synthetic Proteins in Aotearoa New Zealand: A Timeline

Overall there were 129 articles coded and reviewed for relevant future vision making, of which 34 were described as positive, 70 were supportive, 20 were sceptical, and only five were labelled as negative (Table 1). This pattern is ostensibly in keeping with the wider literature in which there is a tendency to discuss synthetic proteins in a positive tone (Helliwell and Burton 2021). Helliwell and Burton (2021) give three possible reasons for this, firstly, the commercial success of plant based proteins has possibly downplayed scrutiny about the feasibility of synthetic proteins, secondly, the general focus of the agri-food sector in contesting the nomenclature of synthetic proteins and not their potential futures, finally, the engagement of established agri-food businesses in the development of synthetic proteins themselves.

It should be noted, however, that the coding of standpoints for this paper differs with those of Helliwell and Burton (2021) in the discrepancy of standpoint and tone. For example, an author could write actively about the extensive influence they envisage synthetic proteins having on the future world whilst being unsure of how to feel about, or even decrying, this future. Following on from which, the geographic reality that synthetic protein technologies are currently all being developed overseas means that future visions for Aotearoa New Zealand have to engage in not only the hypothetical of time, as to the developmental process of the technologies, but also the hypothetical of space, as to how these technologies will relate to or enter into the Aotearoa New Zealand agri-food market. The significance for the standpoints being the general framing of the future as an external force being enacted on Aotearoa New Zealand, which goes some ways to explaining for the modal status of the supportive code (Table 1).

Table 1: Sum Total of Articles per Coded Standpoint n=129

Standpoint	Sum
Positive	34
Supportive	70
Sceptical	20
Negative	5

As with the distribution of standpoints, the timeline of publications was skewed, with only a single relevant publication in 2011, four each in 2012, 2014, and 2015, though none in 2013, three in 2016, and then a spike of 38 in 2017, followed by slightly

decreasing quantities of 30 in 2018, 24 in 2019, a significant dip of only seven in 2020, and then a slight upturn with 15 articles published in 2021 (Figure 1). Broadly speaking this pattern does reflect the trend seen by Helliwell and Burton (2021), who describe the discourse of interest as increasing from 2016 onwards.

While there is no glaringly evident impetus for, or through line between, articles published in 2017, notably, it is the time period when industry organisations such as Agresearch, MPI, Rabobank, Dairy Tomorrow, and the NZ Institute of Primary Industry Management began releasing reports on the state of synthetic protein technologies and their potential impacts. That same year the then Chief Science Advisor Sir Peter Gluckman gave a speech at the NZBIO conference in Wellington warning Aotearoa New Zealand industry, in fairly stark language, of the impending rise of synthetic proteins. Other events of significant media attention include Beef & Lamb NZ’s launch of its Taste Pure Nature campaign, which occurred in 2018. Taste Pure Nature is a national origin brand initiative established in part as a response to a contemporaneously released report by Beef & Lamb on the need to garner a distinct cultural identity for Aotearoa New Zealand meat products in the face of a prospective synthetic protein future. In July that year Air New Zealand began serving the Impossible Burger, which is plant based rather than synthetic, however, it generated substantial interest in food futures more broadly. In 2019 Fonterra took a minority stake in synthetic dairy brand Motif Ingredients, which spurred a series of articles exploring the antagonisms between synthetic and traditional dairying. Finally, in late 2020 the Ministry for Business Innovation and Employment approved an investment project of NZ \$12 million into synthetic protein partnerships with Singapore, the city state becoming the first place to legally sanction the public sale of synthetic meats in the same year.

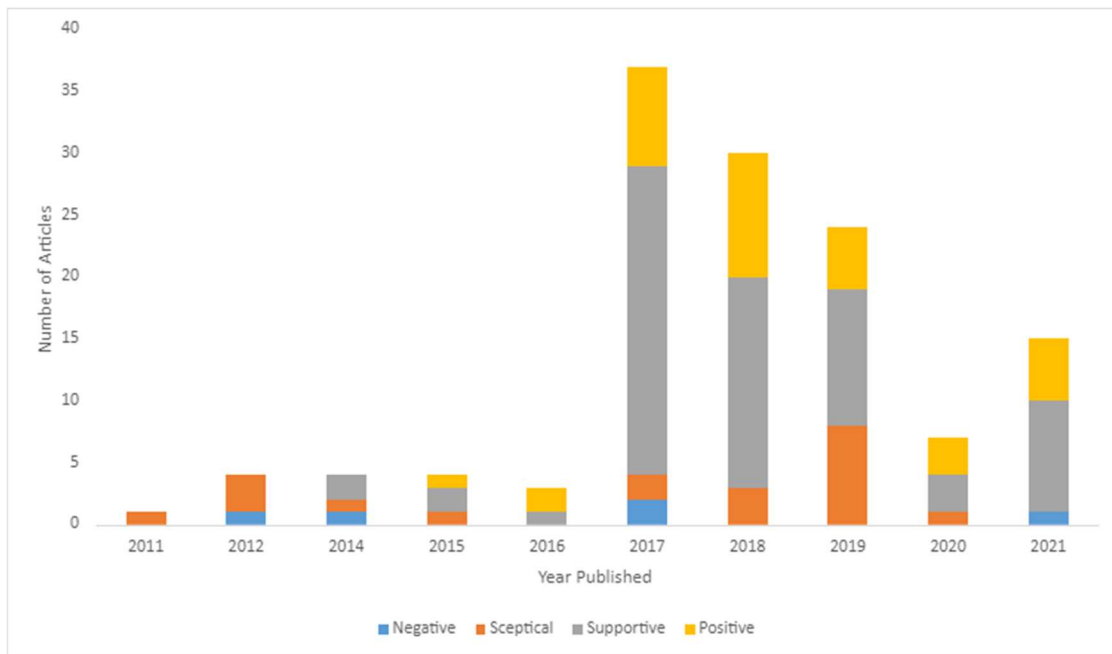


Figure 1: Timeline of Publications in AoNZ Media Relating Synthetic Proteins to Imagined Futures n=129

4. Synthetic Proteins in Aotearoa New Zealand: Environmental Discourses

4.1. Promissory Discourse 1: A Nation of Premium Meat and Dairy in a Bifurcated Market

Promissory narratives were organised into two overarching discourses with regards to how the stories framed the Aotearoa New Zealand landscape, and what changes the hypothetical introduction of synthetic proteins will have. The first discourse pertained to narratives which described a situation where farming will change as a process of already existing developments in agricultural technologies, thus retaining its current place in the Aotearoa New Zealand landscape. In keeping with the sampling methodology, these narratives did speculate that synthetic proteins will play a role in the future of food, however, their effect would be in international markets, not as to influence the productive repertoire of Aotearoa New Zealand pastoral agriculture, hence the discourse forms something of an orthodox perspective.

'Real' as Inherent

There was a steady stream of narratives which sought to affirm the belief that there will always be a market for 'real' products, that being animal protein from farm reared animals. The theme serves an analogous role to the 'not a serious threat' counter-narrative that Sexton, Garnett, and Lorimer (2019) identified the livestock industry generating in response to the premise of alternative proteins, inclusive of plant based and insects. The argument being that synthetic proteins will fill different market niches and so not compete with their real equivalents. While there is some consensus that this narrative has faded internationally with the market successes of alternatives (Sexton, Garnett, and Lorimer 2019, Helliwell and Burton 2021), the belief in the inherent place of real meat was found throughout the sampling period for this research, and from a range of sources.

In an interview for North & South Magazine, Harjinder Singh the Director of the Riddet Institute, a national research centre for food science and technology based in Palmerston North, makes the claim that Aotearoa New Zealand would be best to continue with its current land use strategies while demand for meat is growing, and there are uncertainties surrounding the feasibility of synthetic proteins.

"No one knows quite what the future holds with regard to the uptake of synthetic meat and dairy products, but given the increase in world population and our lead position as a producer of grass-fed meat and milk, there is justifiable confidence that New Zealand's markets will be secure for the foreseeable future. We need to evaluate the nutritional value of these new products and the environmental impacts of their feedstocks and manufacture."

(Lewis, 2019)

Singh's argument is premised on the desire to supply the greatest nutritional value to the most people, saying,

"In many parts of Asia and Africa, millions of children are physically stunted as a result of malnutrition and the unavailability of affordable, high-quality animal protein.

We know that milk and milk products are easily the best way of delivering a complete nutrient package to children who are starving and need high-quality protein for their growth and development. If we care about the poor, the world must continue to produce milk and milk products in formats that are affordable and available for everyone.”

(Lewis, 2019)

To fulfil the role of being an international supplier of nutrition he cites that “three-fifths” of Aotearoa New Zealand land is best used for pasture. Singh’s argument is essentially framed as an interest in food security, which he eloquently links back to land use practice.

The United Nations’ Food and Agriculture Organisation (FAO) predicts meat consumption will increase 14% by 2030, largely due to population and economic growth in the global South (OECD and FAO, 2021). FAO statistics do not take into account the ways in which the potential rise of synthetic proteins may shape future markets, however, those in the food and agricultural sectors are speculating.

Cuisine Magazine outlines a popular vision of a bifurcated market with real meat as the more desirable, premium product. They write,

Whenever it arrives, cultivated meat is an inevitability, so what happens to our meat industry after that? As New Zealand is already catering to a niche market of luxury restaurants around the world, there seems little doubt this trade will continue.

In future, will it only be the very rich who will be eating real meat while the rest of us make do with the cultured version? Only time will tell.

(Cuisine, 2021)

The narrative holds to a continuity of contemporary valorisations of protein, premised on the axiom that consumers of Aotearoa New Zealand produce are highly selective, and so unlikely to be subject to a paradigm shift should synthetic protein companies produce imitations of equivalent quality. Although, that being said, there is an awareness of the disruptive potential of synthetic products. In an interview on NZ Stuff, Taranaki Sheep and Beef farmer Bryan Hocken draws the analogy to the fibre industry,

“Synthetic carpets killed the wool industry and at the time we didn't consider it a threat,” he says.

“Unlike the synthetic carpet tsunami, the synthetic meat challenge is not being ignored by the red meat industry,” he says.

“To avoid a repeat of the carpet saga, the focus for the industry is supplying high quality meat to the high end market,” he says.

And in a world protein market dominated by synthetics, that high end can go higher than ever before.

“Growing the premium \$1500 lamb is a scary thought,” Hocken says, “but not impossible.”

(Watson, 2017)

Hocken suggests that the growth of a synthetic protein market could in fact increase the worth of real meat by clearly distinguishing the values of production processes, with Aotearoa New Zealand benefitting from the premium status that having a pastoral identity affords. The significance being that the argument justifies the current trajectory

of development for pastoral agriculture while recognising that synthetic proteins exist, so as to distinguish the position from the historical analogue of the wool industry. Building on which there are several arguments which are used to position Aotearoa New Zealand pastoral agriculture as being safely in the premium market. Including, being ahead of the curve in sustainability and ethical metrics, attractive values in the production of animal proteins, as articulated by Federated Farmers vice-president Andrew Hoggard,

"New Zealand's in a good position," he says.

"We kind of lead the world in terms of carbon efficiency for our cows, world leading animal welfare regulations. There's a lot of things we're already ahead of the curve on."

(Ray, 2017)

In a comment for NZ Stuff, Julian Mellentin of the European food and health firm New Nutrition Business cites consumer familiarity and perceptions of what is natural as decisive factors which will ensure the future of traditionally derived protein,

"What people are going to do is they're going to respond to it in the same way they responded to GMOs," he says.

Although the science may be safe, Mellentin says the person comparing products in the supermarket will still be put off.

"The single most important development of the last 20 years is consumers noticing and wanting to know, what's in their food."

The cell-based products are being made for shoppers who don't want them, Mellentin says.

(Black, 2019)

Similarly, a Rabobank report into consumer preferences suggests that the cultural capital of red meat will retain its value in Aotearoa New Zealand, while identifying that alternative proteins are growing in EU and US markets,

Rabobank believed domestic market penetration of alternative proteins and substitute foods in New Zealand and Australia would lag behind the EU and US, where current market development efforts were focused.

Trends that occurred in the US and EU eventually flowed through to New Zealand but he could not see alternative proteins "taking off significantly".

Eating red meat was still an important part of the country's culture and it was in the top percentage in volumes consumed.

(Johnston and Shaw, 2017)

Another way in which the report looked to affirm the premium status of Aotearoa New Zealand meat against hypothetical promises of synthetic proteins was in reference to biological complexity, which it acknowledged had not been achieved as of its time of publication in 2017,

The report said alternative proteins would have their own challenges and those producing them needed to ensure quality, including taste and texture, if they were being sold as a substitute for meat. They would need to become "just as good" as meat and that was "not a given", he said.

The sector would also have to overcome perceived concerns from consumers around the process of how they were produced, in terms of not being natural and the role of technology in it.

(Rae, 2017)

In an article for NZ Stuff agricultural consultant Keith Woodford identifies the difficulty in replicating complex cuts of meat as potentially providing market security for sheep meat in particular,

Synthetic meat is unlikely to provide much competition for lamb, which already has a premium-market position well above other products. Once again, the big markets lie in Asia.

As long as we focus on the consumers - largely Chinese and including more than 25 million Muslim Chinese – then our sheep meat industry can prosper. But we do have to focus on the top-end consumer and not the commodity trade. Of course, that is always easier said than done. And if we don't like the dominance of China as a sheepmeat market, then there is nowhere much else to go except the Middle east.

(Woodford, 2017)

The inherent dependence of domestic land use on foreign markets, where most of Aotearoa New Zealand produce is sold, creates the central dynamic for hypothetical narratives. As the quote from the Rabobank report elucidated, being outside the domain of where the assemblage of synthetic protein companies are focusing their investment, Aotearoa New Zealand is likely to witness a lagged cultural uptake of synthetic protein technologies in the public imagination. Here the reliance on China as an importer of Aotearoa New Zealand produce poses an interesting problem in terms of marketing produce in a way that aligns with cultural values.

As part of a set of health guidelines the Chinese Government have targeted the halving of national meat consumption by 2030; Gavin Liu Yang, a trade advisor to Aotearoa New Zealand brands in China identifies that the appeal of Aotearoa New Zealand products in China may be more significantly the result of push factors, such as fear over the standards of local produce, rather than an attraction for the values Aotearoa New Zealand products espouse (Chang and Liu Yang, 2020).

