Effect of different feeding strategies on methane emissions and production parameters of dairy cows

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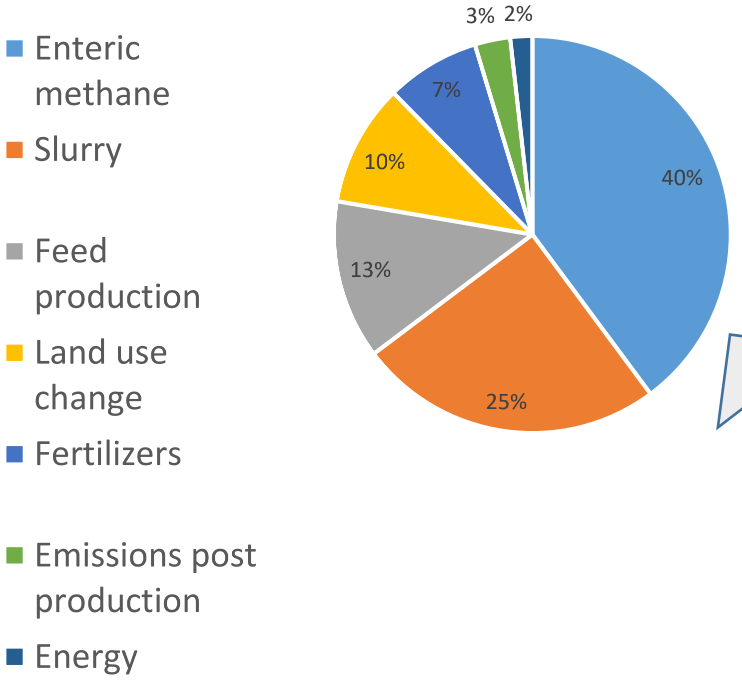
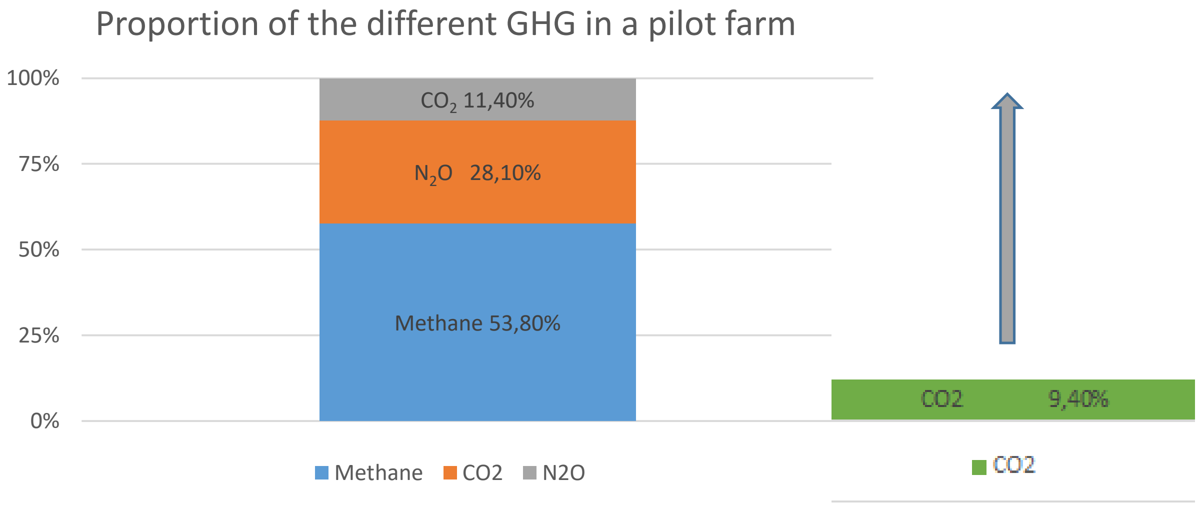
Effect of different feeding strategies

Context

Impact of the agricultural sector on anthropic GHG emissions: 14%

(Tubiello et al., 2014)





Feeding strategies

Mitigation due to carbon storage in PP

Material and methods

- Trials held in 2015-2016 and 2016-2017
- In 2015-2016: Concentrate rich in Starch vs Control

  Concentrate rich in Fat vs Control
- In 2016-2017: Extruded Linseed (ELS) vs Control

  Canola seed vs Control
- Objectives: decrease of methane emissions by 10%

Material and methods

Ration offered:

TMR based on forages

+ **concentrates**

of different composition

↓

Similar to what is offered

In dairy farms

	2015-2016		2016-2017	
% DMI	ST vs control	Fat vs control	ELS vs control	CS vs control
Grass silage	29	28	22	27
Maize silage	24	22	26	29
Ensiled beet pulp	9	8	11	14
Brewers	5	5	-	-
Cereal crop silage	-		11	-
Hay	5	4	-	-
Straw	2	2	-	-
Concentrate rich in protein	9	9	9	7
Concentrate	17	22	21	21
Total DMI	**19.5 kg**	**20.6 kg**	**24.6 kg**	**24.1 kg**

