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Impact of Long-term Phytomanagement of Cu/Pb Mine Tailings on Soil Biochemical Functionality

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Aim: The study evaluates the long-term effects on soil functionality of different phytomanagement options in a former Pb/Zn mine (Rubiais) established in the frame of the PhytoSUDOE and Phy2SUDOE (SOE4/P5/E1021) projects in the temperate-humid zone of Spain.

Methods: The long-term influence of willow (*Salix smithiana* Willd) plants, either as monoculture or intercropped with alder (*Alnus* sp.), and soil amendments based on organic residues (green compost) or inorganic fertilization (NPK) on several soil enzyme activities was evaluated in samples collected in 2021 from field trials established in 2011 in a Pb/Zn/Cd contaminated site. Results from phytomanaged soils are compared with those obtained in unplanted soils, untreated or treated with compost.

Results: In the absence of compost amendment, the soil enzymatic activities in the willow monoculture plots (with near neutral pH) tended to be even lower than in the unplanted plots. The addition of compost led to an increase in soil organic matter and in all enzyme activities. The highest values were observed in compost amended plots cultivated with willow in co-cropping with alder. When activity values are expressed per carbon unit, the positive effect of compost tended to disappear, except in intercropped plots.

Conclusions: The addition of green compost combined with intercropping of willow (*S. smithiana*) with alder (*Alnus* sp.), appears to be a suitable management to increase and maintain in the long term the functionality of mine tailings soils contaminated with Pb, Zn and Cd and with pH close to neutrality.