

Title Life cycle inventory analysis of fresh tomato distribution systems in Japan considering the quality aspect

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Citation Journal of Food Engineering, Volume 86, Issue 2, May 2008, Pages 225-233

Keywords Life cycle of fresh tomato; Distribution systems; CO₂ emission; Japan

Abstract

Life cycle of fresh tomato was evaluated to determine CO₂ emissions during its cultivation and distribution. Low temperature (LT) and modified-atmosphere packaging (MAP) were compared for their effect on quality. Road and sea transport were also compared. The method of cultivation and transport and the distribution systems affected the overall life cycle inventory (LCI, CO₂ emissions). Life cycle inventory was larger for greenhouse produce than for that raised under plastic cover and larger for produce transported by road than for that transported by sea. The distance between production and consumption area affected the LCI significantly. It is worthwhile to note that MAP would not be environmentally acceptable over LT packaging in the case of tomatoes transported by road over a distance shorter than 2000 km although such transport does not require any cooling during transport and storage: MAP would be a better option in the case of sea transport beyond 1000 km. The distance over which MAP is the better option is thus dependent on the mode of transport because the two modes of transport differ in speed and, therefore, in emissions. A change in cultivation from greenhouse to plastic cover, in transport from road to sea, and in packaging from LT to MAP is required to minimize the LCI and would abate approximately 0.14–0.24 million tonnes of CO₂ emissions a year from Japan.