

SINGLE-IMPACT FICHE

SOIL AMENDMENT WITH BIOCHAR

IMPACT: PLANT NUTRIENT UPTAKE

Data extracted in February 2021

Note to the reader: This fiche summarises the impact of soil amendment with biochar on PLANT NUTRIENT UPTAKE (including in particular nitrogen, phosphorous and silicon). It is based on 3 peer-reviewed synthesis research papers¹, each of them including from 5 to 208 individual studies.

1. WEIGHT OF THE EVIDENCE

- **CONSISTENCY OF THE IMPACT:**

Soil amendment with biochar, compared to no-biochar-amendment, led to a positive effect (increase in plant nutrient uptake) in 2 out of the 3 reviewed synthesis papers, while the other synthesis paper reported no effect (for greenhouse vegetables cultivations) (see **Table 1**).

Among the 3 reviewed synthesis papers, 1 did not report data collected in Europe and 2 did not specify geographical locations of the experiments (see **Table 2**).

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	Metric	Positive	Negative	No effect	Uncertain
Increase plant nutrient uptake		2 (2)	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 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 biochar Plant nutrient-uptake.

Reference	Population	Geographical scale	Num. papers	Intervention	Comparator	Metric	Conclusion	Quality score
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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	Geographical scale	Num. papers	Intervention	Comparator	Metric	Conclusion	Quality score
Gu, JX; Wu, YY; Tian, ZY; Xu, HH 2020	Greenhouse vegetables	China	5	Soil amendment with biochar	No amendment	Nitrogen use efficiency	Biochar application to greenhouse vegetables tends to increase, but non-significantly, nitrogen utilisation efficiency.	75%
Li Z, Song Z, Singh BP, Wang H 2019	Not specified (for N and P), Rice (for Silicon)	Global	171	Soil amendment with biochar	No amendment	Plant nutrients uptake (Si, P, N)	Higher amount of silicon and nutrients input through addition of biochars significantly improved crop silicon (in rice) and nutrients (N,P) uptake (crops not specified).	62%
Liu, Q; Zhang, YH; Liu, BJ; Amonette, JE; Lin, ZB; Liu, G; Ambus, P; Xie, ZB 2018	Not specified	Global	208	Soil amendment with biochar	No amendment	Plant nitrogen uptake	Biochar leads to a significant increase in plant N uptake.	69%

3. KNOWLEDGE GAPS

Liu et al., 2018

The biochar effects synthesized in the current paper are mainly derived from experiments characterized by single-dose designs and relatively short-term time scales (months to a few years). Biochar effects with respect to longer-term and repetitive additions require further evaluation with future more relevant experimental data.