Fonterra serves as an example of an Aotearoa New Zealand agribusiness which has shifted its framing of synthetic proteins in the past decade, in a statement on RNZ in 2014 the co-operative dismissed the technology outright,

“Fonterra on Saturday said it does not see the emergence of a new non-dairy milk product as a serious threat to New Zealand's dairy industry.

But Fonterra director of Research, Science and Technology Jeremy Hill said it would be extremely difficult for Muufri to duplicate the nutritional value of milk sourced from animals.

He said it would require genetic modification and even then it was unlikely that artificial milk could match dairy.”

(RNZ, 2014)

By 2019, however, it was announced that Fonterra had become a minor partner in Boston based synthetic dairy firm Motif Ingredients, while identifying that the production of real dairy would always hold a space in a world of growing demand and market niches,

Global consumer and foodservice business head Judith Swales said Fonterra was not "betting the farm" with the investment, which was all about staying "at the forefront of innovation to understand and meet the changing preferences of consumers".

Dairy would always remain Fonterra's core business. Swales said alternative nutrition, whether based on plants, insects, algae or fermentation, would be complementary.

"Consumers around the world will continue to want natural, grass-fed dairy as a premium source of nutrition. At the same time, we recognise that no two consumers are the same. As diets and preferences continue to evolve, we want to be there, providing people with choices."

(Hutching, 2019)

The significance being that acknowledging an inherent market position of real products drives particular strategies for agribusinesses looking to position themselves in a future market alongside synthetic proteins. While outright dismissal may have been all that was required in the early 2010s, by 2019 the potential of synthetic dairy in particular had been realised, with Perfect Day releasing a range of niche synthetic products in stores across the USA. Although the exact nature of Fonterra's share in Motif Ingredients remains confidential, the move shows how big capital agencies invested in real products may be able to adjust to contexts in which synthetic proteins become tangible market commodities. However, the statement serves to suggest that Fonterra does not view the products as competitive, what remains to be seen is whether Fonterra will keep this perspective as the synthetic market grows, and how they will look to operationalise or shape the synthetic protein sector given their status as investors.

Returning to more conventional, contemporary strategies, Dairy Co-operatives Association of NZ Executive Director Kimberly Crewther outlines a three-pronged approach, referenced in Real Farmer Magazine as saying,

the dairy sector was fighting for its corner on three fronts. One was defending the use of the term "milk" and other dairy terms in product labels from non-dairy sources. This had already resulted in a Vita Soy soy and coconut milk advertisement being pulled nationally earlier this year. The second front was supporting research into dairy's unique nutritional properties, like the AgResearch work into milk's deeper nutritional importance. The third area is ensuring the industry can stand up and be counted for providing a sustainable, environmentally friendly food product that can command a premium on international markets.

(Rennie, 2018)

Notably, none of these strategies radically alter the framing of traditional proteins themselves. The importance of distinguishing names serves to ensure consumers are not confused in their purchase, nor alternative products gain from the infrastructure put in place around marketing and the dairy milk supply chain, represented by the research and development into both dairy's nutritional properties, and the land use practices required to provide it. On the basis of the reference, however, the strategy is lacking in actually confronting the motivations of consumers switching to synthetic proteins in the first place.

In sum, the 'real as inherent' theme serves to recognise those arguments which justify the status of animal grown proteins as an intrinsic aspect of future markets.

Farming Stories

A distinction may be drawn between arguments for the strategies laid out in the previous promissory narrative, and those that incorporate or describe a paradigm shift specifically with regards to how food is consumed and so perceived. The significance for the emergent promissory narratives being that these narratives see it as necessary to fundamentally alter the marketing of meat, or rather protein, to retain relevance as the cultural construction of food changes. Central to which are questions of how meat producers can leverage points of difference, with particular regards for the production process, as a way to ensure the premium status of animal grown meat.

Beef + Lamb NZ director Melissa Clark-Reynolds illustrates the distinction in an article for NZ Stuff in which she is cited as saying,

[T]he industry needed to do more than fight to prevent the products from being called "meat" because that strategy would be a failure.

She said the meat produced in New Zealand needed to be both ethically produced but also high quality. Consumers could continue to spend what they used to on a lesser volume of meat if it was of a high quality, she said.

"If you eat less meat perhaps you can eat better meat."

Reynolds said farmers needed to be "love makers", producing food which consumers could express the love of their family with.

(Pickett, 2018)

The conversion of farmers to love makers is an intriguing proposition, which Reynolds clearly justifies on the basis of generating a value-added product to fit consumer trends, in which it may be inferred that meat is framed as a luxury item, to the extent that it is consumed less frequently, and used to convey meanings beyond reductive nutritional value.

To elaborate on the point, in a report on alternative proteins Beef & Lamb NZ outline the process by which they perceive that meat has been reframed within the context of the ways in which broader food has been reframed,

The language of meat has changed: consumers don't always think about meat, they think about protein in their diet. Historically the primary source of protein for consumers was meat, and nutritional guidelines included language such as meat and meat equivalents. For the last 8-10 years, there has been a movement towards consumers adopting the language of protein and instead of seeking meat as the primary protein source, they have introduced other products into their diet to get protein. These include for example whey protein powders and more recently pea protein powders added to foods such as cereal, bars, juices and even chocolate. This shift in language has resulted in consumers thinking about meat or red meat specifically as being one of the many sources of protein that are available to them. Red meat remains relevant as a component of meals, thanks to its strong cultural heritage and the nutritional benefits it provides. Meat substitutes currently intrigue people and are seen as a good thing to consume for the planet but lack the indulgence and experience associated with red meat.

(Beef & Lamb NZ, 2018)

While the driving force for the shift is unclear from the Beef & Lamb report, in a column for Newsroom Rod Oram notes how other major foreign agribusinesses are engaging in narrative restructuring, writing,

Some major competitors are also shifting their strategies with, for example, Nestlé pivoting from chocolate to nutrition as one example in its vast portfolio.

(Oram, 2017)

The shift in the framing of food products from identifiable and culturally tethered terms to universalizable, information based terms such as nutrition and protein might be said to indicate a structural transition in the arrangements of food production and distribution, the analysis of which is beyond the scope of this discussion paper.

That said, however, at the heart of this shift is a conception of the consumer, which itself has changed, according to future of foods strategist Dr. Rosie Bosworth in a news and opinion piece for the University of Auckland,

“At the same time we’re seeing the rise of conscious consumers who are after ethical, sustainable and healthy options for protein, often with impactful meaning. This is what millennials want and they’ve moved beyond the commodity play of just buying food, they want their food to be a values-driven experience,” says Rosie.

(Wong, 2019)

In an interview on Newsroom, Daniel Eb, the owner of rural communications business Dirt Road Comms, takes inspiration from the disruptive forces of synthetic protein companies themselves to elaborate a vision of how Aotearoa New Zealand pastoral agriculture could adapt to the changing construction of food and consumers,

First, he described the big, audacious goals of Memphis Meats, a US cellular meat company with an ambition and vision typical of our new competitors. “Cultured meats will completely replace the status quo and make raising animals to eat them simply unthinkable,” according to Uma Valeit, its chief executive.

Then he described its values - progress, disruption and rationality; and its community of highly aware consumers, and the social communications channels they use.

Next, he described our goals as a food producing nation: “Supply the world’s finest, most sustainable meat and milk products to 40m global customers”; our vision - natural, sustainable, health; and our community – “commodities for the majorities” and “fledgling niche brands and a food systems community.”

But he said that goal was nothing more than a product statement, not a call to action; the values raised too many problems without solutions; and the communities were weak and inward looking.

Eb suggested instead our goal should be to “save the world by pioneering a new food system built for human and environmental resilience in the face of climate change”; our values kaitiakitanga (guardianship), turangawaewae (a place to stand) and leadership; and our community “5m Kiwis and our global advocates.

(Oram, 2019)

The strategy Eb describes hinges on the stated shift from the “product statement” to that of the “call to action”, in doing so invoking the language of activism, which has become so successfully operationalised in modern marketing strategies, including of course the synthetic protein industry. Notably, in converting Aotearoa New Zealand into an activist cause, Eb references both a future focus, in the “pioneering” potential of a new food system, as well as a rooted tradition invoked by Te Ao Māori concepts. That said, there is no reference to how such concepts would be actually acted upon, or how they would be positioned within a bicultural framework.

Going from taking the strengths of the synthetic protein industry to targeting its weaknesses, in an opinion piece on Fonterra's website, rural economist Nathan Penny articulates a strategy to ensure the premium status of pastorally farmed proteins by incorporating the production chain, as a narrative in the sale of product, even referencing the New Zealand Emissions Trading Scheme (ETS) as a point of value added difference.

Keeping our place at the protein table will require NZ farmers to adopt best in class environmental and animal husbandry standards, and not just when the regulator is looking. By the way, we also need to start thinking how we can co-exist with alternative proteins as players in the wider global protein market.

With this in mind, we can start to show those consumers that we hear their questions around how is NZ agriculture playing its part in the fight against climate change. Or, maybe, it's more a matter of agriculture around the world telling its sustainability story better. Either way, the ETS may provide traditional NZ agriculture producers with a rally cry that these consumers can hear.

From such a platform, traditional producers have the opportunity to refocus consumers' attention on other parts of traditional agriculture's story. By that I mean, the connection to the land and the natural environment, farming families' stories and their traditions amongst other things.

Moreover, that is where synthetic producers are weak – they have no farming traditions or affinity to the land and animals! After all, who wants to eat a steak produced by someone in a lab coat when you can eat one produced by a passionate local farming family with a spiritual connection to their land?

(Penny, 2018)

The introduction of cultural narratives to frame food as a part of a full production chain with a history neatly contrasts the shift from the production of food to the production of nutrition, rather than seeing these frameworks as conflictual, however, within the structured interaction of food distribution both would sit next to each other on supermarket aisles, with the radical potential of culturally located food reduced to a form of value-add.

Perhaps the epitome of the shift from selling food products to selling stories is the suggestion of food tourism. Food tourism involves the marketing of farms as sites of tourist attraction, whereby visitors may directly witness the production process, and heritage story, involved in the making of food while also engaging in its direct consumption, in an article for newsroom Associate Professor Ian Yeoman of Victoria University outlines the process,

It can take various forms, including wine, beer and food festivals, regional produce showcases and visits to places of food production, be they wineries, breweries, farms or factories.

Food tourism can offer an insight into current food production practices or provide a window into past practices, through heritage attractions and museums. In many ways, it is the opportunity to have a 'taste of place' and in so doing connect with the people, products and stories of regions.

(Te Herenga Waka – Victoria University of Wellington, 2020)

Although already practiced, most notably in vineyards, the prospects of extending the role of food tourism as to be a fundamental part of the Aotearoa New Zealand pastoral farming sector raises a central question as to the relationship between heritage stories and productivity. After all, since 1985 there has been a concerted push towards intensive dairying (Ministry for the Environment and Stats NZ, 2021). Whether these landscapes will be able to hold in complementarity the notions of a heritage showcase and intensive production remains to be seen.

To conclude, arguments for ‘farming stories’ seek to transform the ways in which animal grown proteins are represented, most notably to include the stories of its production process as a means of incorporating land valorisation in its sale, so as to leverage a point of difference over synthetic proteins and meet the demands of a new consumer.

Re-Organising the National Farming Strategy

Inevitably, industry actors have begun to imagine the practical realities associated with conceptual paradigm shifts, bringing rise to an array of structural and technological innovations which promise to re-organise the national farming strategy, while not necessarily altering land use practice, what might be described as on-farm innovation. Notably, on-farm innovations promise to increase efficiency, to address the central issues by which synthetic proteins undermine pastoral agriculture, without fundamentally disrupting or breaking from the present productive model.

By way of an example, returning to the reference of a shift from food to nutrition, the KPMG agri-business agenda articulates how the process would impact food producers, writing,

The majority of primary food producers across the world are paid based on the volume or weight of their produce. As the consumer shifts to demand products based on nutrition, the producer will be incentivised, or even required to shift to production focused on nutrition.

(KPMG, 2021)

Similarly, the shift to selling stories, has opened up a discourse centred on questions of food distribution, in an interview for NZ Stuff Dr Roland Harrison of Lincoln University elaborates the point,

Animal-free steak and dairy-free milk are now competing against traditional staples on supermarket shelves.

Customers are becoming more discerning, farmers are under pressure to manage the environment better, and hand-held technology is giving shoppers more information than ever.

Shoppers will wield the power of choice, researchers at Lincoln University say, and New Zealand farmers need to make food with their demands in mind.

Food safety is a big driver, Harrison says, and New Zealand can afford to produce for specific shoppers.

"New Zealand can feed somewhere between 40 and 200 million people. Well, 40 million people is two large cities in China.

"We don't have to sell to everybody, we just have to find those people that actually want our products and are prepared to pay more for them."

(Black, 2019)

Engaging with the complex motivations involved in food production, the narrative goal of feeding the 40-200 million who are going to pay the most for Aotearoa New Zealand produce would seem to squarely contrast arguments motivated by the need to feed the malnourished of the world. To undertake this market specialisation, industries are looking into new technologies of market interface to ensure those willing to pay the most are obtaining the product. A press release for the KPMG agri-business outlook, for example, describes the impact of market algorithms, writing,

the trend for personalised nutrition led to a warning for retailers which risked getting left behind by online platforms' embedded algorithms. These could present consumers with products that matched their preferences using food products as a type of "lego block" to build a suitable, personalised diet.

(O'Connell, 2021)

Drawing on the figure of the conscious consumer, at the Grow 2019 Agri-Summit Agriculture Minister Damien O'Connor emphasised the importance of developing reputable blockchains for all national agri-sectors, as a way of ensuring trust, being cited in Rural News as saying,

"Consumers around the world will want to know more about your products and will be expecting us to be able to prove each part of our supply chain and our production system is the very best in the world. Because we will be asking them for more money."

Singling out Zespri, O'Connor said he applauds the horticultural sector for showing the value of consumer-oriented packaging at orchard level and better understanding the requirements of their orchard system, processing and marketing.

"We have to replicate that right out across our economy, in all areas of the primary sector, and I believe we can do it."

(Malthus, 2019)

Building on a hypothetical scenario of expanded market interface, Professor Hugh Campbell, University of Otago, envisages the knock on effects for international trade in an article for newsroom,

The growing realisation of an inexorable green shift in world markets and trading protocols is placing pressure on even our most intensive pastoral sectors to establish and manage for, at least, a bare minimum of environmental standards. This will force a significant re-alignment of internationally-focused farm politics.

