CROP YIELD INCREASES AS A RESULT OF BIOCHAR APPLICATION IN TROPICAL SOILS

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Outstanding Student Poster & PICO Contest

Introduction

Limiting agroecosystem exports

The balance between organic matter (OM) input and its decomposition is a key factor for the **management of soil fertility** in dry and wet tropical agroecosystems. In fact the presence of OM is crucial for soil structure and its recycling essential for nutrient management in the soil-plant continuum.

In this regard, we pyrolyzed **cotton stems**, usually crop residues, to produce **biochar** (BC), a carbon rich highly recalcitrant product and amended it to highly weathered soils of Koumbia, Burkina Faso (BF). For this study we focused on two main points:

1. How can biochar additions to soil modify physical and chemical properties?

2. In turn, how are maize crop yields impacted ?

Material & Methods

We studied **two factors**, **biochar application rate** and its combination with **fertilizer application rate** according to conventional or limited quantities.

Table 1 – Studied variables

Treatment	Biochar (t ha^{-1})	Fertilizer (kg ha^{-1})
A	10	150
B	10	100
C	30	150
D	30	100
E	0	150
F	0	100
G	0	0

Following a baseline soil heterogenity analysis composite soil samples were collected on all 35 plots for physico-chemical analysis. Then on each plot plant and grain subsamples were gather for nutrient contents.

Results & Discussions

Biochar amendments impacts on soil physico-chemical characteristics

Three main effects.

1. pH values increased to neutral values

➢ Biochar has a **liming effect**

2. **Nutrient bioavailability** of two main nutrients, phosphorus (P) and potassium (K) increased with biochar addition

➢ These were present in biochar as soluble salts

➢ Nutrient bioavailability was also improved by a neutral pH

3. **Organic carbon** concentrations increased with BC application.

