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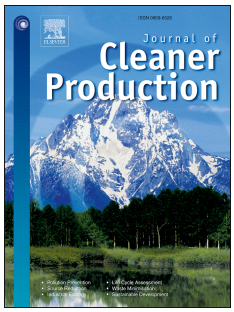

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Yi Yang, J. Elliott Campbell

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Improving attributional life cycle assessment for decision support: the case of local food in sustainable design

Yi Yang[1]*, J. Elliott Campbell[2]*

1. CSRA, Inc.
2. School of Engineering, University of California, Merced

*Correspondence should be made to: yyandgin@gmail.com, ecampbell3@ucmerced.edu

Abstract

Life cycle assessment (LCA) has become widely used to evaluate the environmental sustainability of products. It has been increasingly realized, however, that the conventional framework, attributional LCA (ALCA), may be inadequate for steering decision making. Here we show how ALCA can be improved for decision support if we recognize its limitations. Using local food production in the U.S. as a case study, we show that ALCA can be enhanced by relaxing some of the restrictive assumptions (e.g., static, aggregate, site-generic, linear), by evaluating the situation in question from a more dynamic and prospective angle, and by accounting for the important role of decision makers to introduce innovative systems that reshape the status quo. For local food, studies of food miles have shown that transportation is a minor source of carbon emission, with an implication that local food is not an effective means of helping the environment. But these studies fail to realize other potential benefits which food localization may uniquely enable including recycling of energy, water, and nutrients. These benefits cannot be derived from a simple presentation of the status quo as often done in ALCA studies. Our results show that for some crops, irrigation could contribute up to 50% of the cradle-to-gate carbon emissions, thus they may benefit from food localization making use of water from wastewater treatment plants. Our results also show that local food could reduce the water footprint of lettuce by 50%. Our study suggests that exploring future scenarios, beyond assessing historical outcomes, is critical if ALCA is to support sustainable decision making.

Key words

Attributional, local food, sustainability, wastewater treatment, dietary change, food miles

1. Introduction