

Grain supply chain optimisation: A qualitative perspective

Garima ^a , D. Olaru ^a and K. Siddique ^b

^a Business School, The University of Western Australia, Perth

^b Institute of Agriculture, The University of Western Australia, Perth

Email: y.garima@research.uwa.edu.au

Abstract: Grain supply chains (GSC) are complex systems with numerous stakeholders, dynamic interactions, and uncertainties, requiring sophisticated modelling and simulation for understanding and predicting decision-making (Behzadi et al., 2018). This abstract presents a systematic literature review using content analysis (using Leximancer) to identify gaps and interconnectedness in GSC research. A Boolean search string (agri* AND supply chain* AND (simulation* OR optimi?ation*)) in all fields (title, keywords, abstracts) published in English since 2000) was used to obtain 1,681 records from SCOPUS and Web of Science databases, with 75 relevant studies (13 review articles, 7 conference proceedings, 49 Q1, and 6 Q2 articles) selected following PRISMA guidelines. Existing systematic literature reviews (SLRs) were separately examined to avoid duplication. The Leximancer analysis based on machine learning methods for understanding text data through word frequency relations of 62 selected studies revealed six primary themes: Supply Chain, Model, Farmers, Agents, Simulation, and Transport and Logistics.

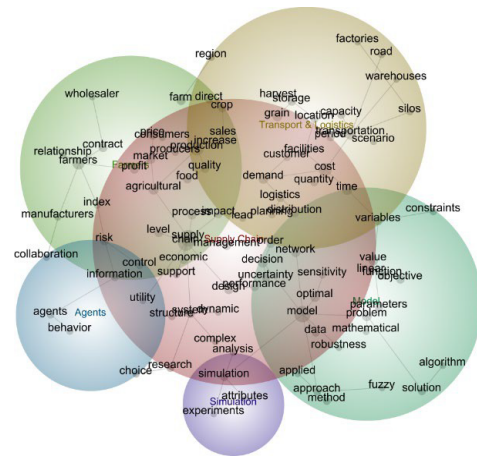


Figure 1. Leximancer concept map of 62 grain supply chain articles

It revealed significant gaps and connections among themes, finding no direct overlap between Farmers and Model themes indicating that research in GSC often limits farmers' roles to production and demand satisfaction, treating them as nodes rather than central figures in models and themes (Kingwell et al., 2020; Krejci & Beamon, 2015). The study emphasizes the need for more simulation-based methods in supply chain research due to their ability to capture complexity, stakeholder behaviour, and uncertainty, offering adaptability and facilitating scenario analysis (Higgins et al., 2018). Transport and Logistics literature focuses on constraints and modelling, while Agents and Simulation themes explore systems and complexity. The absence of overlap between these themes indicates potential for integration to enhance supply chain management (Asgari et al., 2013). Existing SLRs further emphasise the need for a more comprehensive examination of product-specific supply chain themes and exploration and validation of simulation models, based on generic agribusiness, agri-food supply chains, and agriculture-related literature. Only two review papers discussed perishable crop supply chains, primarily focusing on harvest planning stages and post-harvest losses, further highlighting the need for studying product-specific supply chains due to their unique characteristics.

Future research can bridge themes and explore synergies in grain supply chain research to improve modelling and simulation, enhance understanding of product-specific agricultural supply chains, and promote cross-disciplinary collaboration. By integrating diverse perspectives from academia and industry, stakeholders can develop efficient, resilient, and sustainable systems that inform decision-making and policy implementation.

REFERENCES

- Behzadi, G., O'Sullivan, M. J., Olsen, T. L., Zhang, A. (2018). Agribusiness supply chain risk management: A review of quantitative decision models. *Omega*, 79, 21–42.
- Kingwell, R. S., Loxton, R., Mardaneh, E. (2020). Factors and scenarios affecting a farmer's grain harvest logistics. *Australian Journal of Agricultural and Resource Economics*, 64(2), 244–265.
- Krejci, C.C., Beamon, B.M. (2015). Impacts of Farmer Coordination Decisions on Food Supply Chain Structure. *Journal of Artificial Societies and Social Simulation*, 18(2).
- Asgari, N., Farahani, R.Z., Rashidi-Bajgan, H., Sajadieh, M.S. (2013). Developing model-based software to optimise wheat storage and transportation: A real-world application. *Applied Soft Computing*, 13(2), 1074–1084.
- Higgins, A., McFallan, S., Marinoni, O., McKeown, A., Bruce, C., Chilcott, C., Pinkard, L. (2018). Informing transport infrastructure investments using TraNSIT: A case study for Australian agriculture and forestry. *Computers and Electronics in Agriculture*, 154, 187–203.

Keywords: Grain supply chains, decision support, content analysis