

# SINGLE-IMPACT FICHE

## SOIL AMENDMENT WITH BIOCHAR

### IMPACT: WATER USE

Data extracted in February 2021

**Note to the reader:** This fiche summarises the impact of soil amendment with biochar on WATER USE (namely water use efficiency, i.e. the crop biomass yield per unit of water consumption). It is based on two peer-reviewed synthesis research papers<sup>1</sup>, including 43 and 74 individual studies, respectively.

### 1. WEIGHT OF THE EVIDENCE

- **CONSISTENCY OF THE IMPACT:**

Soil amendment with biochar, compared to no-biochar-amendment, has a consistent positive effect (increase in Water use efficiency), according to the 2 reviewed synthesis papers (see **Table 1**).

Among the two reviewed synthesis papers, one includes data collected in Europe and the other does not specify geographical location of 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
Improve water use	Increase Plant water use efficiency	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 biochar on water use.

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<sup>1</sup> 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
Gao, Y; Shao, GC; Lu, J; Zhang, K; Wu, SQ; Wang, ZY 2020	Not specified	Global	43	Soil amendment with biochar	No amendment	Plant water use efficiency (PWUE); Leaf water use efficiency (LWUE)	This analysis showed a statistically significant 18.8 % and 20.0 % increase in PWUE and LWUE, respectively, following biochar application, indicating the potential benefits of biochar application in adapting to climate change.	81%
He, YH; Yao, YX; Ji, YH; Deng, J; Zhou, GY; Liu, RQ; Shao, JJ; Zhou, LY; Li, N; Zhou, XH; Bai, SH 2020	Not specified	Global	74	Soil amendment with biochar	No amendment	Water use efficiency	Overall, we found that biochar amendment significantly increased water use efficiency by 26.8%. However, no significant effects were found for C <sub>4</sub> plants.	81%

### 3. KNOWLEDGE GAPS

#### He et al., 2020

A lack of long-term field experiments, especially those conducted in the Southern Hemisphere, may hamper the evaluation of ecosystem structure and functioning, including photosynthesis and plant productivity, in response to biochar amendment over a larger timescale.