Geophysical Research Abstracts
Vol. 14, EGU2012-612-2, 2012
EGU General Assembly 2012

Biochar amendment decreased global warming potential of a Cd/Pb contaminated paddy ecosystem from the Tai Lake plain, China

A. Zhang (1), Q. Hussian (1,2), L. Li (1), J. Zheng (1), G. Pan (1), X. Zhang (1), and R. Bian (1)

(1) Institute of Resource, Ecosystem and Environment of Agriculture, Nanjing Agricultural University, 1 Weigang, Nanjing 210095, China, (2) Department of Soil Science and Soil Water Conservation, Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi, Pakistan

Nitrous oxide (N_2O), carbon dioxide (CO_2) and methane (CH_4) are concerned as the predominant biogenic greenhouse gases (GHGs) in the net GHGs balance of agro-ecosystems. Predicting the net exchanges of these gases in a systemic approach would be critical for assessing the effects on GHGs mitigation of environmental conditions and crop management. Previous studies have shown a great potential of biochar amendment to mitigate GHGs emission from croplands. Here, we report a field experiment on biochar effects on rice production, net ecosystem exchange (NEE) and global warming potential (GWP) in cadmium (Cd) and lead (Pb) contaminated paddy field. Biochar was amended in 2009 before rice transplanting at rate of 0, 10, 20 and 40 t ha^{-1} and soil emission of CO_2, ecosystem emissions of CH_4 and N_2O were monitored with closed chamber method at 7 days interval throughout the whole rice growing season (WRGS) in 2010. Soil samples were collected after rice harvest in 2010 for analysis of soil property changes with biochar amendment. Biochar amendment increased soil pH, soil organic carbon, total N but decreased soil bulk density. DTPA Cd and Pb were decreased by 25.3%, 21.3% and 48.7%, and by 11.9%, 17.3% and 23.6% under biochar amendment at rates of 10 t ha^{-1}, 20 t ha^{-1} and 40 t ha^{-1}, respectively. Total soil CO_2 emission of WRGS was decreased by 16% and 24% under biochar amendment respectively at 20 and 40 t ha^{-1}. There was a weak correlation of total CO_2 emission with DTPA Pb concentration (p=0.0642). Total WRGS ecosystem emission of N_2O was reduced by 11%, 33% and 50% under biochar amendment at 10 t ha^{-1}, 20 t ha^{-1} and 40 t ha^{-1}, respectively while an increase by 31% in that of CH_4 emission was observed only under biochar amendment at 40 t ha^{-1}.Overall, an consistent increase in ecosystem carbon sink was observed across all treatments of biochar amendment as the overall GWP of the ecosystem was decreased by 54% and 63% under biochar amendment at 20 t ha^{-1} and 40 t ha^{-1}, respectively.

Key words: biochar, net ecosystem exchange, global warming potential, cadmium and lead contaminated paddy field