



Feed efficiency and methane emissions in dairy cattle: Overview of the current recording

Adrien Butty¹, A. Wilson¹, C. Richardson¹,
F. Miglior^{1,2}, C. Baes¹

¹CGIL - University of Guelph; ²Canadian Dairy Network, Guelph, Ontario, Canada

Feed efficiency (FE) & Methane Emissions (ME)

- Continuous growth in demand for high quality milk protein (+238% in Asia in last 30 years)
- Increasing awareness of environmental impact from dairying
- Rising dairy farm input costs where feed represents more than 50% of operation costs

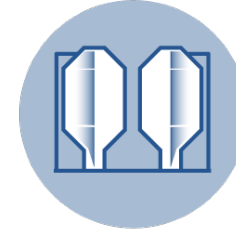
LARGEST EMITTERS IN AGRICULTURE



40%
Enteric
fermentation

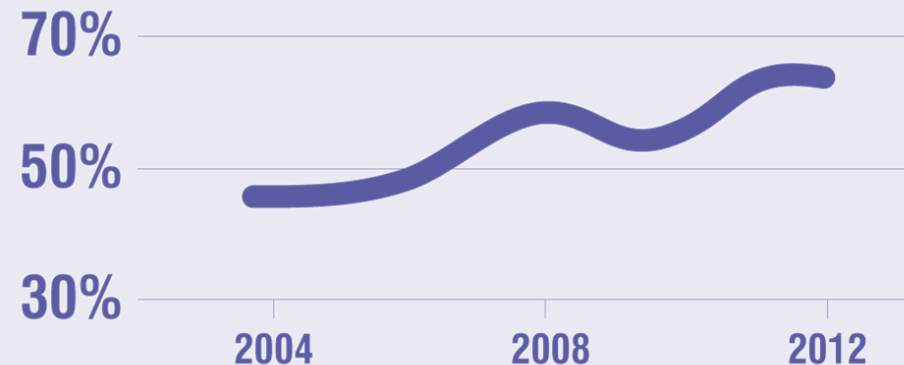


16%
Manure left
on pasture



7%
Manure
management

% FEED COSTS OVER TOTAL

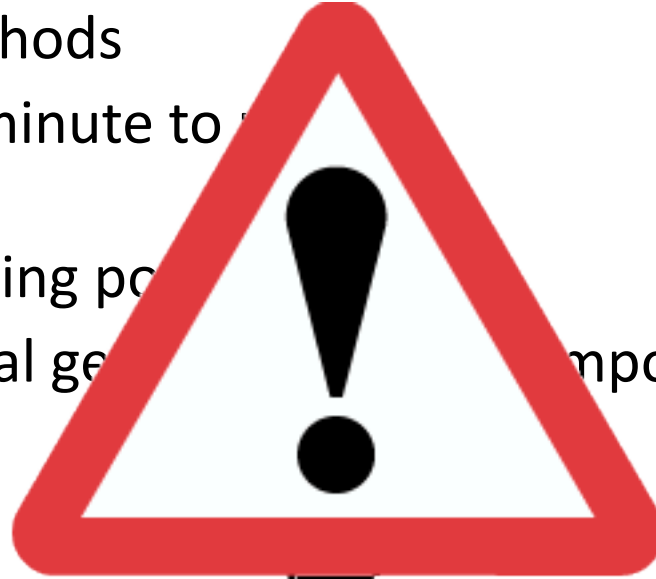


Why only now?

- Feed efficiency & methane emissions are two traits difficult to measure
 - expensive recording methods
 - strongly fluctuate from minute to minute

→ No mass/routine recording possible
→ Traditional genetic selection impossible

but...



use of genomics makes **accurate estimation of breeding values** for these traits possible!

ICAR Feed & Gas Working Group

- Working Group within the International Committee for Animal Recording
- Gather people from 8 countries
 - Benoit Rouillé (F)
 - Raffaella Finocchiaro (I)
 - Phil Garnsworthy (UK)
 - Birgit Gredler (CH)
 - Nina Krattenmacher (D)
 - Jan Lassen (DK)
 - Filippo Miglior (CA)
 - Jennie Pryce (AU)
- Aims to:
 - create an overview of the current data status for FE & ME
 - facilitate the standardization of recording DMI & CH₄
 - enhance international collaboration, technically and methodologically

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The survey

1. Data and Recording Methods for Feed Intake and Methane Emissions

- Materials/Methods used
- Recorded parameters
- Duration, repetition of measurements, ...

