

# Biochar to Enhance Nutrient Availability in Cocoa Systems: A Greenhouse Trial

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## Introduction

Application of biochar-based fertilisers (BBF) in a tropical agronomic context posses the potential of:

- mobilising native soil-nutrients
- enhancing the nutrient uptake of fertilizers
- high carbon sequestration

*T. Cacao* is characterized by high production potential of underutilised biochar feedstock.

An experiment was conducted to investigate the potential of BBF's to alleviate nutrient stress and sustainably intensify productivity of cocoa.

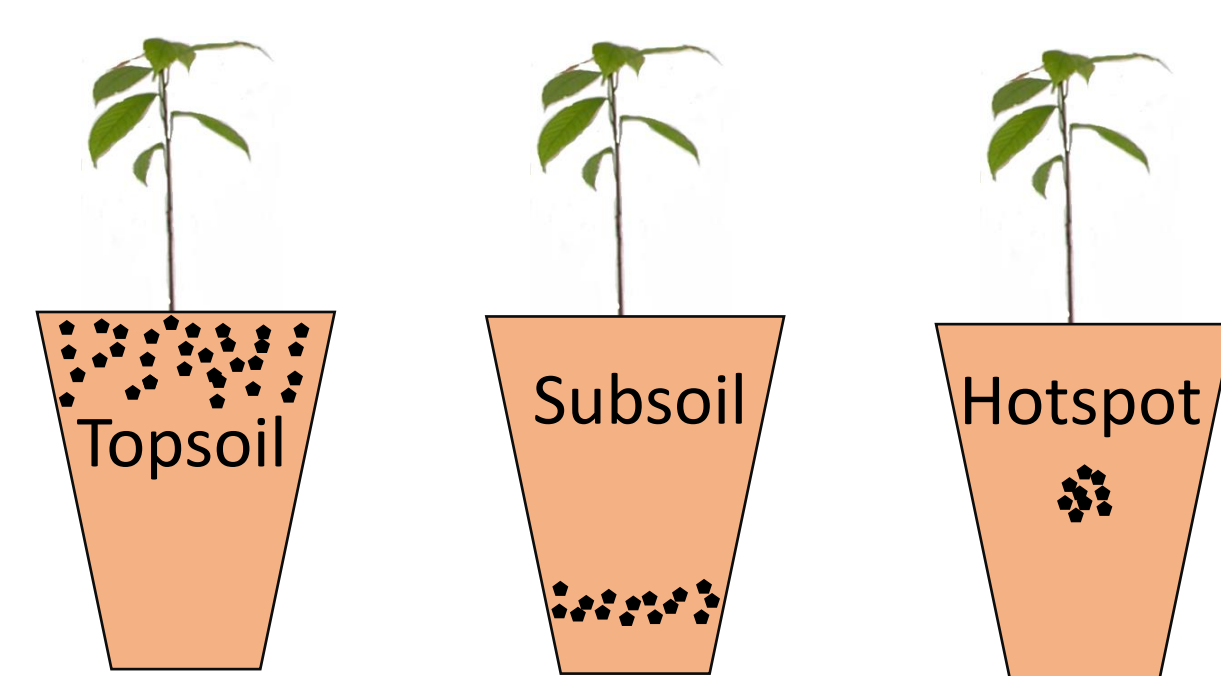
## Materials and Methods

A pot experiment in semi-controlled greenhouse with 12 Treatments plus zero control (6 reps) on cocoa seedlings over 22 weeks

Fertilizer levels:

- C Zero control
- I 16 gr Biochar micro dosing (2t ha<sup>-1</sup>)
- II Mineral fertilizer
- III Combination of I & II
- IV Combination of I & II fermented

Placement levels:



Measured parameters:

Above and belowground biomass, plant physiology and stoichiometry such as P, K, C, N



## Results

- Subsoil aboveground biomass, total leaf area and chlorophyll content index by 56 %, 222 % and 140 % respectively compared to surface application of mineral fertilizer
- Subsoil application of BBF resulted in higher level of foliar P levels (+ 53 %) compared to farmer practice (Fig. 2)
- Optimised Leaf N:P ratio indicate the potential of BBF to alleviate P availability constrains
- Limited effect of surface application of BBFs justify the need-for root zone application through injection technology

