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U.S. Department of Agriculture
National Institute of Food & Agriculture

SunGrant INITIATIVE
South Central Region

Project Title: ***Sustainable Feedstock Production for Bioenergy***

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Project Goal

The primary goal of this project was to utilize low productivity soils to grow feedstocks for bioenergy production. The specific objectives were:

- Methods and procedures to bind biochar with an inexpensive material to increase biochar density for easier handling.
- The ability to use existing farm equipment to handle and land apply aggregated biochar.
- Development of soil fertility BMPs for biochar nutrient recycling on low-productivity soils in the South Central region for the production of perennial grass feedstocks for bioenergy production.
- Improvements of soil tilth and water holding capacity for low productivity soils through applications of biochar.
- The opening of millions of acres of unproductive farmland to the production perennial grass feedstocks for sustainable bioenergy production in the South Central region.
- A comprehensive Extension program for the dissemination of BMPs for the production of bioenergy feedstocks on low productivity soils in SC region.

Project Outcomes

- Wind transport of inherently low-density biochar particles is a concern during application. Adding water in the amount of 80-110% by weight to the biochar produced mixtures with the best aggregation for handling and land application to prevent wind-induced loss biochar from target sites.
- There was a significant linear relationship between water holding capacity (0.1, 0.33, and 3 bar soil pressure) and runoff. Control plots (no biochar) produced the largest amount of runoff as expected. Biochar treated plots produced lower cumulative runoff values but a significant trend did not exist.
- There was a potential inverse relationship between the total biomass and runoff of rainfall, especially for the plots with the highest biochar applications. However, this trend was not statistically significant.
- There was a significant increase in grass production in research plots with the highest rates of incorporated biochar addition. Water holding capacity (at 3 bar soil pressure) also increased for the highest rate of incorporated biochar, likely leading to the observed increase in grass production. A linear relationship existed between water holding capacity (at 3 bar soil pressure) and multiple biomass harvests.
- Saturated hydrologic conductivity, bulk density, and porosity, of the field soil used in this study were not significantly influenced by biochar application.
- Nutrient testing of the research plots revealed significant increases in pH and potassium content of the soil with increasing rates of biochar application, regardless of whether the biochar was unincorporated or incorporated.
- There was a significant increase in nitrate-nitrogen content as unincorporated biochar rates increased.