Can we motivate dairy cows to increase their grass intake by feeding low protein supplements?

June 2018, **R.L.G. Zom, I.A.J. Van Berkel, M.D. Oegema, G. Holshof**

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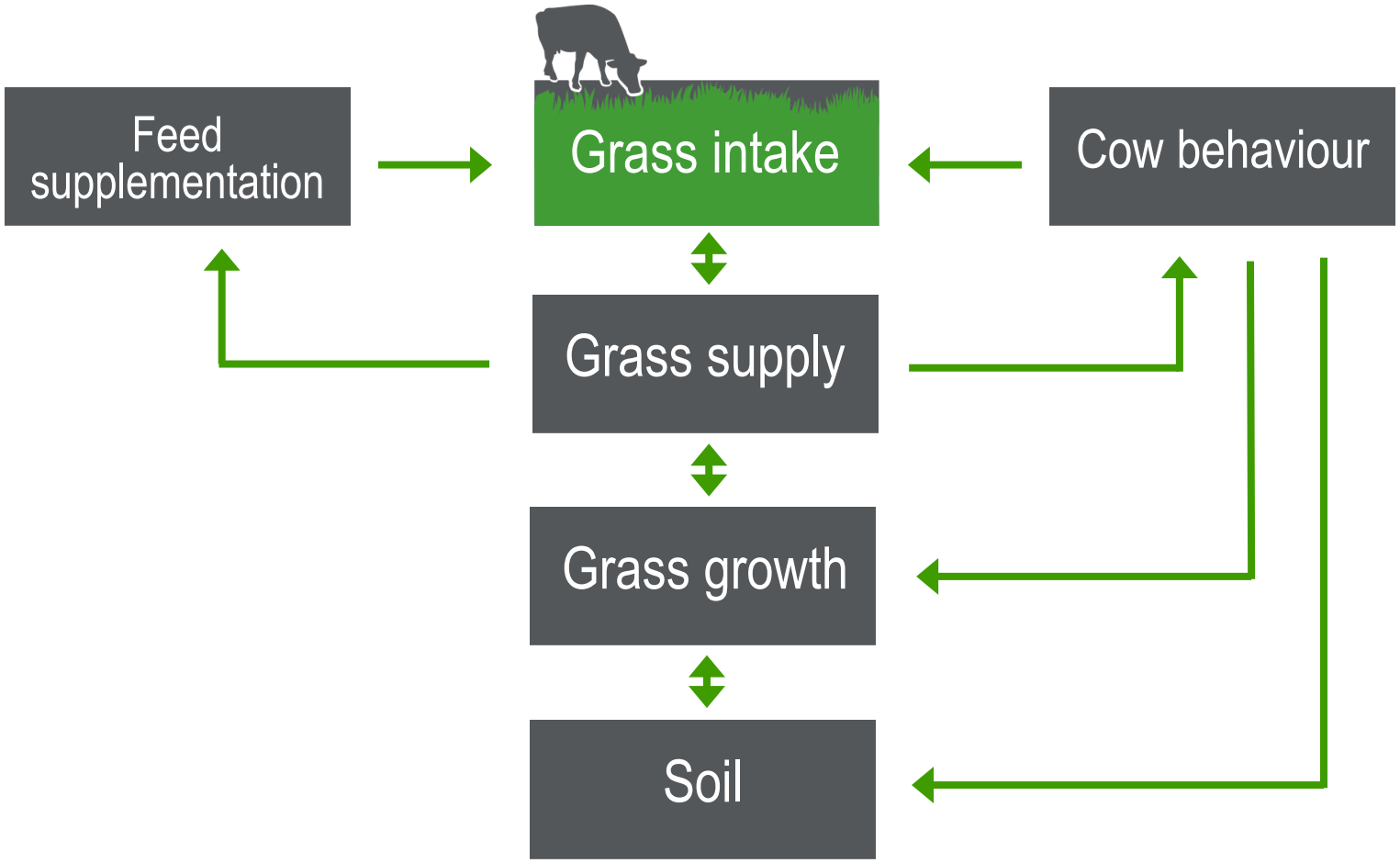
Components of Amazing Grazing



