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Improving Smallholder Groundnut Production Systems through Use of Composted Rock Phosphate – A Case Study at Mutare, Zimbabwe

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Abstract

Phosphorus (P) deficiencies are limiting crop production in many agricultural soils worldwide where conventional fertilisers are inaccessible. Continuous cropping in the absence of external nutrient inputs to soils has led to unproductive farmland due to loss of nutrients including P. This has been made worse by the abandonment of traditional methods of land fallow that were important in soil fertility conservation. Groundnuts are among the most widely grown legumes for food and nutrition therefore their production needs to be improved. Alternative sources of phosphorus replenishment to soil should be able to increase yields and ensure food security in the small-holder agriculture where access to fertilisers is poor due to unaffordability. There is significant response of the composted rock phosphate (RP) on available P and yield. Increase in rate of RP results in increased P solubility thus availability to the groundnut crop. Legumes are effective in dissolving RP and in absorbing its dissolution products because of their demand for Ca and the acidifying effect of nitrogen (N) fixation in the soil near the root system (rhizosphere). Composting RP results in higher levels of P compared to uncomposted RP as a variety of microorganisms such as fungi, bacteria and actinomycetes solubilise different insoluble inorganic phosphates and make P available to the groundnuts through the formulation of humic acids and chelating agents that form complexes, dissolving P from the phosphate rock. Great benefit can therefore be derived from composting RP with different crop residues. Apart from enhancing P availability and solubility, the N fixed in the legumes may also contribute to the yields thus giving a double impact, N and P, which are the most limiting nutrients in smallholder production, therefore improving yields and contributing to food security in Africa.

Keywords: Composting, dorowa phosphate rock, groundnut, P dissolution