Material and methods

Nutritional composition of the diets during the trials:

g/kgDM	TMR + control	TMR + ST	TMR + control	TMR + Fat	TMR + control	TMR + ELS	TMR + control	TMR + CS
DM	430	430	437	437	360	360	360	360
CP	149	145	157	155	158	158	149	148
Starch	108	132	112	124	139	151	142	157
Fat	37	37	37	43	36	48	34	47
NDF	395	352	324	386	410	391	413	392

Material and methods

Experimental design

- Herd divided into 2 groups balanced : DIM – LN- MY
- On average 17 cows in early lactation in each group
- Methane emissions’ estimation on individual basis
- 2 methods:
- Predictions based on spectrum analysis of milk samples (FTIR) (Vanlierde et al., 2015)
- Breath samples analysis (Garnsworthy et al., 2012- Haque et al., 2014)

Material and methods

Predictions based on spectrum analysis of milk samples

milk samples collected 2(3) times during the trials => predictions – stat analysis

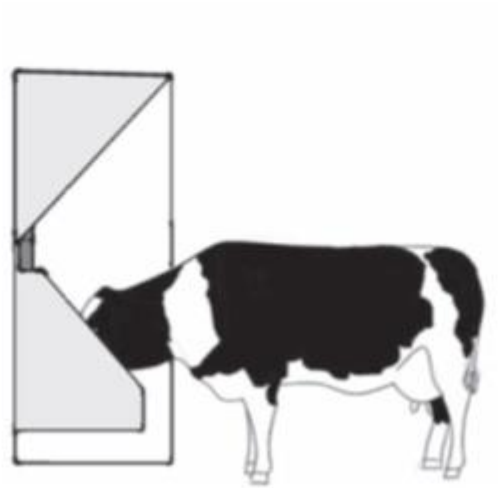
Breath samples analysis (sniffer method)

- At the Experimental Farm (Liège)
- At the CTA

Material and methods

Breath samples analysis (sniffer method)

- At the Experimental Farm (Liège): sampling inlet in the feeding bin of the AMS
- At the CTA: in the automatic concentrate supplier





Results

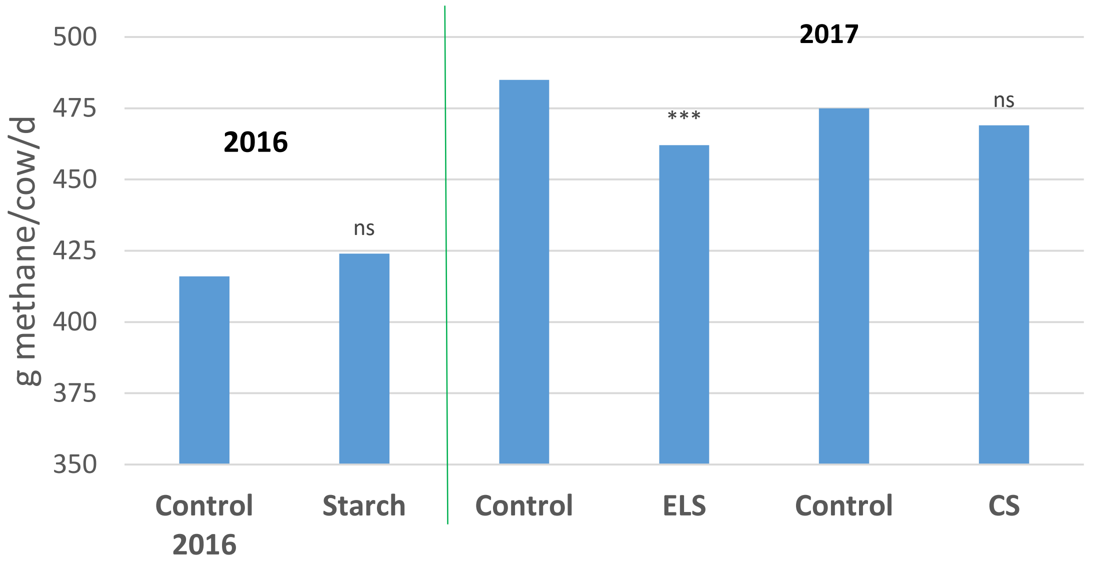
	Control	ST	Sig	Control	FAT	Sig
MY (kg.cow-1.d-1)	28.3 ± 1.5	24.8 ± 1.6	***	29.3 ± 1.2	30.4 ± 1.2	ns
ECM ($kg.cow^{-1}.d^{-1}$)	26.9 ± 1.4	23.7 ± 1.4	***	28.6 ± 1.2	29.4 ± 1.2	ns
CH4 ($g.cow^{-1}.d^{-1}$)	416 ± 10	424 ± 10	ns	465 ± 7	459 ± 7	ns
CH4 ($g.kg^{-1}$milk)	16.1 ± 1.1	19.3 ± 1.1	**	17.0 ± 0.8	16.4 ± 0.8	ns
CH4 ($g.kg^{-1}$ECM)	16.7 ± 1.0	19.9 ± 1.0	*	17.4 ± 0.8	16.9 ± 0.8	ns
Concentrate consumption ($kg.cow^{-1}.d^{-1}$)	3.4 ± 1.7	3.4 ± 1.7	ns	5.3 ± 1.7	5.1 ± 1.7	ns