Introduction

- Animals seems to balance/optimise their nutrient intake
  - Free choice: Dairy cows avoid excess/shortage of Rumen Degradable Protein (RDP) (e.g. Tolkamp et al. 1998)
  - Lams select forages to correct nutritional imbalances (Scott & Provenza, 2000)
  - Grazing dairy cows supplemented with low protein concentrates selected for high protein herbage (Heublein et al. 2017)

Introduction

- Can we use this this mechanism?
  - Can we motivate dairy cows to increase their grass intake by feeding low protein supplements?

- High grazing intake
  - Increased farm profitability
    (van den Pol – van Dasselaar et al. 2013)
  - Increased utilisation of home grown forage

Introduction

- Do dairy cows optimise the protein in their diet?
  - What will happen if we challenge cows with a temporary shortage of nitrogen in the rumen?
  - Will cows compensate this with a higher grass intake?
  - Are there any trade-offs

Introduction

- 60% of Dutch dairy farms
  - Part-time grazing with supplemental forage (maize silage) and concentrates indoors
    - Not enough grassland near the farm for full-time grazing
    - Promote cow traffic in AMS+grazing systems
    - Increase dry matter intake
  - Ideal if the proposed concept will work
    - Feeding indoors with low protein supplements

Materials & Methods

- 60 HF Cows (40 multiparous)
  - 53 ± 25 DIM, 2.5 ± 1.5 lactations
  - MY 38.4 ± 7.5 kg/d, Fat 1608 ± 368 g/d, Protein 1206 ± 206 g/d
- 2 ×2 Factorial design
  - 2 Grazing Systems
  - 2 Levels of Rumen Degradable Protein Balance
  - 3 Grass intake measurement periods (Ju, Jl and Sp)
  - Maize silage – Fixed amounts within grazing system
    - Weekly adjusted to the available herbage

Materials & Methods

- 2 Contrasting grazing systems
  - SG: Strip Grazing (de Geus, 1946)
  - CCG: Compartmented Continuous Grazing (Holshof et al. 2018)
  - Major systems in the Netherlands

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Material & Methods

- 2 Contrasting levels of rumen degradable protein
  - LP: Low RDP; HP: High RDP 5.5 kg DM/d

	LP	HP	
Citrus pulp	19	19	%
Corn	38	38	%
Rapeseed meal		30	%
Rapeseed meal Rumen Bypass	8		
Sugar beet pulp	25	3	%
Sugar beet molasses	7	5	%
Palm oil	2	2	%
Crude Protein	110	220	g/kg DM
Intestinal Degradable protein (DVE)	117	117	g/kg DM
RDP balance (OEB)	-57	54	g/kg DM
NEL	7.8	7.8	MJ/kg DM