It will require a shift away from a sole focus on trade liberalisation and towards greater alliance-building and negotiations to establish benchmarks and credentials with a range of other players – from export industries, to accreditation and certification organisations, to powerful overseas retailers, consumer groups and cooperatives.

These alliances have already begun to build across most horticultural export sectors. Over the next decades they will also become ubiquitous in pastoral export sectors – particularly as the emerging manufacture of synthetic proteins becomes a major contributor to the global market for basic farm proteins, like cheap milk and meat, and squeezes out the bottom half of the market for pastoral commodities.

(Campbell, 2021)

On top of telling and backing up stories about the quality of Aotearoa New Zealand produce, there has been a call for a shift to value-added products, often framed with the prospects of synthetic proteins as a peripheral threat to current food commodity production. Gareth Kiernan, the chief forecaster for Infometrics, cites a shift to adjacent products as an opportunity for value add, writing,

The issues faced by the agricultural sector outlined above suggest it would be prudent to try and reverse this trend to make New Zealand's export base more resilient, as well as facilitating growth in export revenue going forward. But how? Analysis from our Export Market Finder points towards two key concepts that could help.

Firstly, the concept of adjacent products indicates realistic higher-value products that could be focused on given our current export make-up. Sometimes, these adjacent products are obvious: butter or cheese instead of milk powder, for example. Sometimes, they are less obvious: many countries that export shellfish also export a significant volume of fishing nets. Importantly, the concept also helps rule out a product switch that is a step too far, such as shifting from exporting logs to furniture.

(Kiernan, 2021)

Providing food for thought, Daniel Eb outlines hypothetical provisions for institutional scale value-add under a collective Aotearoa New Zealand certification system,

We know that smart land management sequesters carbon and that Kiwi farmers are slashing their emissions, improving water quality and protecting more than a quarter of our native forests, but how far could we pull this intangible value lever? To start, we should implement a national environmental framework like Ireland's Origin Green and processors should reward their best farmers. Fonterra, for example, should stop mixing their most sustainably produced milk with the least. But we'll need to go much further.

What kind of premium could we earn if all NZ produce was certified carbon neutral? What if every lamb chop, piece of cheese or steak purchased increased native biodiversity? How do we get more tourists on-farm to generate value from environmental investments? Could we mainstream regenerative farming practices? What if every NZ product was sold in biodegradable packaging like Bostock chicken?

(Eb, 2019)

Pāmu (formerly Landcorp) CEO Steve Carden provides a hypothetical organisational model to facilitate such a transition to value focused production, speaking on the Our Changing World podcast by RNZ,

One of the advantages we have across 125 farms is that we can invest, and innovate, and try new things, without breaking the company. Much harder if you are a 300 cow private dairy farmer. So I think what we need to be doing as an industry is sharing insights, across the industry, which we are doing already, about what works, and what isn't working, and allow people to experiment collectively in areas, and try new things without putting individual farms at risk in doing so. We need to start thinking more laterally about how we think about farm and land configuration, and having clusters of farms perform different roles collectively, and work together rather than individual farms standing as standalone entities. So you might have a farm which is focused on cropping which works collectively with the farm next door which is very much focused on milk production, and they work cohesively with the runoff of that farm around a horticulture program, and it's a collaborative unit of farms working together rather than individual farms trying to do things on their own, and that's just going to take the industry, you know, some time to figure out how we can make those new farm systems work, but we have to break existing models that we have around farming for this to happen.

(Carden, 2017)

Developing innovative ways to add value sets up the hypothetical promise of a technological sector designed to cater to specific needs, as implicated in a Ravensdown news bulletin,

Our primary industry could possibly end up creating less, but able to charge more through value add. But to command a premium, you need the proof. And that's where technology can help: maps that show exactly how much fertiliser was placed where, robots that measure grass growth, laboratories that diagnose soil needs, algorithms that predict how much feed a farm will grow, special aerial

cameras that can assess soil nutrients remotely and software that maps areas that are at risk of phosphate run-off and models potential for nitrate leaching.

(Campbell, 2017)

As an example of work already being undertaken, Gary Alexander describes a system in which Aotearoa New Zealand farms are interlinked with Canadian equivalents to provide premium quality lamb year round, speaking to the NZ Herald on behalf of Integrated Foods, a Gisborne based company which specialises in large scale farm management,

"In my mind, the traditional farm situation has to change. The lamb business of the future needs a planned, fully-integrated global value chain producing new, distinct and consistent products.

"We are never going to win the cheap game, so we intend to play the unique game."

Alexander says the New Zealand lamb industry may struggle to provide the product the consumer of the future wants. A lamb is classed as a lamb anywhere in age from 12 weeks to 12 months, and with that age difference and other factors such as sex, size and what it has been fed, there will be a range of different taste experience. Some not so good.

Looking ahead, in the not-too-distant future, the plan is to have the Canadian business build capability in finishing lambs to specification, as well as processing and marketing and extracting more value through manufacturing value-added products.

(Gregory, 2017)

Finally, in an article for the Spinoff, Nick Beeby of Beef & Lamb NZ describes how his organisation is acting to address soil and climate goals through farm and region specific planning,

Part of that involves helping sheep and beef farmers do better by addressing the environmental challenges they do face, such as sediment loss, and to continue to reduce their greenhouse gas (GHG) emissions further. With our Land Environment Plan programme, we're helping farmers work through the environmental risks and opportunities on their farm and make specific plans to address them.

We're also investing millions in greenhouse gas mitigation research and genetic improvement, along with working closely with regional councils and farmers to address water quality concerns.

Ultimately, the red meat sector is important to New Zealand's health and success. It's our second largest goods exporter and largest manufacturing industry, representing 3.2% of New Zealand's GDP and accounting for \$7.0 billion. And we are a significant employer in smaller rural communities.

(Beeby, 2017)

As such, the development of technological and institutional innovations on-farm promise to re-organise farming at a national scale. In the context of a hypothetical future with synthetic proteins, it is proposed that such developments will address concerns surrounding land-use practices of pastoral agriculture serving to add value through the market interface of Aotearoa New Zealand product as a reputable brand.

4.2. Promissory Discourse 2: Disruption in the Farmverse

The arguments presented for the previous discourse viewed change as external, or if within the Aotearoa New Zealand agri-food system, then ideological, or technical. Crucially absent were descriptions of disruptive land-use change, that being with regards to the way farming is undertaken. The distinction is by no means binary, inevitably there are arguments for a disruption of the farming sector which may be partial, or include some elements of conventional farming, equally in the previous section there were narratives which did not negate the possibility of a multifaceted agricultural produce sector. In a complex industry this is self-evident, the point of the distinction being to gauge the particular interests of actors integrating themselves within their own imagined futures and the implications for the arrangement of a collective understanding of the future. With that in mind, the second promissory discourse highlights those narratives, or aspects of narratives, which viewed synthetic proteins as a disruptive technology, requiring radical land-use change to meet the needs of a future food market.

The Natural-scape: Organic, Regenerative, Endemic

It is fair to say that arguments which position Aotearoa New Zealand produce as premium in a bifurcated market without fundamentally altering practices assume the continued relevance of the country's clean, green image overseas, that being the trust of foreign consumers in quality protein products from a sustained pastoral environment. Several sources, however, contested the longevity of this image based on current practices, and called for a concerted shift to organic or regenerative practice, possibly coupled with traditional breeding, as the only way to truly back up the claims that shifts in marketing and structural paradigms promise to make. In an opinion piece for NZ Stuff, West Otago organic farmer Allan Richardson makes the case, writing,

To succeed against this looming threat to the way we farm we need to improve our overall game plan, our social licence to farm, which includes being more financially, environmentally and socially sustainable.

Traditional family farming with increasing and more costly chemical and energy inputs has failed to deliver for sheep, beef and dairy farmers. Producing ever more commodity products under a growing mountain of rural debt while impacting negatively on our environment is just plain stupid.

The company making Impossible Burgers is already telling customers on its website that compared to cattle farming it uses 95 per cent less land, 74 per cent less water and produce 8 per cent fewer greenhouse emissions. Ireland has taken the moral high ground with its brilliant Origin Green concept. What is New Zealand's tag line? Will 100% Pure, be enough to maintain our place as preferred suppliers of sheep, beef and dairy products to the world?

The only way we can realistically address these national and global concerns about climate change, water quality and scarcity, greenhouse gas emissions, loss of soil carbon, low commodity prices in real terms, is for a paradigm shift towards biological, regenerative and organic farm systems.

Some of our companies have made a start. Anzco has a strong organic lamb and beef programme into Asia. Tatua with its value-add and Synlait with A2 milk products have tapped into the lucrative health food solutions categories, but how much more would an organic label add to their farmers' returns?

(Richardson, 2017)

Premised on an international synthetic protein revolution, Peter Fraser, former government dairy industry advisor, made the argument for regenerative agriculture at a conference for the Organic Dairy and Pastoral Group, cited on NZ Stuff as saying,

[R]egenerative agriculture is promoting itself as the ethical and sustainable alternative. The game plan for NZ Inc should be to fade out its dirty dairying and concentrate on producing nutrient dense food for discerning international consumers.

“The argument is pretty simple. We don’t need to feed the world. We just need to feed 40m [million] rich folks.”

(McCrone, 2020)

There was also an awareness within the discourse of the narrative role that genetics play in selling value added stories. The Omega Lamb Project serves as a real life example for the process, picked up by Rod Oram to demonstrate the opportunities for red meat in a synthetic protein future, writing in an article on newsroom

Red meat has opportunities too to play to these trends if it takes a holistic approach. For example, the Omega Lamb Project is one of the industry/government ventures in the Primary Growth Partnership. Aimee Charteris, the lead animal geneticist on the project, described the 10-year journey to select and breed ewes and lambs that are healthier and produce meat with superior flavour, texture and health benefits to humans, sold under the Te Mana brand. To get to that desirable point, though the project's farmers and scientists also had to work on the plants that feed the sheep and the soils that feed the plants.

(Oram, 2019)

In response to a question posed in techweek, Dr Rosie Bosworth draws on the theme of matching stock or crop to environments, envisaging a future where the two are combined through horticulture and technology.

What excites you most about New Zealand's agtech sector and what the future holds?

The ability to leverage our fertile lands and R&D capability to join the new animal-free and plant-based food economy in order to transition away from low-value and environmentally harmful commodity animal agriculture.

I’m also excited about our ability to carve a niche in high-value bioactives and nutraceuticals from native plants and crops unique to the Southern hemisphere. We are in an exciting era where we can help to create a future where medicine and healthcare will be driven via plants and technology, and New Zealand is certainly well positioned to help to drive this movement.

(Bosworth, 2018)

To conclude, in recognition that Aotearoa’s clean green image may not live up to scrutiny in a future foods market, arguments for the ‘natural-scape’ proposed a return to narratives of tradition, de-intensification, and the cultivation of stock or crop for specific properties. As a result of which, the theme is inherently at odds with arguments for feeding the world, on which the current paradigm often rests.

The Multi-scape: Growing for Other Industries

While the notion of a ‘natural-scape’ addresses the possibility that even Aotearoa New Zealand intensified, agriculture could fall to the substitutionism of synthetic proteins with their narratives of environmental sustainability, fundamentally those visions still position Aotearoa New Zealand as a distinct nation of pastoral agriculture or harvest quite apart from a world of industrialised commodity food items. In contrast, there are those who have attempted to envisage the integration of Aotearoa New Zealand into the so-called fourth agricultural revolution. For a nation that has been on the periphery of the industrialisation of food for so long these arguments are often particularly hypothetical,

and often encompass multiple potential avenues, for which reason it is difficult to tease apart the impetus of specific parties. Of note being whether Aotearoa New Zealand should sell to alternative protein industries, in much the same way they would for the ingredients market, strategically grow for either foreign or local alternative industries, or engage in the biotech component of alternative proteins, possibly with the goal of developing a full production chain, intertwined with which is the question of genetic modification.

On the Our Changing World podcast for RNZ, Pāmu engineer Angus Robson provides the analogy of the cellphone industry to situate the potential of Aotearoa New Zealand to be a synthetic protein industry adjacent,

If you are deep into the development side of things, then you will always see areas to get patents and preserve your IP and then sell it all over the world and keep the others out. These early stages of any game there's a lot of IP on the table, you know, Intellectual Property. A lot of peripheral stuff that we haven't yet seen what it is yet, but, if we dive in, we will see those opportunities. For example, when the cell phone came in there were the handset makers of course, but they also needed all of the servers, they needed the satellites, they needed the transmission towers, that's all what I'd call peripheral, so if you see a handset, it doesn't mean you have to be a handset maker. You could say right I'm going to be a cell phone tower maker, or a switching gear maker.

(Robson, 2017)

In an interview for Real Farmer magazine Nuffield Scholar and Te Puke Dairy farmer Richard Fowler demonstrates multiple considerations in putting forward the proposition that industry processors should,

make a move into synthetic food investment, or at least engage with some of the big existing players. This may also provide business opportunities. "It is no different from Coca Cola deciding it is not just into soft drinks, and how it got into other drink types, including water." He also saw opportunities for NZ farmers to provide the basic inputs the synthetic proteins still require.

The meat sector may be able to provide stem cells to the cultured meat sector in a "bet both ways" strategy.

(Rennie, 2018)

In the same magazine, Sharma Lee, the founder of the plant-based company SunFed Meats, describes her plan to organise local crop production, with the potential to diversify existing pastoral agriculture,

her company [omitted word] offers the prospect of another income stream for the arable sector in regions like Canterbury. Lee has stated her intention is to build the supply chain backwards, now consumer demand has been proven, and utilise New Zealand grown yellow peas rather than imported peas

The idea of a Canterbury dairy farmer also having some land dedicated to a pea protein crop is quite a realistic one, and one that could provide valuable income diversity. "We should also remember, everyone talks about these disruptive products. But by far more disruptive are changes in routes to market, such as online ordering

(Rennie, 2018)

Food Nation co-founder Miranda Burdon presents plant-based as the more palatable option than synthetic, again implying that diversification could provide Aotearoa New Zealand pastoral agriculture with the means to adapt to market changes, cited in an article for Farmers' Weekly as saying,

"We don't need to all turn vegan to make a difference.

"What does the world want – fake meat, soy, or gluten free, lab grown meat? Three options but not my options.

"We can eat our way out of the problem.

"Shift the plants from the side of the plate to the middle of the plate."

Living in NZ, Burdon says this is a number one solution.

"We have quinoa, buckwheat, hemp, mushrooms to name a few, all grown in Canterbury and all full of protein and nutrition."

