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Biochar production from cotton residues as an agronomical practice improving soil physicochemical properties and maize yields (Zea mays L.) in tropical soils of Burkina Faso

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Up to now, in Burkina Faso, cotton residues have been slashed and burned directly in the field, leading to long-term losses of nutrients in soil-plant systems. Tropical sandy soils are highly weathered and depleted in organic matter and nutrients. The recycling of cotton stems through biochar production as alternative to slash-and-burn is here tested for improving soil physico-chemical properties and the resulting maize yields at the field scale, in a trial implemented in Koumbia, province of Tuy, Burkina Faso. The effect of biochar application rate (0 t ha-1, 10 t ha-1, 30 t ha-1) and its combination with various fertilizer quantities (0 kg ha-1, 100 kg ha-1, 150 kg ha-1) have been investigated.

Soil physico-chemical characteristics, plant tissue nutrient concentrations and yields were analysed. The content of soil bioavailable phosphorus (P) and potassium (K) as well as pH values and organic carbon (OC) concentration all increased with biochar application rates to the soil. Likewise, a significant increase of P content in plant tissue was noted. Our results show an increase in total aboveground biomass in response to biochar application but no significant variation in terms of grain yield. There was a significant difference in terms of nutrient availability between the 10 t ha-1 and 30 t ha-1 biochar amendments but no effect in terms of biomass production. Overall, the combination of low fertilizer input (100 kg ha-1) and biochar resulted in higher soil nutrient bioavailability in comparison to high fertilizers inputs alone (150 kg ha-1).

We conclude that biochar inputs may lead to reduced fertilizer, in turn reducing production costs for farmers. The effects of biochar during the following growing seasons must be studied to investigate biochar amendment effect during the following growing seasons. Moreover, the co-composting of biochar should be investigated in this tropical environment to study its potential to stimulate the positive effects of biochar on soil fertility.