

Nitrogen use efficiency (NUE) under intensive grazing

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Background

- The Dutch dairy sector aims for high milk production, while reducing the environmental impact and maintaining grazing
- The environmental impact of intensive grazing systems is unknown because grass intake data are lacking
- NUE is a relevant environmental indicator because nitrogen (N) losses occur during grazing
- The N content of the feed is known to influence NUE

Objective: Testing the effects of intensive grazing systems and dietary protein level on NUE of 60 individual dairy cows

Conclusions: Combining a low N intake from fresh grass and feed supplementation resulted in the highest NUE at cow level

Methods

A grazing trial with a 2x2 factorial design, testing:

- 2 intensive grazing systems
 - compartmented continuous grazing (CCG) and strip grazing (SG)
- 2 levels of dietary rumen-degradable protein balance (OEB)
 - low (L) and high (H) (a difference of 500 g OEB cow⁻¹ day⁻¹)

- All N in- and outputs were quantified for 60 dairy cows during 2 weeks in July and September

Maize
Concentrates
Fresh grass

N inputs



60 dairy cows

Milk
Faeces
Urine

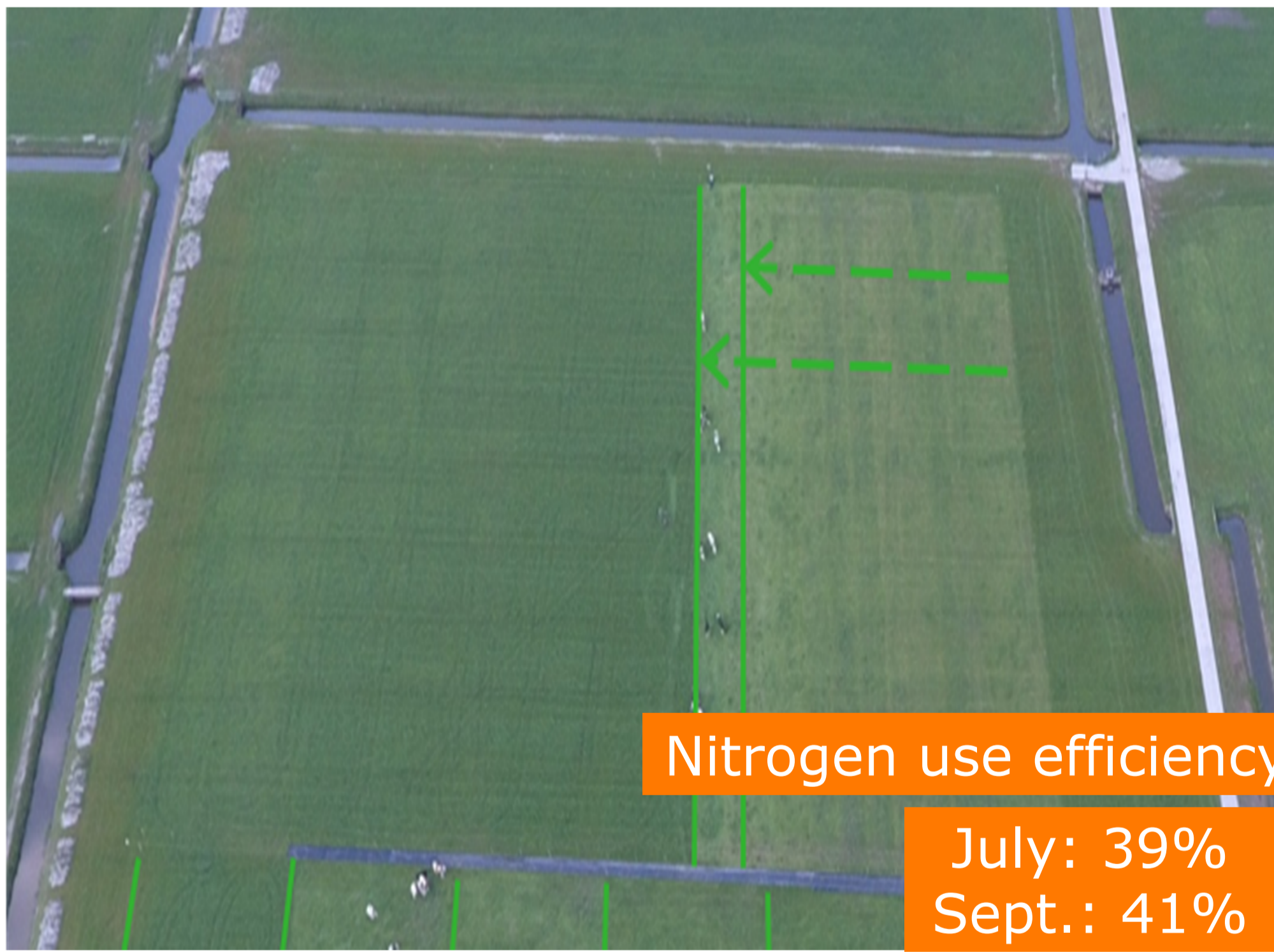
N outputs

Grazing system	Protein level	
	Strip grazing Low OEB SG-L	Strip grazing high OEB SG-H
	Continuous compartmented grazing Low OEB CCG-L	Continuous compartmented grazing High OEB CCG-H

