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Buffer strips as filters for nutrients from grazed lands and nutrient cycling on the buffer strips

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The retention of agricultural nitrogen and phosphorus by 10-m-wide grass buffer strips (GBS) and buffers under natural vegetation (VBS) has been studied for 10 years on an experimental field at Jokioinen (Uusi-Kämppä & Ylärinta 1992). The results have been compared with those from 70-m-long plots without buffers (NBS). Spring barley or oats were cropped on the field until summer 2002. In our new experiment, the grass was sown on the field and NBS in summer 2002. In the future, the field plots and NBS will be grazed. The loads of nitrogen and phosphorus in run-off from pasture with GBS and VBS will be compared to pasture with the grazed buffer strip (NBS). The recycling of phosphorus and nitrogen on the buffers will also be studied.

Several things are studied on the experimental field. Surface and subsurface water samples are taken from each plot for analysis of the concentrations of phosphorus and nitrogen, and of the numbers of faecal coliforms and coliphages. The soil is separately sampled on each of the six field plots and the GBS, VBS and NBS areas at depths of 0–2, 2–5, 5–10, 10–20, 20–40, 40–60 and 60–80 cm. The contents of NH₄-N, NO₃-N and easily soluble P are analysed.

Microbial biomass and microbiologically mediated processes of the nitrogen cycle are determined in autumn. Nitrogen and carbon immobilised in microbial biomass, net nitrogen mineralisation, and potential activities of nitrification and denitrification are analysed in the laboratory.

In the field, fluxes of nitrous oxide will be measured from the buffer strips and the pasture every second week from May 2003 to April 2004 using chambers and gas chromatographic analysis.

Mathematical nutrient leaching models will be used to study the changes in nutrient balances in vegetative filter strips over the course of time. The COUP model (Jansson and Karlberg 2001), previously known as the SOIL/SOIL-N model, will be applied both to the field and the vegetative filter strips in order to study nitrogen dynamics in detail. This dynamic, process-based model can take into account vegetation nutrient uptake, as well as changes in fertilization strategies and in meteorology. Phosphorus load from the experimental field will be estimated by leaching models.

References

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