

Navigating food system transitions in regional Australia

Key points

- Australian communities and industries are under pressure to transition to more sustainable and socially inclusive food systems.
- Current approaches to modelling provide limited insights into practical steps that communities and industries can take towards these transitions.
- Researchers in CSIRO are working to provide new and more flexible approaches to modelling, and using these to support communities and industries facing change.

The Challenge

Like other industrialised economies around the world, Australia has greatly benefited from a multi-decadal focus on the economic efficiency since the competition policy reforms of the 1990s. However, an over-reliance on markets has accumulated a range of sustainability and social inclusion challenges that are either unintended by-products of market-related activity, or are important societal goals that profit-focussed entities often have little or no commercial incentive to provide (e.g., local income, equity between farmers, environmental sustainability). These accumulating challenges are causing pressure to transform Australia's food systems from a near-exclusive focus on production and economic efficiency goals, to include sustainability and social inclusion goals.

As agri-food systems come under pressure to recognise sustainability and social inclusion goals, it follows that the models and analytical capabilities we use to understand and manage these systems need to be able to equally represent economic, environmental, and social outcomes, as well as important interactions between them. This means making a transition from models with a near-exclusive representation of production and economic outcomes, to more flexible and participatory models capable of representing local factors and pathways that communities and industries can take to more sustainable and socially inclusive futures.

Current models

Most economic models use broad scale and highly aggregate representations of markets and economies with assumptions of rational choice and access to perfect information among individual value chain actors to perform cost-benefit analysis. It is difficult to modify these models to represent the nuanced differences between local food systems and other (non-market) priorities that value chain actors could have. Local approaches to managing change are strongly influenced by locally nuanced differences between market structures (such as degrees of cooperation vs competition), decision-making processes (priorities, preferences, governance), and cultural values (history and traditions, dietary patterns, attitudes). The inflexible and expert-driven nature of techno-economic models such as Integrated Assessment Models (IAMs) limit their usefulness for supporting the types of locally diverse, complex, socially-driven, and rapid transitions that are taking place in agri-food systems.



There is also deep concern over the engagement strategies via which economic models are currently applied. A lack of proper consultation is a key concern in communities disproportionately affected by transitions. For example, regional communities in the Central West of New South Wales are deeply concerned about the long-term and uncertain impacts of renewable energy developments on agriculture and land values, and a perceived lack of engagement with them. Participatory approaches to modelling and analysing transitions have the potential to integrate local and expert knowledge, and explore local appropriate trade-offs between contended goals.

Participatory approaches to modelling are also in demand to support sustainability transitions in the Queensland's Lockyer Valley. This region is home to intensive horticulture, cropping, and grazing and is a major food producer for Brisbane and eastern Australia. The region is under pressure to reduce greenhouse gas emissions, enhance resilience to climate change impacts, and deliver a 2032 Olympic Games with a positive sustainability and social inclusion legacy. Flexible and

participatory forms of economic modelling are being developed to support transitions to more sustainable agriculture by adopting waste-to-energy solutions and locally-appropriate low-carbon farming methods.

Our Approach

The approach that CSIRO is developing empowers regional communities by involving them in the design and application of the models to address concerns around engagements and foster options that resonate with local values and needs. CSIRO's approach aims to:

- Account for local factors within each region and community.
- Capture the interactions between the agri-food and other sectors that are most important to each region.
- Enable advantages and disadvantages of proposed policy interventions to be assessed against local values and priorities.
- Help identify regionally important co-benefits and synergies with other sectors such as energy and waste.

Our goal is to help community leaders and local decision-makers anticipate and respond to diverse risks and opportunities that the current and future agri-food systems face. We take a human-centric approach to model development with three steps:

- **LISTEN:** We listen to regional partners to map the complex landscape of risks and opportunities and make connections between what they care about and what future agri-food systems should look like.
- **CO-DEVELOP:** We combine local and scientific knowledge to co-develop pathways that respond to future risks and take advantage of opportunities in an adaptive manner that is tailored to each region.
- **SCALE UP:** We learn from processes and approaches tested in other regions to provide practical means for the uptake of our approach in a larger number of regions which are facing agri-food system transitions.

This novel approach to more insightful and supportive regional modelling has already been tested in regional applications (see Case Studies 1 and 2). Key characteristics of these regional models include:

1. **Improved representation of regional drivers** in agri-food system transitions that are often overlooked or simplified in current models.
2. **Integration of local stakeholder knowledge**, such as diversity of priorities, decision-making processes, and investment opportunities, through transdisciplinary and co-creation exercises with various stakeholders.
3. **Simple and flexible structures for rapid prototyping of new insights in shorter cycles of assessment** through faster model building and applications of models that are more transparent for different stakeholders.

