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Amazonian Dark Earths and the Potential of Biochar for their Re-creation

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Abstract

Amazonian Dark Earths (ADE), in Portuguese Terra Preta de Índio, are anthropogenic soils. Soils of Amazonia are mainly acid Oxisols, Ultisols and Inceptisols with low fertility. Characteristic feature of ADE is high C content, which is increased usually by addition of high amount of biochar. According to many previous studies these anthropogenic soils greatly improve the yields of cultivated crops. The aim was to prove the positive influence of biochar application on plant growth and biomass production and further explore the possibility of biochar to improve the current agricultural systems in Peruvian Amazon, and thus, decrease the deforestation. For the experiment we chose two locally grown crops and one native tree from three distinct families - rice, (*Oryza sativa* L. – Poaceae); cowpea, (*Vigna unguiculata* [L.] Walp – Fabaceae) and bolaina blanca (*Guazuma crinita* Mart. – Malvaceae). The plants were grown in plastic bags with two kilograms of Amazonian Ultisol and different additions of two types of biochar, partly decomposed chicken manure and inorganic NPK fertiliser. After six weeks of cultivation we measured the stems and roots, weighted above- and belowground biomass and analysed pH and soil and foliar nutrient contents. Additionally, study of charcoal production and utilisation was done with in depth interviews using questionnaires among local farmers and charcoal producers. Soil organic matter and pH were increased by all biochar amendments. Generally, biochar improved soil nutrient content and soil properties, but influenced biomass production and foliar content in smaller extent than it was expected. Significant increase of biomass production was observed only in case of cowpea, which was probably caused by the ability of cowpea to balance higher C:N ratio by symbiotic N fixing. Furthermore, we found generally higher influence on root growth which suggests that higher effect on aboveground growth could possibly be observed after longer cultivation time. Residues from charcoal production are potential source of low-cost biochar, however, these are not widely used in agriculture. Results indicate that agricultural method using biochar from charcoal production could be a potential improvement of recent agriculture in Peruvian Amazon. However, more especially long-term experiments need to be done.

Keywords: Biochar, nutrient content, Peruvian Amazon, soil fertility, Ultisol