FARMING PRACTICE
ORGANIC FARMING SYSTEMS

IMPACT: ENERGY USE (LCA)

Reference 27

Tuomisto HL; Hodge ID; Riordana P; Macdonald DW 2012 Does organic farming reduce environmental impacts? – A meta-analysis of European research Journal of Environmental Management 112, 309-320 10.1016/j.jenvman.2012.08.018

Background and objective

Organic farming is often perceived to have generally beneficial impacts on the environment compared to conventional farming. A meta-analysis was used to evaluate the results of peer-reviewed studies comparing the nutrient losses, biodiversity impacts, greenhouse gas (GHG) emissions, eutrophication potential, acidification potential, energy use and land use in organic and conventional farming systems in Europe. Here, only results on energy use are reported.

Search strategy and selection criteria

The following search term combinations were used: (organic AND conventional AND farming) OR (organic AND conventional AND agriculture). The preliminary search was refined to the subject areas "agriculture", "plant sciences", "environmental sciences & ecology" and "biodiversity & conservation" 1)the study was related to European farming systems, 2) the study compared organic and conventional farming and provided quantitative results on at least one of the following aspects: soil organic carbon, land use, energy use, GHG emissions, eutrophication potential, acidification potential, nitrogen leaching, phosphorus losses, ammonia emissions or biodiversity, and 3) the paper was published in a scientific peer-reviewed journal. All types of studies (i.e. original field investigations, modelling studies and Life Cycle Assessment studies) were included in the study.

Data and analysis

The median values of the response ratios for each impact category were calculated. The normality of the data was tested by using the Kolmogorov–Smirnov test. Not all impact ratios were normally distributed, therefore a Wilcoxon Signed Rank test was used to determine whether the median impact ratios were significantly different from zero. The correlations between some farming practices and environmental impacts were examined using the Spearman Rank test. SPSS 14.0 software was used for the statistical analyses.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
71	Field studies, modelling studies and Life Cycle Assessment studies of organic systems in comparison to conventional systems in Europe.	Organic production of olives, milk, cereals, beef, pork, ley	Conventional systems	Metric: Energy use per unit of product (LCA approach); Effect size: Considered metrics: energy use (per unit of product). Effect sizes: standardized difference of the considered metrics between organic systems and conventional systems.	68.75

Results

- Median energy use showed 21% lower energy consumption in organic farming systems per product unit, although the variation was wide; from 63% lower energy use up to 40% higher energy use in organic systems.
- Only three cases out of 34 found higher energy use from organic systems of which two cases were pork production and one potato production.
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Factors influencing effect sizes

- Production of mineral fertilisers : Higher energy inputs in conventional farming were mainly due to the high energy needed for production and transport of non-organic fertilisers, especially synthetic nitrogen fertilisers.

Conclusion

This meta-analysis has shown that organic farming in Europe has generally lower energy consumption than conventional farming.