Food Nation was launched mid covid last year with the whole objective being to showcase plant product, not replace meat. “We need to be showcasing NZ as the garden to the world. “People can eat their way to a healthier planet.”

(Scott, 2021)

At a workshop on alternative proteins titled “Feed the World 2030: Power of Plants Hackathon”, the point was raised querying the ability of Aotearoa New Zealand land systems to compete with larger, warmer countries with regards to plant production, to which point lucerne and red clover were raised as potential avenues into the market,

[T]he idea is to focus on the protein which can be extracted from plant leaves.

If all goes to plan, you could covert that protein into so-called “synthetic meat”, and you could also feed the fibre from the leaf to livestock as a cheap supplement and use the sugar as a biofuel to run the processing factories.

Another member of the team, Paul McGule from Landcorp, says they are chiefly interested in using plants like lucerne and red clover as a feedstock for the technology.

“Those two plants are legumes so you don’t need to use nitrogen fertiliser, which is very energy intensive,” Mr McGule explains “and it’s perennial so that means when we’re competing against other plant-based protein products it’s generally annual crops like soy, sugar cane, wheat, barley”

But perhaps the biggest advantage: unlike all of those crops you can grow lucerne and red clover pretty much anywhere grass grows.

(Ray, 2017)

In an article for the NZ Herald’s Dynamic Business magazine, Dr David Everett of AgResearch is cited as articulating a vision in which the Aotearoa New Zealand agricultural sector could provide ingredients for synthetic industry by drawing on already established links from previous innovation,

He likes the idea of New Zealand coming up with ingredients which add something to a product that may be being made overseas. “If we came along with an ingredient that did the business, if they put 1 per cent of our ingredient in, they have saved the money and we can clip the ticket of going overseas,” he says. The dairy industry has done this in the past, adding whey proteins to food like ham to add body and succulence. The New Zealand food industry will have to stay smart on fads and trends. Some things are just not built to last, he says

And, he warns, today’s high value food is tomorrow’s commodity product. “We have to stay one step ahead of the game, continuing to provide the value proposition, that’s the difficult part.

(South, 2019)

The Stem-scape: Constructing a Biotech Infrastructure

While the idea of diversification looked to integrate the alternative protein sector into the farm as the site of future visions, on the other end of the spectrum were arguments for the development of a biotech infrastructure, either premised on the sale of research and development or serving to facilitate a full production chain.

Future foods analyst Dr Rosie Bosworth had a particularly prominent voice on the role Aotearoa New Zealand could play, answering the question of what the future of food will look like in 500 years for creative business website Idealog,

In an age of customisable, personalised food with a globally distributed food production system, New Zealand’s vast green pastures and rich rain fall suitable for outdoor food production no longer provide a competitive advantage or economic backbone for the country. But the country is thriving more than ever.

New Zealand has successfully transitioned itself away from using its incredible pool of talent and knowledge to grow and export animals and crops. In this new world, instead of exporting food itself in low-value commodity form, New Zealand has established itself as a global leader in biological sciences exporting highly sophisticated and hi-tech, high value food production technology and

IP know-how to the world. With less dependence on food production, New Zealand's focus on biological and STEM skills now gives us a competitive edge across all sectors, including film and entertainment, healthcare, retail, banking and financial, telecommunications and energy.

(Bosworth, 2019)

Moreover, across two articles for Pure Advantage Dr Bosworth elaborates how such a future would be achieved, using public funding to develop STEM subjects,

For NZ to have a chance to compete, a few things need to change. And fast. NZ's education system and initiatives from companies need to invest heavily in science and engineering. To compete with the technology coming out of Silicon Valley and Europe. Classic stem subjects (science, technology, engineering and math). Toute de suite. Science and technology will pave the way for competitive solutions, and it is usually engineers who start companies.

The public and private sector also need to invest heavily in the entrepreneurs driving developments at the nexus of agriculture and lab based bio tech, as well as create the conditions and ecosystem that will allow this new generation of entrepreneurs to thrive. By international standards New Zealand's VC community is small and conservative. So if we want our entrepreneurs and future economy to thrive we need to back them with our own money. Confidently and lucratively. But there is hope for NZ's ag sector in this rapidly changing mix. Kiwis are known for being innovative, and the sheer virtue of our small size and nimble governance structure means we can make decisions and redirect our ship's direction pretty quickly once we frame our strategy.

(Bosworth, 2015)

Rather than hindering entrepreneurs with red tape and resting on our laurels as world class dairy producers, Callaghan and other national industry advisories would be wise to refocus their efforts on retraining our up and coming children and millennials in STEM subjects. To focus on driving and backing technology development programmes so we too, can create an Impossible Foods or Perfect Day of our own. To focus on curbing the growth of dairy farm conversion. On investing in true long term valuing adding activity that our precious land, technological genius and entrepreneurial brains can provide. To focus on how we can insert ourselves into *this* future. The future of Ag 2.0. A future underpinned by technology.

(Bosworth, 2016)

Cited in an article on independent news site Scoop, Biotech NZ executive director Dr Zahra Champion considers how an Aotearoa New Zealand biotech industry would fit into a world economy, framed around feeding future populations, she is cited as saying,

In New Zealand, Kiwis can grow more food by continuing to improve current systems, reducing waste and addressing environmental impacts. New Zealand is great at developing technologies that enable sustainable production, Dr Champion says. *"We can also amplify our impact by sharing our ability to translate technology for the benefit of the food systems around the world. Our agritech developments are incredible for the world. "But it's still insufficient to feed future populations. We need to look at new biotech solutions in our food systems if we are to provide in the future. "New Zealand's innovators have a key role to play because there are real problems to solve and our people have the skills and experience needed "Cell-based culture protein is an industry still in its infancy and at the moment, the primary research has revolved around growing meats (beef, pork, poultry) as well as animal products (milk and egg white) in cell cultures."*

(Lemonade, 2021)

Brendan O'Connell of Agritech NZ, on the other hand, sees Aotearoa New Zealand biotech in an adjacent role to a global alternative protein industry, referenced in an article for NZ stuff as saying,

the very good science that New Zealanders develop around food systems could be an export on its own.

"Even if we don't produce food from New Zealand that's of that type, we can still produce the science that will help feed the world, even if the science is implemented in other parts of the world."

(Harris, 2021)

Cited as part of the Dynamic Business magazine, Dean Tilyard describes a future of agritech companies supported by government infrastructure and university research,

In New Zealand, innovative agritech start-ups like Halter, Robotics Plus and BioLumic are the trailblazers, says Tilyard. “What we have to do is look at these exemplars and have others follow in their footsteps, let’s look at what is good and replicate it.” Collaboration among science institutes, the Government, universities will be key to New Zealand’s future, he says. And Palmerston North will be the hub of agriscience innovations.

(South, 2019)

Even government agencies are speculating with the Productivity Commission’s Low Emissions Economy Report suggesting at the possibility of integrating Aotearoa New Zealand into an alternative protein market, either through plant-based or synthetics,

New Zealand businesses could leverage the food-technology science base and New Zealand’s advantages in food processing, distribution and marketing to take advantage of emerging synthetic food technology and changing consumer preferences (both by shifting to higher-value natural produce and, more speculatively, shifting some production to plant-based and synthetic alternatives) (Box 10.5).

Innovation can and should play a central role in New Zealand’s transition to a low-emissions economy. New technologies can enable production of existing products with reduced emissions (eg, a vaccine that reduces methane emissions from dairy cows), or can spawn new low-emissions industries that disrupt and replace emission-intensive industries (eg, synthetic meat replacing animal farming). While innovation comes in many forms and is unpredictable, it is the closest thing to a “silver bullet” that will enable humanity to meet the challenge of avoiding damaging climate change.

(NZPC, 2018)

The Eco-scape: Environmental Restoration

A noticeable absence from many of the narratives of the previous section pertains to what will happen to land should a biotech infrastructure replace farming as the primary mechanism of food production. The notion of the ‘Eco-scape’ encompasses a broad range of narratives which, premised on the integration of Aotearoa New Zealand into a synthetic protein future, envisaged possible changes in land-use.

As an example of a clear vision of both how Aotearoa New Zealand will fit into a global synthetic protein industry and what impact that will have on its land, in the same Idealog article referenced in the previous section Dr Rosie Bosworth goes on to speculatively elucidate the change in land use that will be affected as a result of the expansion of cellular agriculture,

Today, all food once involving the slaughter of live animals has been replaced with healthy, sustainable versions produced via mass scale fermentation (also known as recombinant or synthetic biology) and cellular agriculture technology (growing animals cells outside of the cow itself). Grown in scalable fermentation towers close to our cities similar to beer breweries and 3D printing factories, in the very consumer markets demanding them. The same goes for other agricultural biproducts traditionally requiring the cow like leather and collagen.

Huge tracts of land once used for dairy and livestock have been repurposed and restored into native forests, bio-diversity parks, sustainable forestry programmes and rolling green hills, creating huge carbon sinks for the country. This leaves the country carbon neutral – even carbon positive. Rolling pastures have native and domesticated animals grazing simply to help regenerate the land.

(Bosworth, 2019)

Talking on the Our Changing World podcast for RNZ, journalist Rod Oram envisages an expanded emissions trading scheme, with the regeneration of native forest used to offset carbon emitted from expanded urban developments,

I’d like to think there would be a market for ecosystem services, in essence we’re already doing that with, for example, planting trees to absorb carbon, if we got really, really serious about the environmental impact of cities, if we were going to build a new subdivision and we understood what the ecological impact of that subdivision is then the build of that subdivision would ideally want to, or need

to, buy offsets elsewhere where ecosystem is recovering, and, therefore, the extra good coming out of that recovery offsets the damage done with that piece of urbanisation. Now that's a very far flung thought, out there about how that might work, but land is important. The natural ecosystem is fundamentally important, so even if we use less of that land for food, which seems to be the way we're going, than natural ecosystem is going to have a greater and greater value the more urbanised we become, the more we are trying to pull back on climate change and other areas of deep sustainability, so still owning land in some way, and owning a chunk of that ecosystem, I think will have great long term value, but it's just quite hard at the moment to be able to be articulate about just how that looks.

(Oram, 2017)

Honing in on the potential role of forestry for an article for Pure Advantage, Oram imagines a more complex industry, integrating native species in sustainable harvest, while drawing on the potential for an international carbon trading scheme,

Forestry will play a major role too, thanks to trees sequestering carbon. But the sector has to rise to four big challenges. First, planting many more natives in permanent forests, and many more natives and other species in harvestable forests and drastically fewer radiata pine, which is an inferior timber in terms of its structural and rot-resistance qualities. Second, producing far more engineered and structural building materials from wood to help displace carbon-intensive steel and cement. Third, help develop international systems for measuring and certifying such carbon sequestration, so forest owners can benefit in the ETS. Fourth, making a big push to use biomass for industrial heat and for converting into liquid fuels, thereby displacing fossil fuels.

(Oram, 2018)

In an article for NZ Stuff, Jan Wright, the then Parliamentary Commissioner for the Environment, is cited as similarly arguing for an extended emissions trading scheme incorporating agriculture as well as encouraging and recognising the role of farmers in managing carbon storage,

The Parliamentary Commissioner for the Environment, Jan Wright says New Zealand farmers should beware of synthetic meat and milk being developed by California's Silicon Valley.

She said farmers should be encouraged to plant trees, as the understanding of tree storage of carbon was well known.

"Whether it is the regeneration of natural forests, manuka, kanuka and other species, it all takes carbon dioxide out of the air. Landcare Research estimates there is a million hectares of marginal land.

"Then there are pine forests which take carbon out of the air until they are harvested. They could buy us some time and something else might be developed."

Wright said farmers do plant a lot of trees and they should get credit for it.

"I am confident our farmers will change. They have done it before and can. It is not like Europe, where generations on the land do the same thing all the time.

"The stand-off is should agricultural emissions be in the ETS? Yes they should."

(Galloway, 2017)

In another article for NZ Stuff, Australian science writer Julian Cribb is cited as developing this notion of the farmer as land steward,

If half of the food production moved to cities where the bulk of food commodities would be made, the rest of the population should pay farmers who remain to regenerate the landscape as well as a huge premium for the produce they make.

"We have to pay farmers to look after the landscape because at the moment, they are doing it for free. If you want them not to pollute the Waikato River then you have to give them some money to put in place the earthworks to prevent in happening."

(Pidcock, 2018)

On the Our Changing World podcast for RNZ agribusiness consultant Alison Dewes makes a case for more direct extractive industry,

I mean if you think about an irrigated dairy farm in canterbury it would use about 5.5 million litres of water per hectare to generate 20 thousand litres of milk 1600 of milk solids a hectare which is about 7 hundred or so kilos of protein a hectare and it's taking 5.5 million litres in some cases of pure water to do that, now I could go to the supermarket and I think I could probably buy a bottle of water for \$3 or \$2.99 I can go and buy milk for a dollar 50 I know it's a crude assumption but you know we have to look at how we are using things and what we are getting

(Dewes, 2017)

Finally, as somewhat of a novel approach in the national discourse, Paul Decker, the founder of the Mahurangi Technical Institute, raises the possibility of using synthetic protein technologies to produce the meat of endangered eel, so as to reduce pressure on the real populations, being cited in an article for NZ Stuff as saying,

Concerns with overfishing, rising contaminants like mercury in some fish, and aquaculture like finfish farming also creating environmental problems, Bosworth sees the technology as a way to provide sustainable fish protein and take pressure off wild stocks.

While it will need to be commercially viable, the possibility cellular agriculture could save endangered animals like eels is very positive and should be pursued, Decker said.

(Dickey, 2018)

4.3. Destructive Silences

The destructive silences encompass those aspects that it is implied, though often not explicitly referenced, would lose out or fade away as part of promised futures.

Firstly, a possible decline in the rural sector, coupled with greater emphasis on biotech R & D could see a dramatic increase in urban migration. Questions that remain therefore include what happens to rural towns and communities that are dependent on the primary industries sector, what happens if the price of land falls, and what would a large-scale transition of land use, including destocking, look like.

What Happens to Farming Identities?

At the centre of all agricultural developments is a question of rural people, regardless of how things pan out, the figure of the farmer will change in a future synthetic market. Whether pastoral agriculture becomes a premium process, diversified, mainstream with a peripheral synthetic niche, or entirely irrelevant will undoubtedly change how farmers view their role and their relationship to the land.

Media focus tends to portray the future as something that will be made by large-corporate or governmental actors and structural processes. While some articles acknowledged micro-scale impacts, few if any directly addressed how a synthetic future could affect cultural and interpersonal socialisation.

