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“Solidarity in a competing world —
fair use of resources”

Rock Dust as Agricultural Soil Amendment: A Review

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Abstract

The declining quality and quantity of soils, climate change and increasing drawbacks of chemical fertilisers are among the top threats for present and future food security. Agricultural rock dust application constitutes a agrogeological technique which could positively contribute to all of the outlined areas. Soils are formed by weathering of primary rocks and from the 18 elements essential for higher plant growth, except nitrogen, all are derived from naturally occurring rocks and minerals. These nutrients contained in the rocks are however not readily plant available, but have to be released through weathering. Subsequently, the continuous weathering of rock dust can remineralise the soil with a wide range of micro and macro nutrients over the long term, whilst commercial fertilisers mainly supply soluble forms of N, P and K.

Results derived from a comprehensive review of the contradictory and limited literature indicate a positive tendency with a wide scope of potential agronomic benefits. Especially in tropical regions, where chemical fertiliser use is limited economically and by the fact that the highly weathered soils cannot retain the soluble nutrients, rock dust has proven to be a suitable soil amendment. The geochemical status is improved and plant yields are similar to synthetic equivalents. When the rock dust is reused from the mining industry, where it is disposed in ample amounts as a problematic by-product, the eco-environmental costs are furthermore decreased. Other benefits include improved disease resistance, reduction of GHG emissions during the composting process and fixation of CO₂ by weathering and subsequent precipitation of Ca- and Mg-carbonates. Examples from Brazil reveal additional socio-economic advantages over the long term and the strengthening of local food networks.

However, the complex interaction of several factors and the lack of consistency in terms of the design of individual trials is limiting comparison and extrapolation. Inter- and trans-disciplinary research is thus needed to understand weathering mechanisms and find appropriate rock dust applications for the respective environment.

Keywords: CO₂ fixation, rock fertiliser, soil remineralisation, waste reuse, weathering