Interactions between agricultural practice, mobility and retention of P in soils

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In Denmark 1400 kg P per ha have accumulated in agricultural soils during the last century. This P is an important resource for agricultural production, and agricultural management should aim at efficient utilization. This P has also raised the potential for P export to the aquatic environment – an export which should be reduced.

In a joint project under the research program "Animal Husbandry, the Neighbors and the Environment" under the Danish Ministry of Food, Agriculture and Fisheries, we have investigated: (1) how phosphorus leaching from the plough layer is affected by agricultural management practices such as manure application method, soil tillage and liming (2) how the accumulated P distributes in the soil profile, (3) the certainty of the Olsen soil P test, how it performs as a predictor for P leaching and how it develops over time under different P input scenarios on different soil types.

Our aims were: (1) to gain better understanding of the soil processes governing P leaching from the plough layer and P redistribution in the soil profile and (2) to gather information, which can be used for devising best management practices for mitigation of the P losses through tile drains to surface waters.

In leaching studies on intact soil columns (20 by 20 cm) we showed that P leaching generally increased with increasing soil P status, and that dissolved P forms dominate in the effluent at higher soil P status levels. Slurry application method and timing of soil tillage had pronounced effects on the soil leaching potential especially on structured soils. In the soils examined here P leaching was less in the limed treatment, even though lime had not been applied recently to the limed treatment.

We also examined further previous findings, which showed that ca. 50% of the accumulation of P in agricultural soils in Denmark seems to take place below the plough layer. We demonstrated that this subsoil P accumulation seem to be related to carbon content in the subsoil.

The model for prediction of Olsen soil P test values in yearly time steps from knowledge of net P input to the field, the soil type and the present Olsen P value is still ongoing, but preliminary results and ideas will be presented in the poster.