

# SINGLE-IMPACT FICHE – ORGANIC SYSTEMS

## IMPACT: NUTRIENT LOSS

Data extracted in October 2021

**Note to the reader:** This fiche summarises the impact of organic systems on NUTRIENT LOSS (nitrogen and phosphorous). It is based on 2 peer-reviewed synthesis research papers<sup>1</sup>, including 9 and 72 studies, respectively.

### 1. WEIGHT OF THE EVIDENCE

- **CONSISTENCY OF THE IMPACT:** The effect on NUTRIENT LOSS of organic farming systems, as compared to conventional systems are reported as:
  - per unit of area: for cropping systems, positive effects were reported for nitrate leaching (decrease) by 2 synthesis papers and no significant effects for phosphorous losses by 2 synthesis papers. For livestock/mixed farming systems, no significant effects were reported for nitrate leaching by one synthesis paper.
  - per unit of product: for cropping systems, different effects were reported, with one synthesis paper reporting no significant effects and another one reporting negative effects, both regarding nitrate leaching. Specific results for livestock/mixed systems are not available.

The 2 synthesis papers included studies conducted in Europe.

**Table 1.** Summary of effects. The effect with the higher score is marked in bold and the cell coloured. 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 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 *
<b>Organic cropping systems</b>									
Decrease Nutrients loss	Nitrogen	2 (2)	0	0	0	0	1 (1)	1 (1)	0
	Phosphorous			2 (2)					
<b>Organic livestock systems</b>									
Decrease Nutrients loss		0	0	1 (1)	0				

\* Number of synthesis papers that report relevant results but without statistical test comparison of the intervention and the control.

- **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 this document [→](#).*

<sup>1</sup> Research synthesis papers include a formal meta-analysis or systematic reviews with some quantitative results

As shown in the "Quality score" in **Table 2**, the quality the 7 synthesis papers retrieved ranged from 50% to 69%. The least frequently satisfied quality criteria were: "Search string", "Number of studies of each step", "Individual effect sizes", "Individual studies weighted", "Heterogeneity of results analysed" and "Publication bias analysed".

## 2. IMPACTS

The main characteristics and results of the 2 synthesis papers are summarized in **Table 2**. The references are ordered chronologically with the most recent publication date first.

**Table 2.** Main characteristics of the synthesis papers reporting impacts on nutrients loss. All detailed results of each synthesis study are reported in the summary reports [→](#).

Reference	Population	Geographical scale	Num. papers	Intervention	Comparator	Metric	Conclusion	Quality score
Mondelaers, K; Aertsens, J; Van Huylenbroeck, G. 2009	Studies assessing the performance of organic systems in comparison to conventional systems.	Global	9	Organic systems	Conventional systems	N leaching; P losses	Nitrate leaching is significantly lower for organic farming. Results for phosphate losses are less clear.	50%
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 systems	Conventional systems	Nitrate leaching and P losses per unit of area; Nitrate leaching per unit of product	Nitrate leaching per unit of area is significantly lower for organic farming. Changes for phosphorous losses per unit of area are not significant. Nitrate leaching per unit of product are significantly higher for organic farming.	69%

## 3. KNOWLEDGE GAPS

The synthesis papers did not indicate relevant knowledge gaps.

## 4. SYSTEMATIC REVIEW SEARCH STRATEGY

<b>Keywords</b>	<p>TOPIC: ("organic farm*" OR "organic agriculture" OR "organic system*" OR "organic product*") AND TOPIC: ("meta-analy*" OR "systematic* review*" OR "evidence map" OR "global synthesis" OR "evidence synthesis" OR "research synthesis")</p> <p>TOPIC: ((organic near/4 farm*) OR (organic near/4 agric*) OR (organic near/4 produc*) OR (organic near/3 livestock) OR (organic near/3 animal)) AND TOPIC: ("animal*" OR "livestock" OR "ruminant*" OR "small ruminant*" OR "cattle" OR "dairy cattle" OR "dairy" OR "beef cattle" OR "sheep" OR "ewe*" OR "lamb*" OR "swine" OR "pig*" OR "porcine*" OR "goat*" OR "rabbit*" OR "poultry" OR "chicken*" OR "broiler*" OR "turkey*" OR "hen*" OR "horse*" OR "mule*" OR "milk" OR "egg" OR "beef" OR "cheese" OR "meat" OR (animal near/2</p>
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	protein*) OR "yogurt" OR "bacon" OR "pork") AND TOPIC: ("meta-analy*" OR "systematic* review*" OR "evidence map" OR "global synthesis" OR "evidence synthesis" OR "research synthesis")
Search dates	No time restrictions
Databases	Web of Science and Scopus, run for the first time in July 2020 and updated in September 2021 and October 2021.
Selection criteria	Four main criteria led to the exclusion of a synthesis paper: (1) the paper does not deal with organic systems; (2) the paper does not assess the impacts of organic systems in comparison to another cropping system; (3) the paper report results on the effect of specific farming practices (e.g. organic fertilisation, green manure, alternative pest control techniques, etc.) which are part of organic systems, instead of the effect of the whole farming system; (4) the paper is neither a meta-analysis nor a systematic review including quantitative results. Synthesis papers that passed the relevance criteria were subject to critical appraisal carried out on paper-by-paper basis. From the 220 potentially relevant synthesis papers, 140 were excluded after reading the title and abstract, and 50 after reading the full text according to the above-mentioned criteria. Finally, 30 synthesis papers were selected for organic farming systems, from which 2 were relevant for this impact.