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An assessment of the agronomic benefits of silicate rock powders in Brazil in the context of a novel classification

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The agronomic potential of crushed silicate rock amendments has long been suggested for highly weathered, nutrient-depleted soils of the tropics. Brazil has emerged as a global leader in the use of silicate agrominerals (ASi); silicate-rich rock powders that supply plant nutrients and improve soil properties. However, despite decades of research and a unique regulatory framework for soil remineralizers, the research landscape remains fragmented, and there is currently no synthesis of tropical ASi experiments.

We synthesized results from 54 peer-reviewed Brazilian field and pot experiments using a novel classification system for ASi based on lithochemistry and practical agricultural considerations. It evaluates the effects of ASi on soils, plant growth, and nutrient uptake. Our results demonstrate that ASi can significantly improve soil pH, cation exchange capacity, and base saturation, while enhancing yield and nutrient availability. Notably, a consistent trend emerged indicating that ASi can indirectly increase soil phosphorus availability, despite low intrinsic P contents of the applied ASi.

We recommend minimum requirements for standardized methodologies and suggest real-world research designs to support broader ASi adoption. Brazil's pioneering role offers valuable insights for scaling the usage of ASi across tropical agricultural systems worldwide, contributing to sustainable food production and climate resilience.