Poznań University of Life Sciences
FACULTY OF VETERINARY MEDICINE AND ANIMAL SCIENCE
Department of Genetics and Animal Breeding

Validation of methane measurements in dairy cows obtained from two non-invasive infrared analyzers

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NATIONAL SCIENCE CENTRE POLAND
GRANT NO: OPUS 2013/09/B/NZ9/03179

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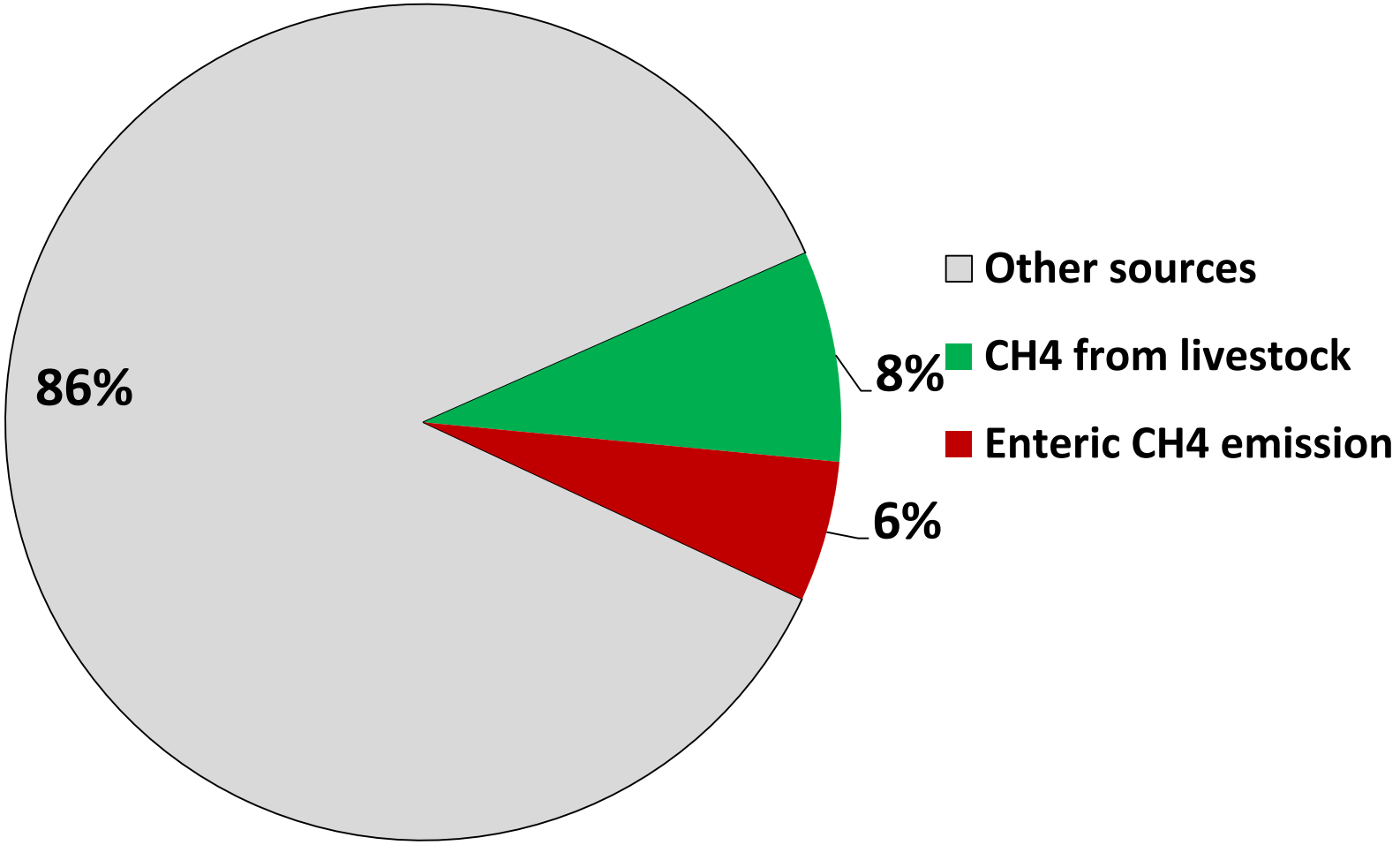
Ecology

CH_4 = Greenhouse gas

6% of the global temperature increase due to enteric CH_4



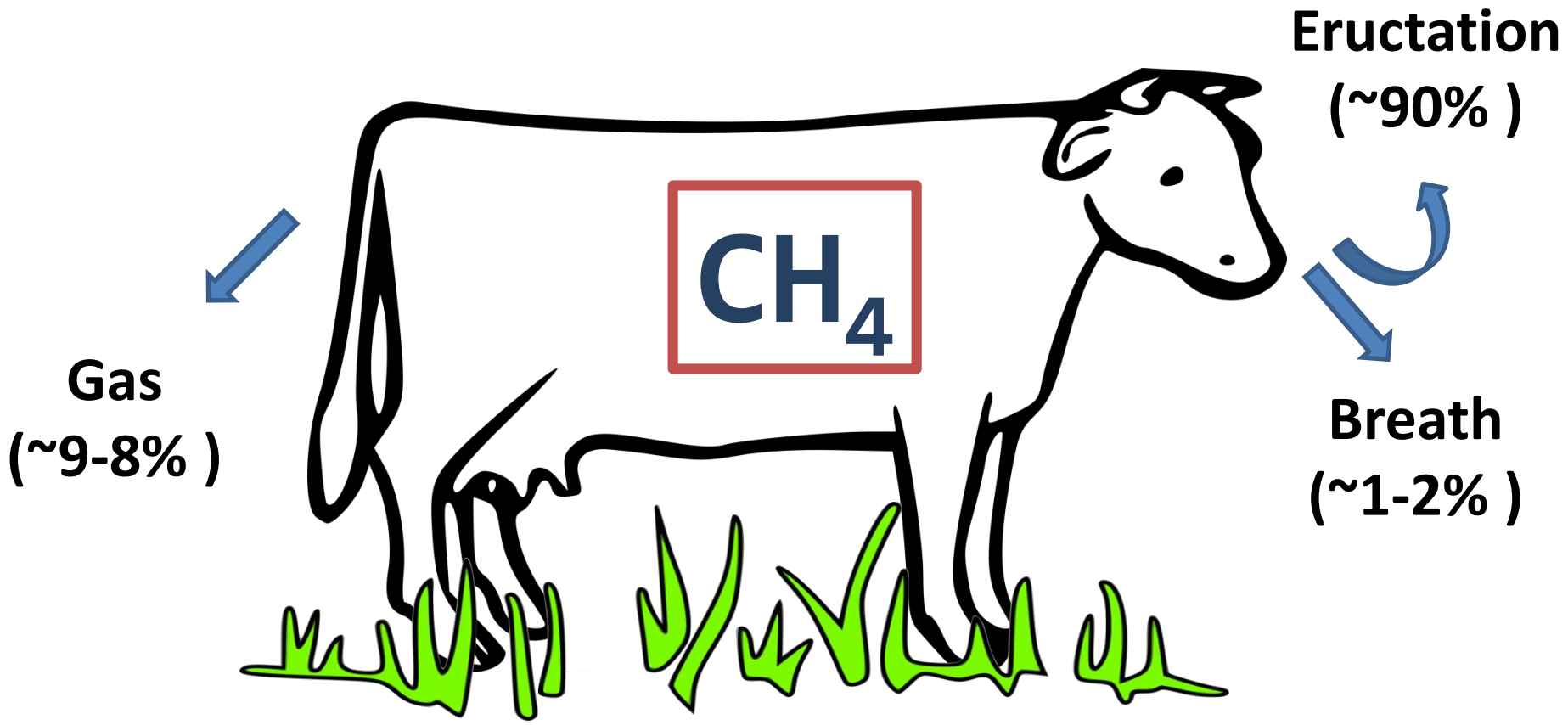
Reisinger and Clark, 2018
FAO


€CONOMY

CH_4 emission means 2% - 12% feed energy loses

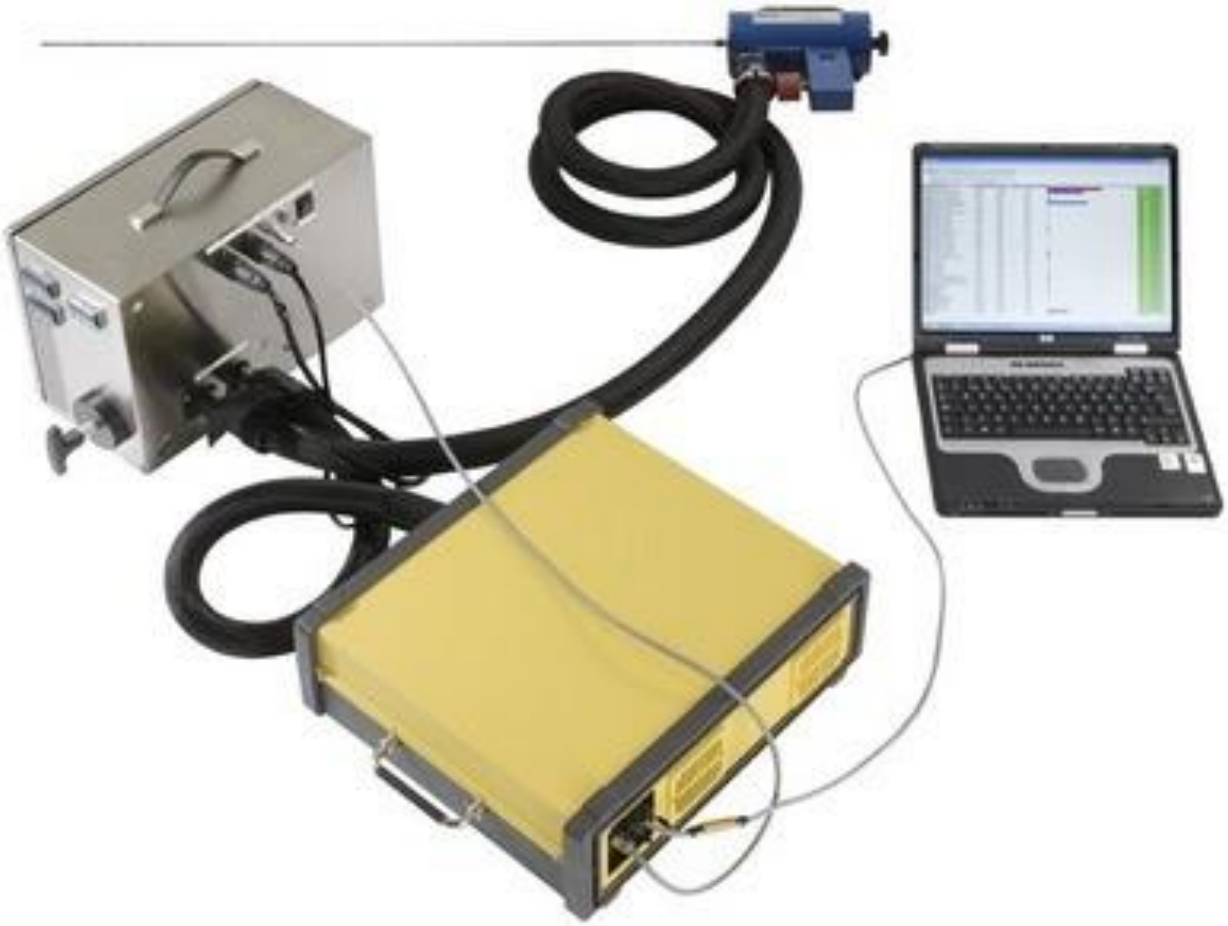
Blaxter, 1962; Johnson and Johnson, 1995

How to measure CH_4?


