

SINGLE-IMPACT FICHE

MANURE PROCESSING TECHNIQUES



IMPACT: NUTRIENTS RECOVERY

Data extracted in July 2021

Note to the reader: This fiche summarises the impact of manure processing techniques on NUTRIENTS RECOVERY. It is based on 1 peer-reviewed synthesis research papers¹, including 28 individual studies.

1. WEIGHT OF THE EVIDENCE

- CONSISTENCY OF THE IMPACT:

Manure processing techniques, namely treatment with struvite precipitation and ammonia stripping, have different effects on nutrients recovery 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".

In particular, a manure management chain including struvite precipitation (compared to the absence of the treatment process) was found to have positive effect on nutrients recovery, while for ammonia stripping evidence was not sufficient (uncertain results).

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

Table 1. Summary of effects. The effect with the higher score is marked in bold and the cell coloured. 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	Metric	Intervention (Technique)	Positive	Negative	No effect	Uncertain*
Increase nutrients recovery	N and P recovery	Treatment with struvite precipitation and ammonia stripping	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 this document [→](#).*

As shown in the "Quality score" in **Table 2**, the quality level of the synthesis papers was of 75%. The least frequently satisfied quality criteria were "Number of studies at each step", "Individual effect sizes", "Dataset available" and "Publication bias analysed".

2. IMPACTS

The main characteristics and results of the synthesis papers are summarized in **Table 2**. Detailed results of each synthesis study are reported in the summary reports .

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

Table 2. Main characteristics of the synthesis papers reporting impacts of manure processing techniques on nutrients recovery. The references are ordered chronologically with the most recent publication date first.

Reference	Population	Scale	Num. papers	Intervention (technique)	Comparator	Metric	Conclusion	Quality score
Lorick, D; Macura, B; Ahlstrom, M; Grimvall, A; Harder, R 2020	Digestate liquid fraction	Global	28	Struvite precipitation	No treatment	Nitrogen and Phosphorous removal from liquid phase	When performed under the right conditions (i.e. pH around 9.5 and Mg:PO ₄ ratio of at least 1:1), struvite precipitation is an effective technology for the recovery of nutrients from the liquid phase of anaerobic digestate. The evidence base was limited for ammonia stripping.	75%

3. KNOWLEDGE GAPS

Lorick et al. 2020	The limitations of the review process may originate from: (1) the search strategy; and (2) bias in the pool of studies found.
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4. SYSTEMATIC REVIEW SEARCH STRATEGY

Keywords	<p>TOPIC: (manure OR slurry OR digestate OR (digested near/3 manure)) AND TOPIC: (management OR storage OR lagoon* OR "anaerobic digest*" OR tank* OR treatment OR process* OR technolog* OR techni* OR (soil near/3 application) OR (soil near/3 distribution) OR (soil near/3 amend*) OR biogas OR precision) AND TOPIC: ("meta-analy*" OR "systematic* review*" OR "evidence map" OR "global synthesis" OR "evidence synthesis" OR "research synthesis")</p> <p>or</p> <p>TITLE-ABS-KEY: (manure OR slurry OR digestate OR (digested W/3 manure)) AND TITLE-ABS-KEY: (management OR storage OR lagoon* OR "anaerobic digest*" OR tank* OR treatment OR process* OR technolog* OR techni* OR (soil W/3 application) OR (soil W/3 distribution) OR (soil W/3 amend*) OR biogas OR precision) AND TITLE-ABS-KEY: ("meta-analy*" OR "systematic* review*" OR "evidence map" OR "global synthesis" OR "evidence synthesis" OR "research synthesis")</p>
Search dates	No time restrictions
Databases	Web of Science and Scopus, run in July 2021
Selection criteria	The main criteria that led to the exclusion of a synthesis paper were if the paper: (1) was out of the scope; (2) did not deal with manure processing techniques or dealt with other stages of manure management (e.g. storage, land application, animal housing techniques); (3) reported studies with absolute values of emission factors, without comparing processing techniques with a reference management scenario; (4) did not clearly state the intervention and comparator; (5) was not either

a systematic review or a meta-analysis; (6) was not written in English. Synthesis papers that passed the relevance criteria were subject to critical appraisal carried out on paper-by-paper basis.

The search returned 269 synthesis papers potentially relevant for the practice object of our fiche. Searches for other farming practices added another 8 potentially relevant synthesis papers. From the 277 potentially relevant synthesis papers, 207 were excluded after reading the title and abstract, and 53 after reading the full text according to the above-mentioned criteria. Finally, 17 synthesis papers were selected for manure processing techniques, from which 1 was relevant for this impact.