# SINGLE-IMPACT FICHE
## MANURE PROCESSING TECHNIQUES

## IMPACT: ENERGY USE

Data extracted in July 2021

**Note to the reader**: This fiche summarises the impact of manure processing techniques on ENERGY USE. It is based on 1 peer-reviewed synthesis research paper[1], including from 23 individual life-cycle assessment (LCA) studies considering the overall manure and farming sewage waste-to-energy pathway (anaerobic digestion).

## 1.WEIGHT OF THE EVIDENCE

- CONSISTENCY OF THE IMPACT:
  The effect of manure processing techniques, namely anaerobic digestion, on energy use is uncertain according to the reviewed synthesis paper (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".
  Available LCA-studies were insufficient to achieve statistically-significant results, for all considered combinations: anaerobic digestion of manure alone (mono-digestion), anaerobic co-digestion of manure and other substrates, and anaerobic digestion combined with other integrated treatment techniques (including filtration, reverse osmosis, microalgae, drying, stripping).
  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 energy use | Anaerobic digestion | 0 | 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 energy use.

[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.

| 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. | Energy use (LCA approach) | All waste-to-energy (anaerobic digestion) pathways have uncertain effects on energy use, due to 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. Regarding Energy use, not sufficient data were available for a proper statistical analysis for all types of anaerobic digestion, including mono-digestion (only manure), anaerobic co-digestion, anaerobic mono-digestion + integrated treatment techniques (including filtration, reverse osmosis, microalgae, drying, stripping). |