

# The road to genetic selection for methane emission from ruminants

## *A global approach*

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# Introduction

- Climate change – growing international concern
  - Reduction of greenhouse gases
- Mitigation strategies
  - Nutrition and feed additives
    - Well known
  - Genetics
    - New option



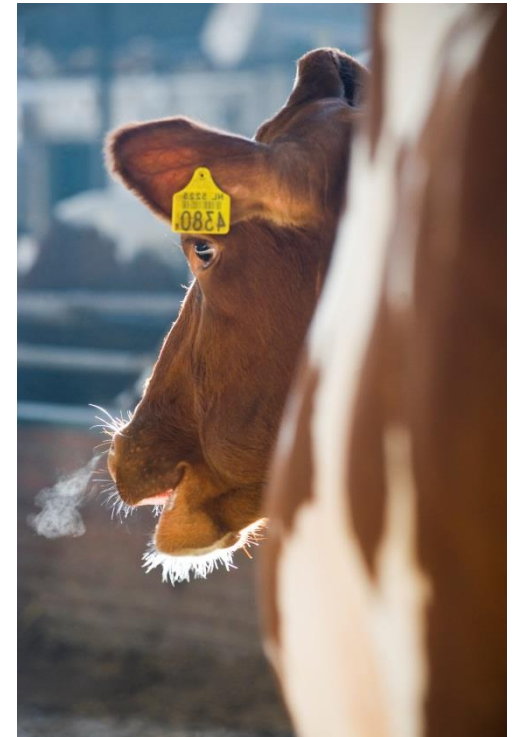
# Outline of today's presentation

## Enteric methane emissions

- Trait definition
- Measuring methods
- Proxies

## International collaboration

- Networks
- Database



**=> Be aware: more questions than answers 😊**

# Trait definition

- Methane production
  - Total methane production in grams/day
- Methane yield
  - Methane production per kg dry matter intake
- Methane intensity
  - Methane production per kg product (e.g., milk, meat, human edible protein)

**=> What is the best trait to breed for?**

# Ways to measure:



Respiration chamber  
Gold standard!

Animal Breeding &  
Genomics Centre





# Ways to measure:



Head hoods



# Ways to measure:

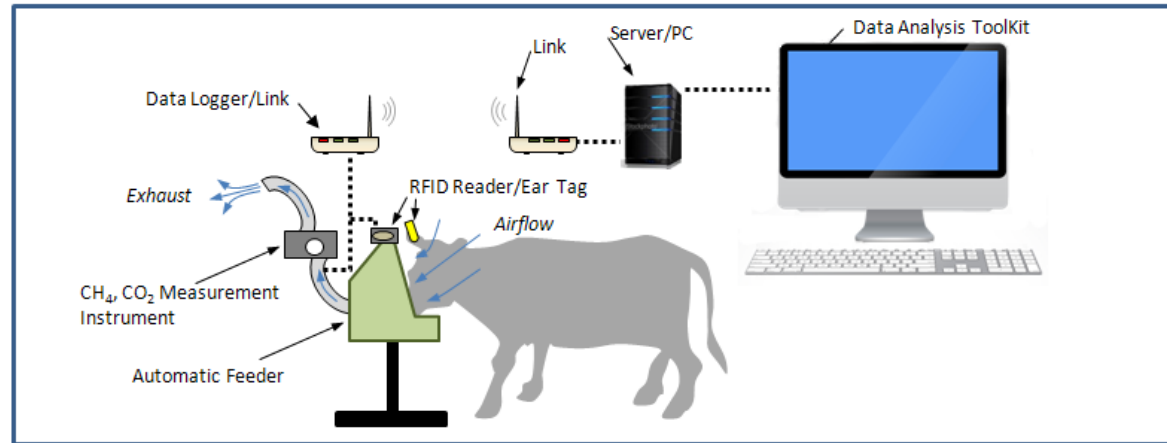


SF6

# Ways to measure:



Laser



GreenFeeder



Butter boxes



# Ways to measure:



FTIR  
(pictures by Jan Lassen)



# Ways to measure:

- |                                |                                 |
|--------------------------------|---------------------------------|
| ■ Respiration chamber          | Full day, continuous            |
| ■ Head hoods                   | Full day, only mouth no hindgut |
| ■ SF6                          | Full day, large variation       |
| ■ Butter boxes/PAC (sheep)     | Several moments per day         |
| ■ GreenFeeder                  | While eating concentrates       |
| ■ Laser                        | Short measurements              |
| ■ FTIR – milking robot         | During milking                  |
| ■ FTIR – concentrate dispenser | During eating                   |