Measurements

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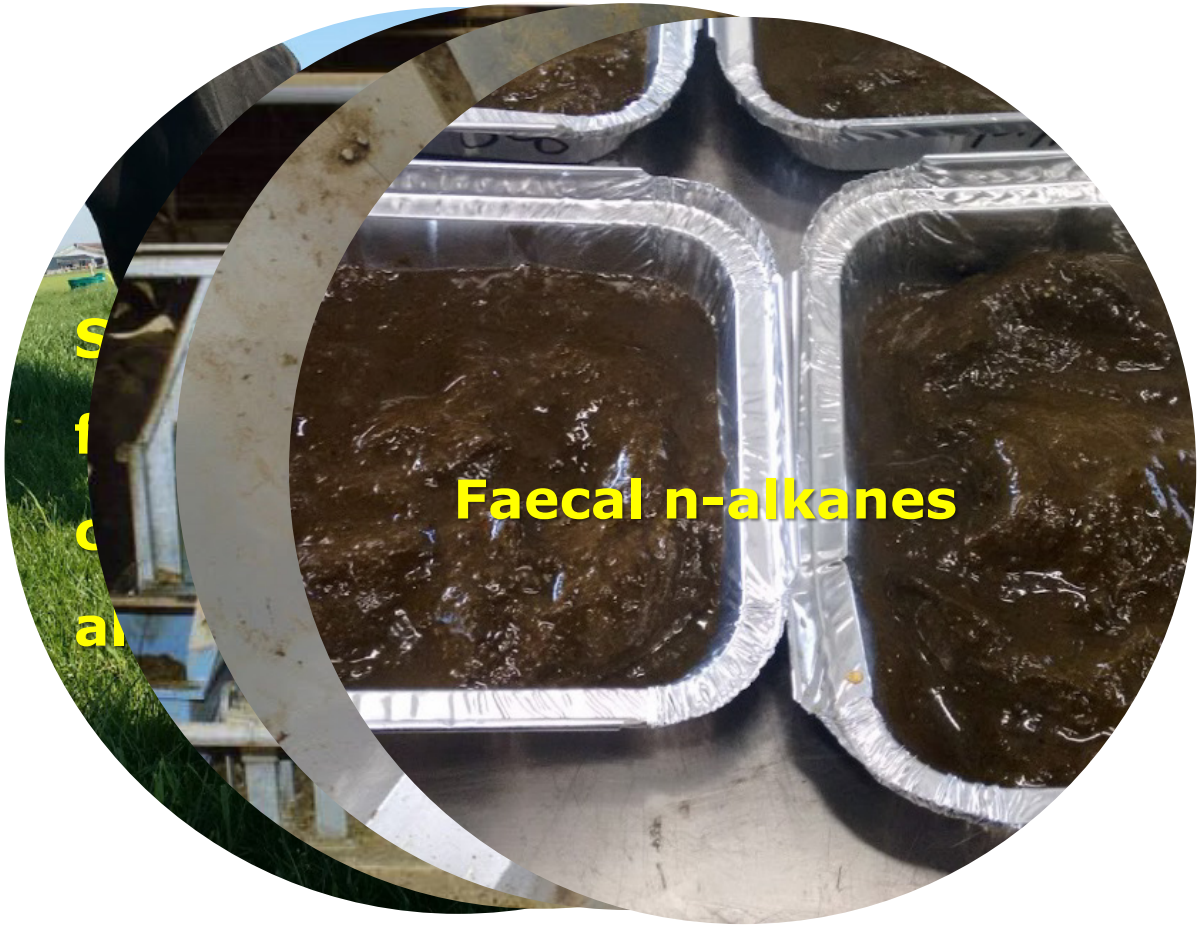
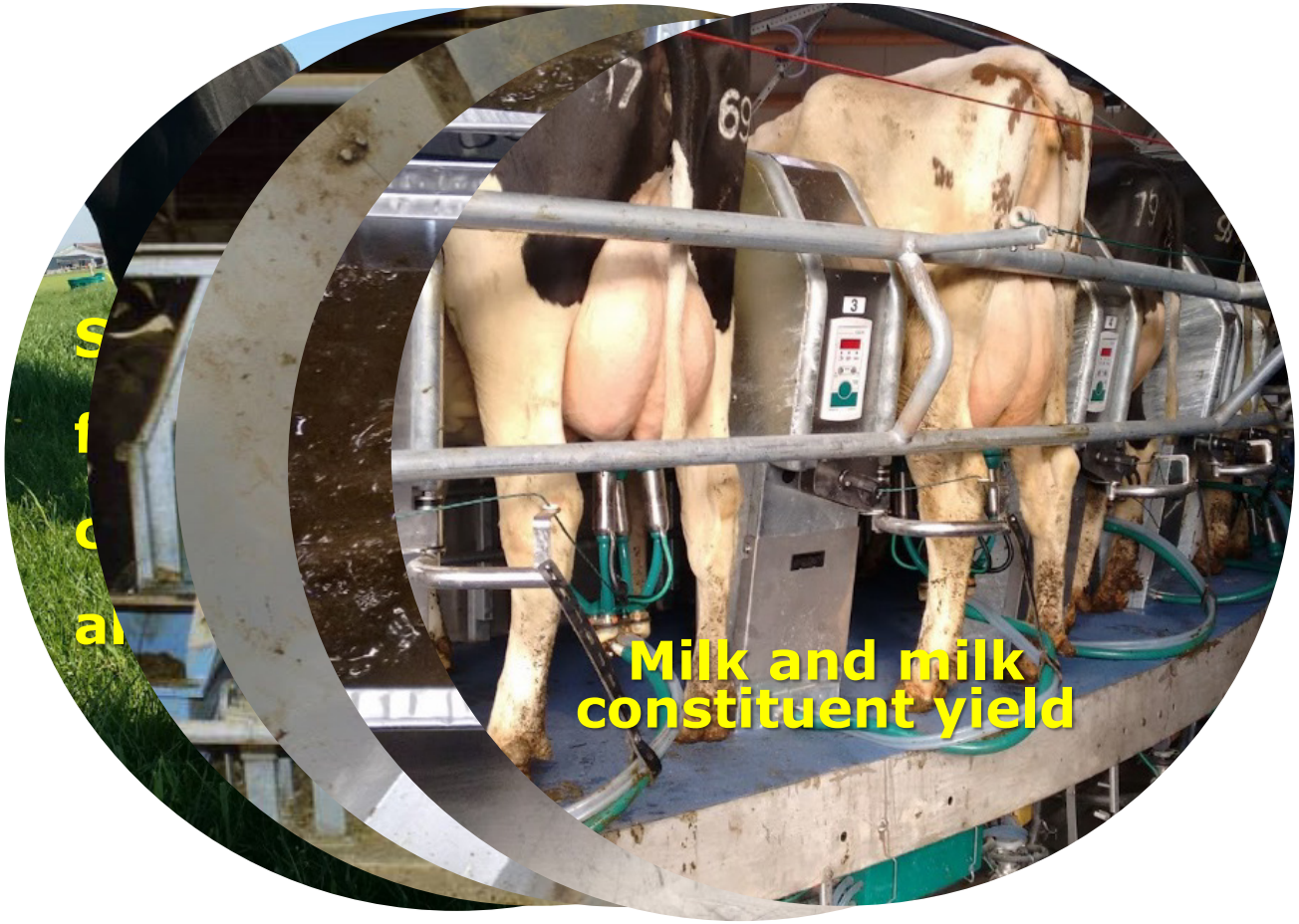