Results

- NUE of each treatment for July and September ranged from:
SG-L 39%-41%; SG-H 34%; CCG-L 40-42%; CCG-H 34%-36%
- Low OEB showed a higher NUE (40%) compared to high OEB (34%) due to higher concentrate N intake ($p < 0.001$)
- In July: higher NUE in CCG (39%) compared to SG (36%) due to a lower grass N intake ($p = 0.003$)
- An overall increase in dietary N resulted in: an increase in urinary N excretion, an increase in N digestibility and a decrease in NUE

SG-L



SG-H

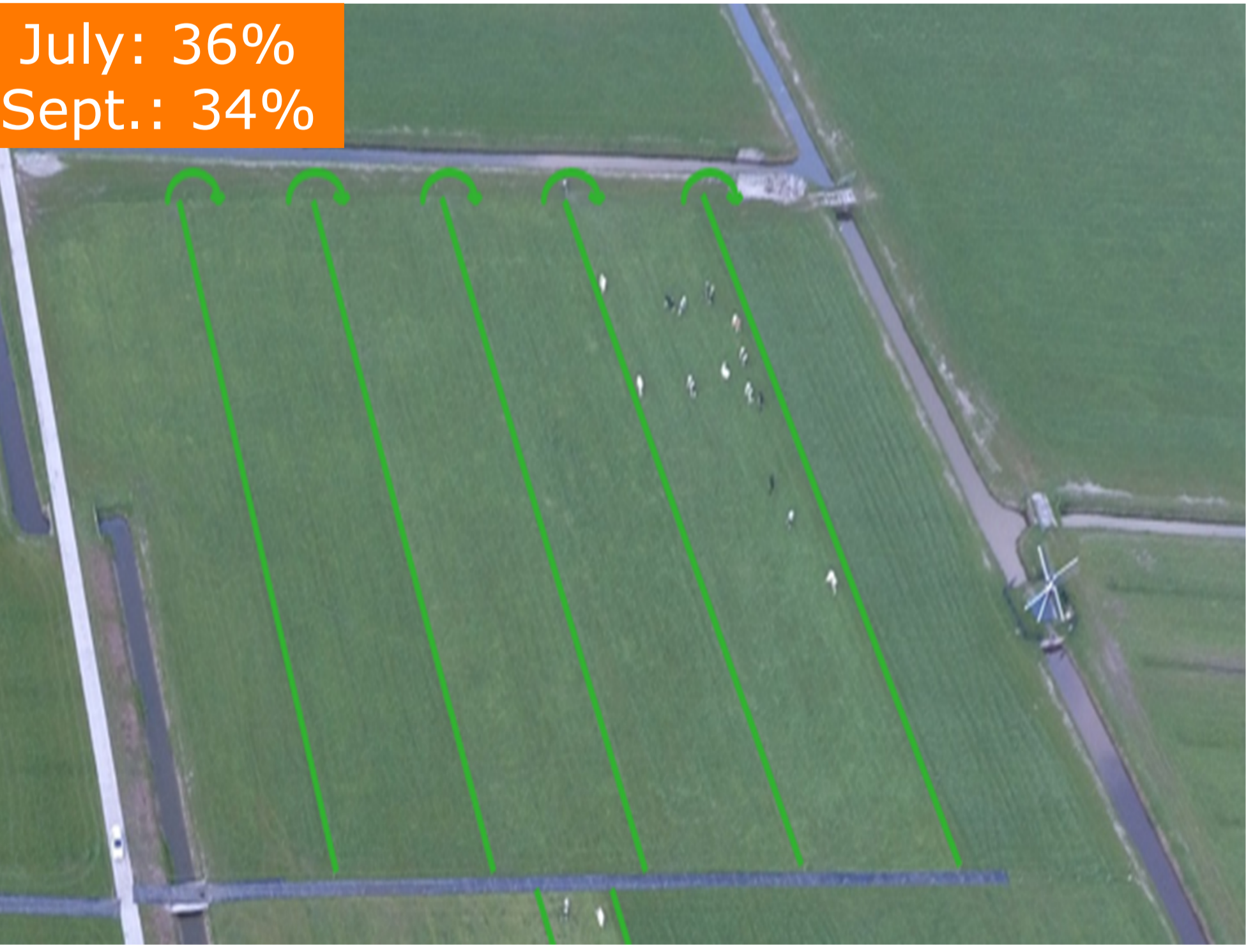


Nitrogen use efficiency (NUE) = N milk/N feed

July: 39%
Sept.: 41%

July: 34%
Sept.: 34%

CCG-L



CCG-H

Societal impact of this study: The results contribute to achieving the goals of the Dutch dairy chain agreement 'Grazing Covenant'