# Gypsum effects on soil characteristics and phosphorus sorption

**Juho-Matti Hämäläinen[1,2*], Ulla Kulokoski[1], Liisa Pietola[1]**

[1]Yara International ASA / Yara Suomi Oy, Mechelininkatu 1a, 00181 Helsinki, Finland,
[2]University of Helsinki, Dept. Food and Environmental Sciences, 00014 Helsinki, Finland,
*juho-matti.hamalainen@helsinki.fi

Effects of gypsum use as soil amendment to enhance phosphorus (P) trapping by agricultural soils were indentified in laboratory and field conditions. Fine textured clay of pH 6 and low-medium P status (PAAc 9.6 mg/l) was treated in laboratory by 0, 2, 4, 6 and 8 g/l gypsum and kept close to saturation in 0.5-litre pots perforated at bottom. After 4-week incubation the soils were watered and percolation water was analyzed. As anticipated from previous studies, turbidity and concentration of dissolved phosphorus were decreased along with elevated electrical conductivity. Accordingly, under field conditions the soil treated by gypsum (0, 2, 4, and 6 ton/ha) showed better aggregated stability and infiltration capacity in wheat cropping by both direct drill or minimum tillage. Improved aggregate stability is most probably the main reason for detected decrease of turbidity and particulate P load by gypsum.

To understand more closely why gypsum controls also dissolved P leaching, adsorption/desorption isotherms of P for soils amended by different gypsum rates were determined with Q/I-plot technique at a soil-to-solution ratio of 1:50 using P additions of 0, 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.8, 1.0 and 1.5 mg $l^{-1}$ by $KH_2PO_4$. The suspensions were shaken for one hour, allowed to stand for 22 hours, shaken for 15 minutes and centrifuged. The suspensions were filtered (Nuclepore polycarbonate, 0.2 mm) and determined for phosphate by the molybdenum blue method. Net adsorption or desorption was calculated from the difference in the P concentration in the solution before and after the equilibration. A modification of the Freundlich adsorption equation was used to calculate equilibrium P concentrations (EPC). The paper gives the primary results on the modified Q/I plots by gypsum. The results clearly indicate increased dissolved P adsorption by gypsum, most efficiently at gypsum rate 4 g/l soil. The used gypsum originated from Siilinjärvi phosphogypsum (see the abstract of Ekholm et al on page 26).