➢ Recalcitrant OC storage

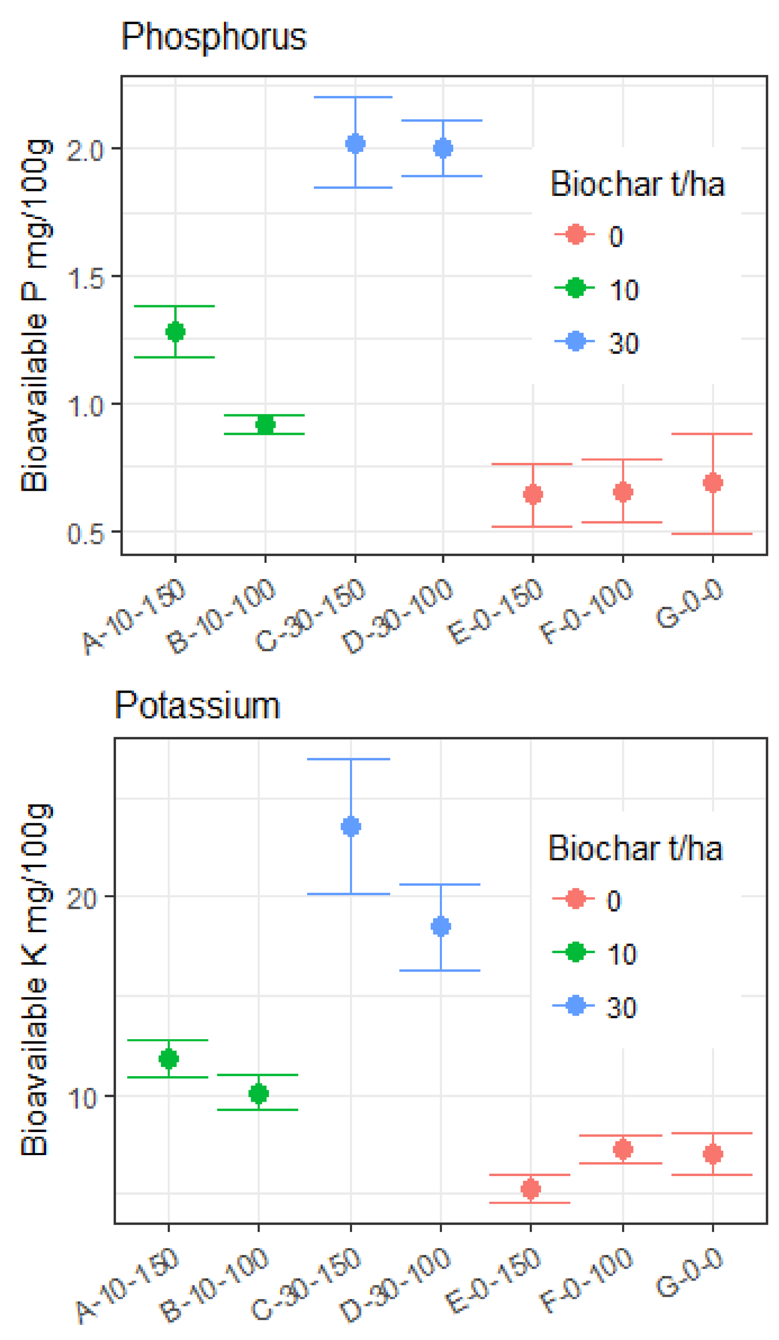

Figure 1 – P & K bioavailability

Plant nutrient uptake

Phosphorus and potassium plant uptake increased as a crop response to nutrient availability.

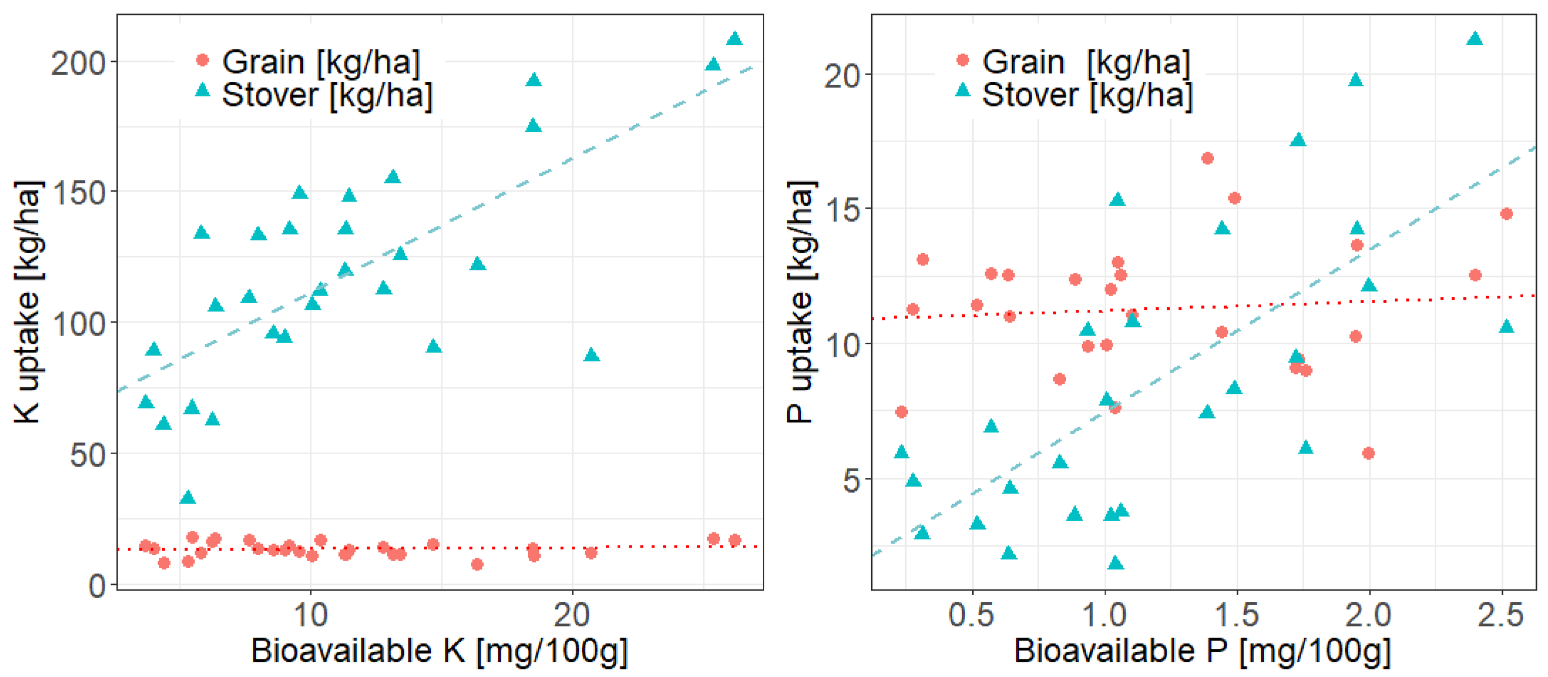

Figure 2 – P & K uptake with respect to bioavailability in soils

Crop productivity

Total **biomass production increased** as a result of biochar application

This increase in total biomass yield is explained by **a greater plant survival** rate.