Eructation
(~90%)
CH_4
Gas
(~9-8%)
Breath
(~1-2%)

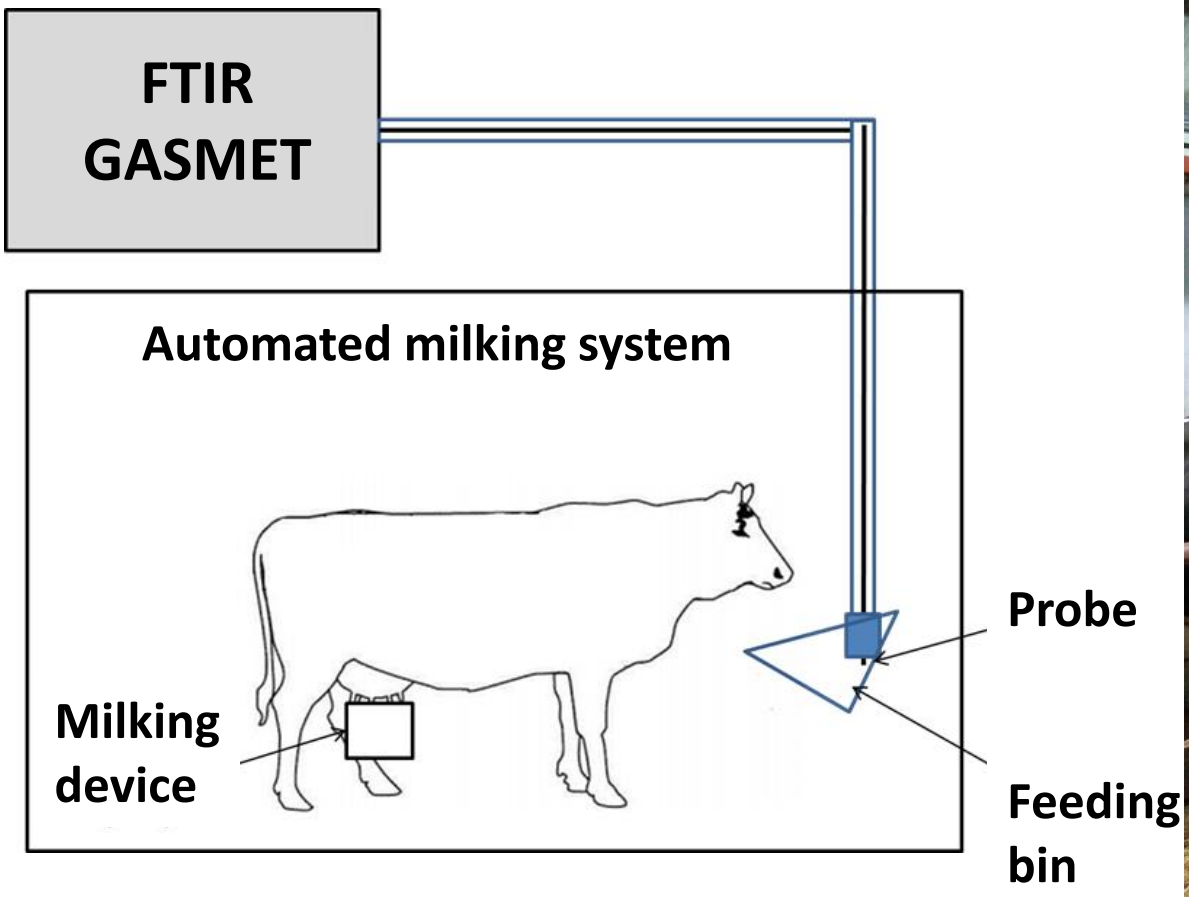
©Adam Cieslak

FTIR (Gasmet dx4000)



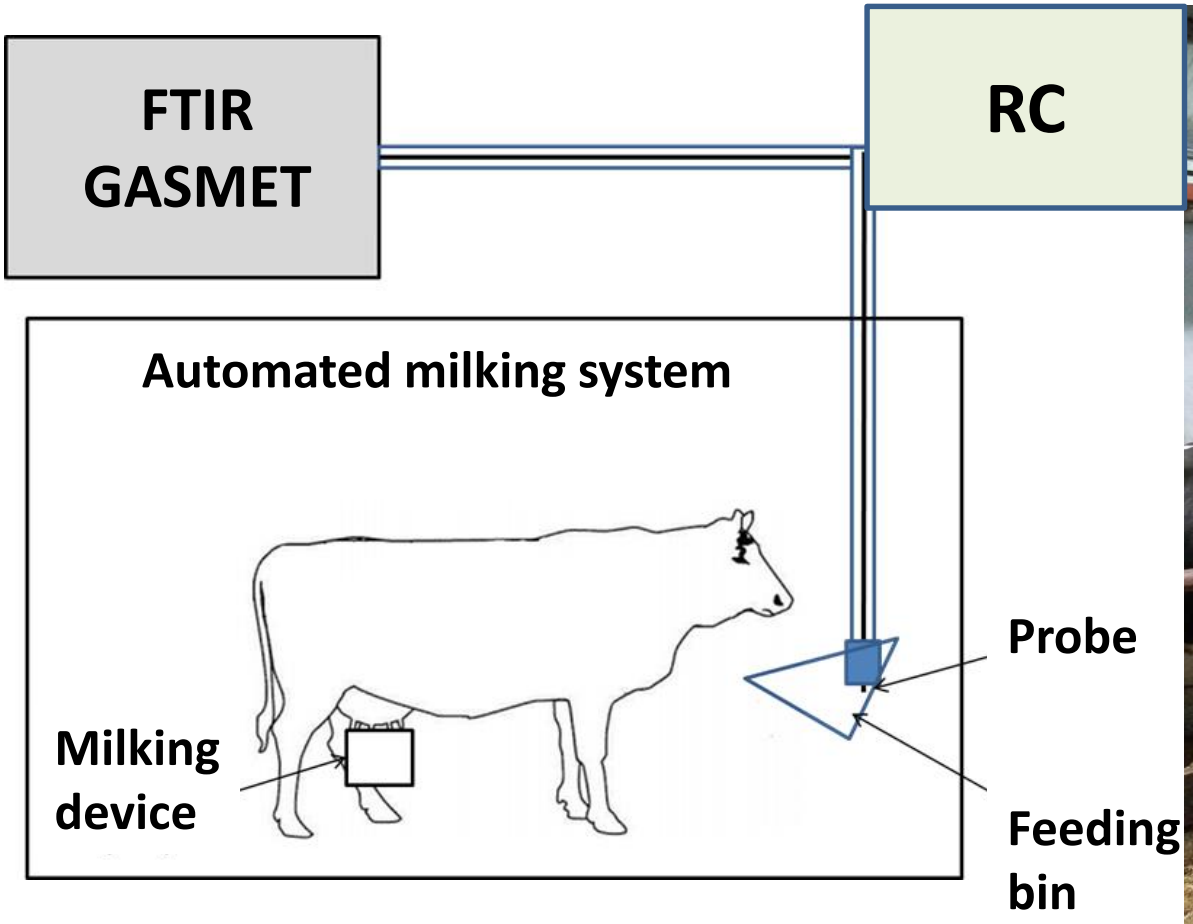
source:
etapii.com/dx4000.html

Sniffer method



Is FTIR sniffer comparable to RC?

Sniffer method vs RC



@marcinTHEbee

Marcin Pszczola @marcinTHEbee · 1 dzień

What's your opinion? FTIR sniffer or Respiration Chamber sensor better for measuring #methane? Want to know the answer? Come: Wednesday #eaap2018 17:30 session 45 @EAAPofficial @METHAGENE

