

Development of a national food system mathematical model for exploring future scenarios and impacts

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Abstract

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Sustainability in Aotearoa New Zealand's food system is essential for environmental health (taiao ora) and human well-being (tangata ora). However, achieving resilience in our food system faces significant cross-sector challenges, requiring a national food strategy that addresses environmental, economic, and social pressures⁽¹⁾. This work aims to develop the first national computational model of Aotearoa New Zealand's food system, integrating key factors into a decision support tool. The model aims to support food system resilience by offering an accessible platform that could help inform decisions to strengthen preparedness for shocks, while also providing insights to enhance everyday food security. The Kai Anamata mō Aotearoa (KAMA) model leverages new data and indigenous crop trials to combine work across agriculture, environment, and human wellbeing, forming a comprehensive tool to examine food system resilience. This model will capture the resources required, outputs produced, and wellbeing outcomes of our food system. The KAMA model was built using a flow-state modelling approach, which allows for flexible configuration of land uses and ensures that the model can adapt to future technologies and climate change scenarios. The preliminary development the KAMA model was used to demonstrate the current production system and applied to a regional case study from Te Taihū, integrating region-specific food production data, including apples, kiwifruit, mussels, wine, and hops production. Outputs included labour, carbon dioxide emissions and mass of production. Beyond food production, this model will enable users to explore the impacts of land use for commodity production, the effects of trade, nutrient supply, and the broader implications for well-being. model will be made publicly accessible online to allow any interested individual to explore the future of the national food system.

Keywords: Resilience; sustainability; wellbeing; National food systems; mathematical modelling

Ethics Declaration: Yes

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References

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