SINGLE-IMPACT FICHE – ORGANIC SYSTEMS

IMPACT: ACIDIFICATION

Data extracted in October 2021

Note to the reader: This fiche summarises the impact of organic systems on ACIDIFICATION[1]. It is based on 2 peer-reviewed synthesis research papers[2]. These two synthesis papers include 9 and 164 individual studies.

1.WEIGHT OF THE EVIDENCE

- CONSISTENCY OF THE IMPACT: The effect on ACIDIFICATION of organic farming systems, as compared to conventional systems, are reported as:
    - per unit of area: no results were available.
    - per unit of product: different effects were reported for organic cropping systems, with one synthesis paper reporting no significant effects and uncertain results for specific product categories (cereals) and one reporting negative effects for all categories of products (Cereals, pulses and oil crops, fruits, vegetables). Negative effects were reported by one synthesis paper for organic livestock farming systems for organic dairy products, eggs and meats, while another one reported uncertain results.

  The 2 synthesis papers included studies conducted in Europe.

Table 1. Summary of effects of acidification. The numbers between parentheses indicate the number of synthesis papers with a quality score of at least 50%. Details on quality criteria can be found in the next section. Some synthesis papers reported effects for more than one type of system.

Impact	Metric	Impacts per unit of agricultural land				Impacts per unit of product			
		Positive	Negative	No effect	Uncertain	Positive	Negative	No effect	Uncertain
Organic cropping systems									
Decrease Acidification						0	1 (1)	1 (1)	1 (1)
Organic livestock systems									
Decrease Acidification						0	1 (1)	1 (1)	1 (1)

QUALITY OF THE SYNTHESIS PAPERS: *The quality score summarises 16 criteria assessing the quality of three main aspects of the synthesis papers: 1) the literature search strategy and studies selection; 2) the statistical analysis; 3) the potential bias. Details on quality criteria can be found in the methodology section of this WIKI.*

2. IMPACTS

[1] Acidification potential is reported in SO_2 equivalents and includes acidification potential from sulfur dioxide, nitrogen oxides, nitrous oxide, and ammonia, among others (Clark and Tilman, 2017, 10.1088/1748-9326/aa6cd5).

[2] Research synthesis papers include a formal meta-analysis or systematic reviews with some quantitative results. Details can be found in the methodology section of the WIKI.

The main characteristics and results of the 2 synthesis papers[1] are summarized in **Table 2**. Summaries of the meta-analyses provide fuller information about the results reported in each synthesis paper, in particular about the modulation of effects by factors related to soil, climate and management practices.

Table 2. Main characteristics of the synthesis papers reporting impacts on acidification. .

Reference	Population	Scale	Num. papers	Intervention	Comparator	Metric	Conclusion	Quality score
Clark, M; Tilman, D. 2017	LCA studies assessing the performance of organic systems in comparison to conventional systems. Emissions are accounted for all 'cradle-to-farm gate' activities.	Global*	164	Organic Cereals, Organic pulses and oil crops, Organic fruits, Organic Vegetables, Organic meats, Organic dairy products and eggs	Conventional systems	Acidication potentials per unit of product. Acidification potential is reported in SO_2 equivalents and includes acidification potential from sulfur dioxide, nitrogen oxides, nitrous oxide, and ammonia, among others.	Organic systems (cereals, oil crops and pulses, fruits, vegetables, meats) show similar acidification potential as conventional systems, per unit of product. Organic dairy products and eggs show higher acidification potential per unit of product.	62%
Tuomisto HL; Hodge ID; Riordana P; Macdonald DW 2012	Field studies, modelling studies and Life Cycle Assessment studies assessing the performance of organic systems in comparison to conventional systems in Europe.	Europe	71	Organic production of milk, cereals, beef, pork	Conventional systems	Acidification potential per unit of product (LCA approach)	The median response ratio for acidification potential was 0.147 (increase of 14.7%, with respect to conventional systems). However, the difference is not statistically significant. When different products were compared, it was found that organic livestock products and cereals had higher acidification potential, whereas some organic crop products had lower acidification potential than conventional products.	69%

*In Clark and Tilman (2017), the majority of LCA publications included are from agricultural systems in Europe, North America, and Australia and New Zealand (86% of systems are from these regions). Systems from China (2%), Japan (2%), the rest of Asia (5%), South America (4%), and Africa (.4%) are much less common. The results presented here are therefore indicative of highly industrialized systems and should be interpreted with this in mind.

3. KNOWLEDGE GAPS

The authors did not report knowledge gaps in the reviewed synthesis papers.