Feed Our Future – an opportunity to discuss the science of sustainable food systems

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The Riddet Institute's Feed Our Future event, held at Te Papa in Wellington (9 June 2021), was a fantastic opportunity to bring together New Zealand policy makers, business, and science, for a conversation that is very relevant to all New Zealand. As a net food exporting nation, New Zealand plays an important role in the global food system and in many cases does so exceptionally well. But the sustainability of our domestic food production and consumption is facing considerable pressure. Whilst New Zealand is well known for the quality of the foods we export, we are increasingly seeing evidence of domestic shortages of foods and specific nutrients, and we are aware of increasing environmental sustainability and perceived health issues. Consequently, the future sustainability of our food production is something that must be considered by all those making decisions about our national food system, and this is increasingly on the minds of all New Zealanders.

Sustainability means different things to different people. For many, it brings to mind thoughts of greenhouse gases and water quality, to others it is all about getting enough food to be adequately fed on a daily basis. But sustainability has to be more holistic than simply environment or health or economic outcomes. A sustainable practice (in this case the global food production system) is one that will continue indefinitely into the future; one that still serves our great-grandchildren as well as, or better than, it served us. Thus, for a food system to be sustainable, it must feed people, provide incomes, be socially acceptable, and not compromise the natural resources on which it depends.

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At Feed Our Future, we attempted to bring together speakers who could cover many aspects of a sustainable food system. This had its challenges, given the huge complexity that surrounds the sustainability of global food production. The reality is that we could only scratch the surface but our aim was to get the conversation started. There were many more voices that we would have liked to include, had we a longer time. However, we would like to thank all of our speakers for their efforts in preparing their talks for the event, and manuscripts for this publication. We asked each of them to be accessible and evidence-based, and to provoke discussion. The quality of the discussion in the room attested to their success. This publication is our attempt to continue that conversation. The speakers' talks are also available on our website.[1]

Again, were we not limited by the capacity of a room, we could have invited many more. There was certainly the interest to attend. By providing recordings of the talks online and summaries of the discussion sessions here, we hope that those who could not attend in person can still benefit from the event. We would also like to thank those who did attend for engaging in the discussion and providing valuable insights and feedback on what they heard.

Feed Our Future was organised by the Sustainable Nutrition Initiative™ (SNi) research program at the Riddet Institute. Our research focusses on the question: "How does the world feed the world?" Part of this research is in the development of the

[1]Video recordings of all talks from the event are available at:

https://www.riddet.ac.nz/feed-our-future-a-new-zealand-sustainable-food-systems-dialogue-event/

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DELTA Model, a publicly-available scenario-testing tool, which allows users to design a global food production system and to see how this measures up against the nutritional requirements of the global population. The model has generated some valuable insights about the current and future global food system.

For example, of the food mass available globally for human consumption, 75% is plant-sourced, the remainder being animal-sourced. This reflects the fact that over 9 billion tonnes of plant food commodities are produced on farms globally each year, compared to around 1.5 billion tonnes of animal-sourced food commodities. One reason for the change in ratios between production and consumption is waste: over 90% of food waste along the supply chain and in home is plant matter.

Plant foods supply the majority of global nutrient availability for most nutrients. The exceptions are things like vitamin B12, calcium and some essential amino acids, which are largely sourced from animal foods. The complementarity of plant and animal production systems, and the complementarity of their products for good nutrition, is an important factor to consider.

When examining global food production and distribution in 2018, the DELTA Model calculated that there is already sufficient energy and protein availability for the current global population. Indeed, there is enough for a further 1 billion people. However, practically we know that there is both over- and undernutrition around the world. This malnutrition reflects the inequity of food distribution in the current global food system. We have not been able to model these issues and so they are not reflected in the DELTA Model. However, recognising these limitations, the model does clearly show that we currently produce adequate levels of macronutrients globally.

An unexpected outcome from the model was the importance of considering micronutrients and trace elements when thinking about adequately feeding the global population. The model suggests there is insufficient calcium and vitamin E available currently to meet the requirements of the global population, even if distributed equitably. Other nutrients, including iron, potassium, zinc and vitamin A and B12 were close to deficient, implying that widespread deficiency will exist, given our current inequitable food distribution.

Furthermore, reducing food waste along the supply chain and in home did not resolve these nutrient gaps when modelling that scenario. We waste less of the foods rich in these micronutrients than we do of foods rich in energy or fibre, so reducing food waste has a differing impact on the availability of different nutrients.

Many have suggested that reductions in the consumption of many animal-sourced foods will be necessary to prevent great damage to our health and environmental sustainability. While the details of these outcomes are uncertain and are topics desperately in need of sensible, fact-based scientific discussion, the DELTA Model at least, allows us to examine what changes to global food production will mean for the adequacy of nutrient supply for human nutrition in the future. Animal-sourced foods currently contribute a quarter of global food mass for consumption but deliver disproportionately high proportions of the global availability of protein, fat, calcium, phosphorous, selenium, zinc, vitamins A, B2, B5, B12, and all of the bioavailable indispensable amino acids. Our findings with the DELTA Model indicate that reductions in animal production as the global population increases will make meeting global nutrient requirements very difficult, due to the nutrient density of these foods and their role in delivering key nutrients not as easily available from plant-sourced foods. This motivated the coining of the phrase *"plant-based and animal-optimised"*, as the goal for what the food system should aim to be. This is not driven by greater support for animal-sourced foods but reflects a reality that to balance global nutrient supply and deliver sustainable nutrition to the global population, the right balance of plant and animal sourced foods will be required.

This is not to say that animal-sourced food consumption by individuals should increase or decrease. Individuals must meet their own nutrient requirements in the way that best suits them, based on their own choices and values. A vegan diet for example, is perfectly feasible for those with the knowledge and income to do it well. What our research does tell us is that, on a global scale, it is difficult or impossible to produce sufficient micronutrients and trace elements to meet the global demands for these nutrients without animal production. Macronutrient supply would not be the problem; it would be adequate micronutrient availability that would be the greatest challenge under an entirely plant-based production system.

Looking to the future, we have high expectations for what SNi can achieve. We are currently building resource footprints into the DELTA Model, starting with land use, so that a user can assess the environmental feasibility of the scenarios they simulate. Elsewhere, we are working with our partners to assess the importance of food trade to nutrition in different countries. We are also quantifying the difference in food composition in different parts of the world and what this means for local and international nutrition. Finally, the creation of a model for the New Zealand food system, to better analyse its sustainability into the future is an important future target for SNi.

Sustainable food systems and sustainable nutrition are exciting fields, attracting global attention. The United Nations Food Systems Summit, held this year to promote action towards sustainable food systems, demonstrates the importance of this science at the highest level. Any decisions made in this field must be evidence-based, or risk jeopardising the ability of the food system to deliver nutrition for all. With events like Feed Our Future, we hope to continue to bring the science to the forefront of decision-making. This is too important a topic not to be at the forefront for discussion in New Zealand.