ENHANCING SOIL PRODUCTIVITY WITH CHAR

By Colleen Scherer, managing editor

Scientists are doing new research on a manmade version of an ancient soil ingredient that could enhance future agricultural productivity. It's known as char, agrichar or biochar. It is a type of charcoal and is mostly carbon.

Preliminary research from South America has identified natural char in highly productive agricultural land. Manmade biochar is the byproduct of a new biomass-to-biofuel technology.

Dynamotive USA, Inc., a wholly-owned subsidiary of Dynamotive Energy Systems Corporation, a Canadian company, uses a process known as fast pyrolysis to convert biomass to biofuels. This technology uses medium temperatures and an oxygen-free environment to extract BioOil from dry, waste cellulosic biomass for industrial power and heat generation.

Dr. Desmond Radlein, Dynamotive's chief scientist, explains, "BioOil is neither ethanol nor biodiesel. It is the condensed liquid product that is obtained during pyrolysis of biomass. The biomass is rapidly heated to 500°C in an inert atmosphere where it decomposes into liquid, gas and solid (char) products. It is a somewhat viscous, dark brown liquid with a smoky odor—suitable only for boilers, kilns, gas turbines etc., but not motor vehicles. The char co-product is known as agrichar or biochar."

Because biochar is a co-product of the fast pyrolysis process, Dynamotive and other companies around the world are researching its properties to determine its benefits for agriculture. Radlein and other scientists say preliminary research shows that applying biochar to less productive soils will improve their production capacities, sequester carbon and improve yields.

To determine how much char could and should be applied to soils and how much of a difference it can make in yields, Dynamotive has partnered with Heartland BioEnergy LLC in Webster City, Iowa, to conduct field trials. Dr. Lon Crosby at Heartland BioEnergy is conducting the trials.

Crosby's field trials involve three strips of corn crop land 800 feet long and 30 feet wide. One strip had no char applied, but the second had 2.5 tons of char applied per acre and the third had 5 tons. Dynamotive also has donated about seven additional tons of biochar to research outside the U.S. Results of the trials are expected later in the season.

"Not only does Dynamotive's biochar have the potential to raise high-yield rates of corn another 20 percent, but we believe there is a real possibility the char trial could also result in evidence that points the way to dramatic improvements in water quality, which could have far-reaching benefits," says Crosby.

Researchers have determined some of what char does in the soil. "First, char enhances the moisture retention in the soils," says Radlein. "Secondly, it increases the habitat for beneficial microorganisms in the soil, and it has good retention of minerals and nitrogen compounds. This prevents leaching."

Radlein also stresses that biochar is a more environmentally friendly way to store carbon dioxide in the soil.

"The char allows for a lot more carbon to be sequestered into the soil where it will provide benefits to agricultural soils and yield. Research has shown that this product may take thousands of years to degrade," he says.

Currently biochar is not being sold because a market has not been established for it, Radlein says. But he expects that biochar will find a marketplace as biofuel production continues to increase. Depending on the biomass used, between 15 percent and 30 percent of the biomass used to create BioOil ends up as biochar. AG

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