Monitoring strategies to breed environment-friendly cows

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Why is breeding for environment-friendly cows gaining importance?

- Global food, forest or fuel discussions
- Global warming (Ruminant animals account for up to 20% of the world methane production)
  - EU25 dairy population producing approximately 3.2 million tonnes of methane (CH_4) per year

- Feed important variable cost at farm level

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How to deal with environmental phenotypes?

- Improving environmental traits has been an important area of research
  - Nutrition
  - Microbes
  - Natural variation   **New!**

- For breeding, we need many individual measurements

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Collecting phenotypes

Main question:

- Do we need to measure with high precision over a short time or better to accept lower precision at a single measurement time and measure repeatedly?

- This also determines the way to measure, and the corresponding costs!

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Aim of feasibility study

To investigate practical measuring systems, calculating the accuracy of daily methane emission predicted in these systems compared with respiration chamber data

Agentschap NL
Ministerie van Economische Zaken,
Landbouw en Innovatie

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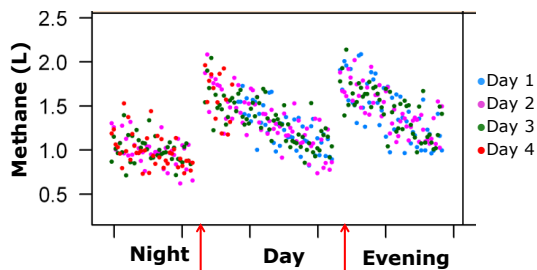WAGENINGEN UR

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Available data

Wageningen respiration chambers

- 10 trials:
  - each involved a pair of cows
  - data reported over a 72 hour period spanning 4 calendar days

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Methane production for 1 trial

Feeding and Milking

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3 scenarios

- Measuring
  - (1) during milking (i.e. twice daily, for 15 minutes);
  - (2) in concentrate feeder (i.e. 5x per day for 6 min.);
  - (3) in cubicles (i.e. 4 hours continuously).

- Scenarios were simulated by omitting samples

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Accuracies compared to resp. chambers

Scenario	CH$_4$	
During milking	0.85	
In concentrate feeder	0.89	
In cubicles	0.96	

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Accuracies compared to resp. chambers

Scenario	CH$_4$	CH$_4$/CO$_2$
During milking	0.85	0.31
In concentrate feeder	0.89	0.33
In cubicles	0.96	0.39

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Conclusion feasibility study

- Daily methane production can be predicted reasonably accurate by collecting samples of all cows during twice daily milking
  - Opens up the possibility of creating a large database of individual methane emission phenotypes

- However, be aware of effect of sampling strategy on prediction of daily methane production!
  - Effect of feeding
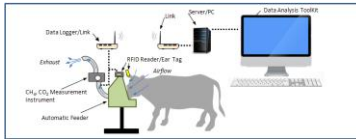 - Effect of background noise   — Further research required

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What equipments are available?

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Measuring methane

GreenFeeder

FTIR
(pictures by Jan Lassen)

Laser

Overall conclusions

- Measuring couple of times per day is pretty good start for building database
- International collaboration is needed to collect enough phenotypes
  - Aiming at starting a COST-application to facilitate discussions and learning from each other
- Keep optimising the practical measuring system
  - Challenge for technology industry to optimise sensors

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Thank you for your attention

Questions??

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