Methane mitigation through cattle nutrition

Roughages and feed nutrients

Symposium October 6th 2016, Melle

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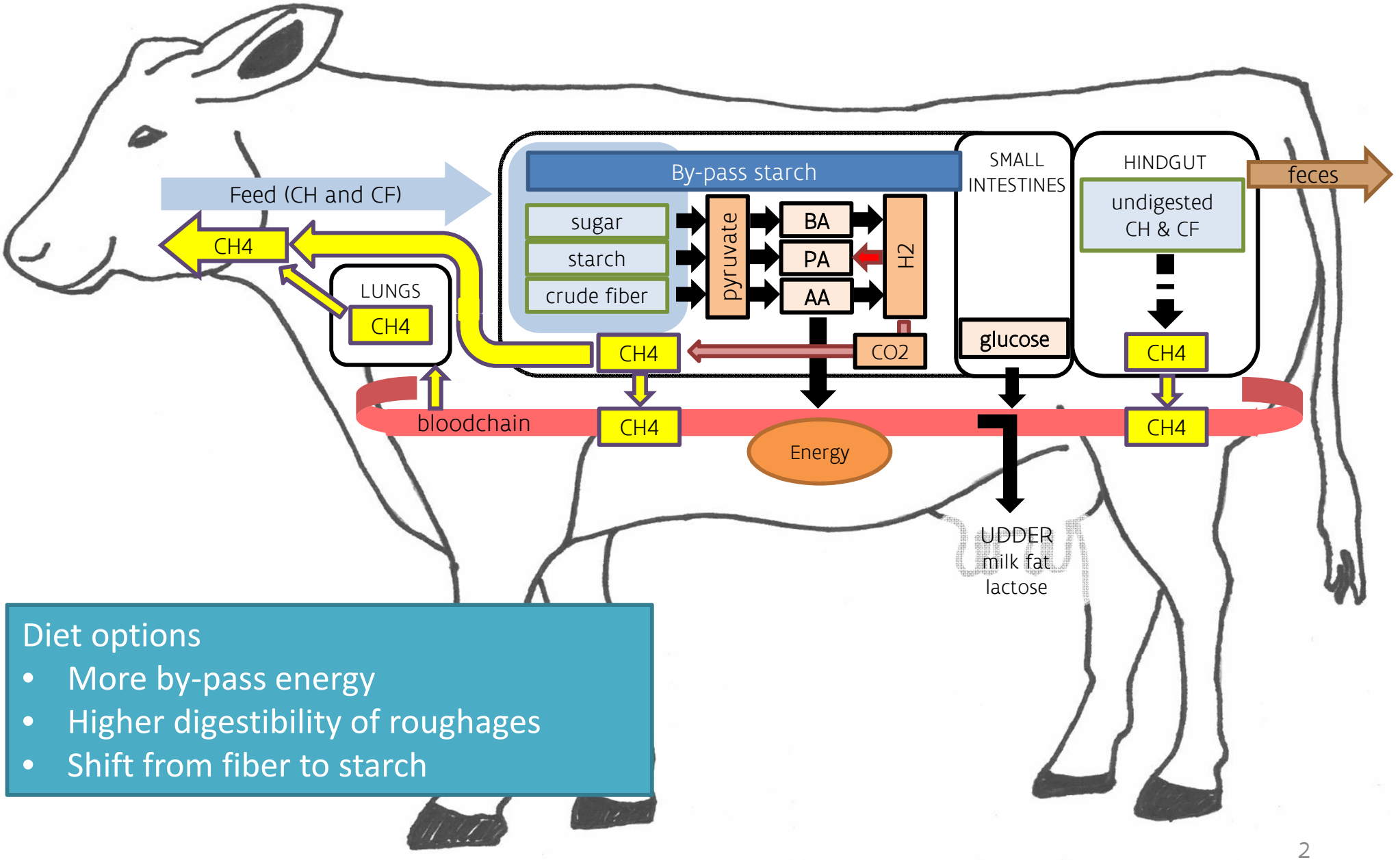
AGENTSCHAP INNOVEREN & ONDERNEMEN

Vlaanderen is ondernemen

Innovatiesteunpunt de toekomst begint vandaag

ILVO Instituut voor Landbouw- en Visserijonderzoek

Rumen fermentation



Diet options

- More by-pass energy
- Higher digestibility of roughages
- Shift from fiber to starch

