Biochar *And Its* Possibilities

Research On Biochar Shows Promise For Soil Fertility, Carbon Sequestration

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Biochar and its potential use in agriculture today is an intriguing topic dear to the heart of Dave Shiley, extension educator in natural resource management out of the Champaign extension center in Central Illinois.

"The use of biochar is not new," he said. "It's been around since Amazonian cultures, but research on its potential implications for agriculture is really beginning to pique the interest of Department of Energy and other groups because of its additional potential for carbon sequestration."

Biochar is produced by the heating of any kind of organic material to a temperature between 200 to 800 degrees celsius under low oxygen conditions.

"The result is a carbon structure, similar to charcoal, that is very porous," Shiley continued. "One benefit of this porous carbon structure is that it provides lots of surface area for microbes to attach, which has benefits to soil health. The porous structure of biochar also has the potential for capturing and holding ammonia and phosphorus, keeping it in the soil where plants can utilize it."

This can be beneficial for the plants and also for the environment as biochar reduces runoff of these compounds into lakes and streams.

"Biochar also can increase the CEC or cation exchange capacity of the soil; therefore, it would have the greatest potential benefit in low fertility soils," he said.

Cations are positively charged ions (ammonium (NH4+), potassium (K+), calcium (Ca2+), magnesium (Mg2+)). In general, the less clay and organic matter in the soil, the lower the CEC, according to Nancy Holm, coordinator of the Illinois Biochar Group and Sponsored Research coordinator for Illinois Sustainable Technology Center.

Shiley said biochar has the potential to be used as a mechanism to hold nutrients in the soil, particularly in sandy soil where leaching potential is high.

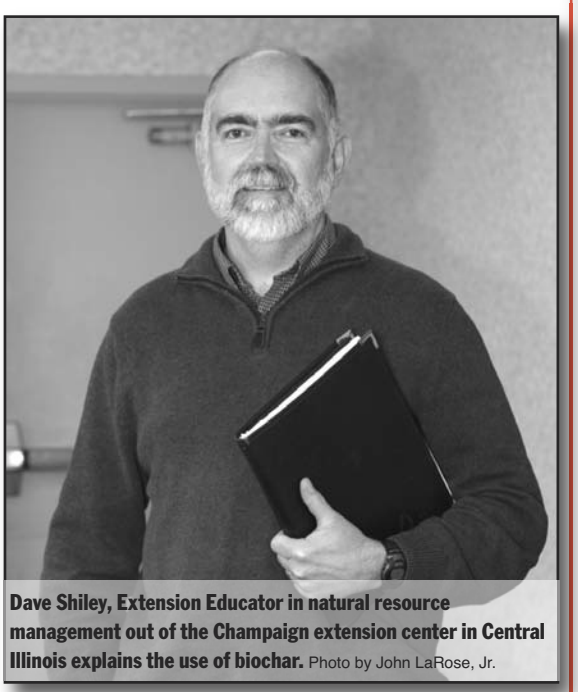
"It would be a mechanism to capture or absorb those nutrients, keep them in the soil column so the plants could utilize the nutrients, whether they are artificially applied or naturally there in the soil.

"Biochar does have a high pH," Shiley said. "Therefore, it has a liming effect. The pH of the biochar is affected by the temperature by which it is processed and can be as high as 10. So, biochar could be produced to target a particular pH range."

According to Holm, "The type of feedstock used also determines the pH of the biochar. Before applying biochar to agricultural soils, especially alkaline soils, the effects of pH changes on the particular soil need to be considered to prevent a detrimental result."

The interest in research using biochar as a soil amendment is relatively new; but if you compare the growth of a plant, corn or any other plant, in soil that has been amended with biochar to those grown in unamended low fertility soils, a visual difference in plant growth is apparent. Hopefully in the near future there will be yield data available from biochar research projects that can quantify the benefits of biochar as well as any problems to consider.

"Another thing that is interesting in terms of biochar is its potential for carbon sequestration. Carbon in the form of biochar has the potential to be residual for hundreds of years in the soil," he reported. "Compared to the rapid carbon cycling of plant residue left to decompose on the soil surface, biochar may have a place in the reduction of carbon in the atmosphere. We will have to watch on-going and future biochar research to fully determine its role in carbon sequestration."



Dave Shiley, Extension Educator in natural resource management out of the Champaign extension center in Central Illinois explains the use of biochar. Photo by John LaRose, Jr.

There are on-going research projects aimed at addressing the question of processing and production of biochar. Current research and development include portable processing units and large industrial scale facilities. In addition the development of soil application and incorporation techniques are on-going.

With the level of research now underway, Shiley could give no cost estimate per acre for farmers. He did note that one factor affecting biochar cost is that it potentially is a byproduct of biofuel production and could be processed at the same time that biofuel and syngas are produced. If biochar is produced using syngas as a fuel source for the pyrolysis, it could reduce the cost of biochar.

Shiley urges farmers to stay tuned, keep an eye open and support research efforts that might include some applied research in the field using biochar. The Illinois Biochar Group has a website to keep interested individuals connected to biochar research. The website can be found at <www.biochar. illinois.edu>. Δ