

SINGLE-IMPACT FICHE – ORGANIC SYSTEMS

IMPACT: SOIL BIOLOGICAL QUALITY

Data extracted in October 2021

Note to the reader: This fiche summarises the impact of organic systems on SOIL BIOLOGICAL QUALITY. It is based on 2 peer-reviewed synthesis research paper¹. These two synthesis papers include 7 and 12 individual studies.

1. WEIGHT OF THE EVIDENCE

- **CONSISTENCY OF THE IMPACT:** positive effects on SOIL BIOLOGICAL QUALITY per unit of area of organic cropping systems, as compared to conventional systems, was found in one synthesis paper, reporting significant increase in nematode abundance. Another synthesis paper reported uncertain results, due to the lack of statistical test comparisons.

No results are available specifically for crop production and livestock/mixed farming systems.

Among the 2 reviewed synthesis papers, 1 include data collected 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	Impacts per unit of agricultural land				Impacts per unit of product			
	Positive	Negative	No effect	Uncertain	Positive	Negative	No effect	Uncertain
Organic systems								
Improve Soil biological quality	1 (1)	0	0	1 (0)				

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

** Studies conducted in Brazil only

- **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 [→](#).*

As shown in the "Quality score" in **Table 2**, the quality the 2 synthesis papers retrieved ranged from 38% to 94%. 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

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

The main characteristics and results of the 2 synthesis papers are summarized in **Table 2**. The references are ordered according to their publication date.

Table 2. Main characteristics of the synthesis papers reporting impacts on soil biological quality. 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
Puissant, J; Villenave, C; Chauvin, C; Plassard, C; Blanchart, E; Trap, J 2021	Not specified	Global	12	Organic systems	Conventional	Nematode abundance (total)	Organic agricultural systems improved nematode abundance, irrespective of trophic groups.	94%
Kaschuk, G; Alberton, O; Hungria, M. 2010	Studies conducted in Brazil assessing the performance of organic systems in comparison to conventional systems.	Brazil	7	Organic systems	Conventional systems	Soil microbial biomass-C (MB-C), microbial quotient (MB-C/TSOC, total soil organic carbon) and metabolic quotient (qCO ₂).	The majority of these studies indicated that organic agriculture improved soil quality. However, the results are rated as uncertain, due to the lack of statistical analysis.	44%

3. KNOWLEDGE GAPS

Kaschuk et al., 2010	Direct relationships between soil microbial biomass -C and nutrient-cycling dynamics, microbial diversity and functionality are still unclear. Further studies are needed to develop strategies to maximize beneficial effects of microbial communities on soil fertility and crop productivity.
Puissant et al., 2021	These findings are dependent on the current limits of soil nematology, in particular (i) the possible lack of consideration of rare taxa due to the low number of individuals identified per soil sample, (ii) the low resolution of the taxonomic assignment (genus or family) which can lead to underestimating taxonomic richness, or (iii) the low consideration of the functional traits that may better capture the ecological strategies of nematodes. Our global pattern was mainly influenced by the three geological areas (Asia, Europe and America) and thus may not represent fully the worldwide pattern.

4. SYSTEMATIC REVIEW SEARCH STRATEGY

Keywords	<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</p>
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	"hen*" OR "horse*" OR "mule*" OR "milk" OR "egg" OR "beef" OR "cheese" OR "meat" OR (animal near/2 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.