



Should we change the cow's genes or the rumen microbes?



Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

Department of Animal Nutrition
and Management

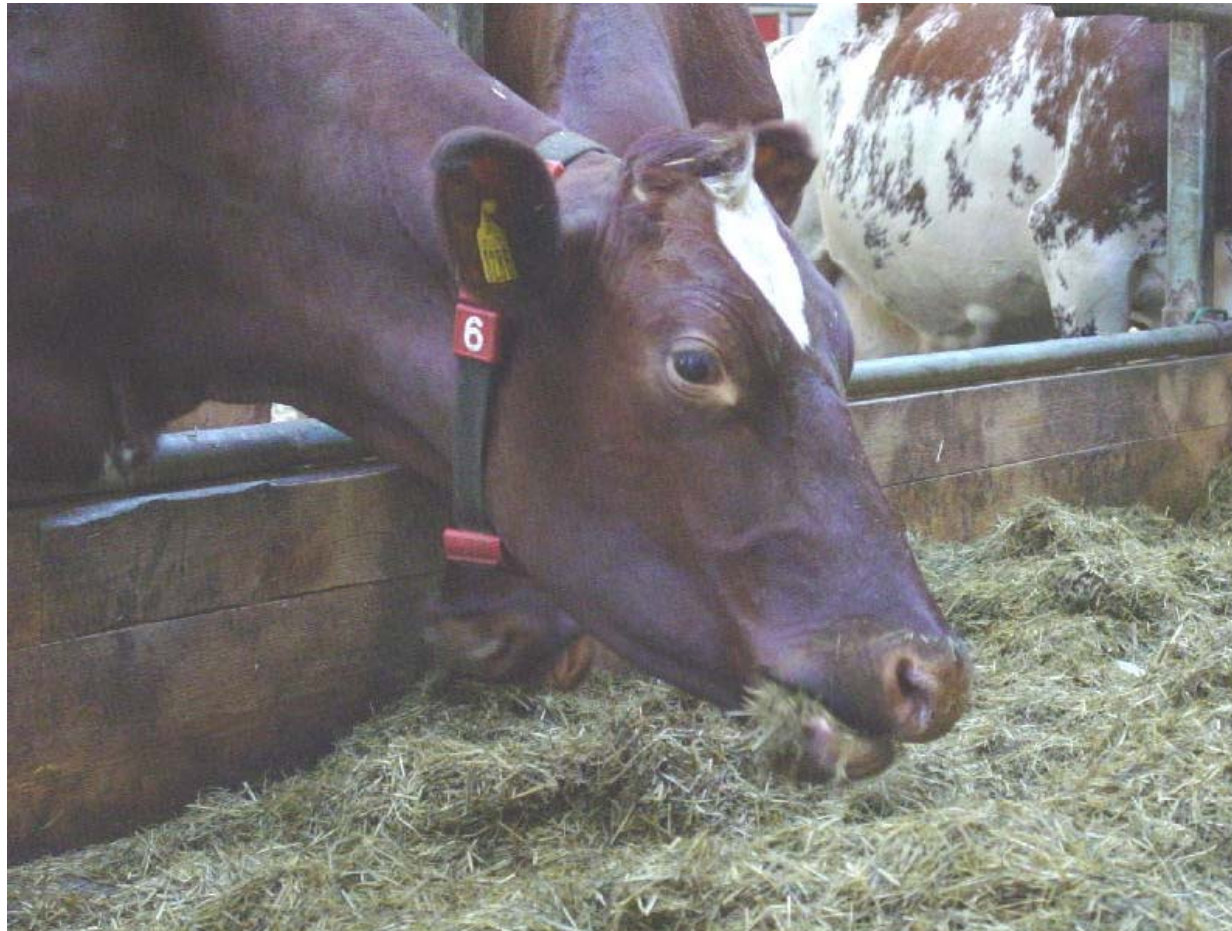
A herdsman's view

Jan Bertilsson & Rebecca Danielsson



She can convert grass to high-quality food

-is the formation of methane an unavoidable prerequisite for this?