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SMART roughages

% in diet (DM)	SMART 6	
Prewilted grass silage	45 (65)	25 (35)
Maize silage	25 (35)	43 (65)
High starch conc	30	-
Low starch conc	-	32

Concentrates with different nutritional value

g/kg prod	VEM (/kg)	DVE	OEB	ZET	RV	NDF
High starch	1036	117	22	317	27	103
Low starch	990	103	3	197	25	169

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Trial set-up roughage trials

Trial set-up was changed
after statistical simulation of data within previous GUK trials

	W1 - W3	W4 - W8	W9	W10 - W14	W15
Ctr group 1 (3)	Adap.	CTRL	GUK 1	CTRL	GUK 1
Trt group 1 (3)	Adap.	CTRL	GUK 1	TRTM	GUK 1

	W2 – W4	W5 - W9	W10	W11 - W15	W16
Ctr group 2 (3)	Adap.	CTRL	GUK 2	TRTM	GUK 2
Trt group 2 (3)	Adap.	CTRL	GUK 2	TRTM	GUK 2

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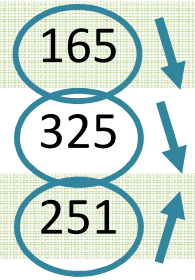
Diet composition

	Control group		Treatment group	
	Period 1	Period 2	Period 1	Period 2
DM (g/kg)	466	497	471	485
Crude Protein (g/kg DM)	164	163	165	164
Crude Fat (g/kg DM)	28.7	29.5	28.7	28.4
Crude Fiber (g/kg DM)	182	184	179	165
NDF (g/kg DM)	351	354	345	325
Starch (g/kg DM)	190	190	194	251
Bypass starch (g/kg DM)	49.0	48.6	50.9	43.0
VEM (/kg DM)	972	952	977	977
DVE (g/kg DM)	92	88	94	90
OEB (g/kg DM)	15	17	14	17



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Dry matter and roughage intake

	Control group		Treatment group		Group*Period	SEM
	Per. 1	Per. 2	Per. 1	Per. 2		
DMI (kg/day)	20.6	21.9	20.8	21.9	0.002	0.8
Roughages (%)	70.2	72.1	67.6	68.1	<0.001	1.6
MP (kg/day)						
FPCM (kg/day)						
Fat (g/day)						
Protein (g/day)						

g/kg DM	DM (g/kg)	RE	RC	VEM	DVE	OEB
GS period 1	392	153	275	825	57	31
GS period 2	449	150	271	811	55	29

Production results

	Control group		Treatment group		Group*Period	SEM
	Period 1	Period 2	Period 1	Period 2		
DMI (kg/day)	20.6	21.9	20.8	21.9	0.002	0.8
Roughages (%)	70.2	72.1	67.6	68.1	<0.001	1.6
MP (kg/day)	28.2	27.6	27.5	27.3	0.69	1.5
FPCM (kg/day)	28.7	28.5	28.3	28.8	0.55	1.6
Fat (g/day)	1149	1157	1160	1207	0.67	92
Protein (g/day)	983	960	923	932	0.19	40

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Methane emission results

	Control cows		Treated cows		Group*Period
	Period 1	Period 2	Period 1	Period 2	
CH_4 (g/day)	435	426	423	425	0.51
CH_4/DMI (g/kg)	22.6	19.2	20.0	20.0	0.05
CH_4/FPCM (g/kg)	15.9	14.7	15.4	15.4	0.20
CH_4/BW (g/kg)	0.70	0.67	0.66	0.67	0.48
CH_4/CO_2	0.038	0.037	0.037	0.034	0.15

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Discussion/conclusion

Corn silage vs Grass silage

- No effect on methane emissions (Livingstone et al., 2015)
- Several review publications indicate lower CH_4/FPCM (Doreau et al., 2012; Hristov et al., 2014; Knapp et al., 2014)

Practice

- Other concentrates needed for high producing dairy cattle
  e.g. Extra starch in concentrate for grass based diet