Przetłumacz tweeta

20% FTIR is better

60% RC is better

20% None of the abobove

5 głosów • Wyniki końcowe

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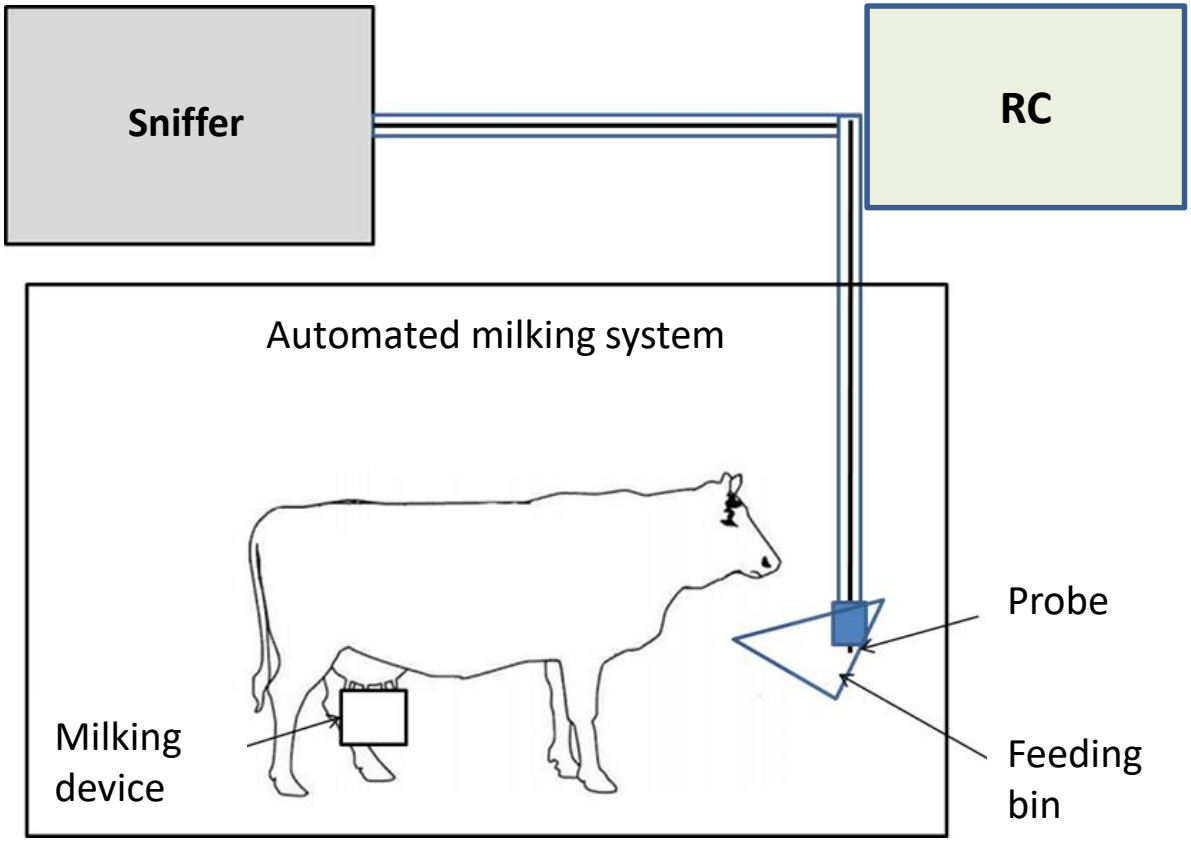
Collected CH_4 & CO_2 data



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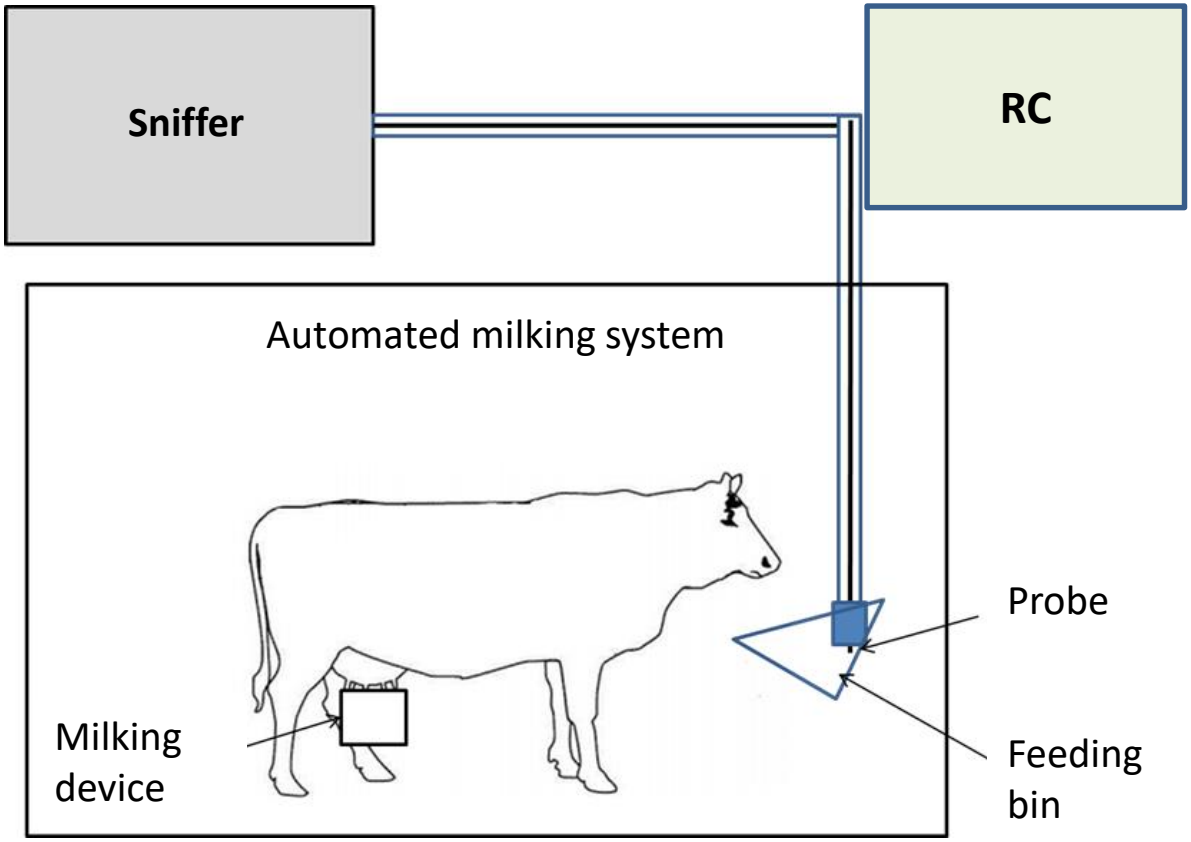