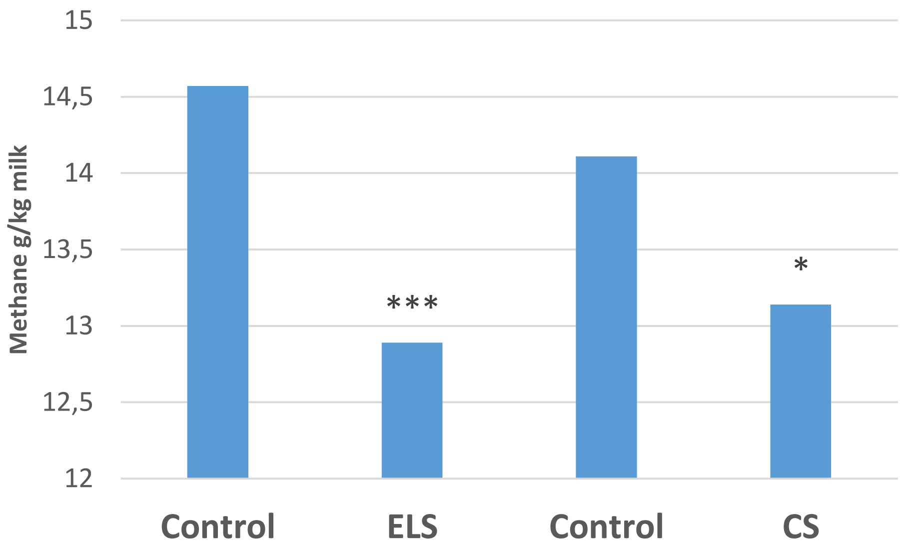
Results

	Control	ELS	sig	Control	CS	sig
MY ($kg.cow^{-1}.d^{-1}$)	34.4 ± 0.5	36.6 ± 0.5	***	34.8 ± 0.7	36.3 ± 0.7	trend
ECM (kg)	34.4 ± 0.5	35.3 ± 0.5	ns	34.7 ± 0.8	34.9 ± 0.8	ns
CH4 ($kg.cow^{-1}.d^{-1}$)	485 ± 4	462 ± 4	***	475 ± 7	469 ± 7	ns
CH4 milk ($g.kg^{-1}$milk)	14.6 ± 0.2	12.9 ± 0.2	***	14.1 ± 0.4	13.1 ± 0.4	*
CH4 ECM ($g.kg^{-1}$ECM)	14.4 ± 0.2	13.4 ± 0.2	***	14.3 ± 0.4	13.9 ± 0.4	ns
Concentrate consumption ($kg.cow^{-1}.d^{-1}$)	5.0 ± 0.2	4.6 ± 0.2	***	4.8 ± 0.2	4.8 ± 0.2	ns

Results

- Methane emissions





Results

- Animal production

	2015 -2016		2016-2017: 1st Trial		2016-2017: 2d Trial	
	Control	Rich in starch	Control	ELS	Control	CS
Milk yield (kg/cow/d)	28,3 ± 1,5^{a}	24,8 ± 1,6	34,4 ± 0,5	36,6 ± 0,5^{b}	34,8 ± 0,7	36,2 ± 0,7
Fat (%)	3,6 ± 0,1	3,7 ± 0,1	4,0 ± 0,1	3,8 ± 0,1^{b}	3,8 ± 0,1	3,8 ± 0,1
Protein (%)	3,4 ± 0,1	3,4 ± 0,1	3,4 ± 0,1	3,2 ± 0,0^{b}	3,4 ± 0,0	3,3 ± 0,1
ECM (kg/cow/d)	26,9 ± 1,4 ^{a}	23,7 ± 1,4	34,4 ± 0,5	35,3 ± 0,5	34,7 ± 0,8	34,9 ± 0,8

Conclusion

- It is possible to lower methane emissions by modifying the diet
- Fat supplementation induced a decrease in enteric methane emissions
- This decrease depended on the F supplementation in the ration
- ELS was more efficient than CS
- A substantial amount of concentrate needs to be provided (early lactation)


Thank you for your attention
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