

Jittirat Choochat 2011: Phosphorus Adsorption and Desorption of Acid Sulfate Soils with Residual Lime. Master of Science (Soil Science), Major Field: Soil Science, Department of Soil Science.  
Thesis Advisor: Miss Suphicha Thanachit, Ph.D. 118 pages.

A study on phosphorus adsorption and desorption of acid sulfate soils with residual lime was conducted in 20 locations in Central Plain, Thailand. They consisted of four locations each of Ongkharak (Ok), Rangsit (Rs), Sena (Se), Bang Nam Prieo (Bp) and Thanyaburi (Tan) soil series. Three locations of each soils were used for paddy rice having residual lime with field pH of topsoils higher than 5.0 and the other left idle area with field pH of lower than 4.5. Results revealed that most chemical and mineralogical properties of acid sulfate soils with residual lime have not been changed by the influence of lime, especially in subsoils. The soils from all locations have silty clay to clay texture. The pH of these soils is ultra to strongly acid (pH 3.4-5.1 in 1:1 H<sub>2</sub>O) conforming to high extractable acidity (26-45 cmol<sub>c</sub> kg<sup>-1</sup>) and low base saturation percentage (21.7-32.7%). Their CEC is moderately high to very high (18.0-24.5 cmol<sub>c</sub> kg<sup>-1</sup>) corresponding to dominant clay mineral, smectite and with respective lower amount of kaolinite and illite. They have 0.1-2.7 g kg<sup>-1</sup> of total phosphorus but with very low availability (3.0-10.2 mg kg<sup>-1</sup>). Inorganic phosphorus fractions are mostly in the forms of Fe-P > Al-P > Ca-P in the ranges of 6.4-44.3, 1.0-5.8 and 0.2-0.6 g kg<sup>-1</sup>, respectively. Phosphorus adsorption has negative correlation ( $r = -0.64^{***}$ ) with P desorption in the ranges of 425-912 and 7.8-28.0 mg kg<sup>-1</sup>, respectively. Ongkharak soil has the highest P adsorption ranging between 599-912 mg kg<sup>-1</sup> and the lowest P desorption (11.7-16.7 mg kg<sup>-1</sup>). The acid sulfate soils with residual lime have lower P adsorption compared to normal acid sulfate soils and their topsoils have lower P adsorption than do subsoils.

Phosphorus adsorption capacities show highly significantly linear correlation with crystalline Fe ( $r = 0.84^{***}$ ) and amorphous Al ( $r = 0.79^{***}$ ). Phosphorus desorption has statistically highly positive linear correlation with total magnesium ( $r = 0.51^{***}$ ) and total phosphorus ( $r = 0.64^{***}$ ), and a negative correlation with amorphous Fe ( $r = -0.79^{***}$ ). The equations suitable for prediction of respective P adsorption and P desorption capacity are "P adsorption =  $-71.25 + 0.46\text{Fe}_d + 0.38\text{Al}_0$ " ( $R^2 = 0.90^{**}$ ) and "P desorption =  $3.81 + 0.35\text{Total P} + 0.47\text{Total Mg} - 0.42\text{Fe}_0$ " ( $R^2 = 0.83^{**}$ ).

---

Student's signature

Thesis Advisor's signature