

## IMPACT: SOIL BIOLOGICAL QUALITY

### Reference 32

Zhou, HM; Zhang, DX; Wang, P; Liu, XY; Cheng, K; Li, LQ; Zheng, JW; Zhang, XH; Zheng, JF; Crowley, D; van Zwieten, L; Pan, GX 2017 Changes in microbial biomass and the metabolic quotient with biochar addition to agricultural soils: A Meta-analysis *Sci Total Environ.* 643:926–35. 10.1016/j.agee.2017.01.006

### Background and objective

Biochar has been increasingly recommended for world agriculture, but the effects on microbial activities in agricultural soils has not yet thoroughly assessed. Microbial health and carbon use efficiency changes following a short term biochar addition have been not yet evaluated. The purpose of this study was to examine the biochar effects on soil microbial carbon use efficiency in relation to microbial growth in agricultural soils.

### Search strategy and selection criteria

We searched literature published since 2001 and up to March 1, 2015 via electronic databases including Wiley-Blackwell, Springer Link, Web of Science, and the Chinese Magazine Network (CNKI). A bulk data base of 550 papers was first created by searching using the key words “biochar” and “soil”, after which the database was further filtered using the individual key words “respiration; mineralization and microbial biomass”. The collected literature was carefully checked to exclude studies conducted with non-agricultural soils. The used biochar could not specified as pure or mixed biochar as detailed information of the applied biochar was not always available in some of the reported experiments.

### Data and analysis

Data treatment and processing were performed with Microsoft Excel 2010 and calculations with meta-analysis were conducted in natural log of response ratios following the procedure given by Hedges et al. (10.1890/0012-9658(1999)080[1150:TMAORR]2.o.CO;2).

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
97	Lab incubations, Pot trials, field trials	Soil amendment with biochar	No amendment	Metric: Soil microbial biomass carbon; Effect size: Logarithm of ratio of the considered metrics in the intervention to the considered metrics in the control	0.75

### Results

- Across the reported studies, biochar provided an overall increase in soil microbial biomass carbon (by 26% on average; CI: 22%–30%).
- Short term experiments with a duration less than 6 months were the majority (79%) of the studies used.

### Factors influencing effect sizes

- Time scale : SMBC was significantly but moderately increased by 26% (CI: 20%–32%) in incubation experiments with durations shorter than 6 months but unchanged in those sustained over 6 months, following biochar addition. Compared to no significant change in the field studies having durations longer than 12 months, SMBC was significantly but largely increased by 34% (CI: 21%–49%) and 35% (CI: 26%–45%) respectively in the pot and field studies having durations less than 12 months.

### Conclusion

This study demonstrated an overall short term increase in microbial biomass, in agricultural soils following a biochar addition.