

Agent-Based Modelling to Improve Dairy-origin Beef Production: Model Description and Evaluation

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Abstract : Agent-based modeling (ABM) enables an in silico representation of complex systems and captures agent behavior resulting from interaction with other agents and their environment. This study developed an ABM to represent a pasture-based beef cattle finishing systems in New Zealand (NZ) using attributes of the rearer, finisher, and processor, as well as specific attributes of dairy-origin beef cattle. The model was parameterized using values representing 1% of NZ dairy-origin cattle, and 10% of rearers and finishers in NZ. The cattle agent consisted of 32% Holstein-Friesian, 50% Holstein-Friesian-Jersey crossbred, and 8% Jersey, with the remainder being other breeds. Rearers and finishers repetitively and simultaneously interacted to determine the type and number of cattle populating the finishing system. Rearers brought in four-day-old spring-born calves and reared them until 60 calves (representing a full truck load) on average had a live weight of 100 kg before selling them on to finishers. Finishers mainly attained weaners from rearers, or directly from dairy farmers when weaner demand was higher than the supply from rearers. Fast-growing cattle were sent for slaughter before the second winter, and the remainder were sent before their third winter. The model finished a higher number of bulls than heifers and steers, although it was 4% lower than the industry reported value. Holstein-Friesian and Holstein-Friesian-Jersey-crossbred cattle dominated the dairy-origin beef finishing system. Jersey cattle account for less than 5% of total processed beef cattle. Further studies to include re-tailer and consumer perspectives and other decision alternatives for finishing farms would improve the applicability of the model for decision-making processes.

Keywords : agent-based modelling, dairy cattle, beef finishing, rearers, finishers

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