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Possibility to use soils from abandoned mining area for agricultural aims

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In many countries is quite common that abandoned mines are close to agricultural areas and might be used for plant food cultivation or animal grazing. However, soils adjacent to mining areas and/or developed on mine wastes can be a source of potentially toxic elements (PTE) for plants. This might be a potentially risk for human and animal health needing to be monitored before taking a decision.

Ferragudo is an abandoned Fe–Mn mine located in SW of Portugal (Beja district) considered with intermediate level of environmental hazard impact due to small volumes of mine wastes with relatively low total concentrations of PTE, except for Mn. In this area holm oak woodland was implemented and soils are usually used for grassland. Animals such as cow, sheep and goat graze in this mining area. Chemical characterization of soil-plant system and potential human health risks of the plants associated with soil contamination were assessed. Samples of oak and grass (total n=8 each) were collected (spring 2017) and composite soil samples around plants, up to 10 cm depth were also collected. Soil properties were analyzed and concentrations of macro and micronutrients in soils and plants (shoots) were determined.

No statistical differences were observed between soils around grass and oak for all the studied parameters. Soils had a pH close to neutral and a good fertility. The mean total content in soils was 86.12 and 88.36 g Mn/kg, and 47.58 and 48.45 g Fe/kg around grass and oak, respectively. These values are higher than the average concentrations in non-contaminated soils of the region (0.74 g Mn/kg and 36.83 g Fe/kg). The Mn and Fe concentration in the soils available fraction (Rhizo method) was lower compared to total (397–441 mg Mn/kg and 18–11 mg Fe/kg in oak and grass, respectively). The concentration in the available fraction of other potentially toxic elements such as Cu and Zn was very low. Although the soils had high concentrations of Mn and Fe, the plant cover is significant and soils are totally colonized by herbaceous plants. Studied species showed a different accumulation pattern for the studied elements except for Cu. *Quercus ilex* showed concentrations of Fe in leaves (mean 158 mg/kg) lower than in grasses (mean 272 mg Fe/kg) while the opposite pattern was observed for Mn (mean 1363 mg/kg for oak and 353 mg/kg for grasses). Manganese concentrations in oak leaves were much greater than the normal range for mature

leaf tissues but non-toxic for cattle and other domestic animals. The Fe concentration in the aerial part of both plants was much lower than the maximum tolerable value for cattle, sheep and poultry and also lower than the range considered normal for plants. Copper and Zn concentration in oak and grass was below the normal values for plants and lower than toxic levels for cattle. The concentration of Mn and Fe in the aerial parts of the studied plant species did not reach toxic levels for animal graze, indicating that these soils can be used for pasture.