

## How-to-use rock phosphate

*During recent years an impressive number of phosphate rock discoveries in Africa as well in Latin America and Asia have been registered. As transformation of the phosphate rock into super phosphate is of ten not possible the question can be raised whether fine grounded phosphate rock can be used for agricultural production. Recently interesting research in this field has been executed by researchers of The Netherlands, Niger and India. Let us see what is published by them.*

Coen Reijntjes

### Farmers' opinion

Although there is a clear long-term effect of alkaline rock phosphate (RP) comparable to that of super phosphate (SSP) farmers are not eager to invest money in fertilizers if a short-term effect is not obtained in the form of a yield increase in the first crop. This is one of the reasons why RP still is not yet widely used by farmers in the tropics.

### Different reaction to RP

Practical agronomists found that plants differ in their ability to use native soil phosphate or RP and that low acidity of the soil improves the uptake of phosphates (P) from RP by plants. The differences in the ability of plants to withdraw P from the slightly soluble RP can be declared by several theories:

1. excretion by roots or bacteria of organic acids, which differs per plant specie, can bring about acidification of the root zone which improves the solubility of RP;
2. extensiveness and density of root systems and their mycorrhizae show wide variations among plant species and have a positive correlation with P uptake;
3. the ability to withdraw Ca from calcium phosphate (important component of RP) differs per plant species;
4. the non-equivalent uptake of nutrient cations and anions by plants causes changes in the pH values of the root zone. Excess uptake of cations over anions will result in root zone acidification and will promote the solubility of RP.

### Acid - Neutral soils

Research by Flach et al, 1987 and De Swart and van Diest, 1987 showed that legumes like *Vigna unguiculata* and *Pueraria javanica* act in conformity with the last theory. Precondition for biological nitrogen fixation and good development of legumes is a sufficient supply of soluble P. In acid soils the solubility of RP proved to be sufficient to start the cyclic interaction between RP dissolving and biological nitrogen fixation in legumes. In neutral soils, however, a small quantity of triple super phosphate proved necessary to start this process.

### Millets - Maize

Not only legumes can utilize RP effectively also finger millet (*Eleusine coracana*) and pearl millet (*Pennisetum typhoides*) proved to give good responses to application of RP. Millets absorb comparatively large quantities of Ca. This could declare their capacity to dissolve RP. Maize however, proved to absorb low quantities of Ca and shows little response to RP.

### Partial Acidulated Rock Phosphate

Bationo et al, 1986, proved that fertilization of pearl millet with partially (50%) acidulated rock phosphate (PA50) or with single super phosphate (SSP) gives comparable yields when 30 kg/ha of P<sub>2</sub>O<sub>5</sub> are used. With RP pearl millet produced only 26% of the yield obtained with SSP. Economically PA50 and RP proved to be competitive with SSP when the prize of PA50 and RP is 75% and 25% respectively of the prize of SSP. Whether the use of P A50 and RP economically will be interesting for farmers depends on the national prize policy for agricultural products and mineral fertilizers. In anyway acidulation will make the use of rock phosphate more attractive for farmers as clearer yield increases will be obtained in the first crop grown after fertilization.

**Composting**

If only RP is available, farmers can acidulate it by composting it together with manure or other organic materials. Mishra and Bangar, 1986 found that compost enriched with RP (17.3 kg P<sub>2</sub>O<sub>5</sub>/ha) was comparable to SSP in crop response (*Cajanus cajan*) and P uptake in soils having a pH between 7 and 8. Even SSP proved to give the best results when used as P-enriched compost. Similar positive results are obtained in Senegal (Pieri, 1985). Though there are differences in solubility and P content between rock phosphates of different origins it can be concluded that if used in the right way and if available for a competitive prize, rock phosphate certainly can be interesting for farmers especially when it is used to fertilize legumes.