

IMPACT: LAND USE (LCA)

Reference 23

Clark, M; Tilman, D 2017 Comparative analysis of environmental impacts of agricultural production systems, agricultural input efficiency, and food choice ENVIRONMENTAL RESEARCH LETTERS, 12(6), 64016. 10.1088/1748-9326/aa6cd5

Background and objective

Understanding how alternative agricultural production systems, agricultural input efficiency, and food choice drive environmental degradation is necessary for reducing agriculture's environmental impacts. The analyses and results presented here expand on current knowledge of how food production system, agricultural input efficiency, and food choice affect agriculture's environmental impacts.

Search strategy and selection criteria

The authors searched Web of Knowledge, PubMed, AGRICOLA, and Google Scholar for food LCAs published before July 2015. The authors excluded several publications because a lack of defined system boundaries made direct comparisons with other LCAs impossible. In addition, some LCAs conducted by for-profit companies were excluded because of potential biases.

Data and analysis

The authors first calculated the ratio of impacts of different production systems by food item within each publication, and then calculated the response ratio by taking the natural log of the ratio of impacts (Hedges et al 1999). The authors tested for significant differences between alternative production systems using t-tests on the response ratio.

| Number of papers | Population | Intervention | Comparator | Outcome | Quality score |
|------------------|-------------|--------------|------------|--|---------------|
| 164 | Beef cattle | Grass-fed | Grain-fed | Metric: Land use; Effect size: Logarithm of ratio of the considered metrics in the intervention to the considered metrics in the control | 56.25 |

Results

- Grass-fed beef had higher land use requirements than grain-fed beef ($p = .0381$, $n = 4$).
- The higher land use in grass-fed beef stem from the lower macronutrient densities and digestibility of feeds used in grass-fed systems because they cause grass-fed beef to require higher feed inputs per unit of beef produced than grain-fed systems.
- NULL
- NULL
- NULL

Factors influencing effect sizes

- No factors influencing effect sizes to report

Conclusion

Grass-fed beef had higher land use requirements than grain-fed beef.