Flows of N and P on large dairy farms with different grazing systems – a model study

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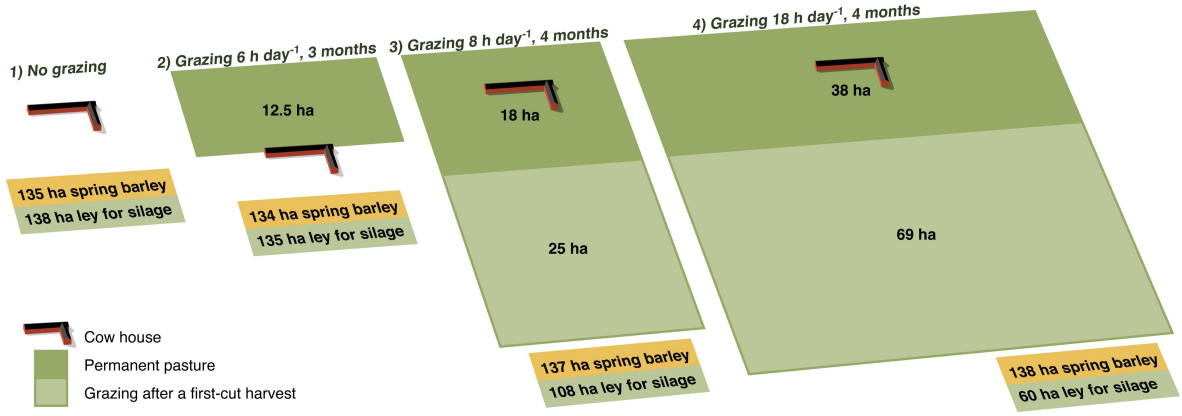
Introduction

A grazing system for dairy cows has the advantages of being beneficial to animal health and welfare. However, with increasing herd size it becomes more difficult to direct/control the flows of nitrogen (N) and phosphorus (P) on the farm.

The objectives of this project were to describe and calculate flows of N and P on 300-cow dairy farms with different grazing systems, and to identify potential risks for negative environmental impacts regarding N and P losses.

Methods

In- and outflow calculations of N and P were established for four theoretical farms, representing the following systems.



Results and conclusions

- At farm level, total losses of N as ammonia emissions decreased as the time cows spent on pasture increased.

Calculated total losses of nitrogen as ammonia emissions, t y^{-1}

	System 1	System 2	System 3	System 4
Cow house	2.6	2.4	2.3	1.9
Manure storage	1.2	1.1	1.1	0.9
Cattle slurry spreading	6.4	5.8	5.2	3.8
Pasture[1]/exercise area	-	0.2	0.3	0.7
Total	**10.1**	**9.5**	**8.9**	**7.4**

1) Including cattle walkways

- At field level, net inflow of N was higher in the pasture systems with herbage production (3 and 4) than in systems 1 and 2, indicating higher risk of N losses. However, N inflow through chemical N fertilisers can be reduced by consider the fertiliser effect of urine-N deposited on pasture. For P, the net inflow was close to balance in all systems.

Net inflow of N at field level, kg ha^{-1} y^{-1}

	System 1	System 2	System 3	System 4
N, field level (basic scenario)	9	9	18	33
N, field level (urine-N included)	9	9	10	17

- Point loads of N and P proved to be very high on the cattle walkways. Technical/biological solutions need to be developed to reduce point loads of N and P on cattle walkways.