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Project Title.

Co-application of biochar and biosolids for carbon sequestration and sustainable soil management in urban-agricultural landscapes

Abstract.

The development of climate smart management strategies aimed at decreasing the carbon footprint of municipalities across the U.S. is becoming increasingly important. A promising strategy especially for municipalities in regions of high agricultural intensity is to increase the soil organic carbon storage and to foster soil health and sustainable crop production on agricultural land located in the urban-rural transition zone by using recycled organic waste such as biosolids. A combined application of biosolids with biochar under no-till and cover crops could maximize their benefits for climate smart management strategies in urban-agricultural landscapes but field data are in critical need for an efficient guidance of municipalities in such endeavor. The proposed project is a joined effort between partners from academia, the public and private sector, a not-for-profit organization, and state agencies. This partnership seeks to establish a long-term field experiment with a minimum running time of 10 years on City of Lincoln owned farmland in the urban-rural transition zone. The field-experiment will be managed by a local farm contractor with corn-soybean rotation under no-till and cover crops. Biosolids generated from the wastewater treatment program and biochar from waste wood sources will be applied individually or in combination. The field experiment will be equipped with sensors to monitor greenhouse gas emissions and will be annually sampled to analyze soil and plant characteristics. This setup will enable us to contrast effects of biosolids and biochar and their combination on crop productivity, CO₂ and N₂O emissions, soil carbon sequestration, availability and retention of nutrients and water, and microbial community response. These indicators will be used for a soil health assessment. Our approach is a holistic assessment of this biosolid-biochar strategy to improve resource efficiency, soil ecosystem services, and soil health in urban-agricultural landscapes, which will be vital for broad acceptance among municipalities and farmers.