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EDITORIAL

Preface—Biochar and agricultural sustainability

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This special issue titled "Biochar and agricultural sustainability" (SI APBC 2018) is a collection of selected contributions from the participants attended "The 4th Asia Pacific Biochar Conference: Advances in Biochar Research & Applications." It was held in Foshan, Guangdong Province, China, 3–8 November 2018.

Increase in atmospheric CO_2 concentration relevant to climate change is an area of growing concern. Better understanding of how carbon cycles through various sources and sinks in different ecosystems has increasingly been paid attention globally. Soil plays a key role in carbon cycling for terrestrial ecosystem (Horwath 2007). If managed properly, soil can retain huge amount of carbon, which is of significance for enhancing the carbon sink capacity of land and mitigating global climate change. In addition, numerous studies have demonstrated that long-term intensive farming practices, such as excessive application of chemical fertilizers and extensive tillage, significantly decreased organic carbon contents in soils (Li et al. 2013) and increased soil acidity (Wei et al. 2019). It is important to adopt sustainable farming practices that can enhance soil productivity while maintaining the ecological functionality of natural soils (Lehmann 2019). Application of biochar has been increasingly recognized as one of the sustainable farming practices meeting these requirements (Wu et al. 2019).

Biochar is typically produced from pyrolysis of biomass in the absence of oxygen (Wu et al. 2012). Recently, increasing interests have been captured for application of biochar as an environmentally friendly carbonaceous material for treatment of wastewater (Fang et al. 2020; Lu et al. 2020; Yin et al. 2020) and air pollution (Zhang et al. 2019), remediation of contaminated soils (Bandara et al. 2020; Chen et al. 2020), and enhancement of soil carbon sequestration and productivity (Wu et al. 2019). Biochar application to soils can also reduce acidity and greenhouse gas emissions (Li et al. 2018).

This special issue focused on the significance of biochar in the development of agricultural sustainability. In total, eight articles were included in this special issue. Deng et al. (2020) reported the effect of biochar treatments on soil greenhouse gas (N_2O, CO_2, and CH_4) emissions after prescribed fire in alpine meadows of mountainous areas in China. Two papers reported the efficacy of engineered biochars as adsorbents for immobilization of potentially toxic elements from contaminated soils (He et al. 2020; Ren et al. 2020). Feng et al. (2020) found that, regardless of the nitrogen concentrations, biochar-derived nitrogen was recalcitrant and was not readily available for plant uptake. It was found that biochar could be used to make a slow-release fertilizer to reduce nitrogen loss in paddy soils (Dong et al. 2020). Zhang et al. (2020) used biochar to improve the productivity of a disturbed acidic soil effectively, whereas Xiao et al. (2020) and Wu et al. (2020) found that biochar or fermented biomass could be applied to ameliorate saline soil and alkaline bauxite residue. The findings reported in this special issue would help us narrow the research gap and expand our understanding of land application of biochar.

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