SUSTAINABLE FOOD AND AGRICULTURE

Biochar and Climate Change

What can the pyrolysis of agricultural wastes do to mitigate climate change?

INCREASES IN GREENHOUSE GASES have been associated with increasing global temperatures, changes in seasonal precipitation patterns and rising sea levels.

Agriculture can play a major role in mitigating greenhouse gas emissions through the sequestering of carbon in the form of carbon dioxide (CO_2) from the atmosphere by increasing soil carbon. Recently the addition of bio-charcoal to soils has been proposed as a new approach to sequester carbon in the ground.

Biocharcoal is produced during the burning of green waste biomass (e.g. nut shells, cuttings and prunnings) to generate renewable energy (Fig. 1). It therefore not only has the potential to sequester carbon when added to soils, but also reduce the CO_2 emissions associated with fossil fuel consumption. Furthermore, incorporation of bio-charcoal can improve soil nutrient availability and soil quality, which can improve crop yields.

We are currently evaluating whether the addition of bio-charcoal to agricultural soils could reduce the more potent greenhouse gases and may mitigate climate change related issues, ensure future food security and combat agricultural waste management issues.

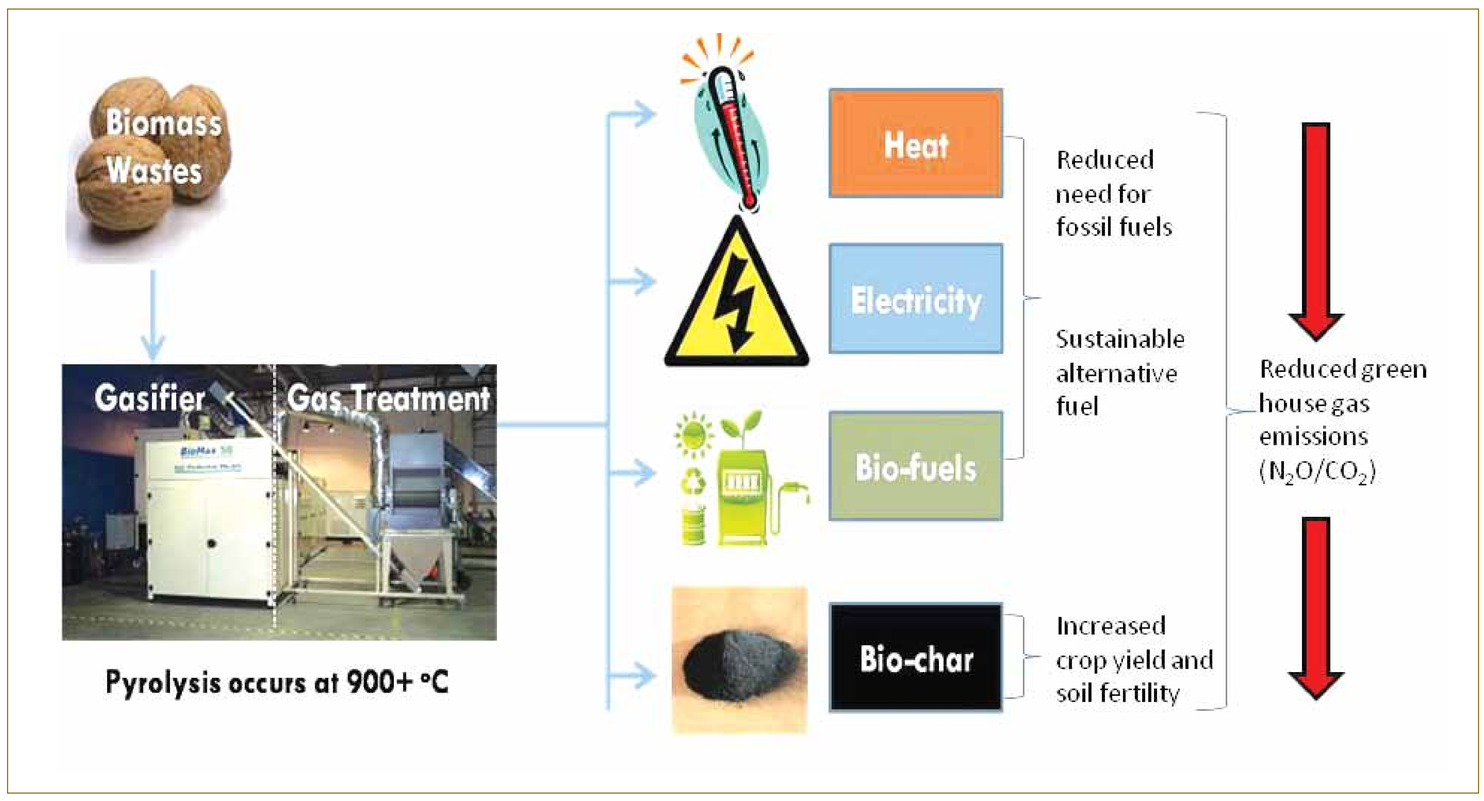
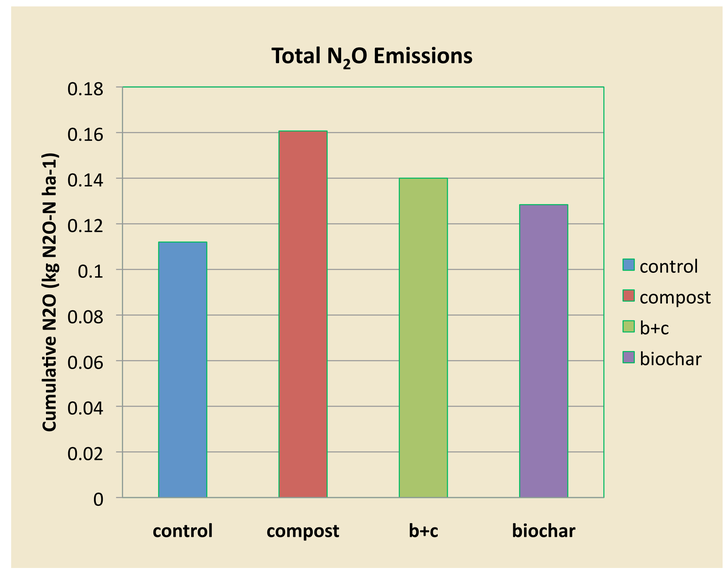


Figure 1—Biocharcoal is produced during the pyrolysis (burning in the presence of little to no oxygen) of agricultural green waste biomass (e.g. nut shells, cuttings and pruning) to generate renewable energy (Fig. 1). During the burning process, along with the production of bio-charcoal, heat is generated, electricity is produced and bio-oils—which can be used as a fuel for tractors and farm equipment—are created.

Our study consisted of four soil treatments, control (nothing added), compost, compost plus biochar and biochar only. The biochar was made from the pyrolysis of waste walnut shell and was incorporated into one-by-one meter plots in an organic farming system that primarily grows various vegetable crops.

Measurements of nitrous oxide were taken using static closed chambers made of PVC and gas tight syringes. Lettuce was planted and once plants reached maturity yields were measured for biochar-coals's impact. Our study showed that biochar had neither a positive or negative effect on yield.



Preliminary results from our study show that the total nitrous oxide emissions are lower for biocharcoal plots compared to compost plots but biocharcoal plots were higher than control plots. This means that while emissions can be lower in some circumstances further research is needed.

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