FERTILITY MANAGEMENT OF SOILS WITH PH-DEPENDENT CHARGED MINERALS

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ABSTRACT

Most of the reactions that control nutrient availability depend upon the physico-chemical processes that occur at the surface of the soil practices. Generally, all acidic soils are ameliorated with agricultural lime. However, the pH of soils with variable charge minerals cannot be increased too greatly because the cost involved in liming such a highly buffered system would be too great and there is the danger of a micronutrient deficiency at high pH.

Acidic soils having pH-dependent charged minerals have different management requirements compared to the acidic soils which are predominantly of the permanent charge minerals.

Two important acid soils with pH-dependent charge minerals such as the Aborlan series (pH 4.2) and Luisiana series (pH 4.5) an Oxisol and Oxic subgroup of Ultisols respectively were studied. Maahas series (pH 6.4) with permanent charged minerals, an Inceptisol was also included for comparison purposes.

The first phase of the study was the characterization of the soils. It was found that the Oxisols and Ultisols were predominantly of variable charged or pH- dependent charged minerals, while the Maahas series, an Inceptisols have permanent charged minerals as determined by the procedure outlined by van Raij and Peech (1972) for surface net charge and NZPC (pH_0).

The second phase of the study was the lowering of the pH_0 with the application of organic matter and phosphate whereby these materials are absorbed into the particle surfaces to mask some of the positive charges.

The result showed that the common intersect of the variable-charge colloid was dispersed with the application of organic matter, phosphate and lime suggesting that the net negative charge was increased and then the CEC.

The third phase of the study was the determination of crop response to the application of organic matter, phosphate and lime on acid soils with variable charge minerals. Rice yield and cassava tubers, height and

other growth parameters significantly increased with the above treatments, indicating therefore that the productivity of acidic soils with variable charged minerals can be improved by lowering the pH_0 with organic matter or phosphate fertilizers.