

Data extracted in October 2021
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Note to the reader: This fiche summarises the effects of Organic farming systems on NUTRIENT LEACHING AND RUN-OFF. It is based on 2 synthesis papers¹, including 9 and 71 primary studies.

1. WEIGHT OF THE EVIDENCE

CONSISTENCY OF THE IMPACT

The effect of organic farming systems on nutrients (nitrogen and phosphorous) leaching and runoff is reported in **Table 1**.

The table below shows the number of synthesis papers with statistical tests reporting i) a significant difference between the Intervention and the Comparator, that is to say, a significant statistical effect, which can be positive or negative; or ii) a non-statistically significant difference between the Intervention and the Comparator. In addition, we include, if any, the number of synthesis papers reporting relevant results but without statistical test of the effects. Details on the quality assessment of the synthesis papers can be found in the methodology section of this WIKI.

- per unit of area: for organic systems (as broad category without distinction on different types), positive effect was reported for nitrate leaching (i.e. decrease) by 2 synthesis papers and non-significant effects for phosphorous losses by 2 synthesis papers. For lorganic mixed farming systems, non-significant effects were reported for nitrate leaching by 1 synthesis paper.
- per unit of product: for organic systems (as broad category without distinction on different types), variable effects were reported, with 1 synthesis paper reporting non-significant effects and another 1 reporting negative effects, both regarding nitrate leaching.

All selected synthesis papers included studies conducted in Europe (see **Table 2**).

Table 1: Summary of effects. Number of synthesis papers reporting positive, negative or non-statistically significant effects on environmental and climate impacts. The number of synthesis papers reporting relevant results but without statistical test of the effects are also provided. When not all the synthesis papers reporting an effect are of high quality, the number of synthesis papers with a quality score of at least 50% is indicated in parentheses. The reference numbers of the synthesis papers reporting each of the effects are provided in **Table 3**. Some synthesis papers may report effects for more than one impact or more than one effect for the same impact.

Impact	Metric	Intervention	Comparator	Statistically tested			Non-statistically tested
				Significantly positive	Significantly negative	Non-significant	
Decrease nutrient leaching and run-off	N losses per unit of area	Organic mixed farming systems	Conventional	0	0	1	0
		Organic systems	Conventional	2	0	0	0
Decrease nutrient leaching and run-off	N losses per unit of product	Organic systems	Conventional	0	1	1	0
Decrease nutrient leaching and run-off	P losses per unit of area	Organic systems	Conventional	0	0	2	0

QUALITY OF THE SYNTHESIS PAPERS

The quality of each synthesis paper was assessed based on 16 criteria regarding three main aspects: 1) the literature search strategy and primary studies selection; 2) the statistical analysis conducted; and 3) the evaluation of potential bias. We assessed whether authors addressed and reported these criteria. Then, a quality score was calculated as the percentage of these 16 criteria properly addressed and reported in each synthesis paper. Details on quality criteria can be found in the methodology section of this WIKI.

2. IMPACTS

The main characteristics and results of the 2 synthesis papers are reported in **Table 2** with the terminology used in those papers, while **Table 3** shows the reference numbers of the synthesis papers reporting for each of the results shown in **Table 1**. Comprehensive 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, are provided in the **summaries of the synthesis papers** available in this WIKI.

Table 2: Main characteristics of the synthesis papers reporting effects on nutrient leaching and run-off. The references are ordered chronologically with the most recent publication date first.

Reference number	Population	Scale	Num. papers	Intervention	Comparator	Metric	Conclusion	Quality score
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¹ Synthesis research papers include either meta-analysis or systematic reviews with quantitative results. Details can be found in the methodology section of the WIKI.

Reference number	Population	Scale	Num. papers	Intervention	Comparator	Metric	Conclusion	Quality score
Ref27	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%
Ref30	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%

Table 3: Reference numbers of the synthesis papers reporting for each of the results shown in **Table 1**.

Impact	Metric	Intervention	Comparator	Statistically tested			Non-statistically tested
				Significantly positive	Significantly negative	Non-significant	
Decrease nutrient leaching and run-off	N losses per unit of area	Organic mixed farming systems	Conventional			Ref30	
		Organic systems	Conventional	Ref27 and Ref30			
Decrease nutrient leaching and run-off	N losses per unit of product	Organic systems	Conventional		Ref27	Ref30	
Decrease nutrient leaching and run-off	P losses per unit of area	Organic systems	Conventional			Ref27 and Ref30	

3. FACTORS INFLUENCING THE EFFECTS ON NUTRIENT LEACHING AND RUN-OFF

Table 4: List of factors reported to significantly affect the size and/or direction of the effects on nutrient leaching and run-off, according to the synthesis papers reviewed.

Factor	Reference number
C/N ratio of fertilisers	Ref30
Crop diversification strategies	Ref30
Fertilisation regime	Ref30
Livestock density	Ref30
Nitrogen input	Ref27

4. KNOWLEDGE GAPS

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

5. SYNTHESIS PAPERS INCLUDED IN THE REVIEW

Table 6: List of synthesis papers included in this review. More details can be found in the summaries of the meta-analyses.

Ref Num	Author(s)	Year	Title	Journal	DOI
Ref27	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
Ref30	Mondelaers, K; Aertsens, J; Van Huylenbroeck, G.	2009	A meta-analysis of the differences in environmental impacts between organic and conventional farming	BRITISH FOOD JOURNAL 111 10, 1098-1119	10.1108/00070700910992925

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