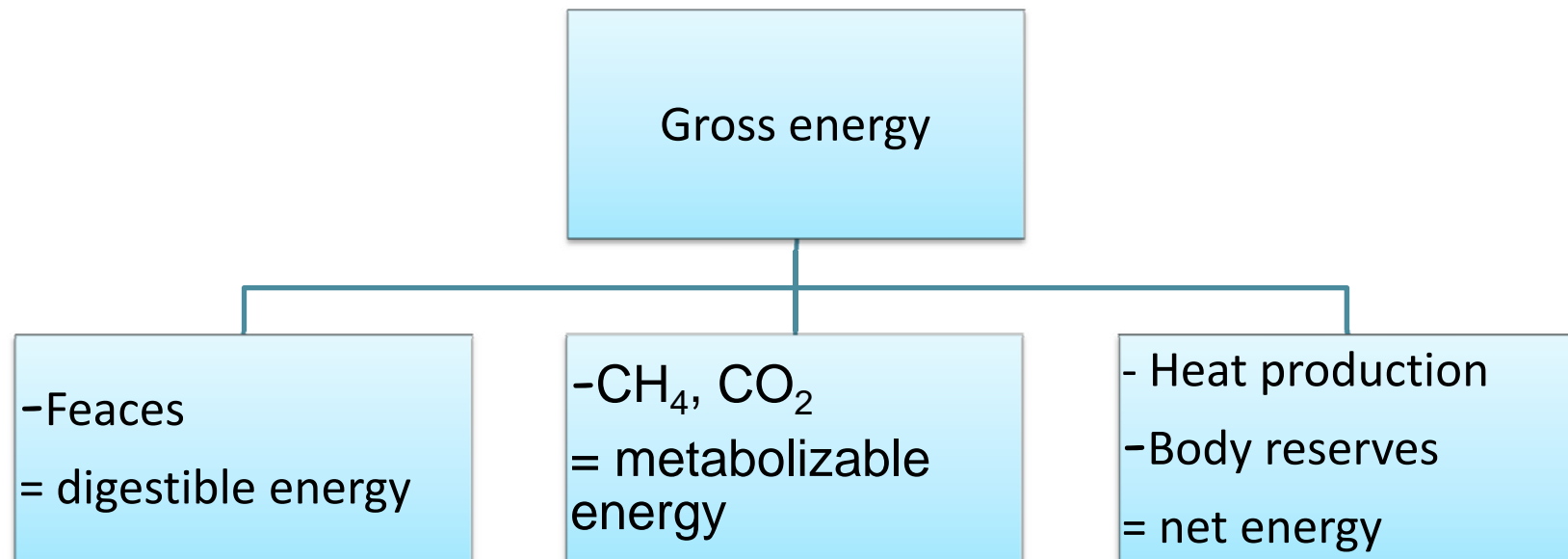


Grass is also beneficial for

The environment and the economy



Methane production means loss of energy for the cow



Are all cows similar?



Variations due to:

- Cow genes
- Microbial population

More basic information needed

Correlation to other
propertys



Monitor CH₄ from many
COWS

Characterization of rumen
microbiota

Tools needed!

