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# Systematic review of greenhouse gas emissions for different fresh food categories

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## Abstract

This paper presents the results of a systematic literature review of greenhouse gas emissions for different food categories from life cycle assessment (LCA) studies, to enable streamline calculations that could inform dietary choice. The motivation for completing the paper was the inadequate synthesis of food greenhouse gas emissions available in the public domain. The paper reviewed 369 published studies that provided 1,718 global warming potential (GWP) values for 168 varieties of fresh produce. A meta-analysis of the LCA studies was completed for the following categories: fresh vegetables (root vegetables, brassica, leaves and stems); fresh fruits, (pepo, hesperidium, true berries, pomes, aggregates fruits and drupes); staples (grains, legumes, nuts, seeds and rice); dairy (almond/coconut milk, soy milk, dairy milk, butter and cheese); non-ruminant livestock (chicken, fish, pork); and ruminant livestock (lamb and beef). The meta-analysis indicates a clear greenhouse gas hierarchy emerging across the food categories, with grains, fruit and vegetables having the lowest impact and meat from ruminants having the highest impact. The meta-analysis presents the median, mean, standard deviation, upper and lower quartile, minimum and maximum results for each food category. The resultant data enables streamline calculations of the global warming potential of human diets, and is illustrated by a short case study of an Australian family's weekly shop. The database is provided in the Appendix as a resource for practitioners. The paper concludes with recommendations for future LCA studies to focus upon with respect to content and approach.

## 1 Introduction

The consumption of food contributes to a significant proportion of a person's overall greenhouse gas impact (Dey et al., 2007), with agricultural production accounting for 19%–29% of global anthropogenic greenhouse gas emissions (Vermeulen et al., 2012). Consumers are also displaying 'a moderately high level of concern' for the sustainability with respect to food production (Grunert et al., 2014, p.187). Life cycle assessments (LCAs) of food

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