

# SINGLE-IMPACT FICHE

## MANURE PROCESSING TECHNIQUES

### IMPACT: ECOTOXICITY

Data extracted in July 2021

**Note to the reader:** This fiche summarises the impact of manure processing techniques on ECOTOXICITY. It is based on 1 peer-reviewed synthesis research paper<sup>1</sup>, including 23 individual life-cycle assessment (LCA) studies about the overall manure and farming sewage waste-to-energy pathway.

#### 1. WEIGHT OF THE EVIDENCE

- **CONSISTENCY OF THE IMPACT:**

Manure processing techniques, namely anaerobic digestion, have variable effects on ecotoxicity according to the configuration of manure processing (see **Table 1**). The number of synthesis papers reporting positive, negative or no effect is based on the statistical comparison of the intervention and the control. The number of synthesis papers reporting relevant results, but without statistical test of the effects is labelled as "uncertain".

Anaerobic digestion of manure alone (mono-digestion) showed a positive effect (decrease of ecotoxicity), when compared to conventional manure management without treatment.

In contrast, the reviewed synthesis paper reported uncertain results for anaerobic co-digestion of manure and other substrates, and of mono-digestion coupled to integrated treatment techniques (including filtration, reverse osmosis, microalgae, drying, stripping), due to lack of data to conduct a proper statistical analysis.

The reviewed synthesis paper include data collected in Europe (see **Table 2**).

**Table 1.** Summary of effects. The numbers between parenthesis 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.

Impact	Intervention (Technique)	Positive	Negative	No effect	Uncertain*
Decrease ecotoxicity	Anaerobic digestion	1 (1)	0	0	1 (1)

\* 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 the methodology section of this WIKI.*

#### 2. IMPACTS

The main characteristics and results of the synthesis papers 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 of manure processing techniques on ecotoxicity.

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<sup>1</sup> 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.

Reference	Population	Scale	Num. papers	Intervention (technique)	Comparator	Metric	Conclusion	Quality score
Zhang, J; Wang, M; Yin, C; Dogot, T; 2021	Dairy farm manure	Global	23	Manure and farming sewage waste-to-energy pathway (anaerobic digestion, including mono-digestion (only manure), co-digestion (manure+ other substrates) + integrated treatment techniques (including filtration, reverse osmosis, microalgae, drying, stripping).	No treatment. The only difference of reference and treatment system is implementing an improved strategy. The rest of the two systems remains the same, such as functional unit, system boundaries, LCA methods adopted, and farming practices.	Ecotoxicity (LCA approach)	All types of waste-to-energy (anaerobic digestion) pathways could have a consensus on reducing ecotoxicity. However, anaerobic co-digestion and anaerobic mono-digestion + integrated treatment techniques (including filtration, reverse osmosis, microalgae, drying, stripping) did not show significant effects, for lack of data.	62%

### 3. KNOWLEDGE GAPS

Zhang et al.	It was not possible for the present study on account of huge differences among publications and the lack of key information. It was not possible to conduct a proper statistical analysis for anaerobic co-digestion and for anaerobic mono-digestion combined with integrated treatment techniques (including filtration, reverse osmosis, microalgae, drying, stripping) due to the lack of data.
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