

# Production of N<sub>2</sub>O in grass-clover pastures

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## Background

Grass-clover pastures are an important component in organic dairy farming systems, and are typically grazed for a significant part of the year. Nitrogen depositions from grazing cattle's excreta are at risk of being lost to the atmosphere or lost via leaching. In addition, the grass-clover pastures are expected to have a high level of nitrogen in the root zone due to the fixation of atmospheric dinitrogen (N<sub>2</sub>). Both factors could contribute to increased emissions of nitrous oxide (N<sub>2</sub>O). Nitrous oxide is a strong greenhouse gas with agricultural soils as a significant source. Thus far, however, there have only been a few accurate estimates of total N<sub>2</sub>O emissions from grassland livestock production systems, and understanding of the factors controlling N<sub>2</sub>O emissions remains unsatisfactory.

## Objective

The aim of the Ph.D.-project is to increase the knowledge of the biological and physical-chemical mechanisms, which control the production of N<sub>2</sub>O in grazed grass-clover pastures. Such knowledge is a necessity for a complete environmental evaluation of organic farming practices. The Ph.D.-project consists of three different experiments, which have the following objectives:

### Experiment 1

- develop a method to measure N<sub>2</sub> fixation and N<sub>2</sub>O production in pot experiments using <sup>15</sup>N<sub>2</sub>-labelling technique
- assess the contribution of recently fixed N<sub>2</sub> as a source of N<sub>2</sub>O and the translocation of N from clover to companion grass

### Experiment 2

- identify which of the two microbial processes, nitrification or denitrification, is the main responsible for the production of N<sub>2</sub>O
- study how nitrification and denitrification are influenced by urine deposition

### Experiment 3

- investigate the connection between N<sub>2</sub>O production and carbon mineralisation in urine spots

## Progress - 2004

Midterm seminar was held 22<sup>nd</sup> October 2003 at Højbakkegård, KVL according to the plan. Furthermore, all experiments and sample analysis have been completed. One manuscript has been drafted and submitted for consideration for publication in the journal of Plant and Soil. A publication was included in the December 2003 issue of DARCOF news.

Maternity leave in the period 1.3.2004 – 15.12.2004. Accordingly, the budget has been revised with the need to transfer an amount of money to 2005. Project will end 30.6.2005.

## Plans - 2005

Final publications and complete thesis report.