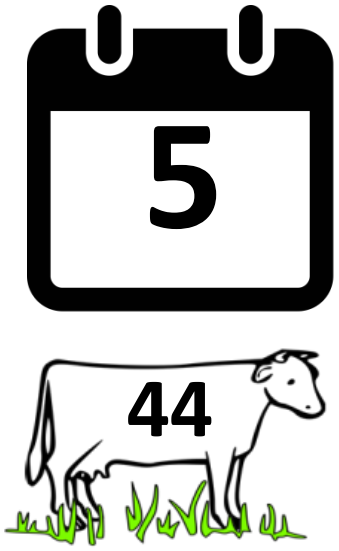

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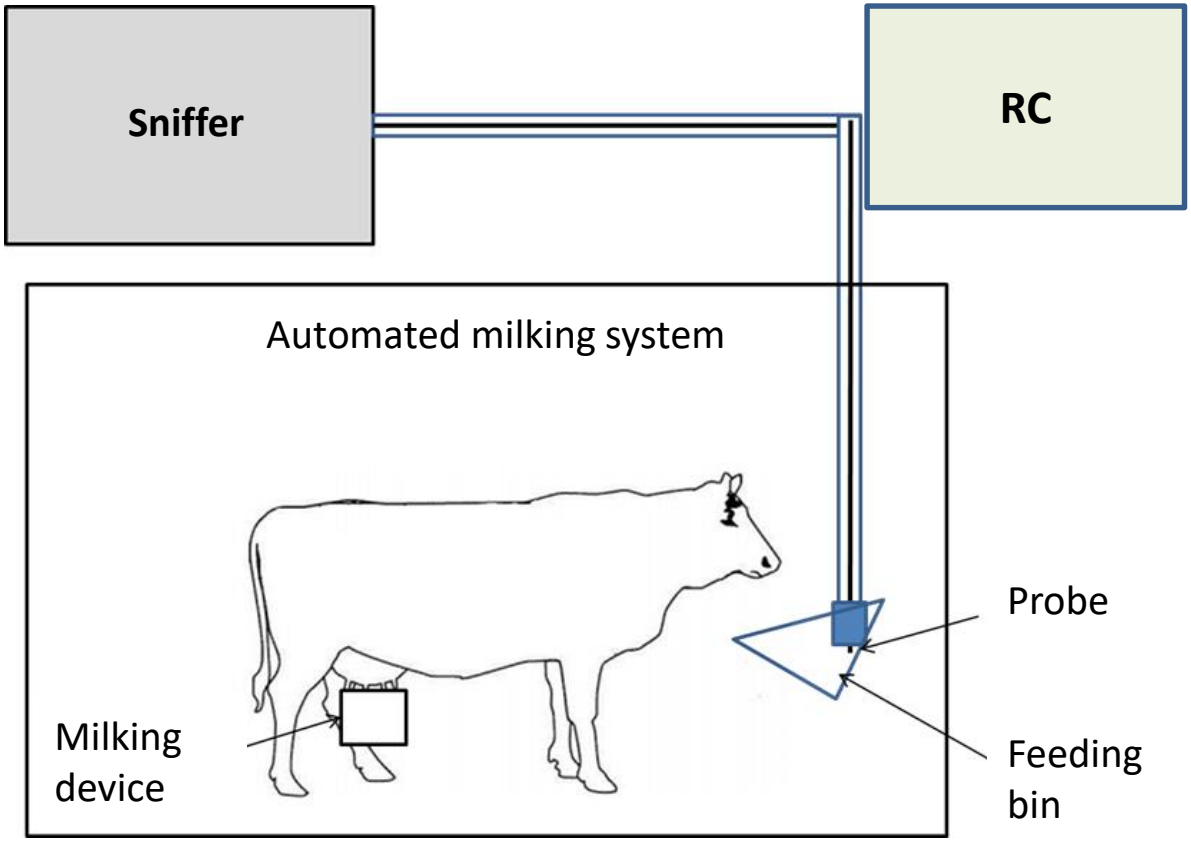
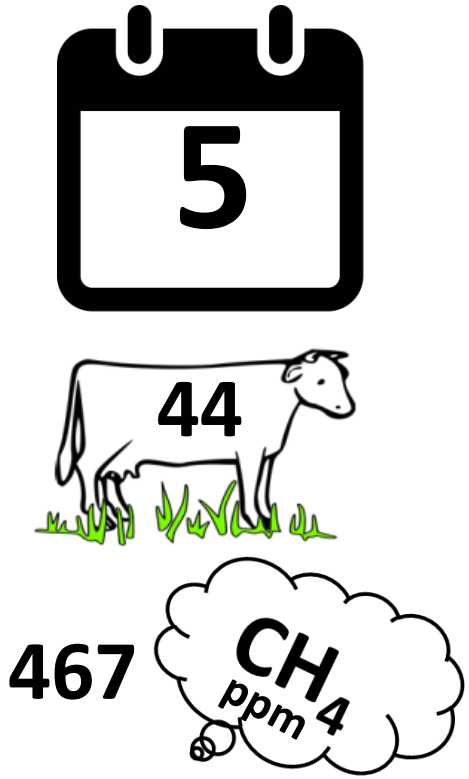
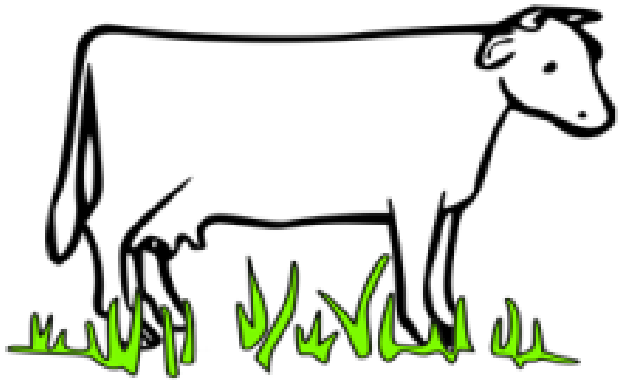
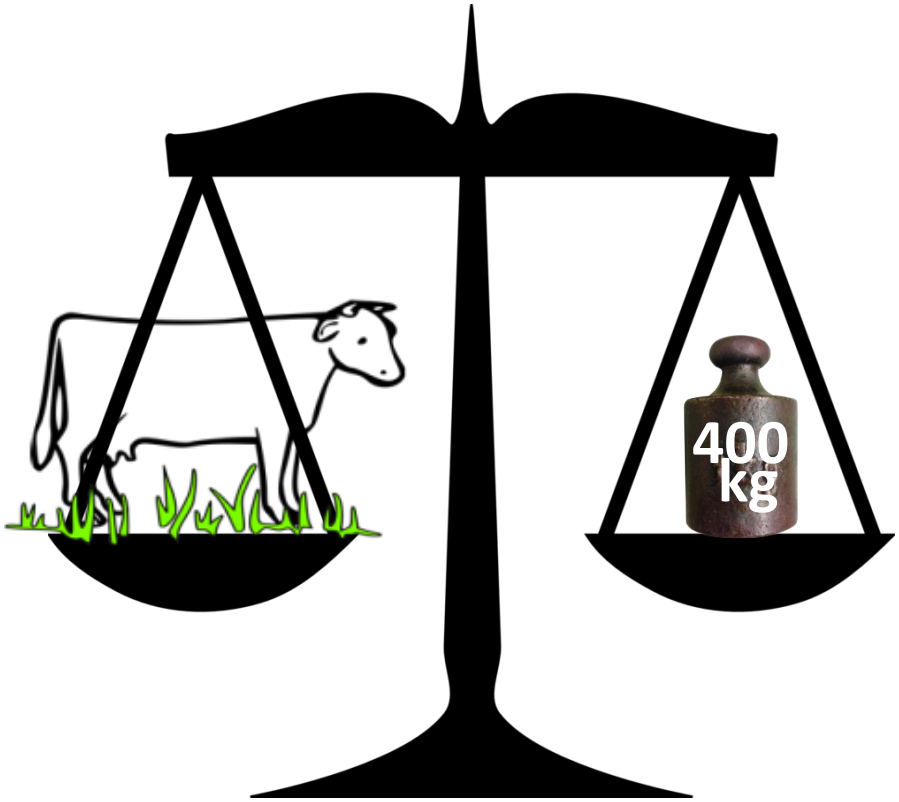
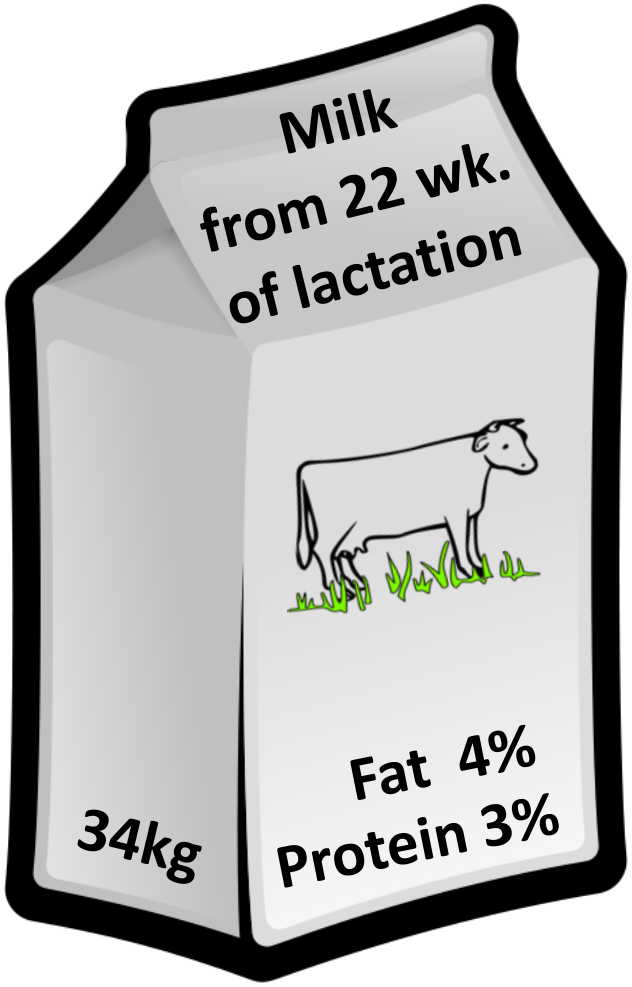


