

# Soil Texture, Biochar, Manure and Tillage Practices affect silage sorghum-Sudan and Soil Properties

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## Introduction

Sparse data exist on whether biochar (BC) impacts warm-climate forage systems. Impacts might include soil fertility/hydrology/C sequestration, forage yields/nutritive value, antibiotic/pathogen mitigation, greenhouse-gas emission, or N/P immobilization.



## OBJECTIVE

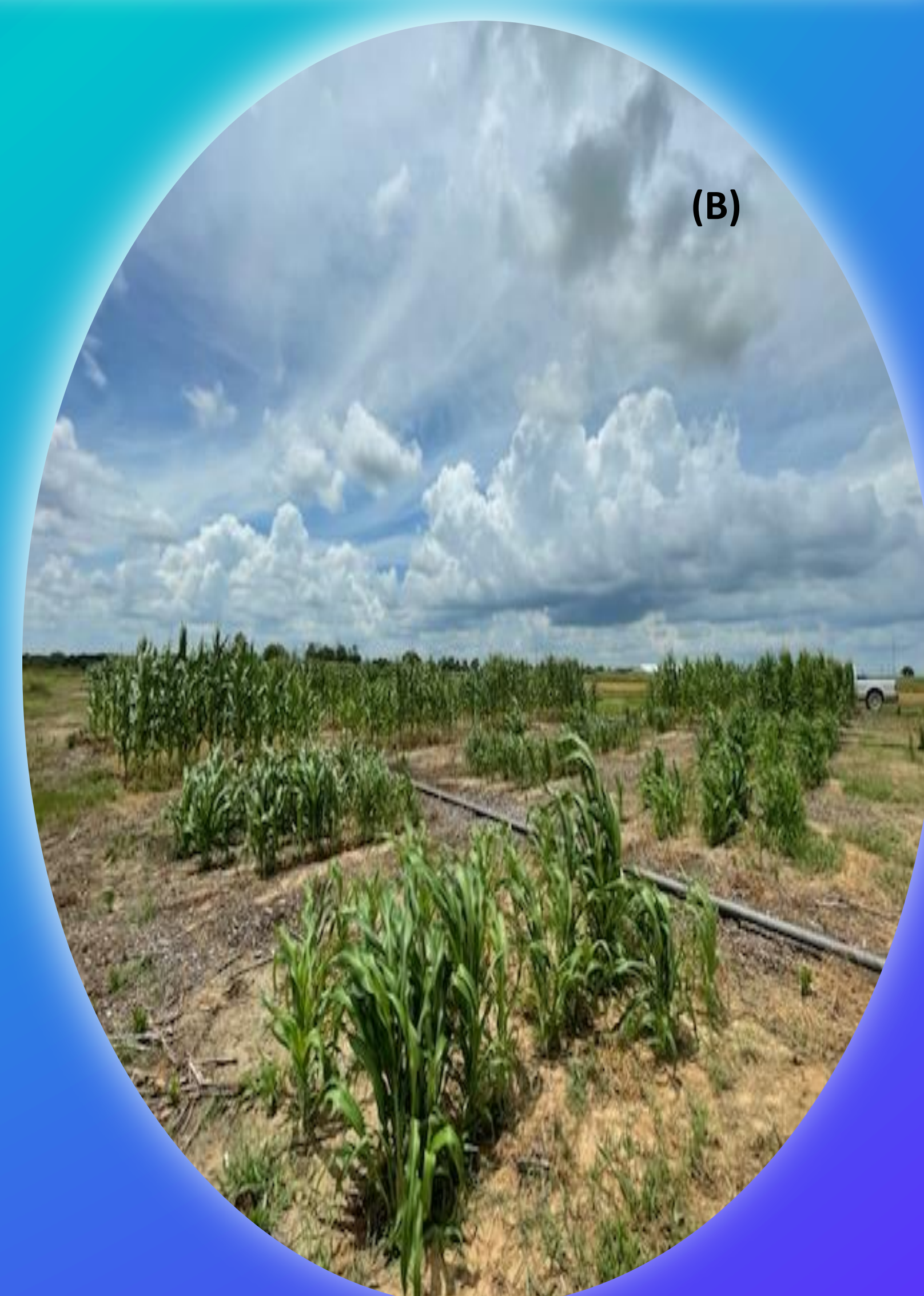
Determine the effects of:

- ✓ wood-BC: 0 (**NBC**), 5 (**LBC**), 10 (**HBC**) Mg DM/ha
- ✓ wood-Ca-BC: 0, 10 (**CBC**) Mg DM/ha
- ✓ dairy **manure**: 0, 10 Mg DM/ha
- ✓ soil texture:
  - loamy sand (**LS**), sandy loam (**SL**), clay loam (**CL**)
- ✓ amendment incorporation: **tillage**

on sorghum-Sudan nutrient content and dry matter yield (DMY) as well as soil properties after the 3<sup>rd</sup> continuous crop season in southcentral North America.

## Methodology

- ✓ Above-ground forage was assayed for several parameters.
- ✓ Data were submitted to variance analysis and Fisher LSD's test using R and considered differences at  $P \leq 0.05$ .



**Figure 1.** Field microplots before (A) and after (B) the harvest.

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## Results

**Table 1.** Above-ground dry matter yield and nutrient concentration and soil parameters alteration by interactions and main effects on silage sorghum-Sudan after the 3<sup>rd</sup> continuous crop season.

Above-ground forage parameters						
kg DM/ha	Soil	Biochar	Tillage	Soil×Manure ↑ manure (SL)	Soil×Tillage ↑ Till (SL;LS)	Biochar×Manure
C	CL>SL>LS					
Ca	CL>SL>LS					↓ HBC (manure)
Fe	CL>SL>LS					
K		↓ LBC			↓ Till (SL;LS)	
Mg	SL>LS>CL					
N	CL>SL=LS		↓			
Na					↑ Till (SL;LS)	
Soil parameters						
Conductivity	Soil	Biochar	Manure	Soil×Manure	Soil × Tillage	Soil × Biochar
Cu	LS>SL=CL		↑		↑ Till (SL)	
Fe		↓ CBC			↑ Till (SL)	
K						
Mg			↑		↑ Till (SL)	
Mn	CL>SL=LS					
Na				↑ manure (CL)		
NO <sub>3</sub> N	SL>CL=LS					
P				↓ manure (SL;LS)		
pH				↑ manure (LS)		↑ CBC (SL;LS)
S				↓ manure (LS)		
Total C	CL>SL>LS		↑			
Total N	CL>SL>LS		↑			
Zn	LS=SL>CL					

## Conclusions

All parameters were altered by “soil” and/or by the interactions “soil×tillage” or “soil×manure”. Thus, it is essential to consider soil texture and nutrient makeup before choosing appropriate tillage and amendment. Longer study periods, may produce different results since, over time, BC can act as a slow released nutrient source.