

An Investigation of the Carbon Footprint of Potato Cultivation under variable Environmental Conditions in PEI

R. Khan¹, A.A. Farooque², C.P. Brown¹, B. Acharya², Q.U. Zaman³, F. Abbas²

¹Department of Environmental Sciences, University of Prince Edward Island, Charlottetown, Prince Edward Island, Canada

²School of Sustainable Design Engineering, University of Prince Edward Island, Charlottetown, Prince Edward Island, Canada

³Department of Engineering, Dalhousie University, Truro, Nova Scotia, Canada

Decreasing soil organic matter (SOM) is a serious threat to global agriculture, and has been linked to reduced productivity in agroecosystems. It has been hypothesized that long-term continuous agricultural cultivation using the industrial model diminishes SOM resulting in deteriorating soil health. Therefore, this research study explores whether or not this globally recognized hypothesis holds true for the soils of Prince Edward Island (PEI), Canada. This research seeks to bridge this knowledge gap with an overall goal of investigating the carbon footprint of agricultural cultivation of potatoes, a major crop in PEI, and its impact on agricultural soils. The specific objectives of the study are to i) monitor the impact of long-term agricultural cultivation on the carbon sequestration (CS) and CO₂ emissions from highly cultivated soils in relation to soil variability, and ii) simulate CS and CO₂ emissions from potato fields. Soil samples and CO₂ emission data were collected from grids of four different organic and inorganic treatments (control, synthetic fertilizer, compost and biochar) established in soils of PEI under long-term agricultural cultivation. Soil samples were analyzed for soil organic carbon (SOC) and other major soil properties. Gas samples were analyzed for concentration of CO₂. Results showed that there were significant relationships found among various soil properties, CO₂ emissions and the yield of potato tubers. Currently, the Rothamsted carbon turnover model is being calibrated to simulate SOC and concentration of CO₂ emissions from the experimental treatments.