

Calculation of Phosphorus Losses from Swedish Agricultural Land in 1995 and 2005

Kristian Persson, Holger Johnsson, Anders Lindsjö, Kristina Mårtensson, Karin Blombäck, Martin Larsson

Swedish University of Agricultural Sciences, Uppsala, Sweden.
kristian.persson@mark.slu.se

Nitrogen and phosphorus leaching losses from arable land in Sweden have been estimated within a broader program aimed at calculating the total nutrient load originating from Sweden that reaches surrounding seas. The results were used for following up on the Swedish environmental policy objective “Zero eutrofication”. Nutrient losses from all arable land in Sweden have been estimated for two years; 1995 and 2005. The estimates were performed using the NLeCCS calculation system. (Johnsson et al. 2008).

NLeCCS is a system that is used for calculation of root zone leaching of both phosphorus and nitrogen and surface losses of phosphorus from arable land (Persson et al. 2007). The NLeCCS system consists of several computer programs and simulation models that are linked in a chain. When calculating the change in leaching between different years, the climate has a very strong influence on the results. In order to normalize the effect of climate, NLeCCS uses 20 to 30 years of climate data. An array of agricultural statistics, i.e. crops, harvests, fertilization schemes, and application dates of agricultural practices, are collected in a database. From these agricultural statistics a 10,000 year long crop sequence and management database is generated that complies with specific rules about crop rotations. This data is then divided into parts that match the available climate data period in length. These management files are used as input for the leaching simulations. Phosphorus simulations are performed with the ICECREAMDB, a modification of the Finnish ICECREAM model to which macropore flow has been added (Larsson et al. 2007). The daily results from this model are then aggregated to calendar years. Leaching coefficients are in turn calculated from the aggregated results. The result is a matrix of leaching coefficients for the following categories; region in Sweden, soil texture class, crop, slope and soil phosphorus content.

The estimated mean leaching loss rates for agricultural land in Sweden indicated a decrease from 0.54 to 0.52 kg P/ha, between the years 1995 and 2005. The calculated difference was ascribed to changes in crop distribution, decreased amounts of applied fertiliser and the introduction of buffer strips in the period from 1995 to 2005. The mean leaching rate from the 22 different regions varied from 0.10 to 1.3 kg/ha with the highest rate in Western Sweden. The lowest losses were in regions with little runoff and a large amount of light soils. In almost all regions there was a slight decrease in the leaching rate from 1995 to 2005. The changed crop distribution was the largest reason for reductions in all regions.

Johnsson, H., Larsson, M., Lindsjö, A., Mårtensson, K., Persson, K. and G. Torstensson. 2008. Läckage av näringsämnen från svensk åkermark. Rapport 5823, Naturvårdsverket.

Larsson, M., Persson, K., Ulén, B., Lindsjö, A. and N. J. Jarvis. 2007. A dual porosity model to quantify phosphorus losses from macroporous soils. *Ecological Modelling* 205:123-134.

Persson, K., Larsson, M. and H. Johnsson. 2007. Nutrient Leaching Coefficient Calculating System (NLeCCS) - Technical description. Teknisk rapport 116, SLU.