CH₄ monitoring classical respiration chamber

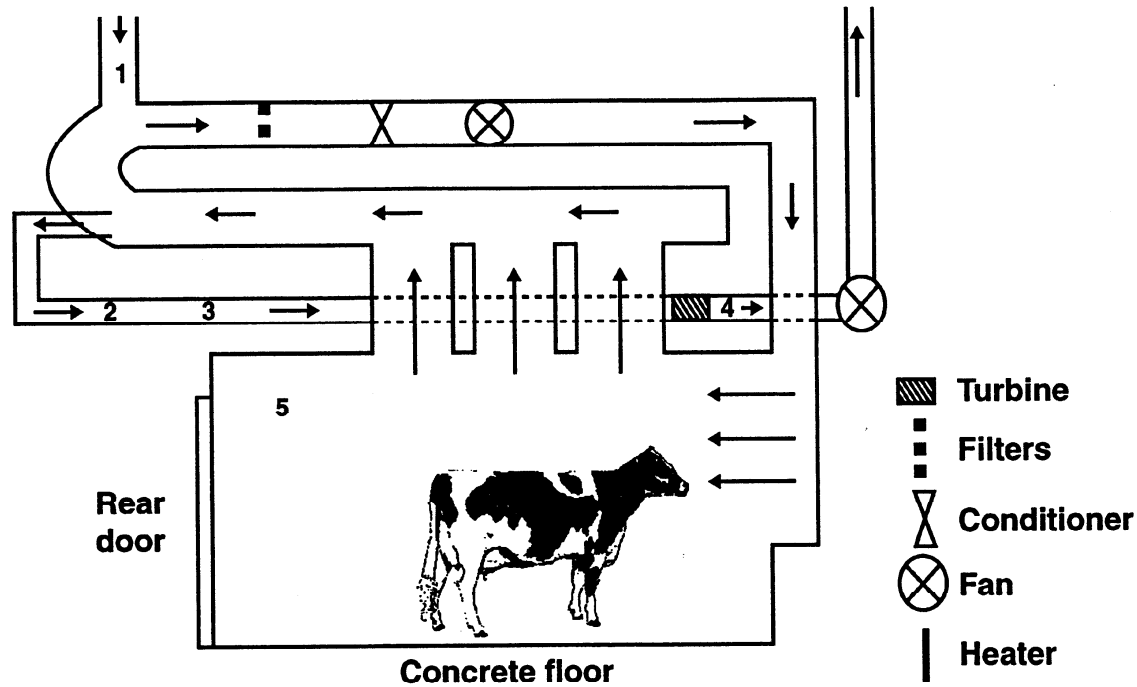


Figure 1. Schematic of the open-circuit respiration chambers located at the Department of Primary Industries, Ellinbank (Victoria, Australia) showing the airflow and conditioning, and release and sampling locations within the circulation system. Locations 1 and 2 are the intake and exhaust ducts sample points for noncalibration periods; location 3 is the injection point enabling the analytical system calibration; location 4 is the sample point for the system calibration; and location 5 denotes the chamber volume.

Tracer gas technique (SF_6)