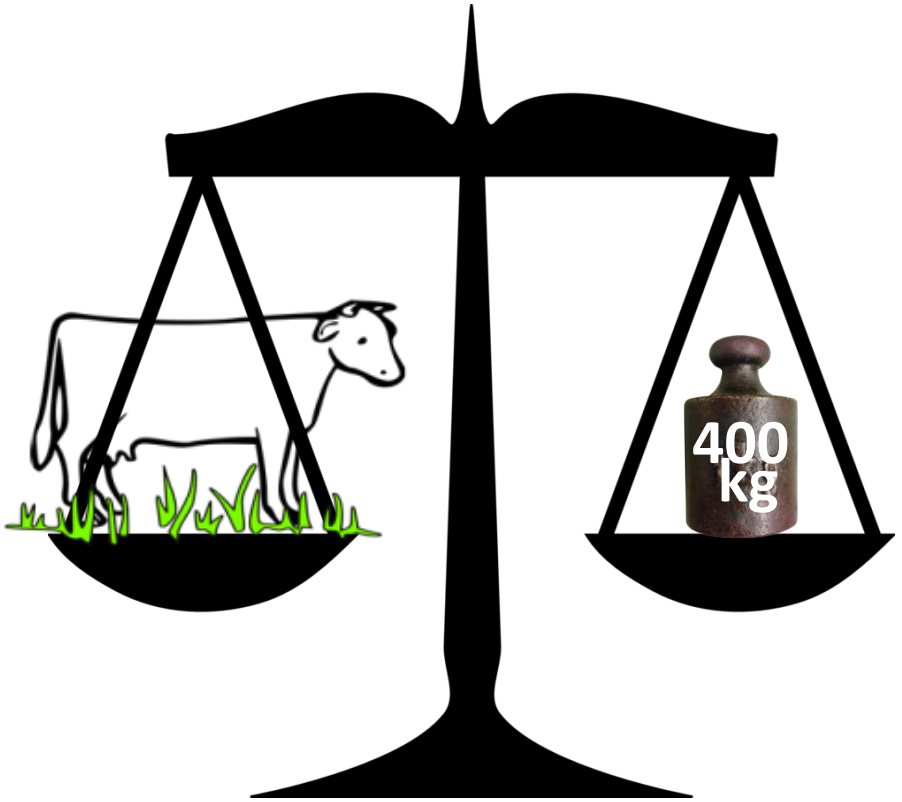


The average analyzed cow



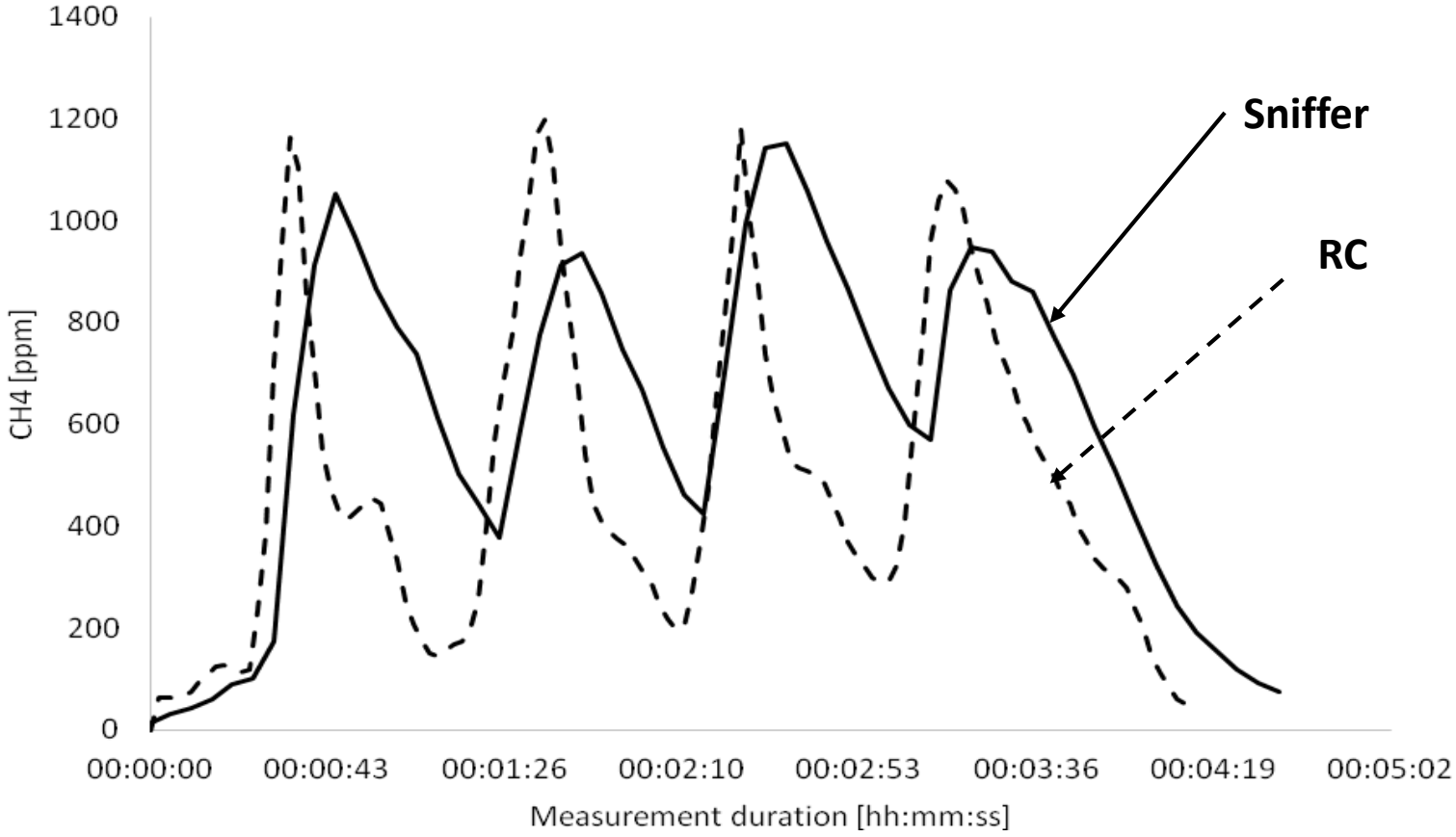

400
kg


Milk
from 22 wk.
of lactation
34kg
Fat 4%
Protein 3%

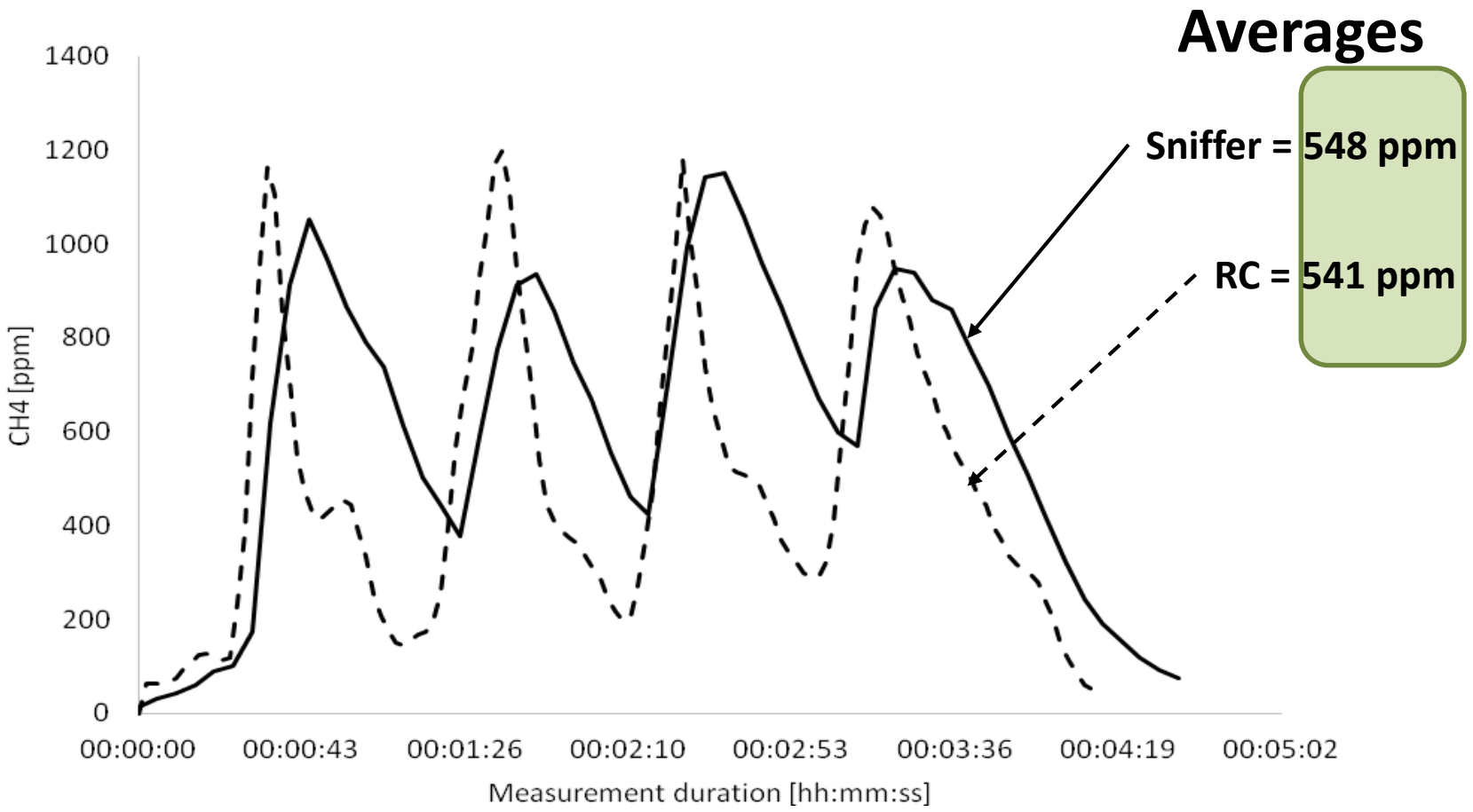

400
kg

Comparison of single milking

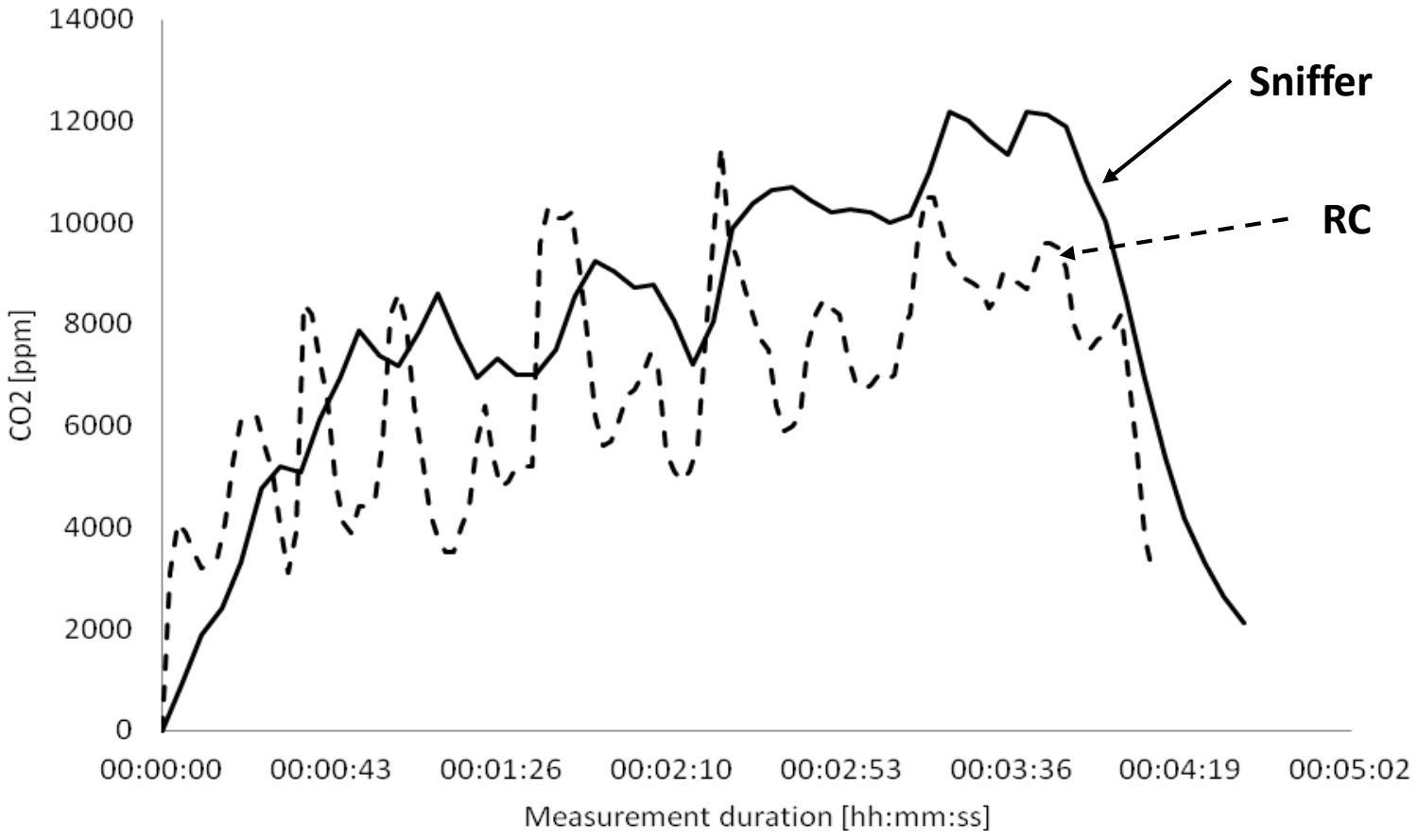
CH_4 single milking



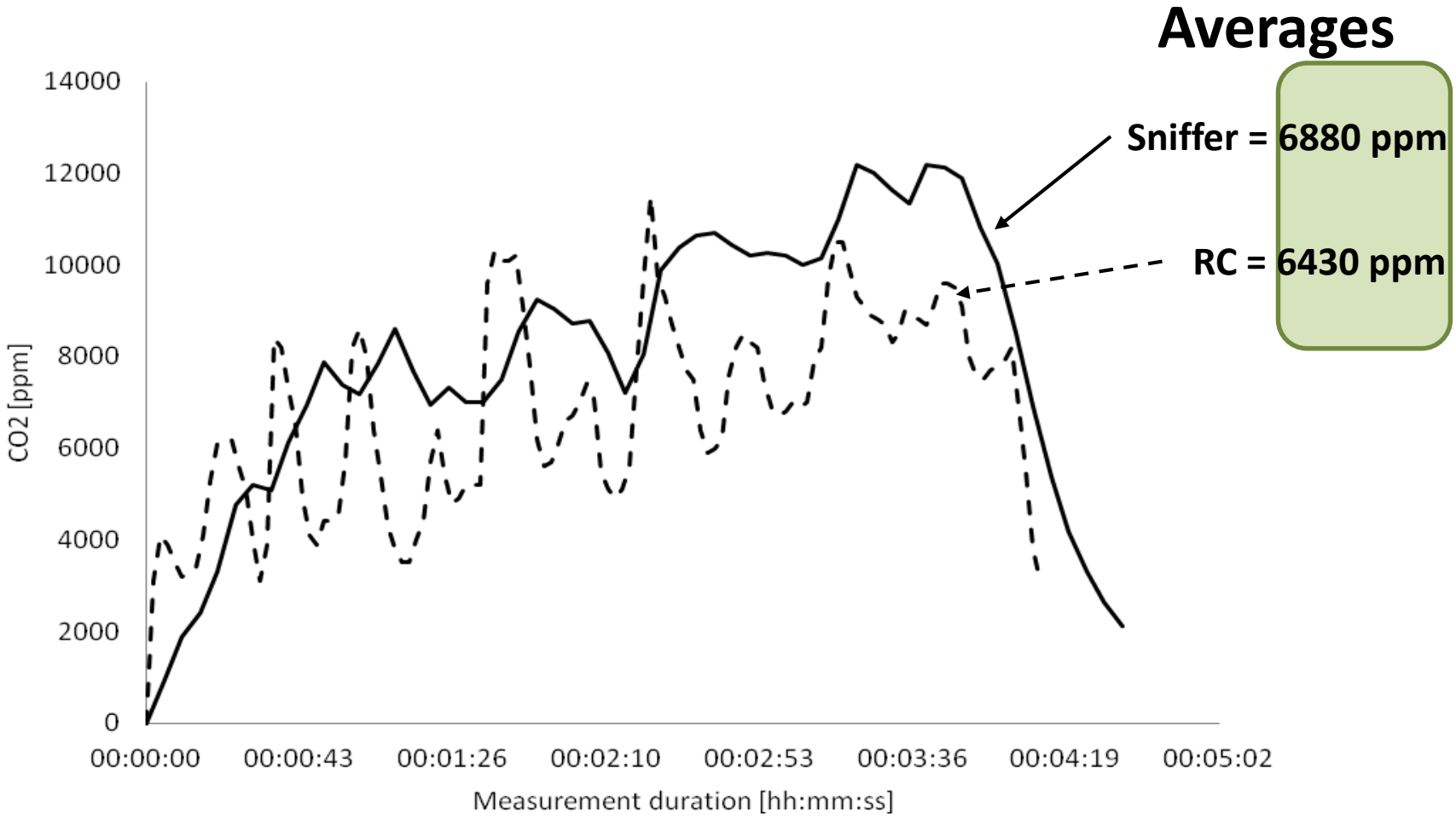
CH_4 single milking



CO_2 single milking

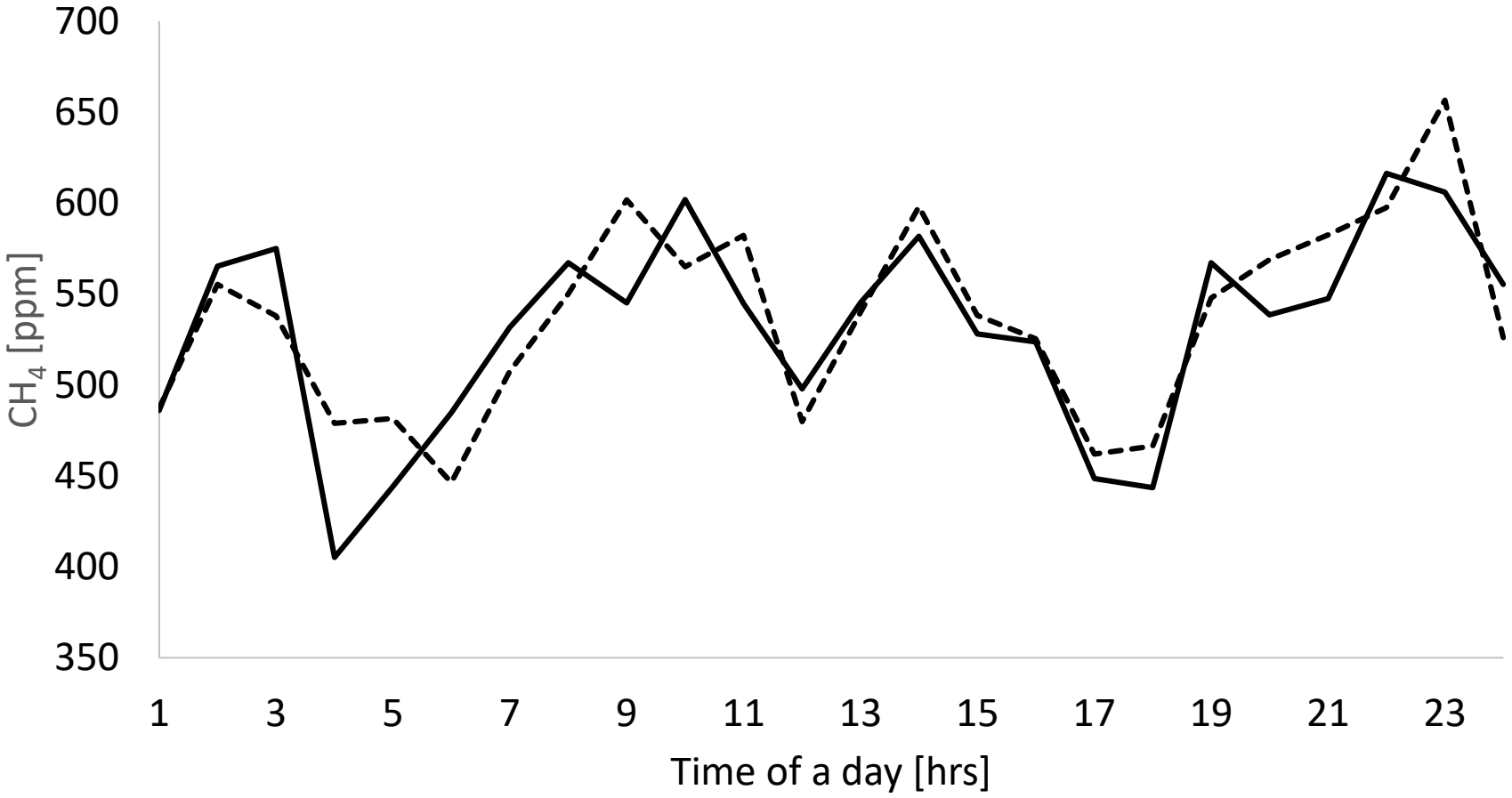


CO_2 single milking

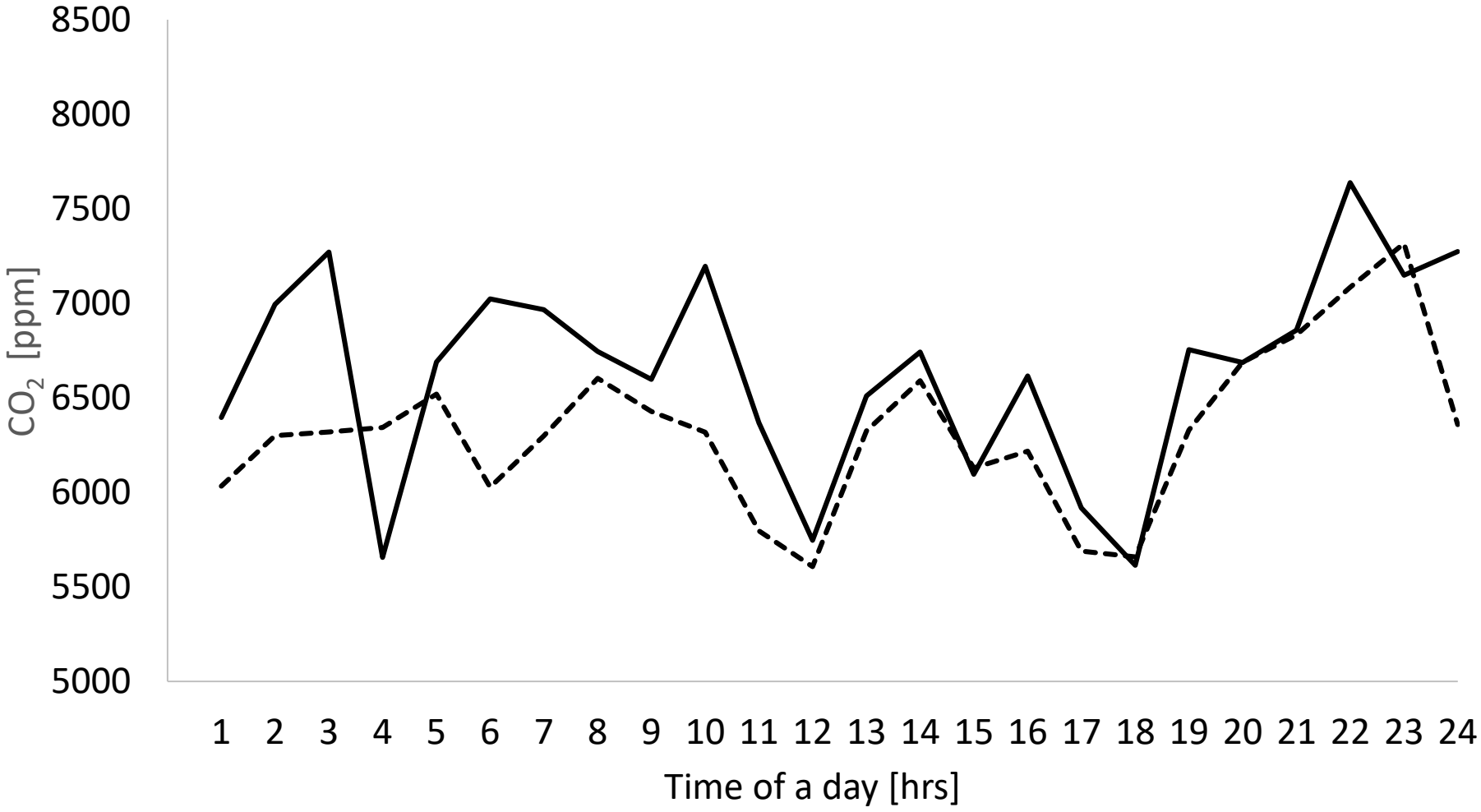


Comparison of hourly averages