2. Selection Goals for Methane Emissions and Feed Intake Traits

- Trait definition used, phenotype source(s)
- Model composition, methodologies, ...
- Status of evaluation for the traits

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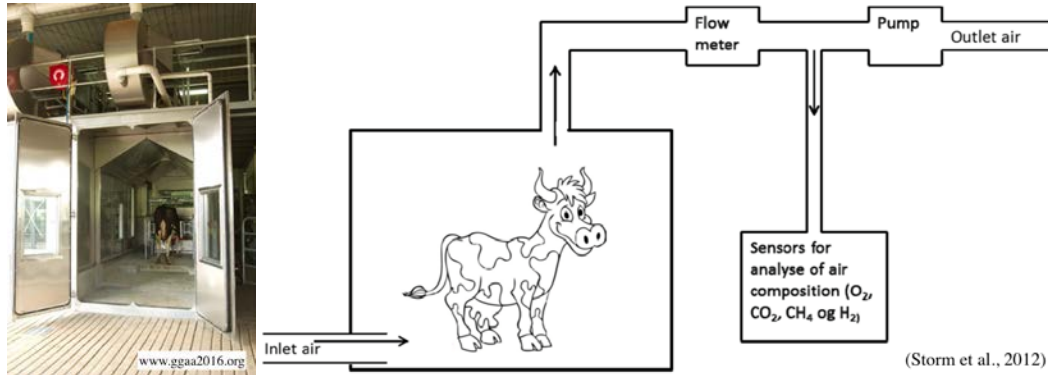
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1. Data and Recording Methods for Feed Intake and Methane Emissions

Respiration Chambers



Sulfur Hexafluoride (SF_6)



Laser Methane Detector



GreenFeed System by C-Lock Inc.

Headbox



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2. Selection Goals for Methane Emissions and Feed Intake Traits

Feed efficiency

Definition	Advantage	Disadvantage
Dry Matter Intake (g / day)	Direct improvement possible	Lowering of production level and loss of appetite
Feed conversion efficiency (kg Milk / kg Feed)	Well understood by farmers	Ratio trait, strongly linked to production
Production efficiency (kg Milk / kg BW)	Fits interests of the farmers	Ratio trait, strongly linked to production
Residual feed intake (DMI observed – DMI predicted)	Include corrections for correlated traits	Inversed values & higher complexity make it hard for farmers

modified from Yvette de Haas, 2015

2. Selection Goals for Methane Emissions and Feed Intake Traits

Methane emissions

Definition	Advantage	Disadvantage
Methane production (g/day)	Direct improvement possible	Lowering of production level and feed intake
Methane intensity (g/kg DMI)	Well understood by farmers	Ratio trait
Methane yield (g/kg milk or g/kg BW)	Fits interests of the farmers	Ratio trait
Residual methane production (g observed – g predicted)	Include corrections for correlated traits	Inversed values & higher complexity make it hard for farmers

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Genetic evaluation

Phenotype sources:

- Direct measurement
- Predicted phenotypes
 - using Milk MIR data
 - predict ME using FE data?
- Combination of both information sources
 - how well do these data can be merged?

Methodology:

- Single-step approach
- Estimation of marker effects and prediction of DGV

Inclusion in breeding goal:

- Which traits will have less weight in the breeding goal?
 - all proportionally?
 - less weight only on production traits?

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Feed efficiency is already applied

- Australia: Feed Saved Breeding Values
 - similar residual feed intake
 - expressed in kg DM
 - allows a BV for which higher values are better
 - introduced in April 2015
- The Netherlands: Dry Matter Intake Breeding Values
 - expressed in kg DM
 - implemented also in the Better Life Efficiency Index
 - introduced in April 2016

Current answers status

	Invited	Total takers	Complete responses	Partial responses
1. Data collection	120	19	7	12
2. Selection objectives	118	5	4	1

to participate contact us at: buttya@uoguelph.ca

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Participating Organizations & Funders

