



Agromining for nickel: a complete chain that optimizes ecosystem services rendered by ultramafic landscapes.

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► To cite this version:

Guillaume Echevarria, Alan Baker, Aïda Bani, Antony van Der Ent, Vivian Houzelot, et al.. Agromining for nickel: a complete chain that optimizes ecosystem services rendered by ultramafic landscapes.. XXVIII International Mineral Processing Congress, Sep 2016, Québec, Canada. 2016. hal-01263587

HAL Id: hal-01263587

<https://hal.science/hal-01263587>

Submitted on 3 Jun 2020

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AGROMINING FOR NICKEL: NEW ECOSYSTEM SERVICES PROVIDED BY ULTRAMAFIC LANDSCAPES

ABSTRACT

Serpentine (i.e. ultramafic) outcrops in Europe cover more than 10,000 km² and have a low-fertility and low-productivity, making them unattractive for traditional agriculture. In general, these areas are slowly abandoned by local farmers, affected by strong rural exodus and landscapes undergo a process of closure. However, ultramafic landscapes have the potential to provide multiple ecosystem services that can contribute to Europe's goals towards insuring food security, production of renewable raw materials and renewable energy. Phytomining (Agromining) aims at cultivating metal hyperaccumulator plants that are able to accumulate Ni and other strategic elements from metal-rich soils and transport them to the shoots (>1%), which can then be harvested as a bio-ore. Such metal-rich biomass can be used to recover highly valuable metals, e.g. nickel (Ni) and also to produce energy (heat, electricity).

Nickel agromining can thus offer an eco-efficient alternative to classical pyro- or hydrometallurgical processes without disturbing the soil cover and the geology from soils and rocks that would be considered as low grade ores or sterile material for conventional mining methods. Phytomining agroecosystems can lead to better soil resource efficiency and can offer a fully integrated, new agromining agriculture that could cover thousands of km² in Europe, benefit local communities with a sustainable rural development and provide a wide array of ecosystem services which will need to be optimised under a Life Cycle Assessment methodology:

1. Production of bio-sourced metal products
2. Production of energy biomass
3. Restoration of soil fertility for conventional agriculture (Ni stress)
4. Limiting Ni intake by local populations and farmers
5. Use and conservation of local biodiversity (plant and soil fauna and microflora) as cultivated ecosystems
6. Store carbon in cultivated soils
7. Enhance pollination activity at landscape level.

Nickel agromining could therefore change the economical balance in historically-disadvantaged ultramafic regions of Europe.

KEYWORDS

phytomining, hyperaccumulator plants, crops, bioore, Life cycle assessment, agroecology, hydrometallurgy