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

Maria Manuela Abreu[1*], Fernando Monteiro[2] and Patrícia Vidigal[1 ¥]

[1]Linking Landscape, Environment, Agriculture and Food (LEAF), Instituto Superior de Agronomia (ISA), Universidade de Lisboa, Lisboa, Portugal | [2]Forest Research Centre (CEF), Instituto Superior de Agronomia (ISA), Universidade de Lisboa, Lisboa, Portugal

* manuelaabreu@isa.ulisboa.pt; ¥ pvidigal@isa.ulisboa.pt

Poor agriculture practices

Intensive extractive activities

Mine wastes and leachates

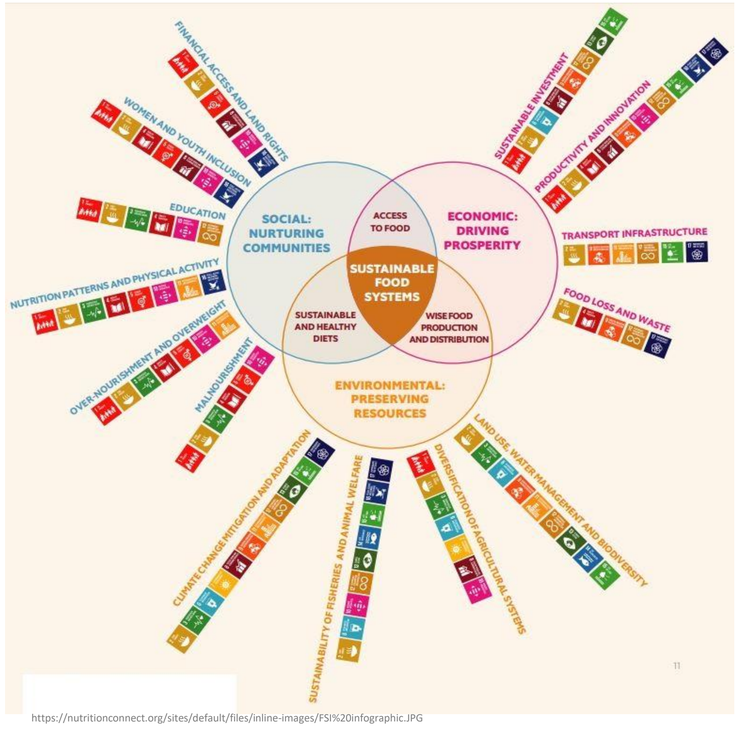
Generation and circulation of acid mine drainage, rich-in

POTENTIALLY HAZARDOUS ELEMENTS (PHE)

SOIL DEGRADATION

1 **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 will result in the need to claim more land. With only 30% land available in the world, it is crucial to find strategies to answer the demands for the near future.**

SUSTAINABLE DEVELOPMENT GOALS



https://nutritionconnect.org/sites/default/files/inline-images/FSI%20infographic.JPG

WE NEED TO INNOVATE IN HOW WE EAT AND FARM

New approaches to **managing waste**, water and energy in food supply chain

Government and private investment in the **production of alternative crops, new production systems**

Restoring/Rehabilitate degraded farmlands, wetlands, forests and **marginal lands**

2 **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 soil degradation, environmental contamination and thus ecosystem disruption [1].**

Contaminated areas

IBERIAN PYRITE BELT

Mine wastes = High total concentrations of PHE + low pH, organic C and nutrients + Poor structure + Low water holding capacity

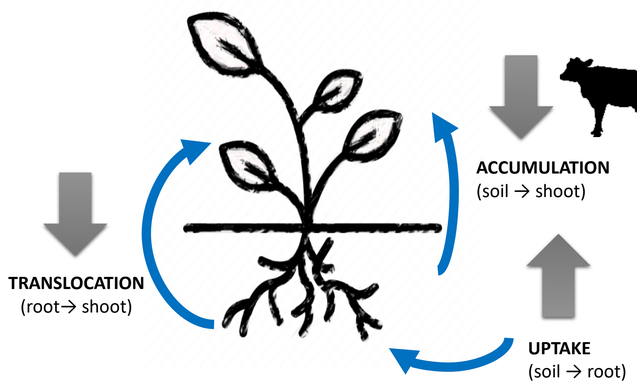
3 **Soils from mining areas are rich in potentially hazardous elements (PHE) that cannot be degraded, thus there has been recent efforts to create sustainable ecotechnologies that could rehabilitate these areas, creating conditions for agriculture activities while assuring food safety. Germination and development of the vegetation directly on tailings and contaminated soils can be very difficult, especially in areas with Mediterranean climate. The slow plant growth can limit the environmental rehabilitation success. Phytostabilisation is a prospective rehabilitation strategy that uses plants with immobilization PHE capacities and most especially with low translocation factors of PHE from the soil/roots to the shoots. The discovery or development of crops that can maintain high yields under extreme climatic and contaminated soil conditions can be key for phytostabilisation success.**

A mix of wastes from the contaminated site (e.g. *gossan*) with other organic wastes (e.g. livestock manure, plant residues, compost) and inorganic wastes (e.g. liming materials, hydrophilic polymers, biochar). This ecotechnology, promotes: (i) different biogeochemical and edaphic processes; (ii) decreases the PHE bioavailability; (iii) improves physicochemical characteristics of the substrata for the growth of plants and soil microbiota; (iv) circular economy

Lablab purpureus

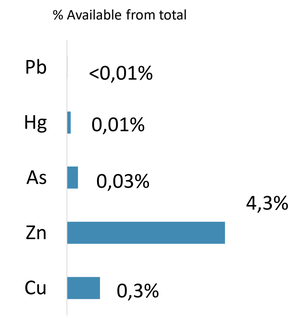
ORPHAN CROPS

Technosols

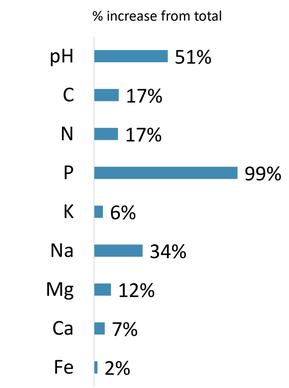


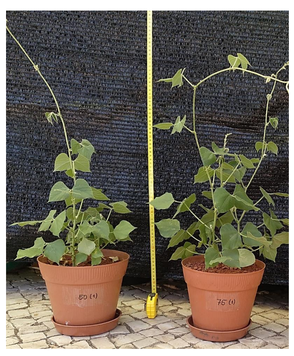
PHYTOSTABILISATION

Decreased PHE availability



Improves chemical characteristics of the substrata





4 **Major crops such as maize, rice and wheat are the sustenance of a big part of the world food supply needs, but unlike undervalued crops, often called orphan crops, are not easily adaptable or have the genetic diversity that allows them to yield under harsh growing conditions. Orphan crops are thus designated, crops that have been neglected for commercial production purposes due to the lack of interest and investment from policymakers, researchers and farmers in detriment of more profitable crops. Yet, the high potential that these crops hold as food, nutritional source, multifunctionality and environmental elasticity are unquestionable, and thus often are referred as crops of the future. One of those crops is the multifunctional (food, feed and green manure) *Lablab purpureus* (L.) Sweet, common name Lablab bean [2]. Lablab bean growing in Technosols showed no symptoms of toxicity, with high PHE uptake, low translocation that was translated to a low accumulation if the shoots in concentrations tolerable to domestic animals. The results showed that phytostabilisation with Lablab is a potential strategy for rehabilitation of mining areas.**

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