CH_4 hourly averages of all cows

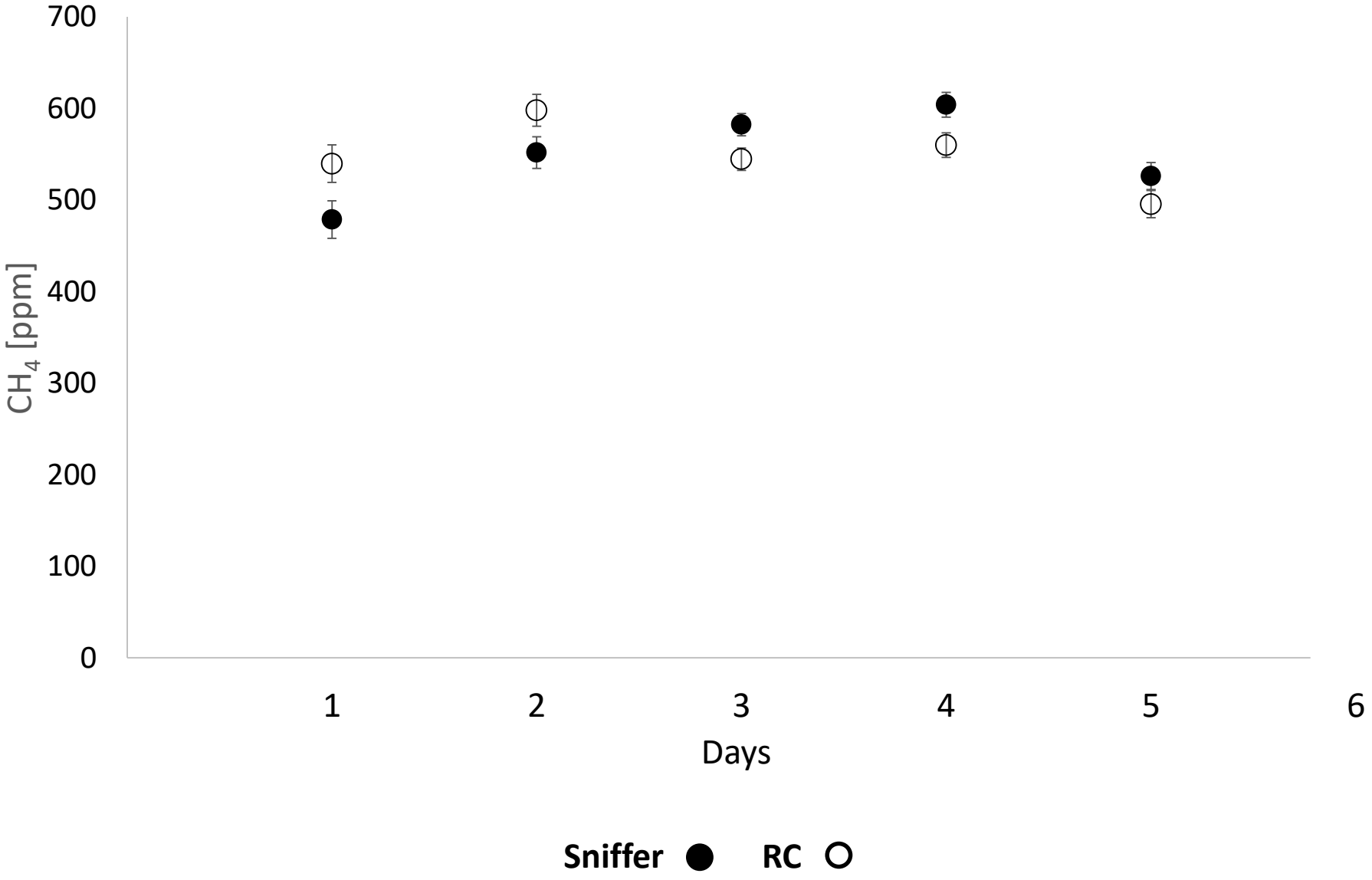


CO_2 hourly averages of all cows

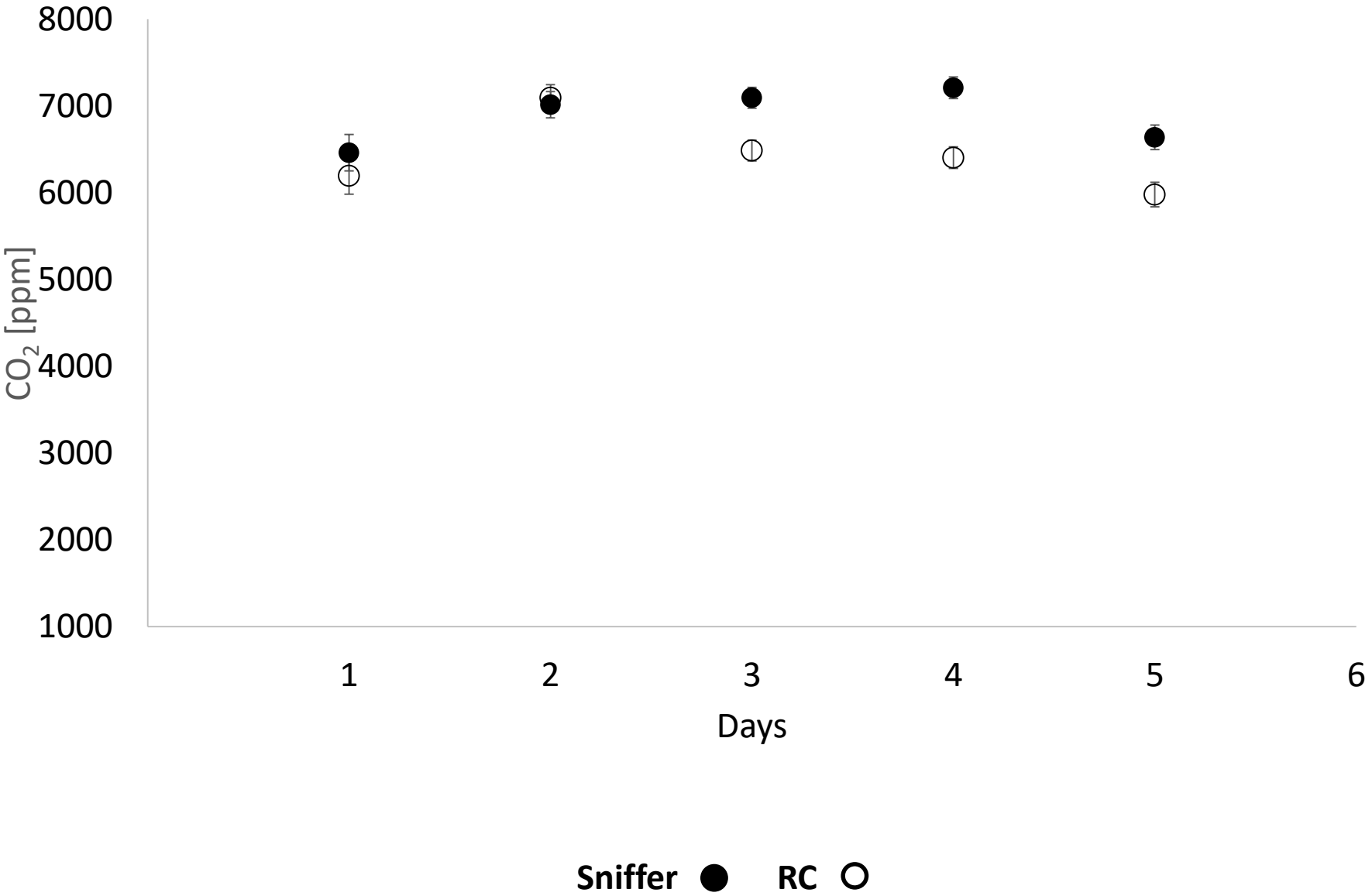


Comparison of daily averages

CH_4 daily averages of all cows



CO_2 daily averages of all cows



Compatibility check – bivariate analyses

Traits: Sniffer CH_4 and RC CH_4

or

Sniffer CO_2 and RC CO_2

Compatibility check – bivariate analyses

Traits: **Sniffer CH_4 and RC CH_4**

or

Sniffer CO_2 and RC CO_2

Fixed effects: **day + time**

Compatibility check – bivariate analyses