Measurements



Measurements

Measurements

Results Intake

Grazing system		CCG		SG						
RDP treatment		HP	LP	HP	LP	lsd	GS	RDP	GS×RDP	P×GS×RDP
GDMI	Ju	7.0	6.5	5.5	6.0	0.7	0.654	0.508	0.437	<0.001
($g.d^{-1}$)	Jl	4.1	4.1	4.6	4.9					
	Sp	2.9	3.3	3.5	3.8					

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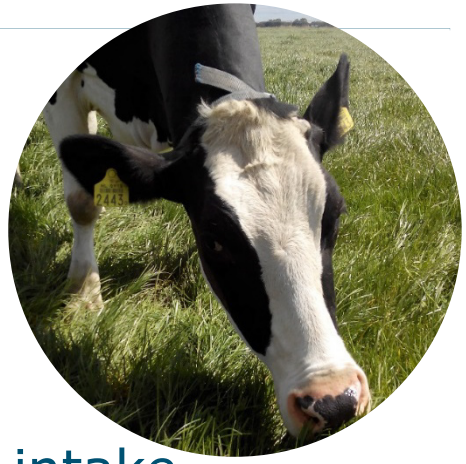
($g.d^{-1}$)	Jl	4.1	4.1	4.6	4.9					
	Sp	2.9	3.3	3.5	3.8					
TDMI	Ju	19.9	19.0	19.5	18.8	1.1	0.015	<0.001	0.945	0.555
($kg.d^{-1}$)	Jl	19.4	18.6	20.5	18.3					
	Sp	18.3	18.0	18.9	17.5					
NEL	Ju	151	141	142	135	7.1	0.042	0.002	0.226	0.132
($MJ.d^{-1}$)	Jl	134	128	132	127					
	Sp	133	127	133	124					
DVE	Ju	1782	1599	1648	1566	78	0.164	<0.001	0.451	0.136
($g.d^{-1}$)	Jl	1606	1513	1614	1550					
	Sp	1550	1505	1565	1486					
OEB	Ju	308	-419	213	-363	58	0.348	<0.001	<0.001	0.002
($g.d^{-1}$)	Jl	233	-379	312	-274					
	Sp	194	-300	209	-311					