⇒ **What is the phenotype we would like to measure?**

⇒ **How can methods be compared amongst each other?**

# Proxies

- Potential use of milk mid-infrared spectra to predict individual methane emissions from dairy cows
  - Study Dehareng et al. (2012)

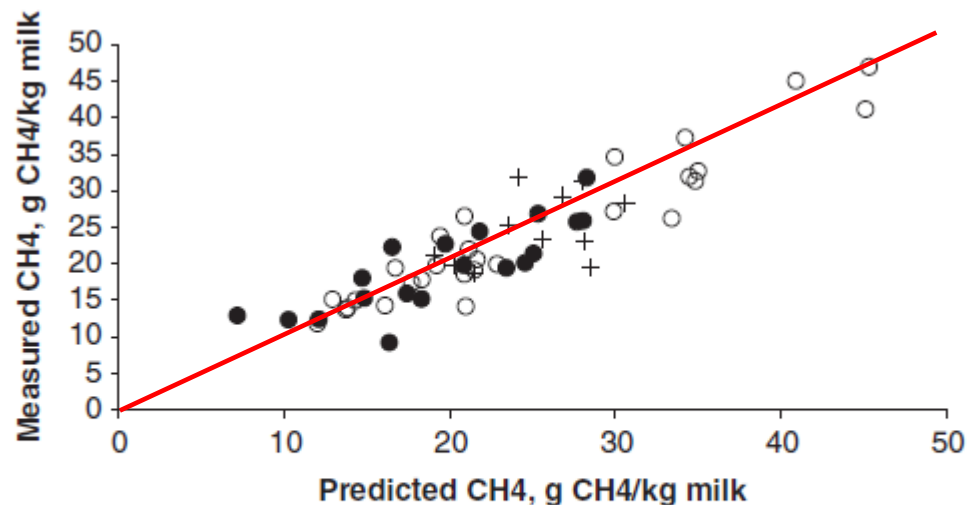
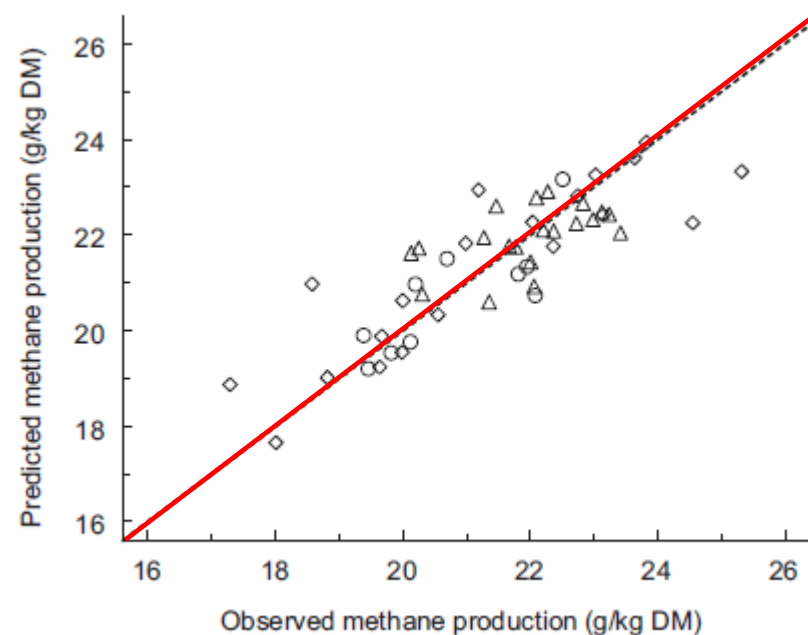


Figure 3 Infrared methane prediction on the basis of milk spectra of the day 1.5 for the different diets: corn silage (●), fresh pasture (○) and grass silage (+). PCA = principal component analysis.

# Proxies

- Relationships between methane production and milk fatty acid profiles in dairy cattle
  - Study Dijkstra et al. (2011)



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**ASGGN** The animal selection, genetics and genomics network.