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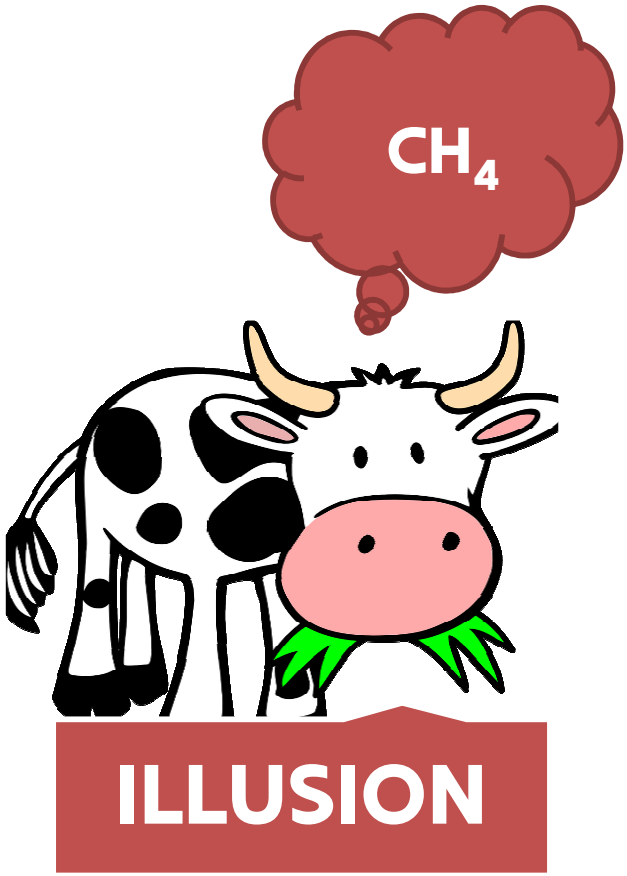
Reality or illusion?



- Shift from grass silage to maize silages is complicated by side-effects
- Impact on methane reduction depends on dry matter intake & milk production
- Results on methane reduction is incomplete to conclude on effect on climate change

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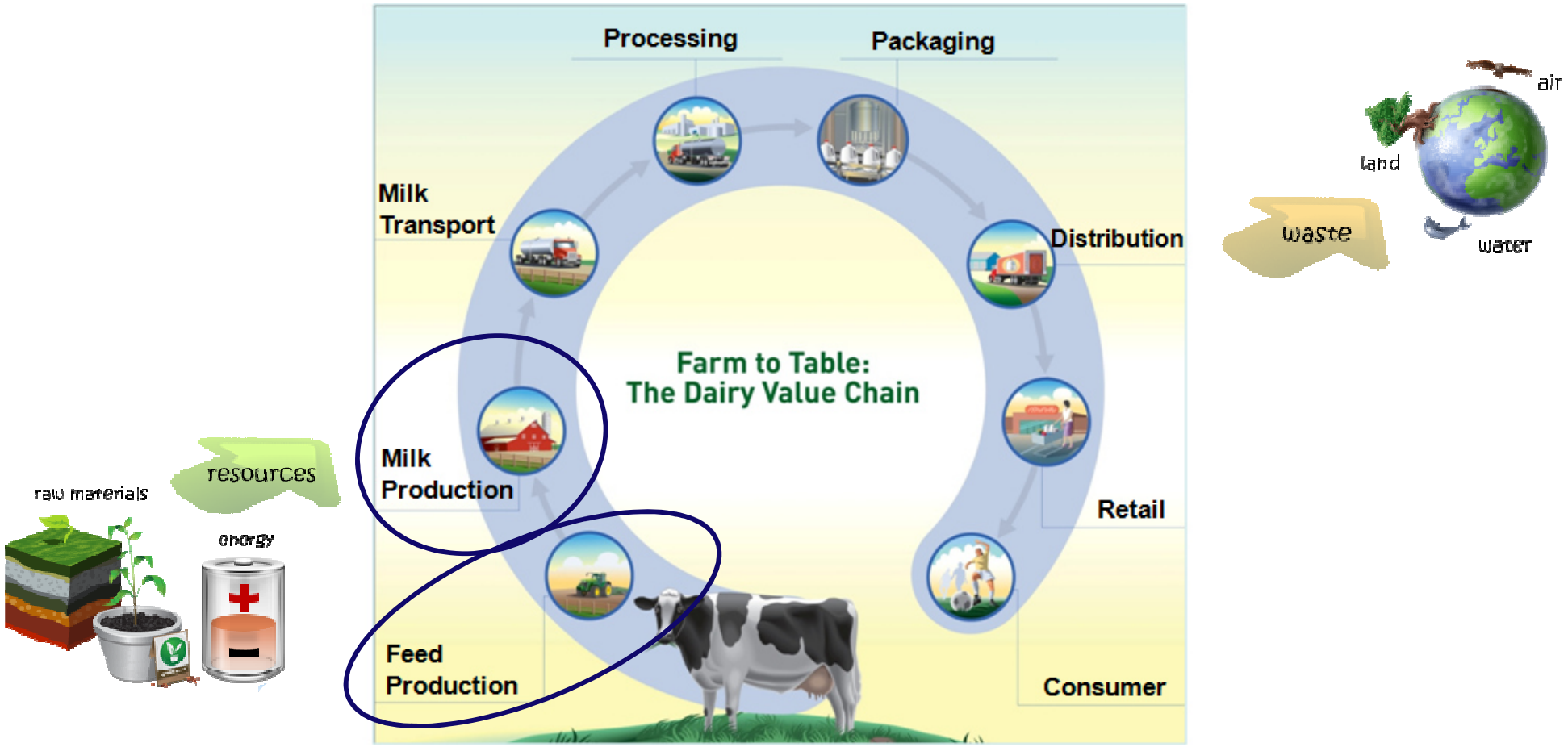
Life cycle assessment



