



Study III – “Potential Treatment of Acid Mine Drainage using Phosphate Rock”

Vertical-flow phosphate rock reactors with an oxidation basin can effectively remove Fe, Al, and acidity in acid mine drainage at rates of 10, 8, and 3.5 g/m²/d, respectively, when a trash Florida phosphate rock is used. Precipitates clogging in phosphate rock is a serious issue that needs addressed before acceptance of the technology for long-term operation in the field.

The Direct Use of Phosphate Rock to Improve Crop Production in Indonesia

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Most fertile land of Indonesia is currently under cultivation. Due to the urgent need to increase food production for the ever growing population there is a high pressure for incorporating marginal soils into agriculture. These tropical soils (mostly Ultisols and Oxisols) are fragile, acid and have several constraints to support intensive food production. One such constraint is the P deficiency. Therefore, P fertilizers must be applied for optimum crop growth and food production.

Attempts have been made to develop management practices for direct application of phosphate rocks for improving food production in Indonesia. For this purpose a series of greenhouse and field experiments was carried out to assess the agronomic effectiveness of P fertilizers in particular local rock phosphates in typical cropping systems grown under lowland and upland conditions. Three pot and five field experiments were carried out using several (local and imported) phosphate rocks (PR) to improve crop production. The crops were lowland and upland rice, soybean and mungbean., using a rotation of upland rice - soybean - mungbean.

In the lowland soils of good fertility and pH near neutrality it was found that lower rates of P fertilizer are necessary to be applied to obtain acceptable rice yields and that PR was as effective as TSP. The ultimate choice will depend on economic factors (cost of products and inputs).

In the acid, P deficient upland soils, very high P rates were applied to study the residual effect in a crop rotation. This residual effect was observed in the third crop of the rotation. These soils have a very high phosphorus fixation capacity. Water was found the most important factor to increase crop yields in these upland areas. Overall, the experiments showed that the application of PR resulted in an increase of crop yields expressed in dry weight of plant, grain, straw or stover. The combined use of PR and TSP enhanced the P uptake by crops. The use of ³²P had an added value in the evaluation of the agronomic effectiveness (AE) of PR through the determination of the substitution ratio. Where no ³²P was applied, the effectiveness of PR was determined by the RAE (relative agronomic effectiveness) indices based on P uptake..

Further experiments are needed to develop P fertilizer management practices for crops growing in the acid upland soils of Indonesia.