PRELIMINARY STUDY ON
LIFE CYCLE ENVIRONMENTAL ASSESSMENT OF BIOCHAR

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Biochar is a carbon rich co-product of a controlled pyrolysis process. Biochar application to the soil may increase soil productivity by reducing nutrient leaching, releasing important nutrients to the soil and immobilizing toxic heavy metals while reducing the emission of greenhouse gas (GHG) to the atmosphere.

This study was mainly focused to determine heavy metals and nutrients adsorption, and desorption capacities of selected biochar, under laboratory condition. Biochar characterization was done by using standard methods. The adsorption behaviors of biochar for heavy metal ions (Cr (VI) and As (III)), and nutrients (NO_3^- and PO_4^{3-}) were observed through batch and column experiments. A literature review was done for the determination of effects of biochar on GHG emissions. Life cycle assessment was carried out on the basis of assumptions based on literature.

The equilibrium data obtained for both cation and anion adsorption was fitted to Langmuir and Freundlich isotherm models. Biochar have showed a higher adsorption capacity for NO_3^- and As (III), compared to Cr (VI) and PO_4^{3-}, under the batch adsorption study. The pseudo first order model was best described the rate of adsorption of Cr (VI) while the pseudo second order model was best described the rate of adsorption of As (III), and other two anions. Total removal percentage of cations and anions from the fixed bed column is lower than the results found in batch study. Also, heavy metal cations showed higher rate of desorption in the fixed bed column. Investigated studies on the impact of use of biochar on GHG emissions were contradictory. However, this may require more studies under different conditions to explain those results further.

Key words: Biochar; Saw dust; Heavy metals; Nutrients; Adsorption; GHG; LCA