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Influence of grassing targeted into the recharge zone on the nitrate concentrations and nitrogen leaching out of the drained catchment.

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Long term experiment with the land use change in tile drainage recharge zone was conducted in the catchment Dehtáře (57.9 ha, Bohemian-Moravian Highlands, Czech Republic). It is a locally typical small agricultural catchment, where the tile drainage acts as the only permanent runoff and the drainage system was built in the slope. Several drainage subsystems with various land use in their recharge and discharge zones has been monitored since 2003. Recharge zones of some subsystems were grassed since the hydrological year 2007 and nitrate concentrations, theirs trends and nitrogen loads were statistically analysed and compared with subsystems without the land use change.

The statistical analysis showed that the flow-weighted nitrate concentrations before grassing the recharge zone were surprisingly higher in drainage subsystems with the permanent grassland in drained area (discharge zone) than in the subsystem under arable land. Approximately one year after grassing the recharge zone, the long-term course of NO_3 concentrations became decreasing. The statistically significant decreases in nitrate concentrations of 32.1% and 25.7% were detected in drainage subsystems under the grassed recharge zone. In the same period, an increase in nitrate concentration was detected in sites without land use change. There was an increase of 10.8% in the drainage subsystem with arable land in both (recharge and discharge) zones and of 8.6% in the subsystem with grassland in the discharge zone, but arable land in the recharge zone. Evaluating the whole drainage system, the fall in nitrate concentrations by 10.5% was detected after grassing about 20% of this systems recharge zone.

In association with the change in nitrate concentrations, the nitrate-nitrogen leaching decreased after grassing. In the scale of whole drainage system, the monthly average load decreased by 23% from 3.2 kg N/month/ha to 2.6 kg N/month/ha. In the drainage subsystem, where the recharge zone was grassed completely, the decrease of the monthly average nitrogen load was even by 47% from 4.75 kg N/month/ha before grassing to 2.52 kg N/month/ha after grassing the recharge area.

The results showed that nitrate concentration in drainage water were much more influenced by the land use of the recharge zones within the drainage subcatchment than by land use in the drained area itself. The experiment proves that grassing focused on the proper catchment area (recharge zone) can be a useful tool for reducing nitrates in drainage water. While permanent grassland placed directly in the drained area (catchment discharge zone) did not show any effect, the grassing focused on the catchment recharge area demonstrated a significant decrease in both, NO_3 concentrations and N loads. This findings are of crucial importance for improving the water quality of small streams as well as groundwater in agriculturally exploited areas, for planning protective zones within large catchments of potable water reservoirs, and also for protecting small local surface or groundwater sources of potable water.