Benefits of this approach

For regions transitioning between agri-food systems, our approach will:

- Identify the opportunities and challenges to leverage existing capabilities within the region.
- Provide evidence-based assessment of regional investment and assess the risks of future agri-food systems.
- Empower the community to negotiate with governments and funding bodies to obtain the support and government buy-in, and improve the confidence of potential investors.

Our approach will also have wider national benefits:

- Empower regions with capabilities that are simple, flexible, and accessible for rapid prototyping of new insights in shorter cycles of assessments, allowing national policymakers to receive strategic inputs from the across the country.
- Ensure genuine engagement with community and other regional stakeholders in supporting future agri-food systems with an inclusive transition that reflects the diverse needs and aspirations of the community within various regions.
- Unlock the roll-out of agri-food system transitions from the bottom-up and in regions to fill in the national-scale gaps with system-wide outcomes such as partnerships, capacity, and revenue across the country.



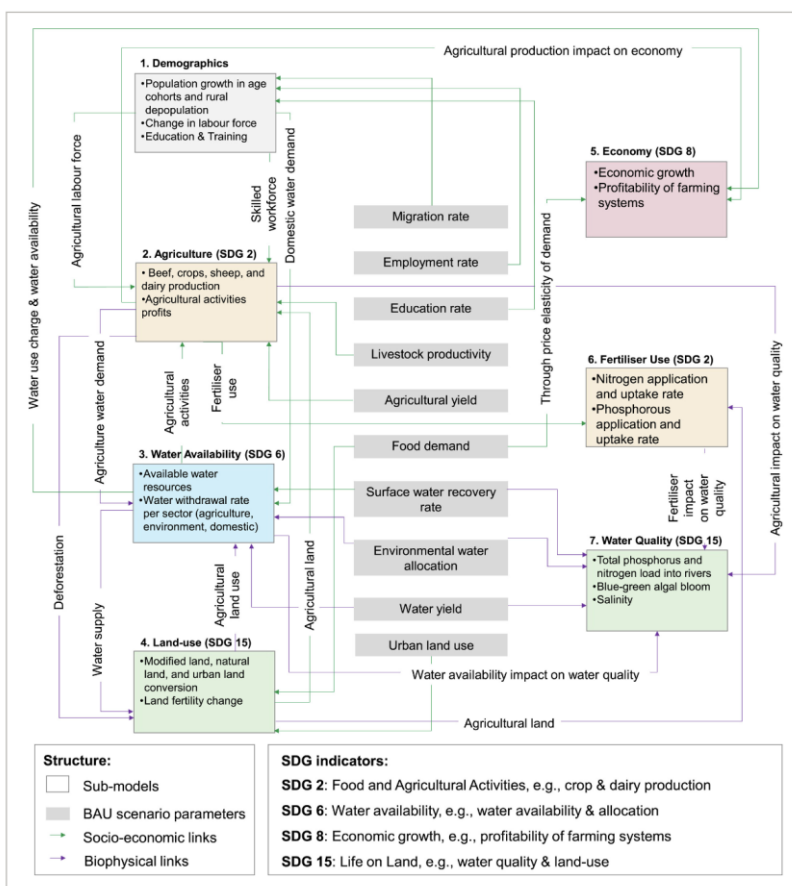
Case study 1

Actionable regional pathways for agriculture-economy-environment trade-offs

Goulburn Murray Irrigation District

The Goulburn-Murray Irrigation District (GMID) in northern Victoria, Australia, is a large area that supports farming and has a population of 170,000 people. This district is facing challenges like climate change, water scarcity, and a declining population. To address these issues, a study was funded by the Ian Potter Foundation and Deakin University. This study reviewed 126 documents related to sustainability in the region, interviewed 16 local experts, and undertook engagements activities with local experts. The study identified **five key priorities** in the GMID that will shape the future of agri-food system in the region: food production, clean water, economic growth, climate action, and environmental health.

A regionally-specific **model** was developed to better understand the complex trade-offs between these priorities and help local decision-makers make informed choices. This model represented regional agriculture, water availability, and the local economy, and it showed how these are connected. It was used to local stakeholders explore options for improving farming productivity, reducing costs, meeting environmental goals, and attracting more people to the region. The model enabled decision-makers to explore the **effectiveness of these options**, and interactions between them, out to 2030 and 2050.



