Leaching of dissolved organic carbon (DOC) and nitrogen (DON) following cultivation of grass-clover pastures

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In mixed arable grassland systems there can be a considerable build-up of nitrogen (N) caused by input through symbiotic N_2 fixation and by the deposition from grazing animals. After ploughing of such grazed grassland large amounts of inorganic N may be released through mineralisation and subsequently leached to deeper soil layers or eventually to the groundwater. However, not much is known about the contribution of dissolved organic nitrogen (DON) to the total amount of N leached.

On a sandy loam soil measurements were carried during the winter season (2002-2003) after spring wheat, which followed a 1st and an 8th year grass-clover pasture, respectively. Parallel measurements were carried out in an existing 9th year grass-clover pasture. Similarly, measurements are carried out on a coarse sandy soil during the growing season of spring barley and the following winter season (2003-2004). The spring barley was sown after ploughing under a 3rd and 5th year grass-clover, respectively, and the spring barley was grown at two fertiliser levels (0 and 120 kg N ha^{-1}) and with or without a catch crop of ryegrass. Using suction cups installed at different depths soil water was withdrawn at weekly or bi-weekly intervals and analysed for dissolved organic carbon (DOC), dissolved total N, inorganic and organic N (DON).

Results from the sandy loam soil show that

1) 25 kg DOC ha^{-1} was leached from the existing 9th year grass-clover and 15 kg DOC ha^{-1} from the ploughed treatments, whereas only 7 kg total N ha^{-1} was leached from the 9th year grass-clover and 13-24 kg total N ha^{-1} from the ploughed treatments during the period from November 2002 to April 2003.
2) DON constituted 15-40% of the total N leached.
3) the C:N-ratio of the dissolved organic matter (DOM) decreased with increasing soil depth, being 9.8 at 30 cm, 8.7 at 60 cm and 7.6 at 90 cm, and the C:N-ratio was significantly higher in the 9th year grass-clover than in the ploughed treatments.

Preliminary results from the coarse sandy soil show that

1) the concentration of DON was relatively constant during the measuring period (1.7±0.1 mg L^{-1}) regardless fertiliser or catch crop treatment and was significantly higher than the concentration in the sandy loam soil (1.4±0.1 mg L^{-1}).
2) DON constituted 15-64% of the total N leached during the period from May to November, where the total amount of N leached ranged from 6 to 21 kg N ha^{-1}.