

SINGLE-IMPACT FICHE

SOIL AMENDMENT WITH LIME OR GYPSUM



IMPACT: SOIL ORGANIC CARBON

Data extracted in April 2021

Note to the reader: This fiche summarises the impact of soil amendment with lime or gypsum on soil organic carbon. It is based on 2 peer-reviewed synthesis research papers, which include 20 and 59 individual studies.

1. WEIGHT OF THE EVIDENCE

- CONSISTENCY OF THE IMPACT:

Compared to no soil amendments, amendment with gypsum showed a positive effect on soil organic carbon in one synthesis paper, while amendment with lime showed no effect in the other synthesis paper (see **Table 1**).

Among the 2 reviewed synthesis papers, only 1 includes data collected in Europe (on lime with no effect on soil organic carbon).

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	Intervention	Control	Positive	Negative	No effect	Uncertain
Increase soil organic carbon	Gypsum	No gypsum	1 (1)	0	0	0
	Lime	No lime	0	0	1 (1)	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 this document [?](#)*

As shown in the "Quality score" in **Table 2**, the quality levels are 62% and 100%.

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](#).

Table 2. Main characteristics of the synthesis papers reporting impacts of soil amendment with lime or gypsum on soil organic content. The references are ordered chronologically with the most recent publication date first.

Reference	Population	Geographical scale	Num. papers	Intervention	Comparator	Metric	Conclusion	Quality score
Wang Y, Wang Z, Liang F, Jing X, Feng W 2021	Saline-sodic soil types	China	59	Soil amendment using flue gas desulfurization gypsum (FGDG)	No amendment control under identical experimental conditions	Soil organic carbon	The application of flue gas desulfurization gypsum (FGDG) significantly increased SOC content.	62%
Eze, S; Palmer, SM; Chapman, P.J. 2018	Grasslands	Global (including Europe)	20	Liming intensity categorised into three rates: low lime, < 3 t/ha lime; moderate lime,	No-liming under same ecosystem and similar	Soil organic	Liming results in a marginal, non-significant increase in soil C stocks	100%

Reference	Population	Geographical scale	Num. papers	Intervention	Comparator	Metric	Conclusion	Quality score
				3–5 t/ha lime; and high lime, > 5 t/ha lime.	environmental characteristics.	carbon stock	of grasslands at global scale.	

3. KNOWLEDGE GAPS

- Wang Y et al** A few studies have estimated soil C sequestration capacity in organic and inorganic forms induced by FGDG application. The magnitude of soil C sequestration potential due to FGDG application at large spatial scales is largely unknown. Large temporal variations occur and it may take years to observe the impacts of FGDG application on them. Unfortunately, most studies of FGDG application measure these soil properties only once, which cannot inform the long-term impacts.
- Eze S et al.** The understanding of the mechanisms of interactions between climate change and management activities in temperate grasslands is still poor.

4. SYSTEMATIC REVIEW SEARCH STRATEGY

Keywords	<p>Search equations WOS <i>TOPIC: ("liming" OR "limest*" OR "chalk*" OR "marl*" OR "gypsum") AND TOPIC: (soil) AND TOPIC: ("meta-analy*" OR "systematic* review*" OR "evidence map" OR "global synthesis" OR "evidence synthesis" OR "research synthesis")</i></p> <p>Search equations SCOPUS <i>TITLE-ABS-KEY (("liming" OR "limest*" OR "chalk*" OR "marl*" OR "gypsum")) AND TITLE-ABS-KEY (soil) AND TITLE-ABS-KEY (("meta-analy*" OR "systematic* review*" OR "evidence map" OR "global synthesis" OR "evidence synthesis" OR "research synthesis"))</i></p>
Search dates	No time restrictions
Databases	Web of Science and Scopus, run in March 2021
Selection criteria	<p>The main criteria that led to the exclusion of a synthesis paper were if the paper: (1) was out of the scope; (2) was not a meta-analysis; (3) was a MA of experimental trials (i.e. no systematic review process); (4) did not deal with soil amendment with lime or gypsum; (5) did not deal with environmental or productivity outcome; (6) did not clearly stated the intervention and comparator treatments; (7) was not written in English. Synthesis papers that passed the relevance criteria were subject to critical appraisal carried out on paper-by-paper basis.</p> <p>The systematic search provided 35 synthesis papers (after removing the duplicates) potentially relevant for the practice object of our fiches. From this set of potentially relevant synthesis papers, 7 synthesis papers were selected, among which 2 were relevant for the impact considered in this fiche.</p>