Geographical location of the case study (top-right); workshops and engagements activities (bottom-right); overview of the participatory model's main components (left)

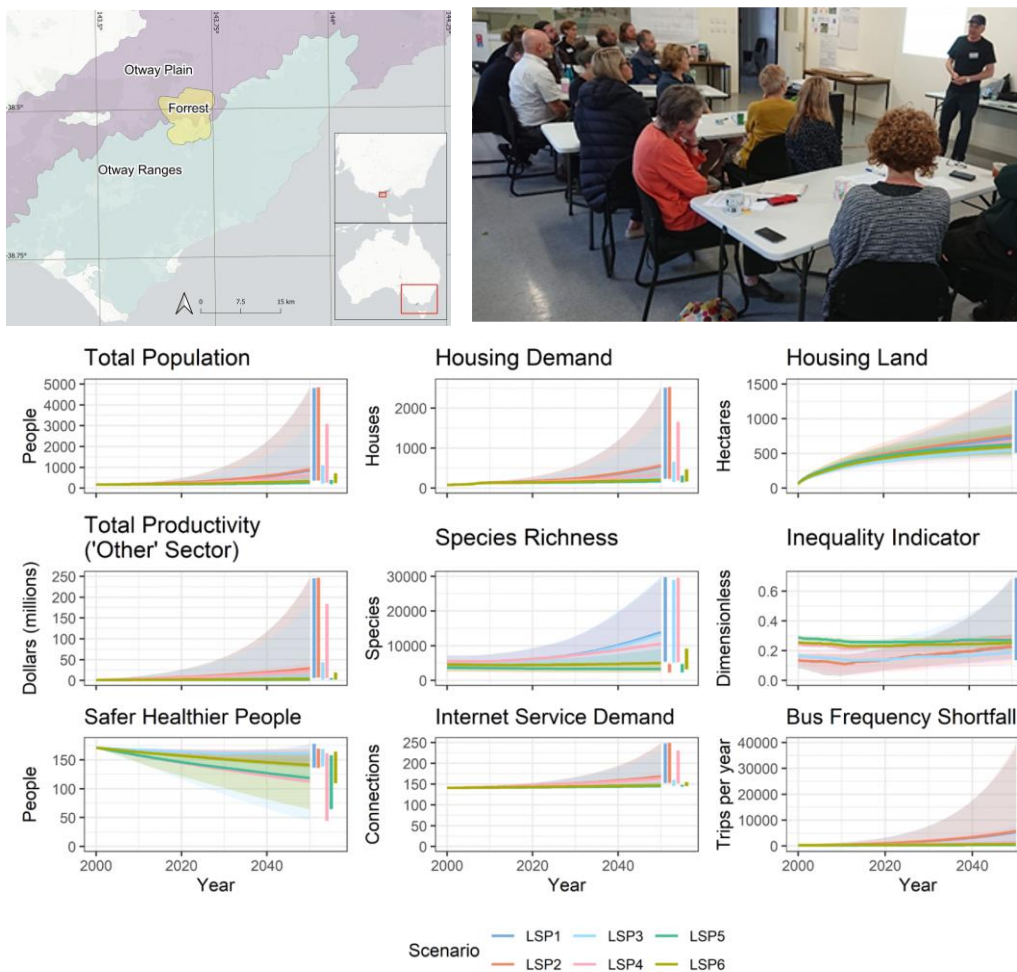
Case study 2

Community sustainability pathways towards local priorities

Otway Ranges

Forrest, a small town in southern Australia, is transitioning from a history of forestry and agriculture to new sectors like tourism. The community is working together to plan for a sustainable future. To identify their future priorities, a study was funded by the Ian Potter Foundation and Deakin University help the community shapes its goals for a sustainable future. This resulted in a conceptual map of how different local issues are connected, such as sustainable growth, social equity, and environmental preservation.

To help plan for the future, local priorities were translated into a participatory model that enabled optimal pathways towards preferred futures to be compared and evaluated. The collective discussion process revealed six possible paths, each with different local priorities. The model helps the community understand the potential consequences of each path, informing choices about their shared future.



Geographical location of the case study (top-left); workshops and engagements activities (top-right); example of projected output indicators and scenarios (bottom-right)

Food System Horizons – Catalysing a sustainable, nutritious, and equitable food system future

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Food System Horizons is a collaborative initiative between The University of Queensland and CSIRO.

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