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## Soil Amendments Improve Crop Yields and Drought Tolerance on ex-Tin Mining Area

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### Abstract

Ex-tin mining areas in Bangka Island (Indonesia) are characterised by a high content of sand particles with low nutrient availability and low water holding capacity. To improve soil fertility and soil moisture of these areas, soil amendments application is important. We hypothesise that soil amendments will improve agricultural yields and drought tolerance.

The study was established in 2018 on the ex-tin mining area in Bangka Island. Different soil amendments were applied in a randomised block design with a plot size of 2 × 2 m in four replicates. The soil amendments included (i) Lime, (ii) Compost; (iii) Charcoal; and combinations of (iv) Charcoal and Compost, and (v) Charcoal and sawdust. The soil was amended with 10 t ha<sup>-1</sup> for the single amendments (treatments i-iii), and with rate 20 t ha<sup>-1</sup> for combined amendments (treatments iv and v). Cassava (*Manihot esculenta*) was planted as the main crop and *Centrosema pubescens* used as a cover crop. Crop yield was determined at harvest. Plant material was dried, homogenized by milling and analysed for carbon isotope discrimination ( $\Delta^{13}\text{C}$ ) to determine drought tolerance.

In this study, the application of soil amendments has significantly improved crop yields. The combined treatment (charcoal and compost, iv) had the highest biomass of cover crop. While the other combined treatment (charcoal and sawdust, v) resulted in the highest cassava yields. The carbon isotope discrimination ( $\Delta^{13}\text{C}$ ) was not significantly different among treatments in *Centrosema* plants. However, the application of soil amendments has slightly increased  $\Delta^{13}\text{C}$  values. The combined treatment (iv) had the highest  $\Delta^{13}\text{C}$  of *Centrosema*, which indicates a better drought tolerance. Significant differences were found in  $\Delta^{13}\text{C}$  of cassava amongst treatments, where charcoal treatment showed the highest  $\Delta^{13}\text{C}$  values. Yields varied with crop type and soil amendments, likely due to different nutrient requirements. Charcoal and its combination (such as compost or sawdust) were most beneficial to improve yields and drought tolerance in degraded sandy soil studied here.

**Keywords:** Carbon isotope discrimination, drought tolerance, ex-tin mining, soil amendments, yields

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