# Enhancing Soil Health with Hardwood Biochar

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**Rationale:** The sustainability of small farms in the Northeastern U.S. has been continually threatened by both the rising costs to operate and the degradation of soil quality. Small farms compete with large farms for economic viability and without the large land area to increase profitability, they must find alternate ways to increase yield and/or decrease operating costs to stay profitable. One large factor involved in the sustainability and yield is the quality and health of the soils. Soil quality must be maintained to ensure high crop yield, yet often, conventional farming practices cause continual soil quality degradation from intensive cultivation and inorganic fertilizer application. Counteracting this inverse relationship is a major challenge and often requires significant shifts in agricultural management practices. Biochar has been touted as having many potential uses as a soil amendment including remediation of contaminated soils, carbon sequestration and specific soil characteristic alteration, such as increased cation exchange capacity, pH and nutrient availability. This project aims to investigate the influence of biochar on the soil's chemical, physical and biological properties as they relate to overall soil health and productivity.

**Research Goals:** The overall goal of this proposed work is to evaluate the addition of biochar as a soil amendment in a temperate agricultural field and in the greenhouse using live field soil. The specific objectives of this study are as follows:

(1) to study nutrient retention in soil amended by biochar; specifically to detect macro- and micronutrient status as a result of application of biochar to the soil.

(2) to quantify and analyze the nitrogen uptake and yield of sweet corn in biochar amended field soils.

(3) to characterize the effect of biochar on selected chemical and physical properties of the soil including pH, moisture retention and CEC.

(4) to observe soil biotic (bacteria and nematodes) community shifts due to application of biochar at field scale.

**Treatments:**

5 levels of biochar, 5 replicates, 25 total plots.

0% by weight, 0 Mg/Ha

2% by weight, 40 Mg/Ha

4% by weight, 80 Mg/Ha

6% by weight, 120 Mg/Ha

8% by weight, 160 Mg/Ha

**Results:** While no significant differences in yield have been seen thus far; there have been significant changes in the soil properties. Besides the increased pH and CEC, large increases in retained cationic nutrients such as Mg, Ca, K and Mn.

| ***Initial Sample & char%*** | ***Density (g/cc)*** | ***Soil pH*** | ***CEC (Meq/cg)*** |
|---|---|---|---|
| ***July 2012*** | ***0.92*** | ***5.6*** | ***8.4*** |
| *July 2013, 0%* | *0.89* | *6.2* | *9.3* |
| *2%* | *0.84* | *6.6* | *9.1* |
| *4%* | *0.84* | *6.9* | *9.2* |
| *6%* | *0.79* | *7.1* | *9.6* |
| *8%* | *0.83* | *7.1* | *9.7* |

Biochar application, July 2012

Sweet corn rows, July 2014

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