Writing in response to the media furore around Air New Zealand's plant-based burger and its food future implications, in an article for the NZ Herald, reporter Ian Taylor begins to draw attention to micro-scale questions,

The way we produce food will be one of those. We should embrace this opportunity rather than hunker down in old-fashioned thinking, and we must do everything we can to ensure this does not become an argument that pits our agricultural heritage against our technological future.

This is a tremendous opportunity for New Zealand to consolidate its global reputation for agricultural excellence. Let's not deny future Kiwis this opportunity by engaging in a simplistic argument about what makes a burger a burger.

And last, but definitely not least, I can't help noting that the people I have quoted here, are all women in technology. In contrast those who have criticised Air New Zealand for its decision to serve Impossible Burgers - some seeming to suggest the decision borders on treason - have all been older men. Perhaps there's a message in there as well.

(Taylor, 2018)

Taylor draws the past and the future as in conflict, leaving a question mark over where Aotearoa New Zealand pastoral farming stands. There is a tendency in the media to either portray agriculture as variably either being world leading, adaptable, and self-sufficient, or retrograde, at risk of being maladapted, and subject to a growing intergenerational divide. The latter of which being picked up by NZ Stuff reporter John McCrone, in an article in which he surveys projected industrial developments of the future,

As with New Zealand and agriculture, the temptation will be to cling on to the national-scale investments already made.

Look at the US. It is not only fracking to keep oil going, it is even talking about making coal great again. Psychologically, it can't let go of the 20th Century economic model that served so well for it.

[Dr Rosie Bosworth] says when New Zealand farmers talk about coming technological revolutions, they think of paddocks fitted with precision sensors, robot milking sheds, self-driving fruit pickers, drones for herding sheep – a game New Zealand could compete in.

Yet now that is not even looking like a game at all. Technology – whipped along by the imperatives of climate change, population growth and sustainability – might just reinvent world food production from the ground up.

And that would leave New Zealand, with its grassy paddocks, great genetics and latest irrigation systems, holding a massive investment in a basically obsolete industrial infrastructure.

(McCrone, 2018)

Similarly, Daniel Eb outlines a techno-materialist reasoning for the inability of traditional agriculture to adapt to a synthetic future while acknowledging the integral link between agriculture and culture in Aotearoa New Zealand, writing in an article for the Spinoff,

I see animal agriculture as central to our economic system, landscape and national identity. Despite recent tussles over the non-existent urban-rural divide, water use and the like, we are all inextricably tied to the humble dairy cow, cattle beast and sheep.

It's hard to imagine losing all that. But we have to.

We need to accept that our agricultural model now has fundamental weaknesses in the face of rapid social and technological change. When I hear things like "there will always be a market for real meat", I hear an assumption based on a lifetime of personal experience. I hear denial because the alternative just doesn't seem feasible.

Animal agriculture will be disrupted for a simple reason – we're pitting millennia-old systems that take decades to evolve against technology that's optimising by the minute.

(Eb, 2019)

Organic farmer Allan Richardson took the opportunity in a segment for RNZ to describe how much of the traditional image or practice of farming has already been lost due to developments in agricultural intensification,

However, Mr Richardson said it was often hard to prove and promote the benefits of organic farming in New Zealand, and he got "stonewalled" by parts of the farming sector.

"It's the vested interest, the people who have the most to lose... the service industries, fertiliser industry, and particularly the scientists that seem to think they have a mortgage on all the science and what works and what doesn't."

He said while attitudes toward change have come a long way, it was still hard to get people on board.

"We've had two or three generations now of chemical farmers, we've lost that knowledge of farmers that used to farm without it.

"You've got farmers that are very dependent on chemical input to the way they farm, clearly that's not sustainable - we all know that. The environment is starting to tell us that too, isn't it."

(Cook, 2017)

In a brief response to the question of lab-grown meat, founder of Kākāno Café and Cookery School, Jade Temepara, pithily encapsulates the struggle of aligning her perceived national identity with that of a synthetic future, talking at a Future of Food event hosted by TechWeek,

What are your thoughts on lab-grown meat?

Temepara: It challenges my ethical and moral ... everything. It's exciting where we're heading, but it's challenging to me as a Kiwi".

(Cotton, 2017)

Alternatively, there are those arguments which are fundamentally optimistic about the ability of farmers, and perhaps the 'kiwi' identity to adapt, often drawn on historical disruptions that have been overcome, such as is represented in this AgResearch opinion piece by Dr Tom Richardson,

Since our first refrigerated food exports left Dunedin for Britain in 1882, through Britain's entry into the European Union and the shift to Asia, our farmers and agri-food business have shown the adaptability that is now more important than ever. We have lived in a disruptive world for our entire existence as a country.

That same cultural DNA within our farmers, agribusiness and scientists leaves me very confident that New Zealand is well positioned to be an even more prosperous provider of safe, high quality foods to the world's most discerning consumers.

(Robinson, 2018)

Similarly, Federated Farmers' Andrew Hoggard cites the ability of the industry to overcome neoliberal policies and the lack of government support as reason to believe that Aotearoa New Zealand farmers will be relatively well placed compared with other nations, speaking on a panel for RNZ,

You know New Zealand farmer's, [...] since 84, [...] we've had very little in the way of government support compared to other farmers around the world. I think what gives me hope is that we're most used to handling change and fluctuation, and I think that, you know, if this comes about, I sense there is some opportunities in there as well, you know, some of my counterparts overseas, yea I don't see them handling this all too well, I actually see it taking them potentially out of the play as competitors and perhaps opening up a few opportunities for us.

I'm a bit lucky because I do mix with switched on farmers, and they're switched on farmers, but maybe that's a lot of our farmers, I think when they sit down and have these conversations, they know it's coming, they're worried about it, they're genuinely wanting to do things, and groups of farmers, often in small sub-catchments, trying to work together, and think together around this, they know that change is coming, they know they have to diversify, and differentiate, and they know they have to get more resilient.

Our guys have lived on the raw edge for a long time, and I think many of them are pretty adaptable, I'm also very encouraged by the strength of the women in the industry, not just in practical things, but in mental strength and in mental abilities, and I think that if there is an adaptation to be made, they won't all still be farmers, but they will still be very valuable citizens who could be responsible for building the new.

(Hoggard, 2017)

Cited in an article for NZ Stuff, Julian Cribb develops a vision for a synthetic future in which rural people will remain integral,

City based future food systems such as cultured meat and vertical farming will rely heavily on the nutrient and water management expertise of dairy farmers, Australian science writer Julian Cribb says.

Food production that took in the emerging innovations would shift to the cities, Cribb said.

For the new systems to succeed, all of the freshwater and wasted nutrients dumped into the ocean via urban sewage and wastewater would have to be [sic] captured and used in the new food production.

"Farmers can actually become the owners, shareholders and investors in this new urban agriculture. This new urban agriculture is going to need expertise in plant and animal management."

"If half of the food production moved to cities where the bulk of food commodities would be made, the rest of the population should pay farmers who remain to regenerate the landscape as well as a huge for the produce they make.

We have to pay farmers to look after the landscape because at the moment, they are doing it for free. If you want them not to pollute the Waikato River then you have to give them some money to put in place the earthworks to prevent in [sic] happening."

(Piddock, 201)

What Happens to Rural Towns and Communities?

Concomitant with the question of rural people, the impact of land use changes on the future of rural towns and regions is an area that was underarticulated in the media.

Urbanisation is already an ongoing trend in Aotearoa New Zealand as a result of a general transition in agriculture towards larger scale farms and industry shifts, the move to a synthetic future is expected to amplify this trend, articulated in the Productivity Commission's Low Emissions Economy Report,

Other drivers of change will influence land use beyond the need to transition to a low-emissions economy. These will need to be on the radar of government and the private sector as they make decisions about land use investments and strategies. Existing trends are likely to continue, such as long-term shifts towards urbanisation, global trends in food production (such as traceability from the farmer to the consumer, efforts to reduce food waste, and the rise of synthetic proteins), and concerns around other environmental factors (such as issues around access to freshwater and water pollution). For example, Local Government New Zealand (LGNZ) expects the further concentration of the population in cities will lead to "a 'hollowing out' of many mid-sized towns and rural areas across New Zealand, which have previously served industries that have declined, relocated, or are predicted to do so in the future" (LGNZ, 2016, p. 14).

(NZPC, 2018)

Massey University banking expert Dr Claire Matthews, illustrates how she sees the devaluation of rural regions playing out on a panel for RNZ, noting, however, that something else will inevitably rise for banks to invest in, thus presenting opportunity to possibly meet the demise,

The reality is it's not going to happen overnight, dairy farms will lose value, and there will be fewer dairy cows around, and so there will be a pulling back, so initially that's going to be slightly slow, would be my guess, and then there will be the sudden step change, but then you're going to have this land and it's going to have to be used for something, so there's going to be this opportunity and that will create something new that banks can potentially lend for, so it may create opportunities for sectors that have been less desirable,

in that the banks might say that well we haven't got this really desirable sector in terms of rural, because rural does tend to be quite desirable, we haven't got this sector any more, so maybe we'll have to look somewhere else, and so other sectors that the banks have said nah, we've got rural so we'll go there instead, can't go to rural so let's have a look at something else

(Matthews, 2017)

Similarly, in an article for Newsroom Rod Oram holds out faith in the value of land, to imply the continued role of the farmer, and further the regional town,

The next urgent step, though, is to learn how to reduce the environmental impact of our current farming practices, particularly their greenhouse gas emissions. The science, economics and systems involved will enhance our knowledge and reputation, and our rewards from farming, and help prepare us for even bolder food and farming futures.

Through all these big changes, though, one thing is certain: land will always be valuable because farmers will learn how to put it to more productive, more nutritious and more environmentally compatible purposes.

(Oram, 2018)

While the quotes above demonstrate some interest in the potential impacts of disruption on rural regions, as a whole dataset there was very little attention paid to rural towns and communities. Questions remain as to how rural communities will be shaped by industrial or sectoral changes, what will happen to sites of heritage or the organisations that investigate and invest in their maintenance, and how will the relationship of urban and rural development manifest?

What Happens to Animal Agriculture?

A final destructive silence encompasses a supposed transition away from animal agriculture, not only was there very little discussion by way of envisaging the process of destocking and shifting to other forms of production, but also there was no acknowledgement of the residual effects of animal agriculture that may complicate land-use change, for example the depletion of necessary mycorrhizal and bacterial communities that would be required for the conversion of pastoral agriculture to native forest regeneration.

That being said, there were some instances when the process of de-stocking was addressed, for example in this piece for the Spinoff by Daniel Eb,

Environmental degradation is the defining issue of our time. On farm, we'll face challenges like prolonged drought, flooding and biosecurity breaches. Off farm, we'll face regulations and a tightening social license to operate. On-shelf, competitors will offer a greener value proposition.

To be blunt, either we get our stock numbers down or the market or nature will do it for us. The solution lies in redesigning our model so that farmers profit when practising environmentalism.

(Eb, 2019)

In the same vein, Dr Rosie Bosworth is cited in an article for NZ Stuff as envisaging a gradual process of destocking towards a synthetic economy,

"We also need to stay open minded that while we've got a rich heritage of top quality dairy, beef and lamb production, that should not hamstring us on becoming leaders in other food categories that are emerging."

Bosworth says farmers will have to reduce stock numbers as the plant-based trend continues, "we will become premium producers for a period of time, but with much smaller stocking rates."

We need to focus our skills on investment, technology and development in new areas, she says.

(Black, 2019)

Addressing a report by Vivid Economics that outlined three possible directions for Aotearoa New Zealand to take with the aim of reaching its net zero 2050 goals, Dr Bosworth outlines and responds to their expected de-stocking process in an article for Pure Advantage,

Innovative New Zealand is perhaps the most aspirational of the three scenarios. It paints a future of 38% less pastoral GHGs by proposing a 20% drop in the national cowherd as well as a 33% and 30% drop in sheep and beef respectively. All the while increasing the productivity of milk production (which leads into another environmental debate to be had for another time).

Before providing her own envisaged direction later in the article,

In my mind, we would be better off focusing on significantly reducing our dairy and herd stock to the tune of 50% (or more!) and moving this production to a premium high value export offering, while converting remaining land to other more value added, less emissions intensive use like horticulture and plant based solutions and nutraceuticals. Or, dare I say it, focus on backing an entirely new animal-less high value sector all together (sorry, farmers).

The Synbio led tsunami that is currently gathering momentum has the potential to crash hard into conventional agriculture's paddock – and probably sooner than we think. Investing in a GHG technological trajectory that locks us into to a cattle led farming future, with no consideration for the alternatives, is akin to investing in clean diesel – a charade at best that may end up being a very expensive game of techno roulette with potentially more pollution as a by-product.

(Bosworth, 2017)

4.4. Creative Silences

The creative silences encompass those aspects of the media discourse which highlight, or simply imply, the inadvertent generation of unexpected futures, being unaccounted for by the dominant promissory narratives.

In keeping with the organisation of promissory discourses these narratives have been separated into those addressing the notional orthodox future narratives and those addressing a disrupted agricultural scape, with the addition of a third section on the implications of promissory narratives on the potential of a bi-cultural approach, drawing both from the implications of other narratives and from a few focused sources.

Creating a Premium Food Regime?

Creating an undesirable product?

Underpinning the notion of a premium food regime of 'real' meat grown in animals, is the axiom that the Aotearoa New Zealand story of traditional farming will retain its appeal amidst a market of synthetic alternatives. In recent history this narrative has come under significant disrepute due in part to the revelations of pastoral farming's environmental impact, a point Daniel Eb picks up on in an article for Newsroom,

The arrival of cruelty-free meat and milk alternatives will shift the goalposts on how we define compassionate treatment. Mother-calf separation at birth, the annual slaughter of 1.7 million bobby calves and the 2-7km daily round trip to the milking shed are ingrained features of the production-first model and weaknesses in the New Zealand agriculture story. We won't find value in just keeping pace with animal welfare standards, but we might if we relentlessly push them forward. New Zealand could very well earn its premium by being clean, green and kind.

The American style cattle feedlot near Ashburton damages our reputation and highlights the intangible value between the 'right' way to farm, and the 'wrong' way. It undercuts our responsibility to protect the dignity of our people, animals and place.

When we terraform the Mackenzie country into dairy farms, import feed or degrade local waterways, we muddy the NZ heritage story.

Take food safety for example. We're number one in the world because our customers believe that we farm the 'right' way. They see first-hand the results of production-first farming and see in us something better. Our reputation for food safety isn't derived from following the production-first model, but by standing apart from it.