[www.asggn.org](http://www.asggn.org)

**METHAGENE**



Methane Phentoype Working Group

[www.methagene.eu](http://www.methagene.eu)



FACCEJPI

Agriculture Food Security and Climate Change



[www.faccejpi.com](http://www.faccejpi.com)

## Basic Data

Title

**GLOBAL NETWORK FOR THE DEVELOPMENT AND MAINTENANCE OF NUTRITION-RELATED STRATEGIES FOR MITIGATION OF METHANE AND NITROUS OXIDE EMISSIONS FROM RUMINANT**



The ability to debate and reach agreement on a variety of topics including:

- common protocols for measurement of CH<sub>4</sub> emissions
- co-measurement of appropriate correlated and productive traits
- formalised protocols for collection and storage of rumen samples from all animals measured
- criteria for data sharing and analysis (including meta analysis) among all contributing parties

# Aims METHAGENE



METHAGENE

Establish a network of European researchers that enables large-scale methane measurements on individual ruminants for genetic evaluations

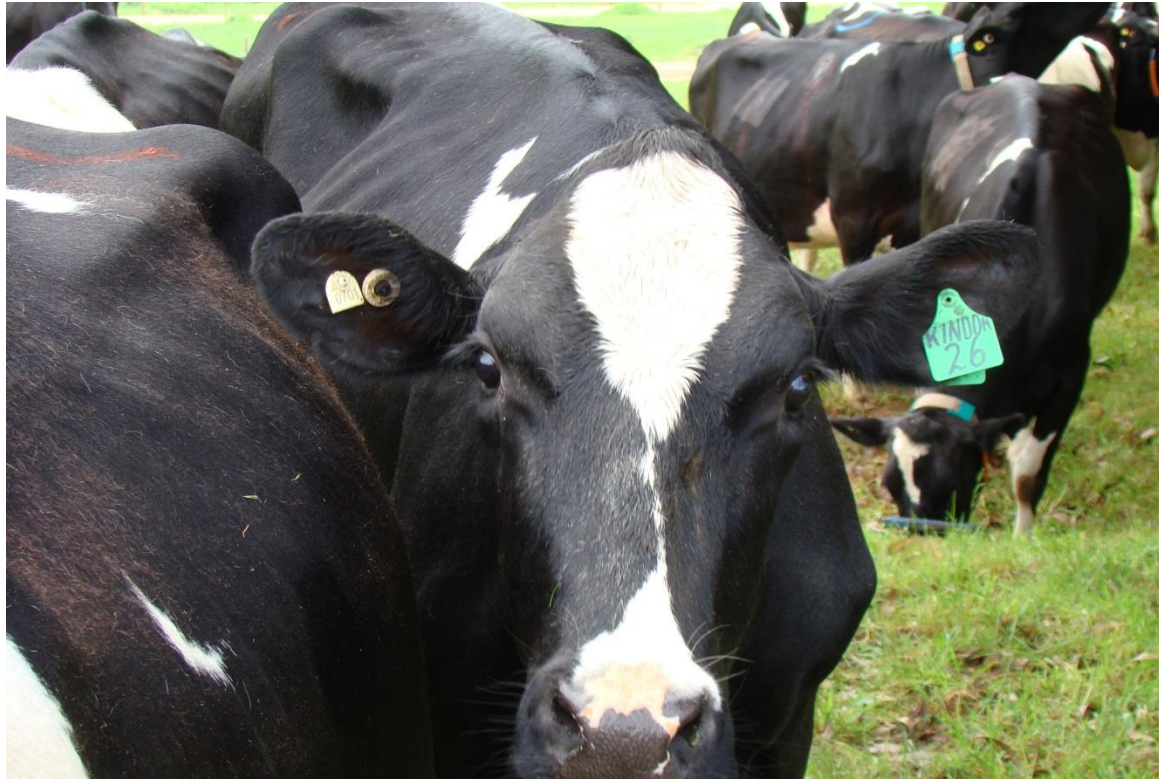
- 1) Define best trait for methane emission;
- 2) Harmonise protocols for large-scale methane measurements using different techniques;
- 3) Identify proxies for methane emissions to be used for genetic evaluations; and
- 4) Quantify benefits for producers when incorporating methane emissions into national breeding strategies.



# Conclusions

- Relatively new area
  - Still more questions than answers 😊
  
- Lots of activities going on
  - Synergies between research groups worldwide
  - Interest from different disciplines and angles
  - Willingness to combine data and indicate presence in an international database
  
- ICAR Working Group on Greenhouse Gas Emissions being established

*Thank you for your attention*



**Questions??**



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