

IMPACT: CROP YIELD

Reference 3

Liu L, Li H, Zhu S, Gao Y, Zheng X, Xu Y. 2021 The response of agronomic characters and rice yield to organic fertilization in subtropical China: A three-level meta-analysis *F Crop Res.* 263:108049. 10.1016/j.fcr.2020.108049

Background and objective

The knowledge of the soil nutritional status, rice agronomic characters, and rice yield in response to organic fertilization, and how these factors are influenced by fertilization regimes, organic fertilizer types, and experimental duration, is of great importance for rice production. 1) how soil physico-chemical properties respond to organic fertilization; 2) how the nutrient uptake, physiological use efficiency and biological indices of rice are affected by organic fertilization and 3) how organic fertilization regimes, organic fertilizer types, SOC, and experimental duration influence the response of the rice yield to organic fertilization. Here we report only results regarding the effect of biochar amendment on crop yield.

Search strategy and selection criteria

Data published in English were collected from the Web of Science (<https://www.webofknowledge.com/>), Science Direct (<https://www.sciencedirect.com/>), and Springer Link (<https://www.springerlink.com/>), and data published in Chinese were collected from the China Knowledge Resource Integrated Database (<https://www.cnki.net/>). The search terms applied for the present study were "Organic fertilizers", "Animal manure", "Crop straw", "Biochar", "Rice growth and development", "Rice agronomic characters", "Rice yield", "Rice yield components" and "Soil physicochemical properties". 1) the studies had to be conducted in the field rather than in a pot or greenhouse; 2) the experimental sites had to be located in subtropical China; 3) the studies had to be conducted with side-by-side comparisons of control (without organic fertilizer application) and treatment (with organic fertilizer application) groups; 4) the means, standard deviations (SD), and sample sizes of the rice yield, yield attributes, and soil physicochemical properties had to be reported or have the possibility of being calculated.

Data and analysis

A random-effect approach was employed in the present study because the included primary studies could be considered as a random sample among a larger number of studies. There were three sources of variance in a three-level meta-analysis: (i) variance between studies (level 3), variance between effect sizes extracted from the same study (level 2), and sample variance of the effect sizes (level 1). This multilevel meta-analysis allows to calculate overall effect size if significant variance on level 2 or level 3 is present. The weighted factor (W_{ij}), weighted response ratio (RR_{++}), standard errors of RR_{++} ($S(RR_{++})$), and 95 % confidence intervals (95 % CIs) were calculated. The 'metafor' package implemented in the R statistical platform was applied to conduct the three-level meta-analyses.

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
74	Rice paddy fields in Subtropical China	Soil amendment with biochar	No amendment	Metric: Crop yield; Effect size: Logarithm of ratio of the considered metrics in the intervention to the considered metrics in the control	0.75

Results

- Organic fertilization with biochar increased the rice yield by 8.3 % (95 %CI: 6.4 %–10.2 %).

Factors influencing effect sizes

- No factors influencing effect sizes to report

Conclusion

Biochar significantly increases rice yield.