SINGLE-IMPACT FICHE
SOIL AMENDMENT WITH LIME OR GYPSUM
IMPACT: SOIL PHYSICO-CHEMICAL QUALITY

Data extracted in April 2021

Note to the reader: This fiche summarises the impact of soil amendment with lime or gypsum on SOIL PHYSICO-CHEMICAL QUALITY. It is based on 3 peer-reviewed synthesis research papers[1]. Each synthesis paper includes a number of individual studies, which in this case is of 39, 59 and 175.

1.WEIGHT OF THE EVIDENCE

- CONSISTENCY OF THE IMPACT:

Soil amendment with both gypsum and lime, compared to no amendment, showed a positive effect on Soil physical-chemical quality in the 3 synthesis papers reviewed (see **Table 1**).

From the 3 reviewed synthesis papers, only 1 includes data collected in Europe (on lime).

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	Control	Positive	Negative	No effect	Uncertain
Improve soil-physical quality	Gypsum	No gypsum	1 (1)	0	0	0
	Lime	No lime	2 (2)	0	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

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 soil amendment with lime or gypsum on soil physico-chemical quality. The references are ordered chronologically with the most recent publication date first.

Reference	Population	Scale	Num. papers	Intervention	Comparator	Metric	Conclusion	Quality score
Wang Y, Wang Z, Liang F, Jing X,	Saline-sodic and alkaline soil types	China	59	Soil amendment with flue gas desulfurization gypsum (FGDG)	No gypsum control under identical	Soil pH, Soil exchangeable sodium	Application of flue gas desulfurization gypsum (FGDG) significantly	62%

[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	Comparator	Metric	Conclusion	Quality score
Feng W 2021					experimental conditions	percentage (ESP)	reduced soil pH (−8.1%) and ESP (−37.4%).	
Kong L, Guo Z, Peng C, Xiao X, He Y 2021	Rice cultivation	Asia	39	Liming treatment, including $CaCO_3$, $Ca(OH)_2$, and CaO	No-liming control under identical experimental conditions	Soil pH	Liming significantly increases acidic-soil pH in rice cultivation.	94%
Li Y.; Cui S.; Chang S.X., Zhang Q. 2019	Field-studies, laboratory incubation or greenhouse pot studies	Global (including Europe)	175	Liming treatment, including dolomite ($CaMg(CO_3)_2$), calcium hydroxide ($Ca(OH)_2$), calcium carbonate ($CaCO_3$), and calcium oxide (CaO)	No-liming control under identical experimental conditions	Soil pH, Cation exchange capacity (CEC), soil nutrients availability	To effectively neutralize soil acidity, the optimum liming duration, rate, and material type were < 3 years, 3–6 Mg ha^{-1}, and $Ca(OH)_2$, respectively. Liming significantly ameliorated soil Al^{3+}, increased basic cations (Ca^{2+} and Mg^{2+}), neutralized soil pH across different cropping systems, and improved the soil nutrient status (increasing exchangeable nitrogen, potassium, and phosphorous).	81%

3. KNOWLEDGE GAPS

Li Y.et al. The complexity of responses identified in this study emphasizes the need for adopting more advanced data-science algorithms coupled with high-dimensional data sets in the future that could enhance our understanding of the underlying mechanisms of liming on an agroecosystem basis.