



Measuring and Modelling Drainage Water Quality under Conditions of Organic Farming

F. Deunert (1) and N. Fohrer (1)

(1) Dep. Hydrology & Water Resources Management, Ecology Centre, CAU Kiel
(nfohrer@hydrology.uni-kiel.de)

Nutrient leaching on agricultural fields through drainage pipes causes non point source pollution of surface and subsurface water bodies and thus contradicts the aims of the European Water Framework Directive. Targeting a fundamental reduction, the conversion to organic farming is politically encouraged, since a lower eutrophication potential seems to be related to this kind of land management. Additionally drainage pipes cause aerobic conditions and thus eases mineralization of organic matter and by that the release and discharge of further nutrients. Ecological modelling can help to evaluate management options, estimating the effects of the political subsidy program, if the model can reproduce all relevant processes. To record discharge and water quality, two drainage lines on an organic farming estate 25 km north of Kiel/ Germany were rerouted through a measuring station. Auto gauging of discharge and analyses on the following parameters are carried out: pH-value, E.C., NO₃, SO₄, Cl, Ca, K, Mg, Na. Field monitoring of the groundwater level allows a rough definition of the drainage area and thereby the estimation of water- and nutrient flows. Independent of atmospheric conditions, nitrate concentrations in drainage water of both field plots showed close connection to crop growing, cultivation scheme and nutrient supply:

If a grass-clover- ley is established in autumn and recurrently cut, small nitrate concentrations can be observed (29,1 mg NO₃/l).

Mulching causes a distinct increase of nitrate concentrations because large quantities of easily decomposable plant material are released (71,5 mg NO₃/l).

Ploughing of grass-clover-leys before sowing winter wheat results in a strong increase of nitrate concentration as well (62,6 mg NO₃/l). The analysis of discharge measurements leads to the conclusion that cropping of grass-clover-leys, even as undersown

crops, can have a reducing effect on the amount of leachate and consequently on the nitrate loads. While the leachate rate amounted 28,1% of rainfall under grass-clover leys, it rose up to 40,1% in crop rotations without undersowing. The collected data are going to be used to calibrate CoupModel and thus optimize the representation of specifics of organic farming. Period and amount of N-fixation and incidence of leachate must be calculated for every soil layer to be able to quantify the plant-available and easily movable N-pool.