European Commission

FARMING PRACTICE ORGANIC FARMING SYSTEMS

IMPACT: ENERGY USE (LCA)

Reference 15

Lee K.S., Choe Y.C., Park S.H. 2015 Measuring the environmental effects of organic farming: A meta-analysis of structural variables in empirical research JOURNAL OF ENVIRONMENTAL MANAGEMENT 162, 263-274. 10.1016/j.jenvman.2015.07.021

Background and objective

In recent decades, studies investigating the environmental impacts of organic farming compared to conventional farming have produced conflicting findings. Although some studies have found organic farming to be superior, others have not. The results of environmental assessments of organic farming are difficult to compare because the extant studies have employed different methodologies and measurement procedures. This meta-analysis seeks to identify the structural variables that accounted for differences between studies that found better performance in organic farming systems and studies that did not.

Search strategy and selection criteria

A search of over 100 studies on the environmental effects of organic farming based on the Google Scholar database and the reference lists of previous studies revealed that 45 studies used EE, 40 studies used GHGE, and 22 studies used both EE and GHGE as outcome measures. This body of literature included working papers, research articles and doctoral dissertations published from 1977 through 2012. The final analysis was based on 107 studies published from 1977 through 2012 that compared organic and conventional farming systems using EE (energy efficiency) and/or GHGE (greenhouse gaz emision) as outcome measures, and thus providing 67 EE studies and 62 GHGE studies overall.

Data and analysis

Structural variables that have been frequently investigated in comparative studies were classified into the five different categories: farm characteristics, study characteristics, dependent variables, data sources, and data analyses.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
62	Farm-level studies assessing the performance of organic systems in comparison to conventional systems.	Organic systems	Conventional systems	Metric: Energy use efficiency. In this analysis, the Energy Analysis Method (EAM), Life Cycle Assessment (LCA), Emergy, and other methods, including Life Cycle Climate Impact (LCCI), are compared.; Effect size: Difference of of the considered metrics between intervention and control	43.75

Results

- In these studies, 67.3% of the 165 observations exhibited positive outcomes, and 32.3% exhibited neutral or negative outcomes. That is, in terms of EE, organic farming was favored over conventional farming.
- The structural variables of product, data source, and sample size were statistically significant. The vegetables and fruits categories exhibited negative statistically significant values, indicating that EE benefits of organic farming were less likely for the categories of vegetables and fruits compared to the category of field crops.
- For EE, the analysis indicated that superior performances for organic farming were associated with field crops, livestock, and mixed crop farms compared to vegetable and fruit farms.
- NULL
- NULL

Factors influencing effect sizes

- Type of product : NA
- Cropping pattern : NA
- Data sample size : Sample sizes of more than 100 were significantly associated with the EE superiority of organic farming (p = .006) compared to sample sizes of 1–20.

Conclusion

Significantly lower energy efficiency for organic fruits and vegetables. Although the values for the dairy, livestock, and mixed crop categories were positive, they were not statistically significant.