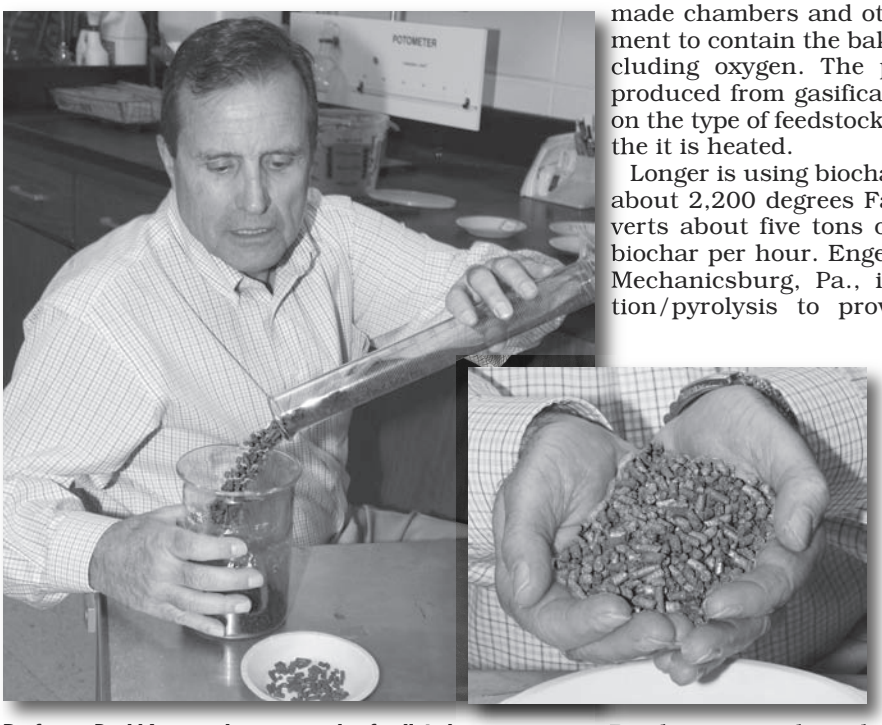
Poultry Litter Biochar May Have Fertilizer Value

FAYETTEVILLE, ARK.

Potential benefits of biochar made from organic material such as wood, plant material and manure are being investigated by agricultural scientists, including David Longer, professor of crop, soil and environmental sciences in the University of Arkansas System Division of Agriculture.

Longer is focusing on poultry litter as a biochar feedstock, since the state's poultry industry produces some two million tons of litter per year. His research is supported in part by Bioenergy Systems, LLC, in Tacoma, Wash., which generates energy and produces biochar from renewable feedstocks.



Professor David Longer shows a sample of pelleted biochar that is a co-product of poultry litter gasification. He is studying the potential for use of biochar as a crop fertility supplement.

The economic viability of large-scale bioenergy production will likely depend to some extent on the marketability of co-products such as biochar, Longer said.

"We have a lot to learn about biochar from poultry litter and other feedstocks," Longer said. "There are currently no recommended agricultural applications, but it has potential for future use in several applications."

Longer said potential future applications may include fertilizer supplementation, adsorption of pesticide or heavy metal residue, improved soil-water retention and increased growth of beneficial soil organisms. An underlying benefit would be sequestration of carbon as a source of greenhouse gases such as carbon dioxide.

On average, poultry litter contains about 4,500 Btu of thermal energy, Longer said. It can be burned in a furnace, or, through the process of gasification, it can be heated to a very high temperature to produce "syngas," which will burn in a manner similar to propane. Biochar is a co-product of gasification.

Gasification/pyrolysis systems use custom made chambers and other specialized equipment to contain the baking biomass while excluding oxygen. The properties of biochar produced from gasification/pyrolysis depend on the type of feedstock and how hot and long the it is heated.

Longer is using biochar from litter heated to about 2,200 degrees Fahrenheit, which converts about five tons of litter to 2.5 tons of biochar per hour. Engenuity Energy, LLC, in Mechanicsburg, Pa., is doing the gasification/pyrolysis to provide the biochar for Longer's experiments.

In the first year of a three-year study, Longer found that cotton yields were increased slightly when either 1,780 or 3,560 pounds per acre of biochar were added to recommended fertilizer rates in test plots at the Arkansas Agricultural Research and Extension Center in Fayetteville.

Biochar is mainly carbon with traces of other minerals, Longer said. The biochar he is using has a fertilizer nutrient value of about 5 percent phosphorus, 5 percent potassium and no nitrogen. When incorporated into the soil, the nutrients will not wash into streams, and the carbon is "sequestered," or removed from the atmosphere.

One of the questions to be answered by Longer and others is the rate at which nutrients in biochar become available to plants under variable soil and cropping conditions.

The U.S. Department of Agriculture's Agricultural Research Service is experimenting with biochar from feedstock such as switchgrass, corn stover, timber harvest residue, animal manures and others. ARS scientists have reported mixed results from studies of different biochars on soils ranging from glacial deposits in Minnesota to sandy loams in South Carolina.

Longer's preliminary findings and the USDA studies suggest that biochar can be beneficial if its properties are matched to specific soil properties and cropping systems. Δ