

SINGLE-IMPACT FICHE

ORGANIC FARMING SYSTEMS

IMPACT: PESTS AND DISEASES

Data extracted in October 2021

Note to the reader: This fiche summarises the impact of organic farming systems on PESTS AND DISEASES (namely: 1) natural enemies of pests abundance and 2) pests/diseases abundance). It is based on 2 peer-reviewed synthesis research papers¹, including 71 and 134 studies, respectively.

1. WEIGHT OF THE EVIDENCE

- CONSISTENCY OF THE IMPACT:** compared to conventional systems, the 2 synthesis papers¹ reported a positive effect of organic cropping systems on abundance of natural enemies (i.e. increased abundance of natural enemies), and a negative effect on pest and disease abundance (i.e. 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. No results were reported per unit of product. All the synthesis papers¹ included results of experiments conducted in Europe.

Table 1. Summary of effects of pest and disease control. 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 |
| Organic cropping systems | | | | | | | | | |
| Decrease Pests and diseases | Increase Natural enemies of pests | 2 (2) | 0 | 0 | 0 | | | | |
| | Decrease Pests per unit of area | 0 | 2 (2) | 0 | 0 | | | | |

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 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 papers¹ 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 pest and disease control.

| Reference | Population | Geographical scale | Num. papers | Intervention | Comparator | Metric | Conclusion | Quality score |
|---|---|--------------------|-------------|--------------------------|-------------------------------|--|--|---------------|
| Garratt, MPD; Wright, DJ; Leather, SR. 2011 | Studies assessing the performance of organic systems in comparison to conventional systems. | Global | 71 | Organic systems | Conventional systems | Abundance, fecundity, development rate, size and damage. Pests and natural enemies of pests. | 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% |
| Muneret, L; Mitchell, M; Seufert, V; Aviron, S; Djoudi, E; Petillon, J; Plantegenest, M; Thierry, D; Rusch, A. 2018 | Studies assessing the performance of organic systems in comparison to conventional systems. | Global | 134 | Organic cropping systems | conventional cropping systems | Biological control potential (predation rate, parasitism rate and soil-suppressiveness, that is, soil ability to suppress pathogens following their inoculation); 2) pest infestation (disease severity or incidence, pest abundance or pest density, weed soil cover, weed biomass or weed density) | 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% |

3. KNOWLEDGE GAPS

| | |
|-----------------------------|---|
| Garratt et al., 2011 | This review also serves to highlight the potential importance that 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. |
| Muneret et al., 2018 | There is a need for more studies about the effect of landscape composition (especially considering organic farming in the landscape) on pest infestation levels. |