(Eb, 2019)

In the face of which, the question remains, therefore, as to whether the Aotearoa New Zealand story will guarantee premium sales.

Responding to Beef and Lamb NZ's Alternative Protein report, Rod Oram draws out three possible arguments which could erode the market pull of 'real' meat in an article for Newsroom,

While Beef + Lamb is not majoring on any one scenario, it is clearly favouring Scenario 2. It believes that our high quality, relatively natural, farm-raised meat will largely escape the rising backlash against industrial farming characterised by feedlots, harsh animal treatment, and heavy use of antibiotics and chemicals. Thus, there are plenty of opportunities for our farmers to produce high quality, high value meat.

I offer three caveats to that view:

- The whole range of proteins and consumer responses to them will shift markedly over the next few decades. Many consumers might lose their taste, literally and metaphorically, for farm-raised meat, even for special occasions.

- Our farm practices do less damage to the environment than the worst of industrial farming. But they still can impair water, land and biodiversity; and ruminant animals are our largest single source of climate-changing greenhouse gas emissions.

- New food technologies will be crucial to human wellbeing. We can't ignore that and cling to being "natural". There is no such thing except in hyper local, hyper niche forms. Our farming is already highly modified. It's big business, especially for our tiny economy.

(Oram, 2018)

Economist Peter Fraser, similarly, questions how the premium appeal of 'real' meat will stand up to the increasingly extensive ethical queries of high end consumers, speaking at a regenerative farming conference,

So it will win on cost. There is the world commodity market gone. Yet also, for both climate change and animal welfare reasons, even wealthy consumers may view it as the more ethical alternative.

Fraser asks how long will it be before sending animals to abattoirs becomes a socially unacceptable practice?

It won't matter how eco-sustainably the animals are reared. The reality is New Zealand will still be sending its frolicking lambs off to an industrial slaughter process. So attitudes to eating real meat may change fast.

"Poor folk won't be able to afford it. But rich folks won't want to buy it."

(McCrone, 2020)

In an article for NZ Stuff independent consultant Keith Woodford pays particular attention to whether the Asian market represents a viable future for Aotearoa New Zealand as a premium producer,

Finding high-priced markets for quality New Zealand beef is going to be a challenge. Despite the drum-beating that we hear about the so-called benefits of grass-fed beef, most of our key Asian markets are yet to decipher the messages we are sending. Most discerning

Asian consumers, particularly those who are wealthy, currently prefer a grain-fed animal, and preferably one that carries unsaturated intra-muscular fat (as in wagyu), rather than saturated extra-muscular fat.

(Woodford, 2017)

Creating an economic impossibility?

Perhaps even more pressing than the question of whether the Aotearoa New Zealand story will retain a premium value, is whether it will even be economically viable to farm animals exclusively for premium meat in a future where synthetics may have the upper hand in terms of the ingredients market.

Rod Oram makes the point in a segment for RNZ, explaining that,

[I]n order to turn a profit on premium products, meat and dairy producers still have to sell a lot of non-premium product into the ingredient market.

“You couldn’t possibly afford to farm cattle for meat or sheep for meat if you were only going to be selling some exquisite part of that animal,” Mr Oram says.

“Even if you look at the premium product which has the biggest volume, infant formula, you’re still taking only a small part of that milk to get the parts you want. Conversely, these new technologies have no residual raw material.”

(Ray, 2017)

Elsewhere in the podcast, engineer Angus Robson highlights how the issue is particularly pertinent for the dairy industry, where synthetic alternatives have had greater success to date,

The problem is that these new products are not only pursuing the consumer market. They are also aiming for the ingredients market, which is where the vast majority of New Zealand’s dairy exports are sold.

“We don’t ourselves have a lot of a say in what the ingredients are,” says Angus Robson, a Waikato-based engineer and innovator who sits on Landcorp’s environmental steering group.

“If, for example, a chocolate maker wants to substitute New Zealand milk powder, which costs them \$3000 a tonne, for artificial milk powder, which may cost them \$2000, [the consumer] would never notice. But it makes an enormous difference to whether we can sell our milk powder.”

We’ve already seen with genetically modified (GM) organisms, that while the ‘ick factor’ for consumers can be strong with raw products like fruit and vegetables, many people are happy to eat processed foods with those ‘icky’ ingredients in them. Witness the number of products on your supermarket shelves containing GM soy.

(Ray, 2017)

To further emphasise the point, food technologist Danielle Appleton explains the possible consequences of such developments in an interview for RNZ,

“When someone like me in the dairy industry thinks about milk, I think about the milk sugar that goes into paracetamol. I think about some of the ingredients used to make wine really crystal clear. Some other stuff that might surprise you are frozen foods, so often [dairy powder is used] to stop your chicken strips or bits of potato sticking together in the freezer and my favorite, [unusual place dairy ends up] is furniture paint.”

Appleton says if synthetic protein companies can work out how to make these proteins cheaper than New Zealand dairy farmers can do it on the paddock, the dairy industry here could be wiped out. She is urging farmers and the New Zealand dairy industry to start having the difficult conversations now, so they can try to get ahead of the change:

(Appleton, 2019)

Creating cut-throat competition?

Assuming that Aotearoa New Zealand does attain a place as a premium entity in a bifurcated market a final creative silence pertains to imagining the international configuration of such a market. Writing for the Spinoff, Daniel Eb lays out the prospective competition,

It won't be easy though. We'll be racing the likes of the USA, France and Argentina who will undoubtedly double down on their protein producing heritage and compete for this premium niche. If we are to premium-ise, we must do it fast and do it best – arguably we are behind the likes of Ireland's Origin Green sustainable framework and food brand.

(Eb, 2019)

Central to the concern is whether the size of the premium market will be able to accommodate the prospective interest of multiple national farming entities all selling themselves as premium, at a conference on regenerative agriculture Peter Fraser disrupts the tranquil image of the envisaged premium farm,

Fraser pauses for the obvious to sink in. If the future does offer a top end market for regenerative products, there will be no shortage of others, with provenance stories and “happy farm” pictures, fighting tooth and nail over it.

Within a decade, New Zealand agriculture could be caught between an ethics-driven collapse in animal protein demand and a stampede of overseas farmers all rushing to go planet-friendly and organic, Fraser warns. Can the conference imagine a worse scenario?

(McCrone, 2020)

Finally, in a strategy document for Aotearoa New Zealand food safety, the Ministry of Primary Industries make the point that as provenance narratives become more significant to the premium value of products, fraud may well rise in tandem,

To achieve this we need everyone to understand and continue to comply with the rules. This may be more challenging in the future, particularly as some products are becoming higher value, which brings with it increased incentive for fraud, tampering or other criminal activities. We have a range of tools we can use to increase compliance and we will continue to ensure that New Zealand has the appropriate level of compliance activity.

(Ministry for Primary Industries, 2019)

Creating a Biotech Food Regime?

Creating a bureaucratic nightmare?

Agriculture is reliant on a massive spatial infrastructural assemblage beyond the farm gate to facilitate the distribution of animals, their conversion into recognisable food products, the development of consumer desire, and the investment into perpetuating the system. While some aspects of this system may be transferrable to emergent synthetic protein technologies the process by which this would be undertaken is underarticulated, particularly from the voices of those actors who would undertake the roles.

One aspect of which, with regards to investment, being the perspective of banking institutions as to when conventional agriculture would become too risky to invest in, or what would have to happen for synthetics to become the more appealing option, agribusiness consultant Alison Dewes makes the point in an interview for the RNZ Our Changing World Podcast, saying,

New Zealand dairy land is some of the most indebted in the world and then you're going to add to that, to head down a pathway in a slightly different industry without support for that industry, then the banks are not going to like it, and probably not going to support you, because it's going to be seen as double risk, because you're going to change your system where you already have really high debt, so that's double dipping into the high risk zone and banks don't like risk

[William Ray - Interviewer]Do you think they perhaps banks need a change of attitude to realise that you know the current situation is also quite risky

I don't know if it's a change of attitude or if it's just a wake up really, you know, the banking industry, again, doesn't like risk, and they're still trying to encourage farmers to continue with the old patterns, which are still more output metrics, that they challenge your farmers with it's like about relating debt to cow numbers and milk solids production, but in reality our security moving forward is going to lie in our ability to be resilient in the face of a whole lot of challenges, and that's these alternative protein threats, climatic volatility, tightening resource constraints, water clawback, farming scrutiny, loss of social licence, all those things are really 3-5 years away from really hitting us, and unless banks support people to change, we're going to see attrition out of our farming sector for sure.

(Dewes, 2017)

To further emphasise the point, in an article for Pure Advantage, Alexandra Allan, the founder of the open access science and technology network NZ Foodbowl, is cited as demonstrating how government ministries facilitate system perpetuation and inhibit disruption,

According to Allan part of the reason why NZ has very little innovation going in the Ag 2.0 paradigm is that it is so costly for a NZ start up to validate the "safety" of new food products and systems of production, and that there's a mine field of needless and innovation-hindering regulation that start ups have to navigate to even get a safe product to market. We can all thank our Ministry of Primary Industries (MPI) for that. It's shortsighted paranoia around the safety of new products hitting the export markets, and inexperience in dealing with technology led food innovations like high pressure processing might be fine for protecting the NZ inc brand today, but it's doing nothing but hinder our ability to build companies that can play in the new world of Ag 2.0.

(Bosworth, 2016)

The Productivity Commission's Low Emissions Economy report touches on the need to explore the scope of government support for a transitioning energy infrastructure, inclusive of the question of synthetic proteins,

Yet, this role throws up a series of political and philosophical choices about the exact nature of government responsibility during the transition. For example, adverse effects arising from domestic policy decisions (such as the effects on certain households due to potentially higher relative costs) may be considered well within the scope of government responsibility to manage (see Chapter 10). But governments may also consider it necessary to develop policies to help address the effects of external disruption. An example of such effects is the potential for significant market disruption in the agricultural sector caused by the offshore development of synthetic food technology. Future governments will need to be clear about the role they intend to play in the transition to provide clarity and direction to the respective decisions of individuals, households and businesses over the coming decades.

(NZPC, 2018)

Finally, in a report produced by the National Institute for Water and Atmospheric Research and titled "Visions for nature and nature's contributions to people for the 21st century", the authors argue for a system of regulation that protects social ties while incorporating disruption, in part as reference to synthetic proteins, they write,

[S]hifts from agriculture toward more multifunctional agricultural landscapes are needed to provide space for multiple types of ecosystem service flows across landscapes. These changes would be enabled by shifts towards healthier, lower meat diets, that allow the world's population to be fed while using less land. These changes will also produce and require shifts in property rights and other institutions that are time dependent and adapt to changes over time. Such changes could grow out of adaptive regulations that lock in rights for a fixed time period, during which rights can be adapted and extended or maintained for the fixed period. There is more social planning for surprise and an increased ability of organisations and individuals to accept, cope with, and benefit from ambiguity, surprise and novelty.

(NIWA, 2017)

Creating a new national identity?

Juxtaposed to the destructive potential that synthetic proteins threaten to bear on the identity of the kiwi farmer is the question of what cultural roles will emerge to replace

them in the iconography of the national consciousness. Whether it is a future of growing for foreign synthetic companies, or one in which biotechnology becomes the preeminent national industry, for a small nation state each path will hold its own cultural markers of signification and sources of identification.

In a news and opinion piece for the University of Auckland, Joya Kemper is cited as outlaying a series of tensions facing Aotearoa New Zealand,

Joya suggests that widespread changes in diet, such as reducing red meat consumption as advocated by the EAT-Lancet report, would require a complex mix of initiatives, from information campaigns to change social norms, to a regulatory framework. Germany, Brazil and Sweden have established guidelines for sustainable food consumption to give legitimacy to those wanting to change behaviour.

However, she says, New Zealanders value personal responsibility highly and any such strategy risks being dubbed an initiative of the nanny state. The push and pull between consumers and markets, the battle between good intention and habit, the ethical and sustainability struggle between alt protein and animal meat will all shape the future of food. How should New Zealand react to this menu of possibles and probables?

(Wong, 2019)

In an interview for TechWeek Dr Rosie Bosworth summarises the capabilities Aotearoa New Zealand does have that could provide an advantage in a novel food future, in view of a prospective national identity the image presented describes a highly specialised, technically proficient class of science and technologists,

What do you think makes the New Zealand tech sector generally unique from a global perspective?

We are small, agile and able to pivot quickly. We also have great skill sets, not only in traditional food technology, plant and food R&D, but also technology and digital platforms in general. These two combined will be able to intersect nicely to create high-value, sustainable and high-tech solutions for future global food systems.

(Bosworth, 2018)

The Ministry for Primary Industries outlines a strategy for the development of science and technology in Aotearoa New Zealand, premised on both what are viewed as traditional strengths and indigenous methods, in confluence with overseas connections to draw on novel trends (synthetic proteins being given as an example), the result being something of a cosmopolitan vision of the island nation,

Equally important to building capability and capacity is how we do our science and who we do it with. Scientific inquiry needs to involve interdisciplinary, cross-sectoral and inter-cultural approaches; to focus on impact-based outcomes with clear benefits; to include extension and uptake of science and technology; to involve industry, community and collectives in effective engagement, co-design and co-innovation; and to be highly collaborative. Success with multi-partner approaches to science will need people with excellent leadership and communication skills.

New Zealanders are generally good at connecting with overseas science organisations. We contribute to international research and have a crucial role in providing scientific and technological expertise to developing countries, especially in the Pacific. New Zealand researchers are involved in many collaborative partnerships which have benefited New Zealand's primary sector, and this will continue to be critical. It will also guide where we focus development of our own capability and capacity (for example, on novel methodologies and indigenous data collection), and where we rely more on international expertise.

Scientific and technological literacy in the primary sector and in the wider population is also fundamental. We need to build the foundations for a society that is able to appreciate scientific concepts and approaches, and contribute to science-based innovation in the primary sector through informed dialogue on acceptable technological development.

(MPI, 2017)

An issue at the heart of the discussion is the role of genetic modification (GM). Aotearoa New Zealand has a complex relationship with genetic modification, the technology is heavily regulated under the Hazardous Substances and New Organisms act of 1996. Aotearoa New Zealand does not produce fresh GM produce, which has become a point of association with a pure or traditional agricultural image, however, Aotearoa New Zealand researchers do investigate uses of GM in overseas laboratories.

