

# Assessing How Biochar Can Affect Soil Fertility and Sorghum Biomass in the Deep South

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## Introduction

Soil management has been a key factor to the production of plants and habitat of animals since the beginning of time. Soil health is imperative for the environment and health of the plants to fuel the world. The soil is responsible for 95% of the world’s food production. When growers produce food, there are many additives needed to create a crop that is healthy and sought after. Many factors go into the production of a healthy and sustainable crop. While genetics and environment play two monumental roles in soil productivity, soil is said to be the single most crucial factor in plant production. This project will evaluate biochar compared to poultry litter and mineral fertilizer, along with a detailed look at biomass sorghum.



Figure 1: Atrazine and S-metolachlor being applied to location 1 prior to planting (3-18-25)

Treatment Type	Description of Product	Will this plot have Biochar	Rate
Trt 1	Control	No	0x
Trt2	Mineral	No	1x
Trt 3	Mineral	No	2x
Trt 4	Litter	No	1x
Trt 5	Litter	No	2x
Trt 6	Mineral	Yes	1x
Trt 7	Mineral	Yes	2x
Trt 8	Litter	Yes	1x
Trt 9	Litter	Yes	2x
Trt 10	Control	No	0x

Replication 1		Replication 2		Replication 3	
Border Row	*Open	Border Row	*Open	Border Row	*Open
101 (Mineral)(With BC)(1x)		201 (Litter)(No BC)(1x)		301 (Mineral)(Yes BC)(2x)	
Border Row		Border Row		Border Row	
Border Row		Border Row		Border Row	
102 (Litter)(No BC)(2x)		202 (Mineral)(Yes BC)(2x)		302 (Mineral)(No BC)(1x)	
Border Row		Border Row		Border Row	
Border Row		Border Row		Border Row	
103 (Mineral)(Yes BC)(2x)		203 (Mineral)(No BC)(1x)		303 (Control)	
Border Row		Border Row		Border Row	
Border Row		Border Row		Border Row	
104 (Mineral)(No BC)(1x)		204 (Mineral)(Yes BC)(1x)		304 (Litter)(Yes BC)(1x)	
Border Row	*Open	Border Row	*Open	Border Row	*Open
Border Row		Border Row		Border Row	
105 (Control)		205 (Control)		305 (Control)	
Border Row		Border Row		Border Row	

## Materials and Methods

The project will consist of three replications and a total of 8 treatments and 2 controls. Treatments that will be used will be mineral fertilizer and poultry litter. Treatments will be applied to one block per replication. Mineral fertilizer will be applied as follows: 1x (no biochar), 2x (no biochar), 1x (with biochar), and 2x (with biochar). Poultry litter will be applied as follows: 1x (no biochar), 2x (no biochar), 1x (with biochar), 2x (with biochar). The treatments will be applied to a randomized complete block. There will be two locations that are replications of one another, Location 1 will be located at the south farm on the campus of Mississippi State University. Location 2 will be at MAFES Bearden Dairy Research Center in Starkville, Mississippi. Each location has been fallowed for at least one year. The application of poultry litter and biochar will be incorporated into the soil prior to planting. Triangle Forage Sorghum NX-4264 will be planted in each location with a four-row planter. Once plants emerge from the soil we will begin gathering data on plant height, SPAD, leaf greenness and stalk diameter. Soil samples will also be gathered throughout the growing year to keep track of data on poultry litter, biochar, and mineral fertilizers.

## Objectives

The purpose of this study was to see how biochar reacts with other minerals in the soil, if it leaches out of the soil, and if biochar reacts well with other soil properties and the overall effect it has with the soil year over year. The second part of this project was to examine biomass in sorghum and how well the overall growth and development of the sorghum would perform in each block. The objectives of this were to examine plant height, SPAD readings, stalk diameter, and leaf greenness to make educated management decisions going forward.

## Conclusion

The goal of this project is to compare biochar to poultry litter and mineralization while also studying production and yield of biomass sorghum (*Sorghum bicolor L. Moench*). Research on biochar and biomass sorghum will help growers make better use of their resources to make management decisions based on which hybrids performed well in particular soil profiles. A research project that includes both biomass production data, along with soil fertilizer application data will be beneficial in today’s ever-changing world.



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