



Meta-modelling of the pesticide fate model MACRO for groundwater vulnerability assessments

F. Stenemo, A.M.L. Lindahl, A. Gärdenäs and N. Jarvis

Department of Soil Sciences, Swedish University of Agricultural Sciences
(Fredrik.Stenemo@mv.slu.se)

A meta-model of the pesticide fate model MACRO, designed for groundwater vulnerability assessments, was developed for one climate region in Sweden. Simulation results from combinations of soil properties and pesticide data were used to construct the meta-model using artificial neural networks. The meta-model predicts the 80th-percentile of the simulated yearly pesticide concentrations at one meter depth for a 20 year simulation. Inputs to the meta-model were the clay and sand content of the topsoil and subsoil, the topsoil organic carbon content, pesticide half-life and the soil organic carbon sorption coefficient. Different artificial neural networks were tested.

It was concluded that a fully connected two hidden-layer feed-forward network that classifies input into three leaching classes, linked to fully connected feed-forward neural networks with one hidden layer, trained on sub-sets of the target variable, is a suitable meta-model for the intended purpose. A sensitivity analysis of the meta-model was performed using FAST (Fourier Amplitude Sensitivity Test) and the use of the meta-model is exemplified with a case-study.