Traits: Sniffer CH_4 and RC CH_4

or

Sniffer CO_2 and RC CO_2

Fixed effects: day + time $\sum_{n=1}^{5}(f_{sjm}sin\emptyset + f_{cjm}cos\emptyset)$

Compatibility check – bivariate analyses

Traits: Sniffer CH_4 and RC CH_4

or

Sniffer CO_2 and RC CO_2

Fixed effects: day + time

Random effects: cow + error

Compatibility check – outcomes

	CH_4	CO_2
Repeatability correlation	0.98	0.97
Coefficient of individual agreement (CIA)	0.98	0.89

Conclusion:

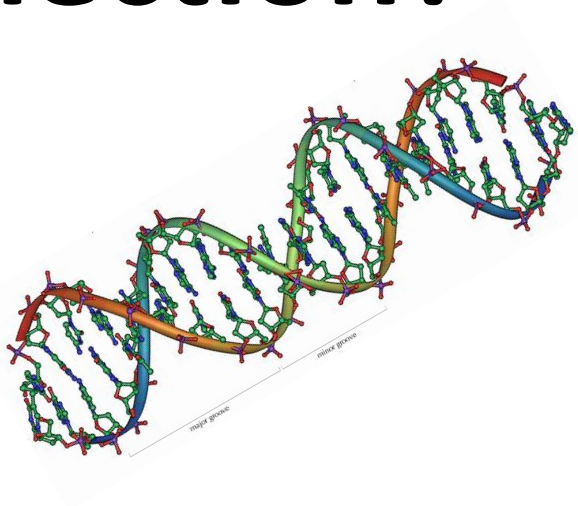
Sniffer (a non-invasive FTIR analyzer)

