

Impact of different Fertilization Intensity on Nutrient leaching in ley-based farming systems



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Introduction

Ley-farming based on highly productive grass-clover mixtures can be an interesting amendment to permanent grassland and is of growing importance regarding the European - wide discussion about protein substitution in feeding. But during the course of grassland ploughing until the full establishment of the ley farming vegetation there is an extended risk for nutrient leaching

Material & Methods

- ◆ A field experiment was established at Winklhof/Salzburg in 2007. This site is located at 452 m a.s.l and characterized by an average rainfall of 1,500 mm year⁻¹ and a mean temperature of 9.1°C during the observation period of 4 years



- ◆ Two fertilization intensities (85 and 170 kg N_{ex storage} ha⁻¹ year⁻¹ using cattle slurry) were used and the plots were cut four times per year
- ◆ To determine the amount and quality of leachate, gravitation lysimeter chambers (1.1 m diameter, 1.4 m depth) were permanently installed in the plots



Results

- ▶ In the year of establishment yield productivity was at a disappointing low level without significant differences between the proofed fertilization intensities
- ▶ Compared to the used seed mixture composition, legumes contributed disproportionately high (> 40%) to the yield in all years at both fertilization levels
- ▶ The high fertilization level representing the upper limit of the Council Directive 91/676 (EEC, 1991) indeed had a significant but disappointing low effect on yield productivity and consequentially on nitrogen removal
- ▶ In the establishment year an average nitrate concentration of nearly 80 mg l⁻¹ leachate was detected with maximum values of more than 350 ppm
- ▶ In both fertilization systems more than 40% of all leachate were beyond the EU-wide existing nitrate threshold of 50 ppm whereas in the following years no more exceedance occurred

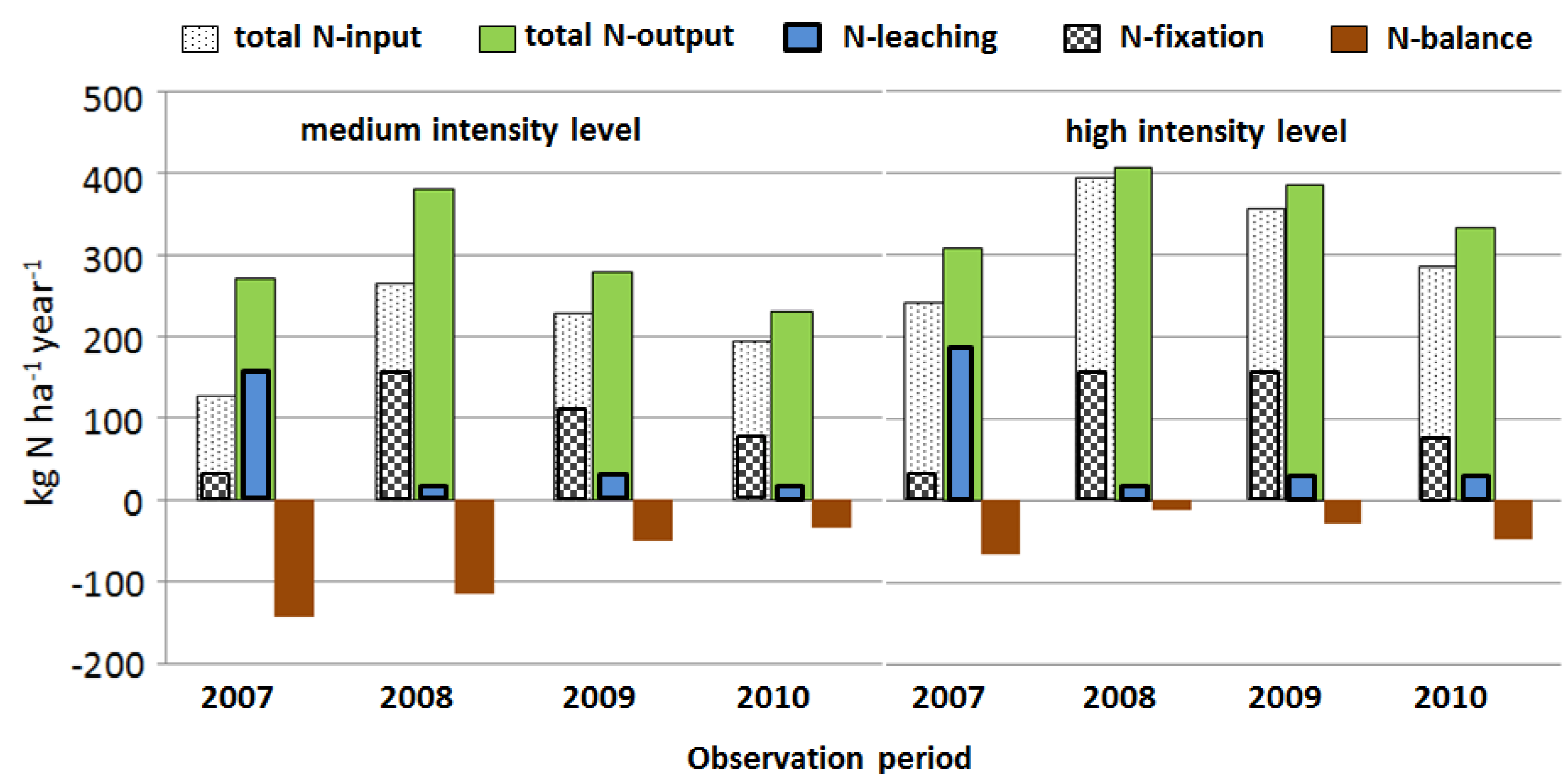


Figure 1: Nitrogen field balance in the lysimeter experiment at Winklhof, Austria

- ▶ The total N-input was strongly influenced by biological N-fixation (up to 150 kg N ha⁻¹, estimated by N-difference method) whereas nitrogen leaching significantly contributed to the total N-output in the first year (Figure 1)

Conclusions

- Ley-farming provides an attractive option to produce forage of high quality
- Compared to permanent grassland there is a considerable risk for high nitrate concentration in the leachate and nitrogen losses, especially in the year of establishment
- To avoid such environmental problems, the awareness of farmers has to be raised to adapt the fertilization level to the expected lower yields in this critical period