# Use of Biochar in Brazilian Land-Use Systems: The Current State of Knowledge

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## Introduction

- Several soil constraints limit agricultural production in Brazil.
- Biochar as a soil amendment in land-use systems has attained prominence recently.

## Objective

- Assess the current state of knowledge of biochar use in Brazil.

## Methodology

- The study is based on a “Biochar + Brazil” literature search in databases on experiments involving plants.

## Results

- A total of 16 experiments.
- Ten reported positive effect on plants (Table 1).
- Most of the biochars used were plant-based – native trees or *Eucalyptus* sp. No feedstock source mentioned in four of the studies.
- For seedlings of *Eucalyptus* sp., biochar application at 7.5% of volume basis of soil promoted growth, but was detrimental at 30% rate.
- Biochar application resulted in yield increases only in two studies, one with upland rice (*Oryza sativa*), and the other with soybean (*Glycine max*). In the rice experiment, yield increase was attributed to increased water retention capacity (WRC) of the soil.
- Three field studies considered the potential of biochar to increase soil organic carbon, SOC (Fig.1). Two positive results, but in one, the decomposition rate of biochar was faster than that of native soil organic matter.

## Discussion

- SOC content increased more when biochar was applied in combination with residue added via crop rotation (potential key component).
- Tree seedling growth is increased with biochar application at moderate levels; but excessive application can be detrimental.
- Potential use of biochar for drought-sensitive plants should be explored in the dry regions of the country.
- Studies involving comparisons of biochar from different feedstocks, and methods of pyrolysis, and methods of applications in the field were not found in the datasets.
- No positive effect of biochar noted in some field experiments were associated with the low nutrient requirements of the plants in those studies. And for some plants, maybe the results could have been different if the biochar was from an animal-based source because plant-based feedstocks likely have less nutrients.

Table 1. Summary of biochar experiments involving plants in Brazil reviewed.

| Effect of biochar application on | No. of experiments | |
|---|---|---|
| | With positive results | Out of a total of |
| Nursery experiments (Seedling development) | 8 | 10 |
| Field experiments | 2 | 6 |
| Tree species | 6 | 10 |
| Crop species | 4 | 6 |
| Soil carbon sequestration | 2 | 3 |

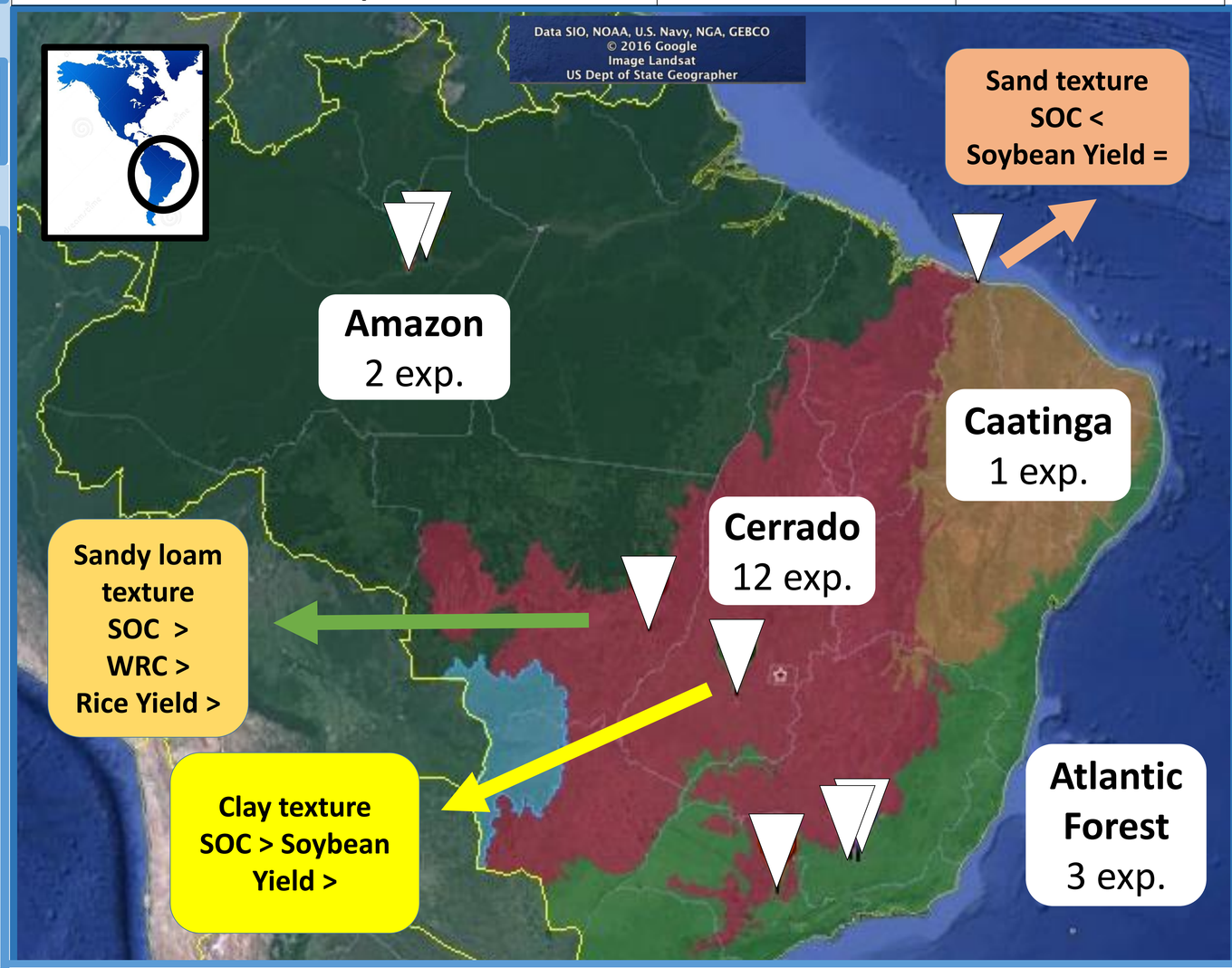


Fig. 1: Map showing the geographical spread of study locations of the biochar experiments (exp.) in Brazil. White triangles: The seven experimental locations. White boxes: Number of experiments in four Brazilian biomes; the biomes are shaded in different colors. Colored boxes: The three field experiments that considered the effect of biochar on SOC (>: increased, <: decreased, =: not affected).

## Conclusions

- Biochar could potentially be beneficial in Brazilian land-use systems especially for tree-seedling production for large-scale reforestation projects and for drought sensitive plants.
- More investigations are needed, especially focusing on field application, use of different feedstocks sources of biochar and its potential for increasing SOC.

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