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Simulated nitrogen leaching, nitrogen mass field balances and
their correlation on four farms in south-western Finland during
the period 2000–2005

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Abstract

Nitrogen (N) gross balance is one of the indicators designed for following developments in agriculture in the European Union. A nutrient surplus occurs when the quantity of a nutrient applied in fertilizers is greater than that removed during harvest. In this study the usefulness of N balance in studying the fate of N and controlling N leaching from agricultural fields in south-western Finland was evaluated. To estimate N leaching in 2000–2005 the mathematical, process-based model COUP was applied to twelve fields representing four agricultural production sectors. The fields represented conventional cereal production, organic cereal production and both conventional cattle and pig husbandry. Simulated N leaching was lowest from cereal production fields with a low N balance. Higher N leaching from pig and cattle production farms might be reduced by decreasing the N balance but also by applying manure in spring instead of autumn. Both N balance and simulated N leaching from organic farm were relatively high compared to low N application rate to the fields. N balance appears to be a rather useful indicator of N leaching over longer periods of time. In the short term, N leaching depends mainly on precipitation and on cultivation practices, like timing and amount of fertilizer application. Statistical evaluation indicated significant positive correlation between calculated N balance and simulated N leaching, especially when supported by constant values of precipitation and N mineralization rate. Decrease of N balance by 1 kg ha⁻¹yr⁻¹ decreased N leaching by 0.3 kg ha⁻¹yr⁻¹. High positive N balances are conducive to abundant accumulation of residual N in soil and consequently to a high risk of N leaching during rainy seasons.

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