

Feeding the future: Reflections on the food systems discussion

John Roche^{a,b,*}

^aMinistry for Primary Industries, Wellington 6140, New Zealand

^bSchool of Biological Sciences, University of Auckland, Auckland 1010, New Zealand

After an excellent day of talks and discussion among the attendees at Feed Our Future, there were many important themes and messages that must be captured. I admit that it is both an honour and a challenge to try to summarise the day's proceedings.

I joined the Ministry for Primary Industries (MPI) in 2018, and I find myself very privileged to belong to that particular agency considering the conversation that took place at Feed Our Future. Over the course of a few hours, there was excellent discussion about what we at MPI are responsible for in New Zealand: the production and harvesting of food and ensuring its safety for consumers. I have learned much over the last 18 months in this new COVID-19 world about the fragility and the interconnectedness of the food supply chain. It was astounding at times how close we as a country came to shortages in food. This has led to much reflection: even in a country producing food for 50 million people, food security was not assured.

During the COVID-19 lockdown in New Zealand, it became clear that overseas students and tourism were unlikely to be large contributors to gross domestic product for an indefinite period of time. Thus, the main contributor to export earnings would be the primary sector. We were therefore faced, as a Ministry, with the question of how our sector was going to maintain the New Zealand economy.

The government has spent a large amount of money keeping the pandemic out of the country. This has enabled New Zealanders to keep the lifestyle that we have had for the last year. Many people tend to forget this privilege until they see the news from overseas.

Almost a year ago, the Prime Minister launched our economic recovery strategy: 'Fit for a better world'.¹ The strategy has three pillars, the first of which is productivity. The aim is to increase the revenue from the primary sector to New Zealand over the next decade by \$44 billion, and then gradually increasing thereon by adding value and building off the strong position of our core sectors.

The second pillar is sustainability. As was highlighted in the Feed Our Future discussion, we as a country do not wish to engage in a 'race to the bottom': attempting simply to be the lowest footprint producers of food. Instead, we must meet our national climate change targets and the aspirations of our communities and our farmers and growers for freshwater.

The third pillar, also well discussed at the event, was inclusiveness. This reflects the fact that, in a country that produces food for approximately 50 million people, there are those in New Zealand who go home, to school, or to bed hungry. There are also those that eat plenty of food, but not enough of the right foods.

A fantastic piece of nutrition advice that is widely repeated is to walk around the outer aisle of the supermarket when shopping, avoiding the inner aisles. New Zealand produces the foods on the outer aisle of the supermarket. As someone said in the event discussion, we could in the future be the artisan food producers of the world – the country producing those niche products that everybody wants.

Following Professor Wood's talk on the future of alternative proteins, there was good discussion of whether looking at these

*Correspondence: John.Roche@mpi.govt.nz

¹ Ministry for Primary Industries (2020) *Fit for a Better World – Accelerating our Economic Potential*. ISBN: 978-1-99-002545-7



John Roche is the Chief Science Advisor to New Zealand's Ministry for Primary Industries. Affiliated with the University of Auckland's School of Biological Sciences, he has an Honours degree in Agricultural Science, a Masters in Farm Systems and Pasture Management and Agronomy, and a PhD in Nutritional Biochemistry.

Dr Roche was previously DairyNZ's Principal Scientist for Animal Science and has held science appointments with the National Centre for Dairy Production Research in Ireland, the Department of Primary Industries in Australia, and the University of Tasmania. He is also Managing Director of Down to Earth Advice Ltd.

technologies through the lens of today's technology is appropriate, or if we need to adopt a future lens. I agree completely that we do often examine technologies of the future through the lens of the present. An interesting question arises: can biological technologies, such as fermentation-produced proteins, follow Moore's law: will the exponential increase in technological innovation be matched by an exponentially decreasing price of the technology? Or are there stricter limits to what is possible from biological systems?

The challenge that the world faces is the need to produce almost as much protein in the next 30 years to satisfy global demand as we did in the last 2000 years. As a result, I do not see cell-based meat or plant-based proteins replacing conventional sources: the world will need all of these sources. Some may be higher value and higher cost, and therefore feed the richer of the world, but there must be enough balanced nutrition to meet the needs of the global population. This will come from many and diverse sources.

Professor Singh began the Feed Our Future event with an excellent list of challenges that face the food production sector, from environmental to economic to consumer. There are opportunities in all of these challenges. New Zealand is very focussed on its current large export categories, so perhaps there is opportunity to diversify. Plant-based foods, diets, and alternative proteins are all receiving much attention at present, and perhaps there are opportunities here for New Zealand. It is true that research and development spending outside of the government sector is relatively low in this country, which is its own challenge. The Riddet Institute's vision: future foods in harmony with nature, is exactly in keeping with where I believe New Zealand research must look.

Professor Burlingame then began with a history of the discussion of sustainable food systems, which goes back more than 150 years. However, the discussion really gained momentum in the 1960s. All of you will have heard of the Irish potato famine of the 1800s. But my father, as a farmer there, will tell you that he saw a famine in every decade of his life until 1970. At that point, chemical fertilisers, fungicides, herbicides, and superior breeding stabilised food production – a great win for humanity.

But, as humans are prone to do when something is successful, we used ever more of these technologies. I believe we need to consider that we might have increased the use of some technologies beyond a sustainable use level, as Professor Burlingame suggested, and it is important to reflect on this as we look to the future.

