



Long term dynamics of nitrate concentrations and leaching losses in tile drainage water from cultivated clayey till fields

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Since 1985, several political agreements have been adopted to protect the aquatic environment and nature in Denmark. The farmers have repeatedly been ordered to reduce the consumption of nitrogen in their agricultural production. The reductions have been imposed nation-wide regardless of e.g. climate, soil type and local hydraulic conditions.

By the end of 2013, the Danish Commission of Nature and Agriculture issued a report which recommend that for the future protection of surface nitrogen regulations should be locally adapted, and if possible, at the level of field scale. This kind of regulations will require very detailed information concerning e.g. climate, soil, geological settings, and hydrological conditions.

The purpose of this study was to investigate the contribution of nitrate (concentrations and losses) from drainage water at three fields (1.3-2.3 ha) located across Denmark varying in climate, soil type and geology. Each site, is systematically subsurface tile drained in a depth of about 1.1 meters and with a horizontal spacing of 18-20 meters. On each site detailed information are recorded regarding crop development, tillage, N-fertilization (amount, type and time of application). Furthermore, the standard climatic conditions (e.g. temperature, precipitation) as well as soil moisture and temperature to a depth of approx. 2 meter were measured. Concentrations of nitrate in the drainage and groundwater, recharge of water through the drainage system as well as depth to the water table are available for twelve years, starting in 2000.

Based on this large data-set a detailed level analysis was performed describing the seasonal variation in concentrations and leaching losses of nitrate to the drainage water. The twelve years of measurements show significant differences in concentrations and leaching losses of nitrate as well as in the dynamic over time.

The results highlight some of the problems ahead when future regulations change from nation-wide to local scale.