A green solution for the rehabilitation marginal lands: the case of Lablab purpureus (L.) Sweet

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With the increasing population growth rate, and in order to attain the goals set by the 2030 Agenda for Sustainable Development, it is necessary to find solutions that can ensure food security and food safety. Population growth implies not only increasing food demand, but also land use for housing, which ultimately results in the need to claim more land. However, with only 30% land available in the world, it is crucial to find strategies to answer the demands for the near future. A potential strategy could be the reclaiming/recovery of marginal lands, such as salt and drought prone lands, or even abandoned mining areas, that are not suitable for farming. The latter is still a controversial approach, because of the knowledge void, as to determining pollution level, environmental and health risk assessment protocols, contaminated sites identification, all factors that can diminish the success of sustainably recover abandoned mining areas. Mining activities result in land degradation, environmental contamination and thus ecosystem disruption. Soils/wastes from mining areas are rich in potentially hazardous elements (PHE) that cannot be degraded, thus there has been recent efforts to create sustainable ecotechnologies that could rehabilitate these areas, creating conditions for agriculture activities while assuring food safety. Phytostabilization is a prospective rehabilitation strategy that uses adapted/tolerant plants towards PHE immobilization in the rhizosphere and most especially with low PHE translocation factors from soil/roots to shoots. Allying with this, one can improve soil properties (e.g. fertility, water-holding capacity, structure) to promote plant growth and PHE availability decrease, by engineering a soil (Technosol) using organic and/or inorganic amendments together with soils/wastes from the contaminated site. The combination of phytostabilization with geotechnologies can minimize the risk to both human health and the environment, while promoting solutions for waste management and circular economy. Although the combination of these strategies seems ideal, it is not without issues that have to be addressed, such as the highly important task of identifying the nature/amount of PHE, soil proprieties, climatic conditions and the PHE translocation factor of the species that could be stablished in a specific mining site for rehabilitation. In other words, for each contaminated site it is necessary to design a specific phytotechnology tailor-made for each situation. In the present study, it was evaluated the
response of a highly drought tolerant legume, *Lablab purpureus* (L.) Sweet, which due to its multifunctionality (forage, food, ornamental and medicinal), can offer a wide range of revenue to areas that otherwise would be neglected for agricultural activities as is the case of São Domingos abandoned mine area, our study area. After Lablab growing in Technosols made with high contaminated soils (e.g. As, Pb, Cu, Zn) and organic/inorganic wastes, our findings show that Lablab accumulates PHE in the roots and the concentrations present in the shoots are safe for animal consumption, thus presenting a potential plant to rehabilitate highly contaminated sites using Technosols.