BEST MANAGEMENT PRACTICES FOR BIOCHAR USE IN SUGARCANE

SITUATION

Sugarcane is Louisiana's No. 1 valued row crop. Commercial sugarcane is a large grass that produces high biomass composed of sucrose in the juice and fiber. Upon receipt at the raw sugar factory, sugarcane stalks are shredded, and juice is extracted by a series of mills. The juice is clarified, evaporated, crystallized and processed into raw sugar and molasses. The leftover pulp is referred to as bagasse. Bagasse is composed of fiber (cellulose, hemicellulose, lignin and ash content), some field soil and water. The moisture content of bagasse is about 50%. Approximately, 30% of the sugarcane brought into the raw sugar factory for processing is bagasse.

USES OF BAGASSE

Most bagasse produced at the raw sugar factory goes immediately to the boilers. Bagasse is burned as a fuel source to generate steam — the main energy supply for factory operations. However, the raw sugar factory does not use all the bagasse as a fuel source. About 5%-20% of bagasse production is excess and stored in large, nearby piles. These bagasse piles are expensive to maintain, a safety hazard and remove valuable acres from agricultural production.

The Louisiana sugar industry has spent decades and millions of dollars looking for alternative uses of excess sugarcane bagasse. One solution is the production of biochar from sugarcane bagasse.

WHAT IS BIOCHAR?

Biochar is like charcoal and produced by heating sugarcane bagasse at moderate to high temperatures in the absence of oxygen. The composition of biochar varies with feedstock source (fresh vs. aged within the bagasse pileor bagasse vs. leafy trash from the field.) Composition varies with pyrolysis conditions (mainly temperature and time of treatment). The table below provides further information of biochar composition.

A load of biochar is being readied for a fallow field application.
Photo by Isabel Lima

Type of Bagasse	Carbon, %	Fixed Carbon, %	Ash Content, %
Fresh Bagasse	43.07	15.33	6.08
Biochar From Fresh Bagasse 350°C	58.15	24.79	8.22
Biochar From Fresh Bagasse 500°C	67.73	62.40	17.22
Biochar From Fresh Bagasse 650°C	68.61	69.86	20.24

Type of Bagasse	Carbon, %	Fixed Carbon, %	Ash Content, %
Aged Bagasse	25.75	13.72	20.30
Biochar From Aged Bagasse 350°C	21.17	18.48	29.70
Biochar From Aged Bagasse 500°C	35.66	31.69	50.86
Biochar From Aged Bagasse 650°C	43.67	36.59	53.73

The row on the left has received an application of biochar into the row furrow. Sugarcane is being planted after the biochar application. *Photo by Paul White*

Benefits of applying biochar to the soil

- Provide carbon sequestration. Biochar is a more stable form of carbon storage in the soil.
- Increase soil organic carbon and overall soil health.
- Improve soil nutrient retention by providing nutrients to the plant such as calcium, potassium, manganese and phosphorous.
- Increase the quantity and diversity of soil organisms.
- Small increase of soil pH over time.
- Reduce soil compaction by improving soil aggregation.
- Improve sugar and cane yields in a sugarcane crop.
- Improve soil water holding capacity.
- Finding a beneficial use for bagasse reduces the size and/or removes large piles of excess bagasse stored at the raw sugar factory.

APPLICATION TIMING AND RATES

Application rates will influence the cost of the application of biochar to sugarcane fields. U.S. Department of Agriculture Natural Resource Conservation Service programs may help offset these costs.

The rate range for biochar application is 1 to 2 tons of biochar/acre. A moisture content of 20% is recommended. Application of biochar during the fallow year of the sugarcane production cycle is best. During the fallow year, biochar applications can be incorporated into the soil. An ideal application is to have the sugarcane rows in place and the biochar placed in the row furrow and then covered with field soil. The placement of biochar in the root zone will maximize its benefits to the sugarcane crop.

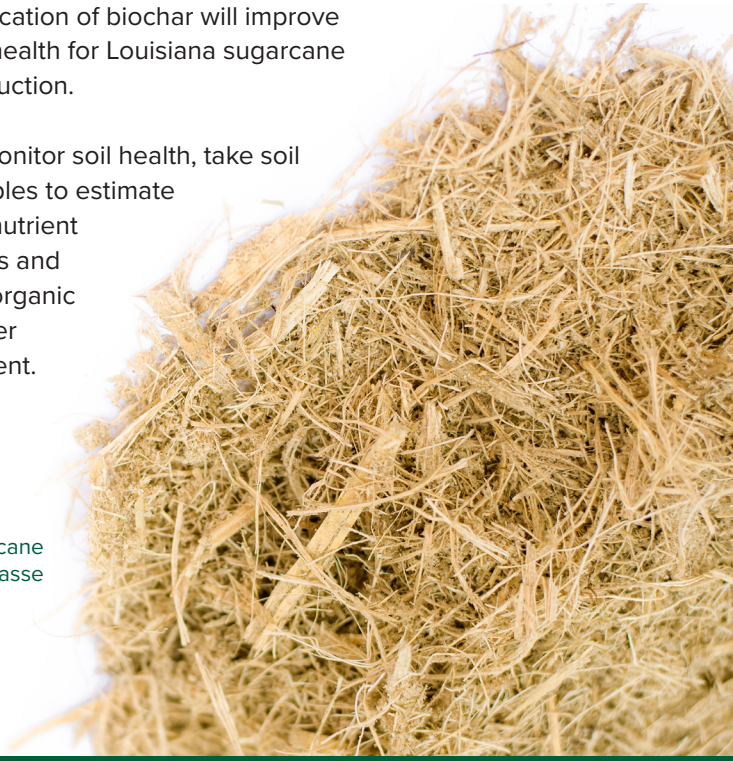
Biochar in row furrow. *Photo by Isabel Lima*

Annual applications can be made but incorporation will be more difficult. Again, it is best to place the biochar near the root zone of the sugarcane plant. If the biochar is not incorporated into the soil and left on the soil surface, soil applied herbicides may be bound by the carbon and become inactive.

HOW LONG WILL IT TAKE BIOCHAR TO IMPROVE THE SOIL?

Improving soil properties is a long-term process. Some of the benefits to sugarcane may not be observed until the end of the first crop cycle or even into the beginning of the second crop cycle. Biochar can improve the cation exchange capacity (CEC) of the soil; however, the duration of this effect is not well understood. The application of biochar will improve soil health for Louisiana sugarcane production.

To monitor soil health, take soil samples to estimate soil nutrient levels and soil organic matter content.



Sugarcane bagasse

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