Risk and Resilience of Australian agri-food supply chains

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Abstract

Australian agribusiness has made a significant transition from commodity delivery to consumer-oriented value addition. This sector is mainly export-oriented and operates on a large scale. Its considerable distances, linking production, markets, inputs, and infrastructure, make it a high-cost operator relative to international competitors. Over the last decade, a succession of shocks to both demand and supply have challenged the Australian agri-food supply chains (SC) in the forms of natural disasters, geopolitical maneuvering in trade policies, pandemics, and drought. These shocks are in many cases associated with broader trends such as climate change, expanded biosecurity threats, more fickle consumer needs, and changes in labor mobility.

The current state of concentration in key food products has increased the importance of assessing risks and building resiliency in the design of food SCs. Nonetheless, the management focus has been on the conventional performance metrics associated with cost and capacity utilization. The growing risks are strong incentives for developing advanced analytical and predictive tools to enable better-informed food value chain management. Adopting these analytical capabilities in agri-food SCs requires that they be decision-ready and demonstrate a value proposition. The related research and practical applications of these tools in agriculture and food systems are dominated by blockchain, artificial intelligence, simulation and modeling, etc.

Collaboration along the agri-food SC is central to the realization of benefits from many data-driven solutions. Many of the farm management decision-making tools are inconsistent with the SC analytics and their integration has been limited. In fact, there are missing feedback loops between market demand, prices, and farm management decisions, what and how much to produce, and what practices and when to adopt. Modeling, especially participatory modeling, is essential to understand the various scenarios and management solutions. Although studies addressing simultaneous and dynamic SC decisions are still lacking, the literature trend is towards more integrative, holistic agri-food models.

Through the engagement of stakeholders and using real-time data, this study develop an integrated decision-making tool that include a range of decisions from farm level (e.g., regenerative versus conventional farming) to the production, distribution (e.g., technology selection), and consumer level (e.g., adaptive diet). The tool allows to explore resilience strategies in SCs and can scale them up to highlight their potential applications in advancing resiliency and adaptation throughout the food system. It outlines a set of shocks or challenges associated with different commodity sectors and identifies thematic impacts of strategies on varying echelons of SCs. The results provide evidence-based policy implications for decision-makers in the food sector to understand the effect of various interventions on strengthening the resilience of our global food system.