

Pedotransfer Functions to Estimate Mineral Phosphorous Fractions and Dynamics in Swedish Agricultural Soils

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In Sweden estimation of phosphorous (P) losses from agricultural land has been calculated with the modified ICECREAM model (Larsson et al., 2007) both for scientific purposes and for national environmental assessments (HELCOM) (Brandt et al., 2008). However a need to adjust the model description of the mineral P dynamics to better describe conditions for Swedish soils has been identified (Djodjic et al., 2008). Earlier studies have shown a close dependency between the measured P-contents and the desorption and release of P from Swedish soils, but also that P-sorption capacity and P-saturation should be taken into account (Börling et al., 2004). The aim of this project is to develop estimation routines, so called pedotransfer functions, to describe P solubility and the partitioning between P-pools in relation to these and also other basic soil characteristics. The new pedotransfer functions will be used to develop an improved version of the model.

60 soil samples, representing a wide range of soils differing in soil texture and chemical characteristics as well as history of P fertilisation, are used to secure a statistical basis for the pedotransfer functions. Different soluble P fractions in the soils are determined by extraction with HCl, ammonium lactate (AL), Olsen-P, CaCl₂ and H₂O, respectively. Other soil characteristics determined are ammonium oxalate- and pyrophosphate soluble Al and Fe, Ca-AL, sorption characteristics, P saturation, pH, organic C and soil texture. The pedotransfer function development will be based on the dependency between the sorption characteristics and the P concentration and other measured soil characteristics.

By adapting the description of mineral P dynamics in ICECREAM to Swedish conditions and analytical methods more data for parameterisation and testing will become available. With a better description of P dynamics in the model, the hypothesis is that ICECREAM will be a more reliable tool for national calculations as well as for evaluating the effects on P-losses for different agricultural management scenarios mainly focusing on fertilisation practices.

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