passed validation

using NDIR sensor from Respiration Chamber

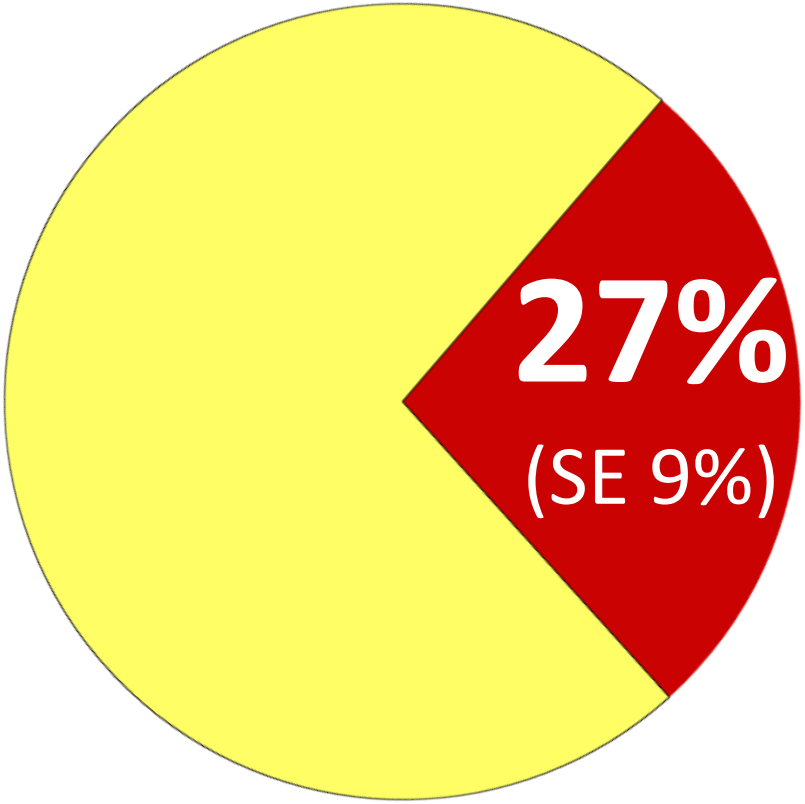
for measuring CH_4 and CO_2

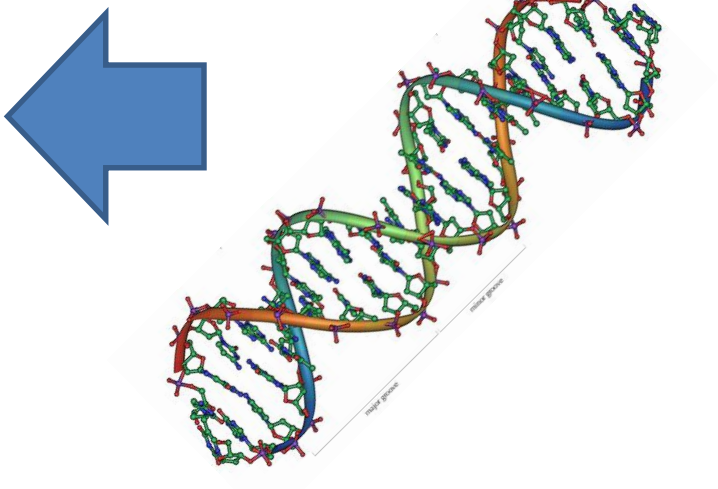
Is sniffer useful for genetic studies/selection?



Pszczola et al. JAS, 2017

Over ¼ of variation in CH_4 is genetics





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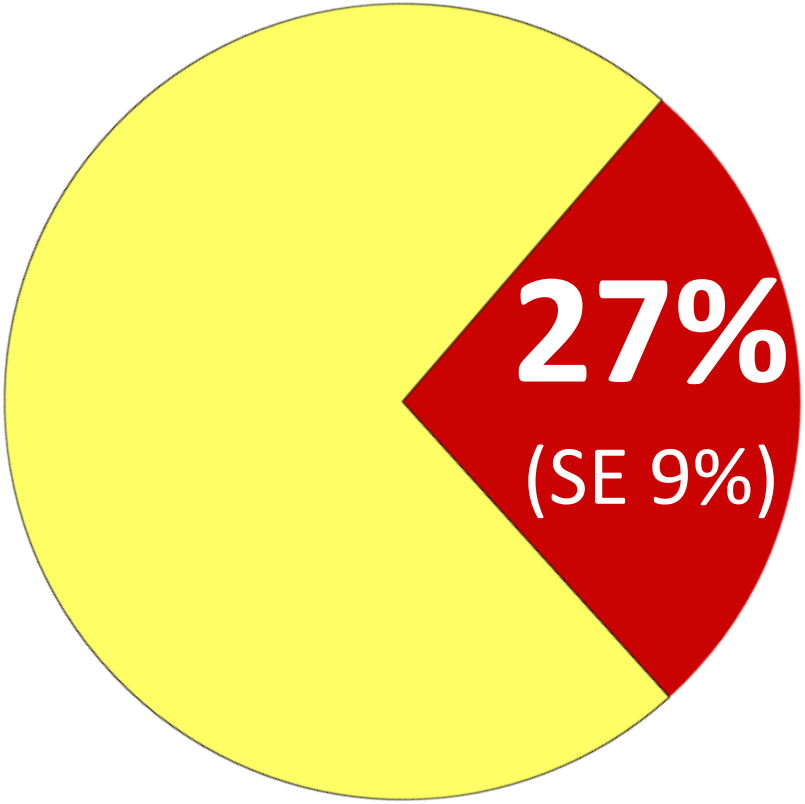
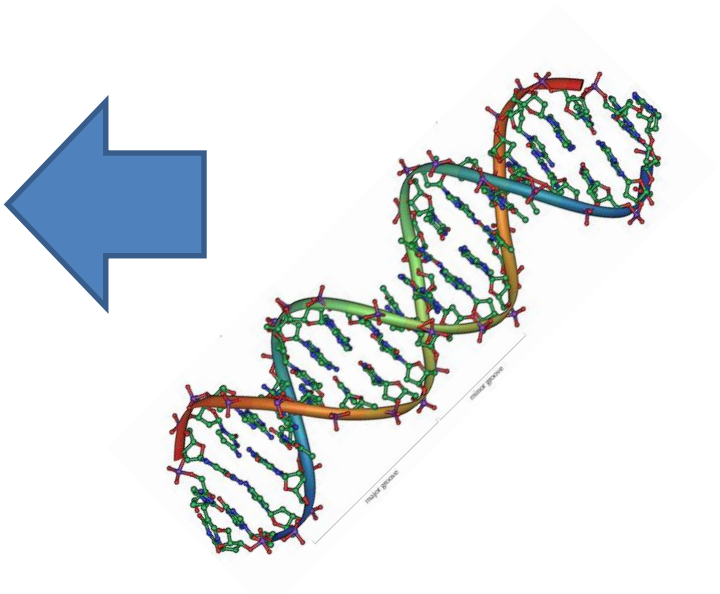
g/day





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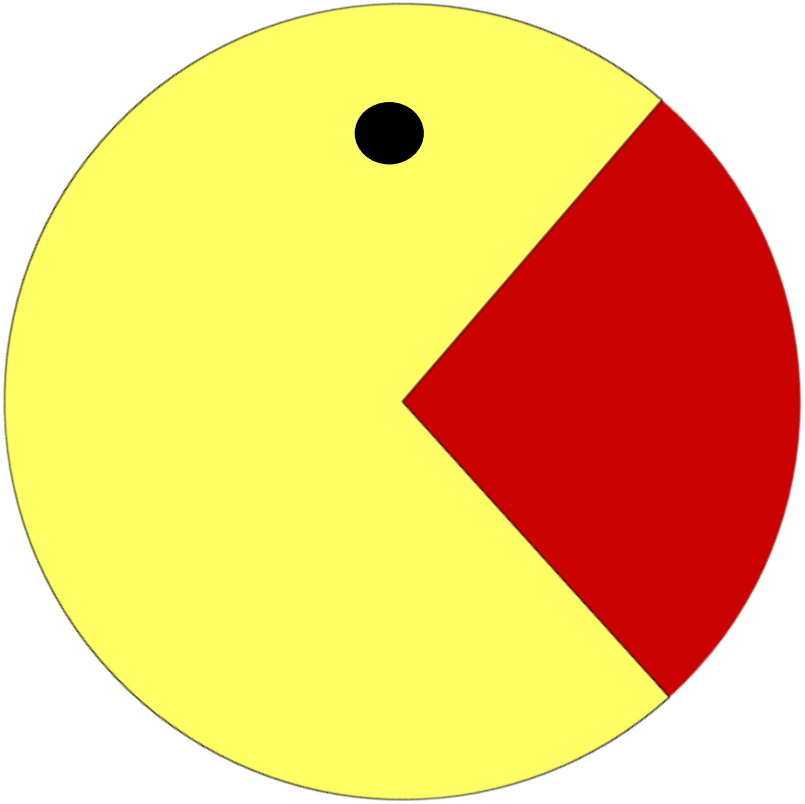

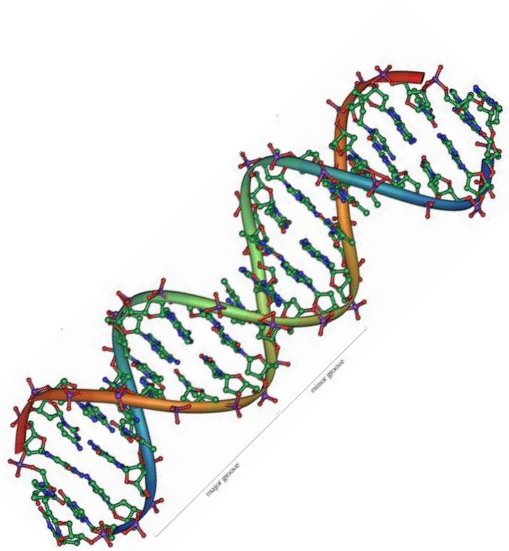

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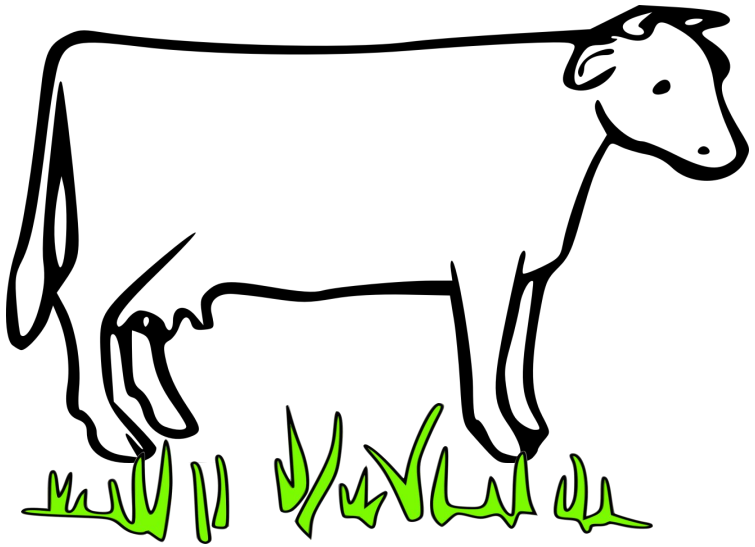

Sniffer validated against sensor from RC & is useful to reduce methane emission by breeding

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