The next speakers covered one of my favourite mantras: nutrition comes first. The discussion after these talks raised the question of why we talk about individual food ingredients or nutrients, when in reality we mix foods together in our diets and obtain more than the sum of the parts. This is an excellent point, and led me to wonder why we break those ingredients down into yet smaller parts. Take saturated fats as an example. We often speak negatively of saturated fats, and yet most foods that contain saturated fats tend also to carry many essential nutrients in high density. A more holistic view on the value of a food or diet is required.

The talks and discussions continued to the topic of affordability and availability of food. A common rhetoric was that talking about these concepts in a global context or even a New Zealand context does not capture the problem entirely. Lockdown restrictions in this country demonstrated that many individuals do not live near a supermarket and rely on fishing or hunting for a major part of their diet. When these people are locked into their house, they are also locked out of their food supply. As we discuss the accessibility of food, it is essential to consider those that are less fortunate.

I always enjoy the passion of Professor Leroy's talks. He takes a line of argument that most people will never have applied to the food system debate: a human psychology perspective. Much of the discussion after his talk centred on the question of why we talk about plants *or* animals, rather than plants *and* animals. There is a pressing need for us all to develop our communication awareness: our understanding of how we communicate and how we perceive the communications of others, including the media. The responsibility for this is on each of us as individuals.

Moving to Professor Van Zanten's talk, the circular economy is a concept that the Dutch have been leading the narrative on for some time. As a small country with a large population and a huge amount of food being imported and exported, circular thinking is very valid for them. Rightly, the question was asked at Feed Our Future about what circularity would mean for New Zealand. When we think about the way we produce meat and milk, in many ways it is circular. What is not circular is sending the product overseas, incurring an environmental footprint to us as the producer, rather than to the consumer, as Dr Ledgard pointed out. It is interesting to consider the same situation for fossil fuels: assigning a footprint to the producer rather than the consumer would simply not work, and yet we take this approach for food.

Professor Martindale gave a highly optimistic and informative presentation on food waste. New to me was the approach of using big data and blockchain technologies, giving us the ability to trace food and thus food waste around the world. We now have a huge opportunity to identify where there are greater risks of food waste and put in place mitigation strategies in those markets. This may lead to redistribution or rethinking our supply chains to ensure that there is time to adjust.

It is worth noting that Dr Ledgard and I have known each other for the better part of 30 years. When we first met, he was the foremost Southern Hemisphere expert on nitrogen fertiliser, and today he holds a similar position for life cycle assessment – an amazing achievement. Dr Ledgard demonstrated how good we are in New Zealand at producing food with a low footprint, showing that we can drop a leg of lamb on a supermarket shelf in the United Kingdom at a lower environmental footprint than the average local farmer could. While this is an extraordinary achievement and worthy of celebration, it was rightly pointed out in the discussion that we should not be the 'best of the worst'. Our production systems need to be, and are, working towards being benign in their interaction with nature.

Professor Wood asked and attempted to answer many big questions about alternative food production systems of the future. I am often guilty of looking at these new technologies through a lens of today. However, the figures cited by Professor Wood for the reductions necessary in the price of lab-grown meat before it becomes competitive with conventional production were astounding. We should definitely be asking whether it will be possible to develop these technologies at the rate and price that we have developed non-biological technologies, such as computer chips, or whether there are stricter limits to biology.

The final speaker, Professor Hort, spoke on one of my favourite topics: trying to understand people. As she emphasised, 95% of our decisions are based on fast-thinking intuition, while only 5% are rational. The consumer is king, and it is an incredibly important message to take away from this event that, although we have spoken much about the biophysics, biochemistry and the nutritional aspects of the food system, it is all redundant if a consumer is not going to buy it. We need to understand what motivates their decisions.

Returning to my work at MPI, I have recently been assigned another polarising topic: regenerative agriculture. This is a concept largely of African and North American origin that has recently been talked about in Australia regarding degraded soil systems. An upswell in interest in New Zealand has resulted in the need for the Ministry to investigate the role of regenerative agriculture in sustainable food production systems. Regenerative

practices, in our definition, are those that in isolation or collectively can achieve improved outcomes for our productive landscapes, rivers, coastal and marine environments; biodiversity; natural ecosystems and animal welfare; promote health and wellbeing for humans; and ensure we can grow and consume more food and fibre products sustainably.² This definition largely encompasses all that we discussed at Feed Our Future.

One attendee said at the event that, while New Zealand cannot feed the world, we can help the world learn to feed themselves. This echoes the words of the Minister for Primary Industries, the Hon Damien O'Connor, who says that New Zealand farmers should be the best farmers *for* the world, rather than the best farmers *in* the world. The complexity of the global food system is enormous, yet the narrative is incredibly simple. We cannot 'greenwash' our production systems; we cannot be the best of a bad bunch. One of the major points raised at Feed Our Future was that we need to get better at communicating the facts. If the facts and the narrative are lost on the average consumer, then we need to understand better how to communicate with the consumer.

Much food for thought.

² Ministry for Primary Industries, webpage: <https://www.mpi.govt.nz/funding-rural-support/sustainable-food-fibre-futures/regenerative-farming-practices-project/>