Root growth and leaching of nitrogen of catch crops - Results from a lysimeter project

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Following cereals, catch crops can reduce the leaching loss of nitrate (NO_3-N). In a three-year experiment a bare soil fallow and *Phacelia*, sunflower and a brassica catch crop succeeded spring wheat at two levels of nitrogen (N) input with the aim of investigating the relationship of NO_3-N leaching loss with the root growth, rooting depth and N uptake of catch crops and if these relationships depended on N input and years. The main N input was applied to the preceding spring wheat crop at 2 and 27 g N m^{-2}. Water percolation from the lysimeters and nitrate concentration in the leachate were measured on weekly intervals from the sowing until the harvest of the catch crops to calculate NO_3-N leaching loss. N uptake was calculated at the frost killing of the catch crops from biomass yield and N concentration. Minirhizotrons were used to assess the spatial and temporal patterns of root growth from 0.10 to 1.00 m. The time course of root length density and rooting depth were fitted to a logistic and a piecewise regression model, respectively. The parameters of these models and N uptake were studied by means of correlations to asses their relationship with NO_3-N leaching loss.

Catch crops species differed in N uptake, root growth and rooting depth. The brassica species were the most effective reducing NO_3-N leaching loss despite having intermediate N uptake. Fast growth of the roots in deep soil layers was the main characteristic of catch crops reducing NO_3-N leaching loss. Consequently, the parameters that indicated earliness of root growth associated relatively stronger and more consistently with NO_3-N leaching loss than N uptake or parameters that indicated static characteristics of the root system.