FAO, 2006. Livestock's long shadow - environmental issues and options.

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Impact on Carbon Footprint of Roughages and Diet Components

- Fuel: production and combustion
- Mineral fertilizers: production and application
- Organic fertilizer: application
- Machinery: production
- Seeds: production
- Crop protection: production

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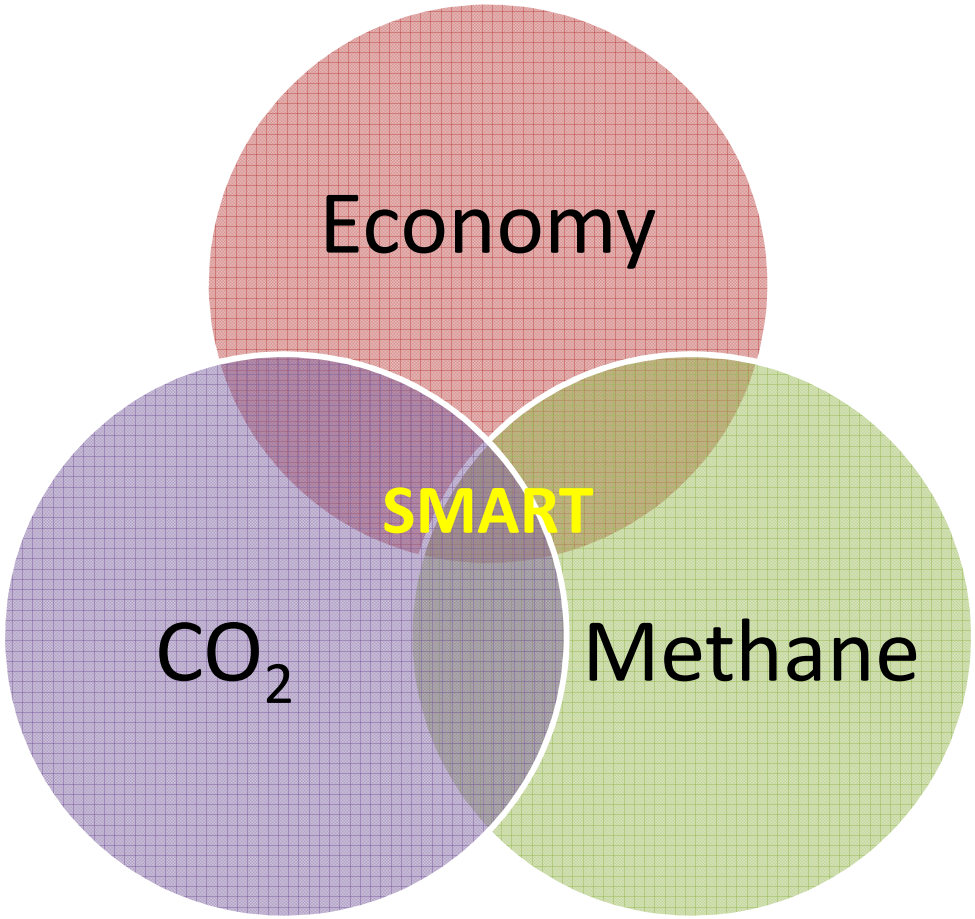
Future research in "SMART melken"



- By-products
- Life cycle assessment tested diets
- Efficiency analysis

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Questions?

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