Results Milk constituents yields

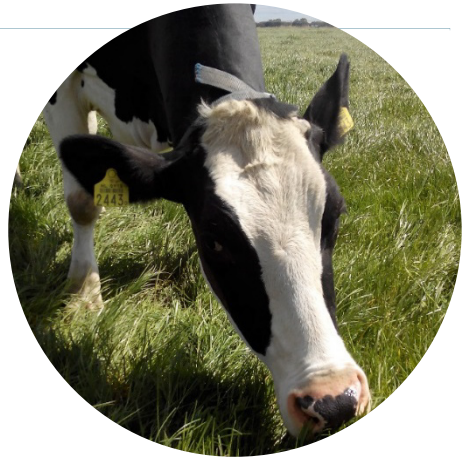
Grazing system		CCG		SG						
RDP treatment		HP	LP	HP	LP	lsd	GS	RDP	GS×RDP	P×GS×RDP
Milk yield	Ju	34.3	29.6	33.6	28.4	2.5	0.740	<0.001	0.888	0.953
(kg.d^{-1})	Jl	30.7	25.7	30.9	25.8					
	Sp	29.0	25.0	29.3	25.4					
Fat	Ju	1.28	1.16	1.22	1.11	0.1	0.440	<0.001	0.675	0.599
(kg.d^{-1})	Jl	1.12	1.05	1.09	1.01					
	Sp	0.89	0.98	0.93	0.96					
Protein	Ju	1.19	1.04	1.14	0.98	0.1	0.269	<0.001	0.226	0.826
(kg.d^{-1})	Jl	1.08	0.94	1.05	0.91					
	Sp	0.96	0.91	0.97	0.90					
Urea	Ju	12	7	9	5	2.5	0.122	<0.001	0.698	0.698
(mg.100 ml^{-1})	Jl	13	8	14	10					
	Sp	11	8	11	6					

Discussion



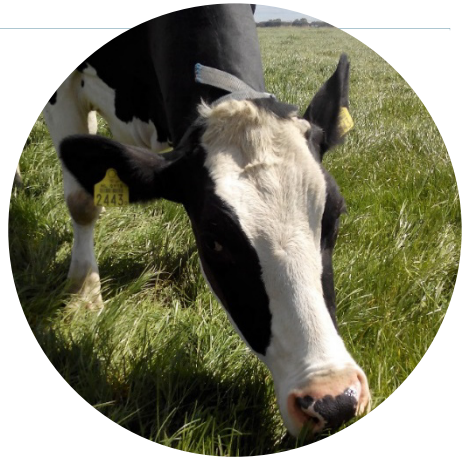
- Feeding a low protein supplement:
  - Did not motivate cows to increase grazing intake
  - Cows reduced the intake of (low protein) maize silage
  - So, cows seem to balance their nutrient intake
    - Effect of rumen function (N shortage for rumen microbes)?
    - Metabolic regulation?
  - Reduced Intake -> Reduced Milk performance
    - Milk and milk protein yields were reduced

Discussion



- Feeding a low protein supplement:
  - Other observations:
  - Rumen NH_3 and milk urea were very low in both LP and HP
  - Rumen NH_3 :
    - 2.63, 2.15 mmol/L for HP-CCG and HP-SG
    - 1.84 and 1.35 mmol/L for LP-CCG and LP-SG
    - 3 mmol/L minimum threshold for good rumen function
  - This does not match with the calculated DVE and OEB values
  - Should we reconsider protein digestibility of grass?

Conclusion



Q: Can we motivate dairy cows to increase their grass intake by feeding low protein supplements?

A:

NO

But we did see some things that need further research

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