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Nitrate leaching concentrations in the Netherlands decreased more than expected

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The implementation of EU environmental directives and national policies into measures has led to a decrease in nitrogen (N) surplus in agriculture, notably at dairy farms in the 1995-2002 period. In addition, N emissions to air from agricultural fields have been reduced, and atmospheric N deposition on nature areas subsequently lessened. The nitrate concentrations in root zone leaching at dairy farms and nature areas in the Sand region of the Netherlands also decreased. These decreases were larger than would be expected based on the decreases in net loads. We have formulated and tested hypotheses to explain these extra decreases at farms and in nature areas.

Dairy farms cover about 60% of the area in the sandy region of the Netherlands. They have shown a nitrate leaching decrease of 100 mg/l during the 1992-2010 period (67%). The N-surplus at dairy farms decreased from about 340 to 180 kg/ha in this period (47%). Other farm management factors may have caused the additional decrease in root zone leaching concentration on farm level. The main potential factors are the ratio grassland – arable land, the grazing intensity and the ratio artificial fertilizer N – manure N. There are no indications that the ratio grassland – arable land or the ratio artificial fertilizer N – manure N significantly changed between 1992 and 2010. The mowing percentage, as an indicator for grazing intensity, increased from about 180 to 290% in the study period. About 80% (80 mg/l) of the decrease at dairy farms can be attributed to a lower N-surplus and about 20% (20 mg/l) is postulated to be caused by an increasing mowing percentage or less fodder grazing.

Nature areas cover about 20% of the area in the Sand region. Nitrate concentrations in root zone leaching in nature areas showed a decrease of 55% in 2010 compared to 1990. Yet in rainwater, the concentration decrease is only 40%. Several factors may cause an additional decrease in nitrate concentration particularly an increase of plant uptake and or denitrification, an increase of groundwater recharge and less co-deposition of N with sulphate. Because in later years especially low concentrations became lower, we postulate that an increase in plant uptake and or denitrification causes this difference because of less acid deposition.