

Life Cycle Assessment of Almond Processing: Off-ground Harvesting Scenarios

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Abstract : The environmental impact and particulate matter emissions (PM) associated with the production and packaging of 1 kg of almonds were evaluated using life cycle assessment (LCA). The assessment began at the point of ready to harvest with a system boundary was a cradle-to-gate assessment of almond packaging in California. The assessment included three scenarios of off-ground harvesting of almonds. The three general off-ground harvesting scenarios with variations include the harvested almonds solar dried on a paper tarp in the orchard, the harvested almonds solar dried on the floor in a separate lot, and the harvested almonds dried mechanically. The life cycle inventory (LCI) data for almond production were based on previously published literature and data provided by Almond Board of California (ABC). The ReCiPe 2016 method was used to calculate the midpoint impacts. Using consequential LCA model, the global warming potential (GWP) for the three harvesting scenarios are 2.90, 2.86, and 3.09 kg CO₂ eq/ kg of packaged almond for scenarios 1, 2a, and 3a, respectively. The global warming potential for conventional harvesting method was 2.89 kg CO₂ eq/ kg of packaged almond. The particulate matter emissions for each scenario per hectare for each off-ground harvesting scenario is 77.14, 9.56, 66.86, and 8.75 for conventional harvesting and scenarios 1, 2, and 3, respectively. The most significant contributions to the overall emissions were from almond production. The farm gate almond production had a global warming potential of 2.12 kg CO₂ eq/ kg of packaged almond, approximately 73% of the overall emissions. Based on comparisons between the GWP and PM emissions, scenario 2a was the best tradeoff between GHG and PM production.

Keywords : life cycle assessment, low moisture foods, sustainability, LCA

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