FARMING PRACTICE
IL AMENDMENT WITH LIME AND GYPSUM

IMPACT: SOIL PHYSICO-CHEMICAL QUALITY

Reference 3

Wang Y, Wang Z, Liang F, Jing X, Feng W 2021 Application of flue gas desulfurization gypsum improves multiple functions of saline-sodic soils across China. Chemosphere. 277:130345 10.1016/j.chemosphere.2021.130345

Background and objective

Saline-sodic soils cover ~10% of the global land surface and deliver various ecosystem services to human society in the arid/semiarid regions. Flue gas desulfurization gypsum (FGDG), a byproduct from coal-fired power plants, is widely used to ameliorate saline-sodic soils. 1) Quantify both the positive and negative impacts of FGDG application on multiple soil properties and on plant productivity across climatic and soil conditions and management practices; 2) identify the best management practice for soil amelioration and to explore how FGDG application affects plant productivity.

Search strategy and selection criteria

Data were collected from articles in the China National Knowledge Infrastructure, Web of Science, and Google Scholar published in Chinese or English. 1) the soil in the study sites was saline or sodic soil (EC > 4 dS m−1 or pH > 8.5), 2) there were paired treatments with and without FGDG application, 3) the study measured at least one of the following variables for plant productivity, soil physical, chemical, and biological properties, and heavy metals; 4) the authors excluded the laboratory studies with FGDG application because laboratory environments are different from field conditions. Thus, all the selected studies were conducted in the field.

Data and analysis

Response ratios of all the variables were calculated by using the "metafor" package in R (version 3.6.1) with a continuous random effect . To explore the relations between climate, hydrological conditions, initial soil conditions and RR of soil properties and productivity, we conducted the Pearson correlation analysis among these variables using SPSS (version 25.0). Before the correlation analysis, the data were natural logarithm transformed to increase data normality except for lnRR values.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
59	Saline-sodic soil types	Soil amendment using flue gas desulfurization gypsum (FGDG)	No-amendment control under identical experimental conditions	Metric: Soil pH, Soil exchangeable sodium percentage; Effect size: Logarithm of ratio of the considered metrics in the intervention to the considered metrics in the control	0.625

Results

- The FGDG application significantly decreased soil pH by 8.1% ± 1.7% and soil exchangeable sodium percentage by 37.4% ± 9.6%.

Factors influencing effect sizes

- Incorporation depth : Decreases in pH generally decreased with soil depth, with the greatest decreases in the 0–20 cm soil layer. Decreases in pH were also greater for deep FGDG incorporation depth (>20 cm) than for shallow FGDG incorporation depth (0–20 cm)
- Soil salinity : Decreases in soil pH were greater in heavy sodic and strong sodic soils than in moderate sodic and saline soils.

Conclusion

Soil amendment using flue gas desulfurization gypsum (FGDG) significantly reduced soil pH (−8.1%) and soil exchangeable sodium percentage (−37.4%).