Oceania Chapter of the System Dynamics Society
Systems Thinking & Modelling Symposium
7 February 2025

Agriculture into a climate changed future – a prototype serious game to explore the sustainability of current practice trajectories.

Justin Connolly [a], Warren Fitzgerald [a], Melissa Hackell [b] and Blair Keenan [b]
a. Deliberate Consulting Limited
b. Waikato Regional Council
Presenting author is underlined.

Corresponding Author Email: justin.connolly@deliberate.co.nz

The agricultural sector is an important component of the Aotearoa-New Zealand economy, more so than other similar OECD countries. Most of this agricultural activity, its expected production and anticipated financial returns, rely on practices that are coming under pressure in a climate changed future. As a result, there is increasing conversation about whether agriculture in its current form can be sustained into a climate changed future. While there is broad acceptance that some changes in agricultural practice are required, there is little agreement about what sort of changes and to what extent.

Agreement on the nature of change required in agricultural practice is in part inhibited by a lack of alignment on the sustainability of current practice. In part, this disagreement is underpinned by different temporal understandings and incentives in the agricultural sector – this is, a tension between operating for benefit now and operating for benefit in the longer-term. This work seeks to synthesise relevant interacting complexities of agricultural production and climate change to help build a shared understanding of the potential sustainability of agricultural practices.

Previous work had built a causal diagram (including stocks and flows) that articulated the dynamics of drought by focusing on the water cycle. This work focused that on the particular geographic area of the Hauraki Plains, and area of drained peat wetlands at risk from increased sea-level rise. It also expanded the causal diagram to include the impacts of drought as well as flood – both likely impacts of climate change.

The causal diagram was built with internal expertise from the Waikato Regional Council, who have legislative responsibility for flood protection. Once completed it was developed into a prototype serious game, designed to focus on important dynamics and decision areas most relevant to farmers.

The prototype serious game includes core tensions and elements of agricultural life. To make the game accessible to a wide audience it focuses on relative financial returns from the perspective of anthropogenic use of land for agricultural and financial return. It is intended to be run multiple times with the same players to allow multiple possible futures to be explored.

It includes variables such as the ability to maximise production and reduce costs (responding to traditional agricultural aspirations), which increase financial return. This is contrasted with financial tensions such as debt, insurance, and rates (taxes). Changing probabilities of different annual weather conditions, as well as major drought or flood events, also have a financial impact and seek to inject a realistic representation of changing climate conditions. Additional climate impact mitigations are added to later rounds to explore a range of possibilities.

While full testing is yet to be completed, initial testing indicates that the game helps participants realise that most trajectories into the future trend downwards in terms of sustainability. It highlights a tension between the benefits of seeking financial sustainability in the short term, with the likely challenges of financial sustainability and climate impacts in the longer-term. It is anticipated that this can play an important role in increasing the shared understanding of the likely challenges if agricultural production continues along a business-as-usual path. It is intended to help support wider conversations about the future of agricultural landscapes in a climate changed future.