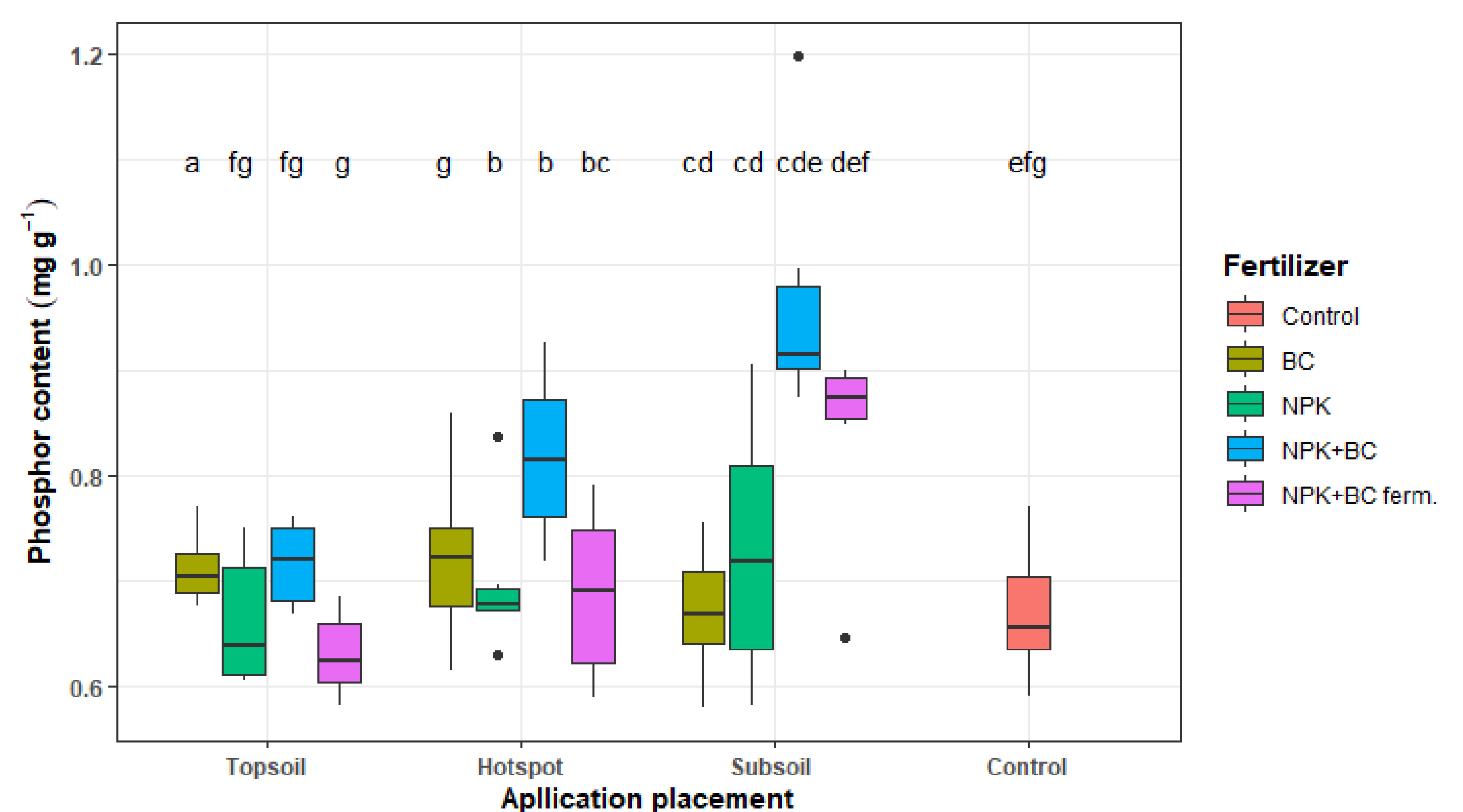


Fig. 2: Boxplots of Phosphorus content (mg g<sup>-1</sup>) of cocoa seedlings as a function of fertilizer and placement levels. Treatments sharing a letter are not significantly different in means. (Tukey-HSD Test)

## Conclusion

- Results of this study support previous findings on the benefits of BC and BBFs on cocoa performance
- Increased performance is expected to result in improved vigour, survival and potentially yields
- Implementation of BC-based fertilization to smallholder cocoa (agroforestry) systems and other tropical perennial crop systems can contribute to achieving following sustainable development goals:
  1. SDG 1 (no poverty)
  2. SDG 2 (zero hunger)
  3. SDG 13 (climate action)
  4. SDG 15 (life on land)



Fig. 1: Cocoa plants after 22 weeks with different fertility treatments and subsoil application