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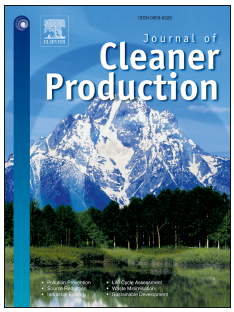

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LIFE CYCLE ASSESSMENT OF CANADIAN EGG PRODUCTS, WITH DIFFERENTIATION BY HEN HOUSING SYSTEM TYPE

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ABSTRACT

In order to elucidate the current sustainability profile of the Canadian egg industry, and to support Canadian egg farmers and processors in supply chain management for sustainability objectives, an ISO 14044-compliant environmental life cycle assessment study of egg product supply chains, including differentiation by hen housing system type, was undertaken. It was found that the cradle-to-consumer resource use and emissions attributable to eggs and egg products in Canada are largely determined by a small number of variables. Foremost among these is the composition and amount of feed consumed in breeder flock, pullet and layer facilities – accounting for, on average, 35-81% of impacts at the egg farm gate, depending on the category of resource use or emissions considered. After feed composition and feed conversion efficiency, another critical determinant of supply chain emissions is manure management (17-46% of emissions) – in particular for emissions of acidifying (45%) and eutrophying (46%) compounds. These emissions are nfluenced by feed composition (i.e. N and P content of feed inputs), feed conversion efficiencies, and manure handling strategies. Industry-level initiatives focused on optimizing nutrient cycling and minimizing losses of N and P may potentially leverage significant improvements in the overall environmental profile of the Canadian egg industry. Sourcing of pullets also made non-trivial contributions (19-23% of impacts, on average, across the housing systems), while contributions related to energy inputs (1-9%) and water inputs (0-17%) were smaller. These observed patterns were quite consistent between conventional cage, enriched, free run and free range production, whereas organic production evinced a different pattern due to the lesser role of feeds in influencing the overall impacts of egg production.

Among the five housing technologies considered (i.e. conventional cage, enriched cage, free run, free range, and organic), both the life cycle inventory and impact assessment results suggested quite similar levels of performance between the non-organic systems. Only for organic production were life cycle resource use and emissions significantly different from the other housing systems. Here, the lower observed resource use and emissions intensity of organic eggs (57-80% of impacts compared to the national average) is largely explained by the superior environmental performance of organic feeds compared to conventional feeds rather than differences in egg farm level performance.

Shell egg processing and packaging, as well as egg breaking and further processing activities add only small increments to the overall supply chain resource use and emissions associated with Canadian eggs and egg products. The kinds and amounts of packaging used for egg products may, however, present improvement