SINGLE-IMPACT FICHE – ORGANIC SYSTEMS

IMPACT: PEST AND DISEASE CONTROL

Data extracted in September 2020

Note to the reader: This fiche summarises the impact of organic systems on PEST AND DISEASE CONTROL. It is based on 2 peer-reviewed synthesis research papers[1], including 72 and 102 studies, respectively.

1. WEIGHT OF THE EVIDENCE

- CONSISTENCY OF THE IMPACT: Compared to conventional systems, the two synthesis papers[1] reported a positive effect of organic systems on abundance of natural enemies (increased abundance of natural enemies), and a negative effect on pest and disease control (an increased incidence and/or severity level of pests and diseases). See these effects in the **Table 1**. All results are expressed per unit of area (e.g., per ha). Thus, although abundance of natural enemies was increased in organic systems, the disease and pest pressures were higher in organic systems than in conventional systems. All the synthesis papers[1] included results of experiments conducted in Europe.

Table 1. Summary of impacts. The effect with the higher score is marked in bold and the cell coloured. The numbers between parenthesis indicate the number of synthesis papers[1] with a quality score of at least 50%. Details on quality criteria can be found in the next section.

	Effects per unit of area (e.g., per ha)			
Impact	**Positive**	**Negative**	**No effect**	**Uncertain**
Improved pest and disease control: Increase abundance of natural enemies	**2**	0	0	0
Improved pest and disease control: Decrease of pests and diseases	0	**2**	0	0

- QUALITY OF THE SYNTHESIS PAPERS[1]: [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" of the table in section 2, the quality level of the studies was equal to 56% and 94% in the two considered synthesis papers. The least frequently satisfied quality criteria were "Number of studies at each step" (not provided in any of the two synthesis papers).

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

2. IMPACTS

The main characteristics and results of the 2 synthesis papers[1] 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 pest and disease. All detailed results of each synthesis study are reported in the summary reports  .

Nr	Reference	Population	Geographical scale	Intervention	Comparator	Conclusion	Quality score	Global effect
1	Muneret, L; Mitchell, M; Seufert, V; Aviron, S; Djoudi, E; Petillon, J; Plantegenest, M; Thiery, D; Rusch, A. 2018	Organic and conventional cropping systems (annual and perennial).	Global	Organic cropping systems	Conventional cropping systems	Results show that, compared to conventional cropping systems, 1) organic farming promotes overall biological pest control potential, 2) organic farming has higher levels of overall pest infestations but 3) this effect strongly depends on the pest type. The meta analyses show that there are lower levels of pathogen infestation, similar levels of animal pest infestation and much higher levels of weed infestation in organic than in conventional systems.	94%	Positive (biological control), Negative (pest infestation)
2	Garratt, MPD; Wright, DJ; Leather, SR. 2011	Organic and conventional systems.	Global	Organic systems	Conventional systems	Pest responses suggest that controlling pests in organic systems may be a limitation. Nonetheless, natural enemy abundance is higher in organic systems than in conventional systems.	56%	Negative (increase of pest abundance) Positive (increase of natural enemy of pests)

3. KNOWLEDGE GAPS

- The first synthesis paper highlights the potential importance fertilisers play within a farming context in determining pest and natural enemy populations, although it does emphasise a gap in the research, predominantly with regards to natural enemies and the impact of organic and conventional fertilisers.
- According to the second synthesis paper, there is a need for more studies about the effect of landscape composition (especially considering organic farming in the landscape) on pest infestation levels.

4. SYSTEMATIC REVIEW SEARCH STRATEGY

Keywords	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")
Search dates	No time restrictions

Databases	Web of Science and Scopus, run on 20 July 2020
Selection criteria	Three 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 is neither a meta-analysis nor a systematic review. Synthesis papers that passed the relevance criteria were subject to critical appraisal carried out on paper by paper basis. From an initial number of 122 synthesis papers, we finally selected 2 meta-analyses or systematic reviews.