The following segment from a Newsroom article draws on a speech delivered by Sir Peter Gluckman, the then chief science advisor, at the NZ Biotech conference in Wellington, Gluckman calls for a renewed national discussion on the subject of GM,

[S]hould we stay GM-free and focus on producing high-end ingredients for the production of synthetic milks which are made elsewhere, say in Singapore? Or should we invest in a full product chain and make the products here, thinking about the reality that if you did this well, the potential for market differentiation is very high," he said.

"The position that we took 20 years ago that projecting 'natural' into this meant that you didn't have any GM products in NZ, or at least grown in NZ, is that a position that is sustainable into the future?" Gluckman asked.

"We have this very unusual situation with GM," Gluckman said. "Even with nuclear – we regulate the technology because we use it in medicine and food safety, we don't ban the technology, we regulate the technology."

"If it remained completely blocked then it would stifle innovation because it is at the heart of life sciences development - in medicine, in agriculture, environmental management etc.

"What is 'natural' [to you] is what you grow up with as a teenager. By the time you become an adult you accept what you see in your youth as being effectively natural," he said.

(Grievson, 2017)

The subject remains controversial, however, in the following NZ Stuff article GE Free New Zealand are cited to articulate a counterpoint to Fonterra's investment into Motif Ingredients,

Fonterra's move is seen by some as risky, because it's a move that signals an even bigger step away from the clean green sustainable New Zealand image than it did in 2011 when it cut half of its organic suppliers.

GE Free New Zealand opposed the investment in gene edited and genetically engineered biotech saying it put the Fonterra brand at risk.

"Fonterra is letting its farmer shareholders down and moving away from its core business, milk. The investment in synthetic, GE processed food is a total contradiction to their mission statement of clean green grass fed food," GE Free president Claire Bleakley said.

(Flaws, 2019)

Creating new monocultures?

The synthetic future is not without its sceptics, one area that was relatively well represented being the potential environmental impact of converting pasture to monocultures of sugar, and yet there was little to no real engagement with how and through what institutions such a transition would take place.

As instanced in this RNZ article, the caveat that extensive sugar monocultures represent to synthetic protein's environmental arguments was used to justify the continued prominence of proteins grown in animal,

Fonterra's chief science and technology officer Jeremy Hill said the co-op was keeping an eye on what was happening with synthetics. "There's some interesting developments. We're part of that picture and we think it's going to play a role. The question at this point is just how big." And while yeast-fermentation is often billed as "clean" dairy, Hill says it isn't without its problems. "There's no free lunch. So when you look at these fermentation produce processes, just like cows need to eat grass, they use need to consume the nutrients. So to produce the protein, you've got to feed them a lot of sugar, and it's an awful lot of sugar... you need five to 10 grams of sugar to get one gram of protein."

(Cowie, 2019)

Along a similar vein, Glen Herud, founder of the Happy Cow Milk Company, argues protein grown in animals can have a role in the future, premised, in part, by unpicking the historical developments that have played a part in the emergence of synthetic proteins as to demystify their solution narrative,

Synthetics are not new, they're not wacky or weird. Their rise in dairy is very logical and predictable.

The production of synthetic substances will not be perfect. It will require a lot of biomass such as sugar cane. The downside of plant-based agriculture is it generally relies on intensive monoculture agriculture which has significant environmental effects.

The problem for dairy farmers is believability always beats the truth. For many urban people, the dairy industry telling them plants are bad for the environment and cows are good is unbelievable.

The modern dairy farmer must be able to show that dairy is not scary. That will require radical honesty and transparency.

(Herud, 2019)

Drawing on the extensive industrialisation that will presumably be needed to facilitate synthetic proteins, former Lincoln University Professor Keith Woodford looks to juxtapose the complexity involved in establishing an entirely new agri-food system with a simplified image of the current model in an article for financial forecasting website interest.co.nz,

If we go back to basics, then all energy on earth comes from, or has come from, a single source. It is called 'the sun'. The hydrogen is simply one means of storing the sun's energy. If the world is going to be saved by artificial food, then we will need a huge number of solar panels and wind turbines, along with a transmission and storage system, so as to get the sun's energy transferred across the world to the big tanks of bacteria.

In contrast, in our current food-producing world we use plants to capture the sun's energy. It is a marvellous process called photosynthesis. It is something plants do naturally all over the world.

(Woodford, 2020)

Likewise, industrial agriculture was juxtaposed with the prospects of a regenerative future in an article for NZ Stuff,

Former environmental policy specialist and biological soils consultant Phyllis Tichinin, said the rush towards tech-based solutions was alarming, and that the oversimplification of science in agri-tech showed ignorance about the complex nature of agriculture as an interconnected system.

Consumers and scientists needed to question the environmental footprint of synthetic protein compared with raising livestock regeneratively on diverse green pastures, Tichinin said.

(Flaws, 2019)

Finally, in a separate NZ Stuff article, Dr Mike Boland of the Riddet Institute brought up the uncertainty involved in the ability of synthetic proteins to upscale given the requirements of sterility,

"Although meat can be demonstrably grown in the lab, the potential regulatory environment is untested, and there will always be issues around requirements for stringent sterility that do not occur in production of other food types," he said.

"Cells grown in a culture rather than as part of an animal have no built-in immune system so they will need a completely sterile environment."

This would need to be on-par with an operating theatre or higher as in a theatre there is still the patient's immune system helping, he said.

(Dickey, 2018)

Creating a Bi-Cultural Food Regime?

Beyond a symbolic role briefly touched upon in visions of selling unique heritage stories, or in questions of framing future identities, the role of Māori agriculture remains significantly underexplored in the context of a synthetic protein future. In particular, the question of not just incorporating Māori terms as token gestures, but actually imagining a bi-cultural approach to agriculture in every stage of the production chain. Central to which would need to be an understanding of differing conceptions and practices involved in the construction of food.

A press release for doctoral scholar Kirsty Dunn's investigation into the ethics of food cites her interest in negotiating a te Ao Māori perspective with poles of Western thought,

Debate on food in the Western context can become polarised between the rationale supporting intensive animal agricultural practices and vegan ethics.

Ms Dunn suggests that the ethics she is exploring have the potential to act as an intermediary between the two, as well as in discussions about alternative plant-proteins and issues such as genetic modification and lab-grown meat.

"Perspectives from tangata whenua regarding plant-based kai ethics, food sovereignty and decolonial diets based on the principles I identified in my research can provide various avenues for critique: they are particularly valuable because they are in and of this place, this whenua."

(UC Communications Team, 2019)

Joanne Todd, director of High-Value Nutrition, describes how her organisation aims to promote a sustainable Aotearoa New Zealand agriculture through supporting Māori science and technology in a citation for a news and opinion piece for the University of Auckland,

China's big problem is that it needs to feed a fifth of the world's population and has only one tenth of its farmland. About 57 percent of its population now live in cities and their affluence is rising. As it rises, their diet now resembles what has become the bane of

Western countries, much more processed food, a dramatic rise in consumption of pork, red meat and dairy and, with that, an epidemic of obesity and diabetes.

Little of this looks sustainable, which is why High-Value Nutrition supports food businesses that tread more lightly on the environment. “Sustainability is very much part of the mix we want in every business we work with,” says Joanne Todd, director of HVN. As part of the criteria for funding, a business must provide evidence of how it responds to the UN’s SDGs.

This includes working with innovative Maori businesses to ensure that Vision Matauranga, or unleashing the science and innovation of Maori knowledge and resources, is part of the future of food.

A blog post for the Poutama Trust, a Māori business development organisation, describes the need to involve Māori in the development of synthetic agriculture while questioning whether Māori land holdings are prepared for the disruptive impact of the technology,

Dr Bosworth says that Ag 2.0 renegades are unleashing the new wave of food and agriculture systems and that progressive technologists, entrepreneurs and start ups are leading the way and by-passing Big Ag. Māori need to be part of this wave otherwise we will just be by-standers watching things happen around us while the value of our efforts are eroded. You could say we are starting to get on this wave with a small number of our food companies acting smarter and leveraging everything available. But they are in the minority. Where the real challenges lie will be with our land owning agriculture dependent entities. How will they react to this disruption, are they even aware of it?

(The Poutama Trust, 2017)

Finally, in an article for Newsroom, Professor Hugh Campbell describes a vision of future food trade in which Māori agriculture takes a central role, prompted in part by the envisaged rise of synthetic proteins,

The key to how our future takes shape is the one big partnership that is still waiting to be established: When the great Pākehā farming world of the 20th century recognises, partners with, and starts to celebrate both its own successes and that of a resurgent Māori land-economy.

Māori land use is rapidly becoming one of the emerging powers in the farming politics of the 21st century. That is the new site of potential political partnership that will truly set the pattern of future land-use in rural New Zealand.

Earlier in the piece, the question Professor Campbell asks is what a future would look like incorporating the timescales of Mātauranga Māori planning,

Pākehā family farmers are used to planning and directing their farms to move from one generation to the next – a planning timeline that spans whole lifetimes. Imagine instead the important shifts and decisions that must occur when you start planning, as many Māori trusts and iwi organisations are, for landscape outcomes directed towards a 300 to 500 year timeline.

(Campbell, 2021)

The dearth of citations incorporating Māori agriculture in their future visions provides some reference to the scale of the work that would be required to fulfil such a shift in decision making. Beyond which, the question of establishing a bi-cultural approach to agriculture would require negotiation at all processes of the production line.

6. Conclusion

Since the first shipment of refrigerated meat left Dunedin for Britain in 1882 the Aotearoa New Zealand landscape, cast in the form of pastoral agriculture, has been

integrally tied to the global agri-food system, and with it the disruptive forces of the industry. This discussion paper series has aimed to explore the dynamics of the primary industries' responses to disruptive technologies. A parallel report (Kemnitz, Campbell, and Burton, 2022) has analysed the transition from wool to artificial fibres to ground the effects disruptive technologies can play. In the pivot to a future focus, history serves as a reference point, from where developmental narratives are envisioned, and strategies of response are drawn.

This paper has aimed to convey a broad sweep of the discourse in pastoral agriculture, as it vies with the potential of a future with synthetic proteins. Situated within the objectives of the Protein 2.0 project, and drawing from the theoretical framing of Helliwell and Burton (2021), this paper has been founded on a particular focus on the imagined futures of rural life and landscape. The purpose being to reckon with those components of unacknowledged destruction and unintended creation housed in the promissory narratives of a synthetic protein future.

The findings of this analysis show a widespread interest in the impact synthetic proteins could have. Discourses have grappled with the questions of whether synthetic proteins will add value to protein grown in animal, or incur a paradigm shift away from pastoral agriculture all together, with whether synthetic protein technologies should be embraced and land use diversified, or even given to regeneration, or whether doing so would harm the national clean, green, non-GMO image.

In answering these questions, the style has been speculative, and the voices have been abstract. Little attention has been given to how farming identities are placed to adapt to such changes, to what will happen to rural towns and communities, or to what residual effects nearly two centuries of pastoral agriculture will have on the prospects of changing land use. Equally, the range of future visions came with their own caveats of unintended consequences. While the prospects of holding a premium status as a pastoral agricultural nation rely on maintaining an uncertain international desire for such products, the prospects of entering a synthetic protein economy come up against a matrix of institutions designed to regulate and perpetuate current models of agricultural production against the uncertainty of change. Within this maelstrom of future vision making a question of national identity holds fast. In particular, as to how to reconcile a land's, and its people's, history with its future. Towards which, the question of a bi-cultural agriculture remains underarticulated by the voices engaging in this discussion.

References

- Appleton, D. 2019. Milk shake - Why the future of dairy looks scary. *In*: Cowie, T. (ed.) *Insight*. RNZ.
- Beeby, N. 2017. 'Alternative proteins is not a new concept': Beef + Lamb NZ on the threat of synthetic meat [Online]. Available: <https://thespinoff.co.nz/business/01-11-2017/alternative-proteins-is-not-a-new-concept-beef-lamb-nz-on-the-threat-of-synthetic-meat> [Accessed 2021].
- Beef and Lamb NZ 2018. Future of Meat: How should New Zealand's red meat sector respond to alternative protein advancements. Beef & Lamb NZ.
- Black, R. 2019. *Milk powder without cows joins animal-free mega trend* [Online]. Available: <https://www.stuff.co.nz/business/115199256/milk-powder-without-cows-joins-animal-free-mega-trend> [Accessed 2021].
- Black, R. 2019. *New Zealand has to stake its claim in the supermarket aisles of the future* [Online]. Available: <https://www.stuff.co.nz/business/farming/114692461/new-zealand-has-to-stake-its-claim-in-the-supermarket-aisles-of-the-future> [Accessed 2021].
- Bosworth, R. 2015. *The Future of Food and Agriculture* [Online]. Pure Advantage. Available: <https://pureadvantage.org/the-future-of-food-and-agriculture/> [Accessed 2021].
- Bosworth, R. 2016. *In lament of the NZ Farm* [Online]. Pure Advantage. Available: <https://pureadvantage.org/lament-nz-farm/> [Accessed 2021].
- Bosworth, R. 2017. *The Race to Reduce Agriculture's Emissions* [Online]. Pure Advantage. Available: <https://pureadvantage.org/synthetic-biology-vs-paris-race-reduce-agricultures-emissions/> [Accessed 2021].
- Bosworth, R. 2018. Q&A with future of foods strategist Dr. Rosie Bosworth. *In*: TECHWEEK (ed.). TechWeek.
- Bosworth, R. 2019. *The future of food: What will it look like in 500 years?* [Online]. Idealog. [Accessed 2021].

