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Nitrogen and phosphorus trend analysis in Latvia agricultural monitoring stations

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Water quality depends on human activity. Intensive agriculture is one of the main sources, that cause water quality pollution and eutrophication. The use of fertilizers not only improves soil fertility, crop yield and quality, but also causes water pollution. Human activities, including the use of fertilizer, promote nutrient (nitrogen and phosphorus) concentrations in water.
Compared to the 90th agricultural production in Latvia has progressed. Vulnerable zones have been specified in the country. It is situated in the region of Zemgale's south site, within the border Lithuania. There are defined requirements for water and soil protection from agricultural activity that cause nitrate pollution. The EU Nitrates Directive aim is to protect water from nitrate pollution. In Latvia defined nitrate values are: 50 mg/l NO_3 or 11.2 mg/l N/NO_3 and Ptot – 0.2 mg/l.
As agriculture has became intensive and the use of fertilizers has grown, results indicate that the leaching potential and values of N and P has increased. Nutrients leaching in agricultural areas have observed all year in vulnerable zones, but it's values changes depending on season. The highest nutrient concentrations observe in winter and spring periods, particularly in snow and ice melting periods. The lowest values are in summer. Nutrient leaching potencial depends on precipitation, plant vegetation, season, fertilization type and soil cultivation process. N and P leaching can decrease, taking consideration the use time of fertilizers and good agricultural practices.
Research objects are monitoring stations Bērze and Mellupīte with tree research scales: drainage fields, small catchments and observation wells. The research analyses N and P concentrations in groundwater (2006-2010) and drain field and small catchment runoff (1995-2010). The aim of the research is to analyze nitrate and phosphorus concentration fluctuations in a time period. To determine nutrient concentrations, water samples were collected and analyzed in laboratory. Groundwater samples were collected monthly, runoff samples – every couple of month.
Results has shown that in monitoring stations Bērze and Mellupīte the defined values of Nitrates Directive were exceeded. The concentration of NO_3-N in water from drain and small catchment exceed 11.2 mg/l. The highest Ntot value (102.7 mg/l) was observed in the drain runoff of monitoring station Bērze. Average Ntot and Ptot drain runoff values in monitoring station Bērze are 12.4 mg/l and 0.07 mg/l, in station Mellupīte accordingly 7.25 mg/l and 0.08 mg/l, small catchment runoff average Ntot and Ptot values in monitoring station Bērze accordingly 8.73 mg/l and 0.18 mg/l and un monitoring station Mellupīte 3.76 mg/l and 0.08 mg/l. Average groundwater Ntot values in monitoring stations Bērze and Mellupīte are 1.12 mg/l and 5.04 mg/l, but in both stations Ptot concentrations are 0.04 mg/l.
As P fertilizers are more expensive as N fertilizers, its use has been decreased in monitoring station Mellupīte because agriculture in not so intensive there as in monitoring station Bērze. Since 1995 in monitoring station Bērze Ntot and Ptot concentrations in drain runoff has increased for 132% and 203%. In monitoring station Mellupīte Ntot value has increased for 47%, but Ptot has decreased for 93%.
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