No difference in grain yield was however noted.

This is likely due to **diminished competition** for resources in plots without biochar.

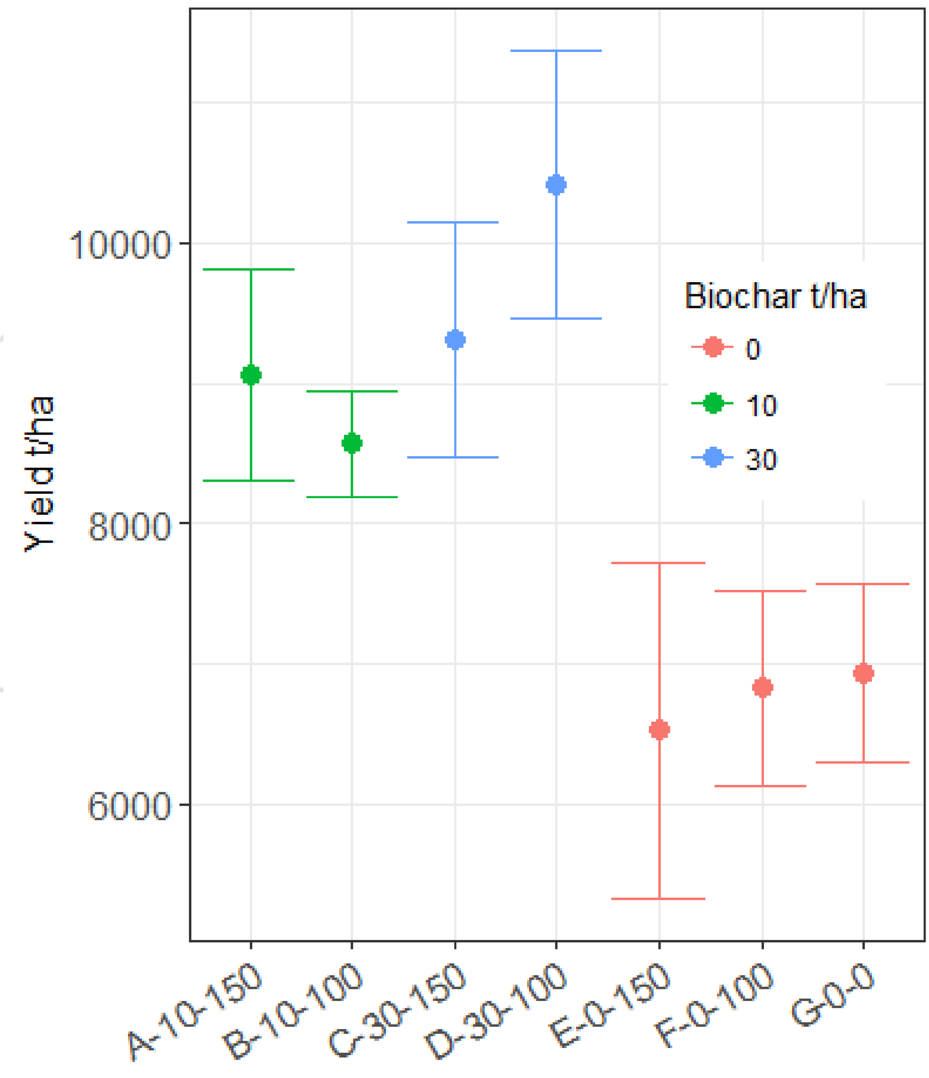

Figure 3 – Crop yield with respect to treatment

Trends suggest plant P and K maximum uptake is reached when 30 t.ha^{-1} of biochar was applied bringing forward that biochar applications could have been limited down to 5 t ha^{-1} to meet K needs and down to 10 t ha^{-1} to meet P needs

Conclusions

- Biochar from waste material improved P and K bioavailability. Fertilizer inputs when combined to biochar can hence be reduced.

Using waste crop residues can improve soil fertility whilst producing energy from renewable material and storing carbon in soils on the long-term

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Comments or suggestions?
Please do not hesitate !

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