- Burton, R. J. F. 2019. The potential impact of synthetic animal protein on livestock production: the new “war against agriculture”? *Journal of Rural Studies*, 68, 33-45.
- Campbell, G. 2017. Smarter farming at the heart of why we’re here. *Connect - updating shareholders about their cooperative* [Online]. Available: <https://www.ravensdown.co.nz/media/3781/connect-december.pdf>.
- Campbell, H. 2021. *Farming the future: Trading on animal welfare and emissions, not tariffs* [Online]. Newsroom. Available: <https://www.newsroom.co.nz/ideasroom/future-trade-deals-will-focus-on-animal-welfare-and-emissions-not-tariffs> [Accessed 2021].
- Carden, S. 2017. What do we do? Agriculture in the age of synthetic food. In: Ray, W. (ed.) *Our Changing World*. RNZ.
- Chang, J. and Liu Yang, G., 2020. *China's changing appetites - and why NZ must change*. [podcast] The Detail RNZ. Available at: <https://www.rnz.co.nz/programmes/the-detail/story/2018757228/china-s-changing-appetites-and-why-nz-must-change> [Accessed 6 July 2022].
- Cook, A. 2017. *Time short to face 'threat' of synthetic proteins* [Online]. RNZ. Available: <https://www.rnz.co.nz/news/country/342891/time-short-to-face-threat-of-synthetic-proteins> [Accessed 2021].
- Cotton, J. 2017. *What will we eat in the future? And how will we grow it?* [Online]. The Spinoff. Available: <https://thespinoff.co.nz/techweek17/15-05-2017/what-will-we-eat-in-the-future-and-how-will-we-grow-it> [Accessed 2021].
- Cowie, T. 2019. *Milk shake - Why the future of dairy looks scary* [Online]. RNZ. Available: <https://www.rnz.co.nz/national/programmes/insight/audio/2018709853/milk-shake-why-the-future-of-dairy-looks-scary> [Accessed 2021].
- Cuisine. 2021. *Meat & Greet* [Online]. Available: <https://www.cuisine.co.nz/meat-greet/> [Accessed 2021].
- Dewes, A. 2017. What do we do? Agriculture in the age of synthetic food. In: Ray, W. (ed.) *Our Changing World*. RNZ.

- Dickey, D. 2018. *Eel could be back in the menu as 'clean' meat* [Online]. NZ Stuff. Available: <https://www.stuff.co.nz/business/farming/102990916/eel-could-be-back-in-the-menu-as-clean-meat> [Accessed 2021].
- Dickey, D. 2018. *Sustainable branding the future of New Zealand meat* [Online]. NZ Stuff. Available: <https://www.stuff.co.nz/auckland/103250382/sustainable-branding-the-future-of-new-zealand-meat?rm=m> [Accessed 2021].
- Eb, D. 2019. *The vegans are coming, so Kiwi farmers need to give us something to believe in* [Online]. The Spinoff. Available: <https://thespinoff.co.nz/business/10-01-2019/the-vegans-are-coming-and-kiwi-farmers-need-to-give-us-something-to-believe-in> [Accessed 2021].
- Flaws, B. 2019. *Fonterra is investing in artificial meat, but would you eat it?* [Online]. NZ Stuff. Available: <https://www.stuff.co.nz/business/111546089/fonterra-is-investing-in-labgrown-meat-but-would-you-eat-it> [Accessed 2021].
- Galloway, J. 2017. *Warning to farmers of looming synthetic meat and milk* [Online]. NZ Stuff. Available: <https://www.stuff.co.nz/business/farming/90979628/warning-to-farmers-of-looming-synthetic-meat-and-milk> [Accessed 2021].
- Gregory, D. 2017. Agribusiness behind one of NZ's biggest Maori incorporations goes global with composite breed. *Gisborne Herald*.
- Grievson, L. 2017. *Challenges and opportunities in clean, green synthetic foods* [Online]. Newsroom. Available: <https://www.newsroom.co.nz/challenges-and-opportunities-in-clean-green-synthetic-foods> [Accessed 2021].
- Guthman, J. 2022. The CAFO in the Bioreactor: Reflections on Efficiency Logics in Bio-industrialisation Present and Future. *Environmental Humanities*, 14, 71-88.
- Harris, C. 2021. *The future of farming: What will NZ's agri sector look like in 20 years?* [Online]. NZ Stuff. Available: <https://www.stuff.co.nz/business/126303356/the-future-of-farming-what-will-nzs-agri-sector-look-like-in-20-years?rm=a> [Accessed 2021].
- Helliwell, R. and Burton, R. J. F. 2021. The Promised Land?: Exploring the future visions and narrative silences of cellular agriculture in news and industry media. *Journal of Rural Studies*, 84, 180-191.

- Herud, G. 2019. *Fermentation might lead to a dairy protein to make fake milk* [Online]. NZ Stuff. Available: <https://www.stuff.co.nz/business/farming/opinion/115280308/fermentation-might-lead-to-a-dairy-protein-to-make-fake-milk> [Accessed 2021].
- Hoggard, A. 2017. What do we do? Agriculture in the age of synthetic food. In: Ray, W. (ed.) *Our Changing World*. RNZ.
- Hutching, G. 2019. *Fonterra invests in United States bio-engineering food company* [Online]. Available: <https://www.stuff.co.nz/business/farming/110899336/fonterra-invests-in-united-states-bioengineering-food-company> [Accessed 2021].
- Johnston, D. and Shaw, D. 2017. The rise of alternative proteins – on the verge of mainstream. Available: <https://www.rabobank.co.nz/media-releases/2017/171120-the-rise-of-alternative-proteins-on-the-verge-of-mainstream/>.
- Jönsson, E. 2016. Benevolent technotopias and hitherto unimaginable meats: Tracing the promises of in vitro meat. *Social Studies of Science*, 46, 725-748.
- Kemnitz, N., Campbell, H., and Burton, R. 2022. Technology Crises in Primary Production: The Transition from Wool to Artificial Fibres in New Zealand. Centre for Sustainability Research Report No. 6. *University of Otago*
- Kiernan, G. 2021. *Don't be complacent about agriculture's ability to rescue us* [Online]. Available: <https://www.stuff.co.nz/business/industries/300411127/dont-be-complacent-about-agricultures-ability-to-rescue-us> [Accessed 2021].
- Klerx, L. & Rose, D. 2020. Dealing with the game-changing technologies of Agriculture 4.0: How do we manage diversity and responsibility in food system transition pathways? *Global Food Security*, 24.
- KPMG 2021. Agri-business Agenda 2021. KPMG.
- Lemonade, M. 2021. *Biotech Driving The Future Of Clean Food* [Online]. Scoop. Available: <https://www.scoop.co.nz/stories/SC2107/S00074/biotech-driving-the-future-of-clean-food.htm> [Accessed 2021].
- Lewis, G. 2019. Is the vilification of NZ's meat and dairy justified? *North and South* [Online]. Available: <https://www.stuff.co.nz/life-style/food-wine/118105995/is-the-vilification-of-nzs-meat-and-dairy-justified?rm=a>.
- Malthus, N. 2019. *Embrace change or die* [Online]. Available:

<https://www.ruralnewsgroup.co.nz/rural-news/rural-general-news/embrace-change-or-die> [Accessed 2021].

- Matthews, C. 2017. What do we do? Agriculture in the age of synthetic food. *In: Ray, W. (ed.) Our Changing World*. RNZ.
- McCrone, J. 2018. *The future of everything: Why the third industrial revolution is a risk to NZ* [Online]. NZ Stuff. Available: <https://www.stuff.co.nz/technology/102640438/the-future-of-everything-why-the-third-industrial-revolution-is-a-risk-to-nz> [Accessed 2021].
- McCrone, J. 2020. Not your typical sheep paddock: why sunflowers and lentils herald NZ's regenerative revolution. [Online]. NZ Stuff. Available: <https://www.stuff.co.nz/environment/climate-news/120516134/not-your-typical-sheep-paddock-why-sunflowers-and-lentils-herald-nzs-regenerative-revolution> [Accessed 2021].
- Ministry for the Environment & Stats NZ. 2021. New Zealand's Environment Reporting Series: Our Land 2021. Wellington: Ministry for the Environment & Stats NZ.
- MFE. 2004. *Genetic modification in New Zealand* [Online]. Ministry for the Environment. Available: <https://environment.govt.nz/publications/genetic-modification-the-new-zealand-approach/genetic-modification-in-new-zealand/> [Accessed 23.03 2022].
- MPI. 2017. Primary Sector Science Roadmap Te Ao Tūroa. Ministry for Primary Industries.
- NIWA 2017. Visions for nature and nature's contributions to people for the 21st century National Institute for Water and Atmospheric Research.
- NZPCM. 2018. Low-emissions economy. New Zealand Productivity Commission.
- O'Connell, B. 2021. A view of food futures – three megatrends mean disruption for NZ food sector. Available: <https://www.foodticker.co.nz/a-view-of-food-futures-megatrends-mean-disruption-for-nz-food-stakeholders/>.
- OECD and FAO. 2021. OECD-FAO Agricultural Outlook 2021-2030. OECDiLibrary: OECD-FAO.
- Oram, R. 2017. What do we do? Agriculture in the age of synthetic food. *In: Ray, W. (ed.) Our Changing World*. RNZ.
- Oram, R. 2017. *Rod Oram: A complacent agricultural nation?* [Online]. Available: <https://www.newsroom.co.nz/2017/12/02/64990/rod-oram-a-complacent-agricultural-nation> [Accessed 2021].

- Oram, R. 2018. *Rod Oram: Revolutionary new foods challenge 'natural' farm products* [Online]. Newsroom. Available: <https://www.newsroom.co.nz/rod-oram-revolutionary-new-foods-challenge-natural-farm-products> [Accessed 2021].
- Oram, R. 2018. *How to solve our paradox of poverty and plenty* [Online]. Newsroom. Available: <https://www.newsroom.co.nz/how-to-solve-our-paradox-of-poverty-and-plenty> [Accessed 2021].
- Oram, R. 2019. Getting ready for the food revolution. *Newsroom*.
- Penny, N. 2018. *OPINION: The ETS: Scary for agriculture, but opportunity also knocks* [Online]. Available: <https://www.fonterra.com/nz/en/our-stories/articles/the-ets-scary-for-agriculture-but-opportunity-also-knocks.html> [Accessed 2021].
- Pickett, B. 2018. *'Clean meat' cultivated in fermentation tanks to share shopping aisles with traditional meat* [Online]. Available: <https://www.stuff.co.nz/business/farming/101118228/clean-meat-cultivated-in-fermentation-tanks-to-share-shopping-aisles-with-traditional-meat> [Accessed 2021].
- Piddock, G. 2018. *NZ dairy farmers key to new food revolution* [Online]. NZ Stuff. Available: <https://www.stuff.co.nz/business/farming/103357364/nz-dairy-farmers-expertise-key-to-urban-food-production-evolution> [Accessed 2021].
- Poutama Trust. 2017. *Opportunity or Threat for Māori food producers?* [Online]. Poutama. Available: <https://poutama.co.nz/opp-or-threat-for-maori-food/> [Accessed 2021].
- Rae, S. 2017. *Alternative proteins pose a threat for meat* [Online]. Available: <https://www.odt.co.nz/business/alternative-proteins-pose-threat-meat> [Accessed 2021].
- Ray, W. 2017. *What do we do? Agriculture in the age of synthetic food* [Online]. RNZ. Available: <https://www.rnz.co.nz/national/programmes/ourchangingworld/audio/2018626540/what-do-we-do-agriculture-in-the-age-of-synthetic-food> [Accessed].
- Rennie, R. 2018. Non pastoral protein brings clouds and silver linings. *Real Farmer*.
- RNZ. 2014. *Non-dairy milk not aimed at NZ* [Online]. Available: <https://www.rnz.co.nz/news/national/249590/non-dairy-milk-not-aimed-at-nz> [Accessed 2021].

- Robinson, A. 2017. Take the farming high ground: Go organic. *NZ Stuff*.
- Robinson, T. 2018. *Opinion: The future of food* [Online]. AgResearch. Available: <https://www.agresearch.co.nz/news/opinion-the-future-of-food/> [Accessed 2021].
- Robson, A. 2017. What do we do? Agriculture in the age of synthetic food. In: Ray, W. (ed.) *Our Changing World*. RNZ.
- Ruralis. 2022. *PROTEIN 2.0: The biosynthetic protein transition: assessing impacts, outcomes and opportunities for Norway's post-animal bioeconomy* [Online]. Ruralis - Institute for Rural and Regional Research. Available: <https://ruralis.no/en/projects/protein2-0-overgangen-til-biosyntetisk-protein-evaluering-av-effekter-utfall-og-muligheter-for-norges-post-animalske-bioekonomi/> [Accessed 26.03 2022].
- Scott, A. 2021. Focus on the future. *Farmers Weekly*.
- Sexton, A. E., Garnett, T. & Lorimer, J. 2019. Framing the future of food: The contested promises of alternative proteins. *Nature and Space*, 2, 47-72.
- Sexton, A. E. 2018. Eating for the post-Anthropocene: Alternative proteins and the biopolitics of edibility. *Transactions of the Institute of British Geographers*, 43, 586-600.
- South, G. 2019. Looking down the barrel. *Dynamic Business Report*.
- Stephens, N., Sexton, A. E., and Driessen, C. 2019. Making Sense of Making Meat: Key Moments in the First 20 Years of Tissue Engineering Muscle to Make Food. *Frontiers in Sustainable Food Systems*, 3.
- Taylor, I. 2018. *Ian Taylor: Artificial meat can be part of New Zealand's future* [Online]. NZ Herald. Available: <https://www.nzherald.co.nz/business/ian-taylor-artificial-meat-can-be-part-of-new-zealands-future/63QZNY54PFVQIEY5HGZM73GQBA/> [Accessed 2021].
- Te Herenga Waka – Victoria University of Wellington.. 2020. *Could food and drink save the tourism industry?* [Online]. Newsroom. Available: <https://www.newsroom.co.nz/ideasroom/2020/06/08/1223344/could-food-and-drink-save-the-tourism-industry/> [Accessed 2021].
- UC Communications Team. 2019. *UC scholar studies Māori perspectives on plant-based kai* [Online]. University of Canterbury. Available: <https://www.canterbury.ac.nz/news/2019/uc-scholar-studies-mori-perspectives->

- on-plant-based-kai.html [Accessed 2021].
- Watson, M. 2017. *A food future of lab grown steaks and yeast brewed milk* [Online]. Available: <https://www.stuff.co.nz/business/farming/98632123/a-food-future-of-lab-grown-steaks-and-yeast-brewed-milk> [Accessed 2021].
- Wong, G. 2019. *The future of food* [Online]. University of Auckland. Available: <https://www.auckland.ac.nz/en/news/2019/11/25/the-future-of-food.html> [Accessed 2021].
- Woodford, K. 2017. *Keith Woodford: The wheat and chaff of synthetic food* [Online]. Available: <https://www.stuff.co.nz/business/farming/beef/97295184/keith-woodford-the-wheat-and-chaff-of-synthetic-food> [Accessed 2021].
- Woodford, K. 2020. *Keith Woodford explains how the artificial-food debate has lost sight of the fundamental biological and physical sciences, at which stage it becomes science fiction led by shock-jock commmunicators* [Online]. Interest.co.nz. Available: <https://www.interest.co.nz/rural-news/103216/keith-woodford-explains-how-artificial-food-debate-has-lost-sight-fundamental> [Accessed 2021].

