

Biochar as a soil amendment in tropical Australia: Crop yield and growth, greenhouse gas fluxes and soil chemistry

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Abstract:

In many places, intensive agricultural practices have led to significant soil degradation through erosion, organic matter and nutrient depletion and nutrient imbalances. Maintaining or improving soil fertility is a major challenge for providing high agricultural productivity and food security. Biochar (highly stable carbon-rich material produced by the carbonisation of biomass waste for use as a soil amendment in agriculture or carbon sequestration technique) has the potential to increase agricultural production, improve soil quality and reduce non-CO₂ greenhouse gas production rates. However, extensive field trials are lacking and are still required to assess the likely impacts, especially when application of biochar is concurrent with other amendments such as compost. To date, examination of the effects biochar and biochar-compost mixes have on tropical Australian agriculture has been limited. In this study we detail results from six field trials in tropical north Queensland, in bananas (two trials), sugarcane, corn, peanut and pawpaw plantations. Greenhouse gas fluxes, soil water content, plant biometrics and soil chemistry were measured at regular intervals from crop planting to harvest. We report significant variation in crop yield and growth and greenhouse gas emissions in response to both biochar and biochar-compost amendment. Concurrent soil sample collection and analysis of soil properties allows the deduction of the mechanisms by which changes occur.