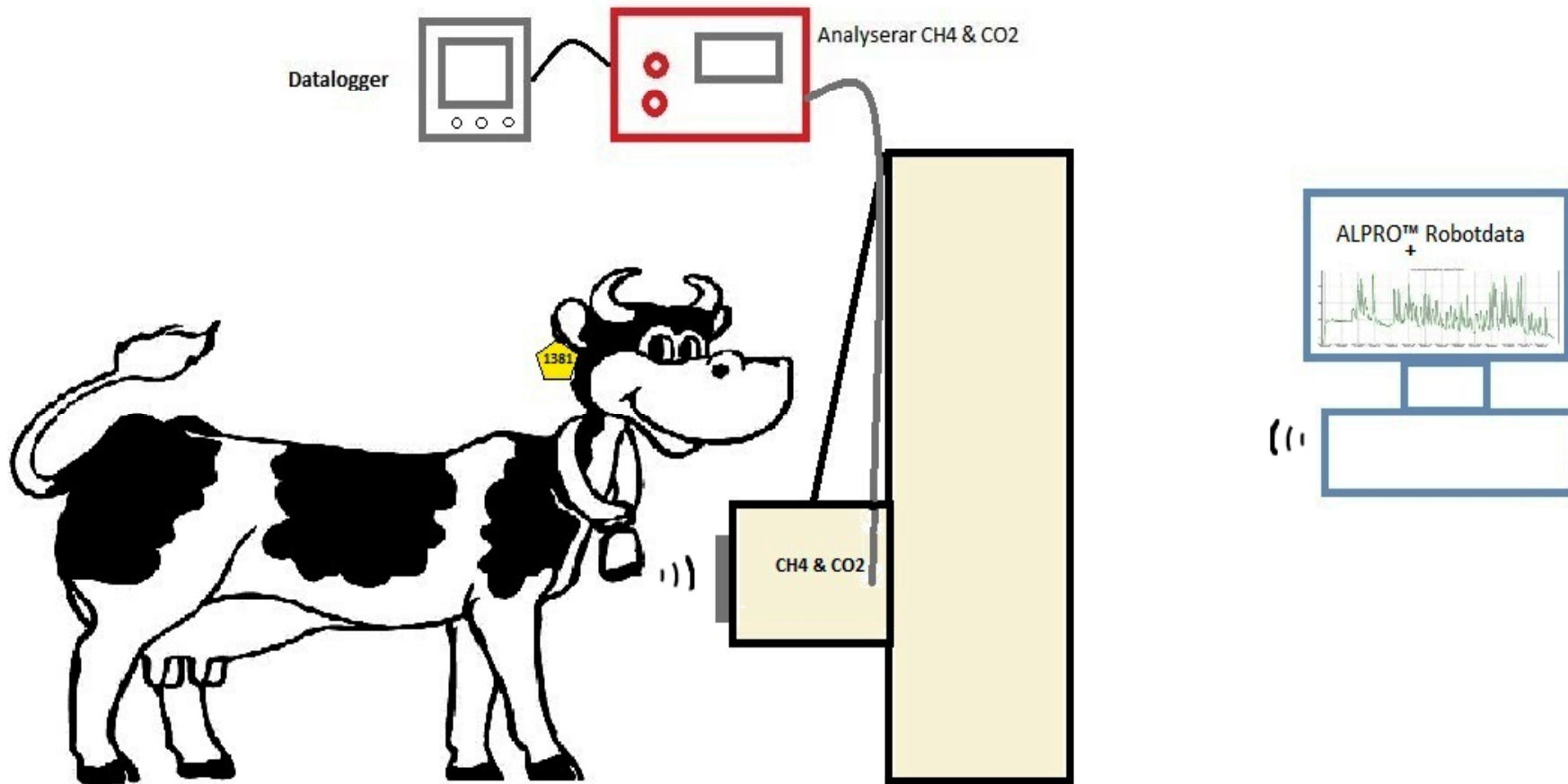




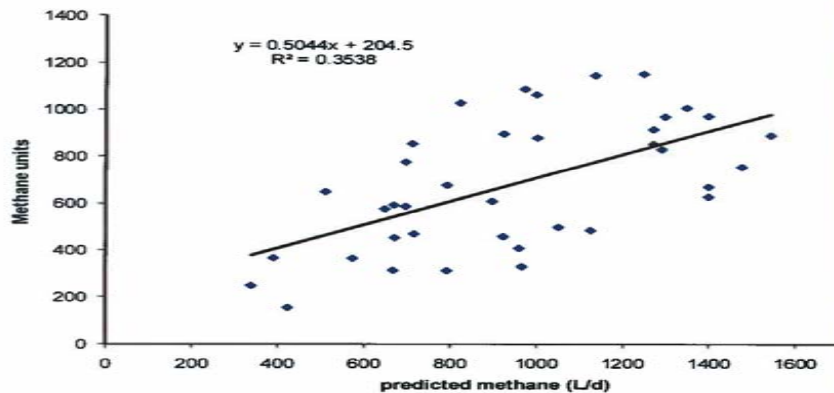
IR-technique (‘Nottingham-technique’)



The University of
Nottingham



IR-technique increase variation but drastically increase possibilities to monitor many cows



**Total emissions agree with predictions,
BUT
With a lot of individual cow variation.
MAYBE
We could select cows for methane?**





New microbiological methods for characterisation of rumen microbiota

Culture independent methods are now available

Quantitative and qualitative analyzes

- Quantitative (q)PCR
- Terminal restriction length polymorphism, T-RFLP and clone library
- (Pyrosequencing)



Published paper in **Applied and Environmental Microbiology** 2012
(Danielsson et al.)

Methanogenic population and CH₄ production in Swedish dairy cows fed different levels of forage

- Methanogenic population similar to cows on other geographical locations
- Number of methanogens is not correlated to CH₄ produced
- CH₄ production seems to be correlated with a certain group of methanogenic species
- Large individual variations

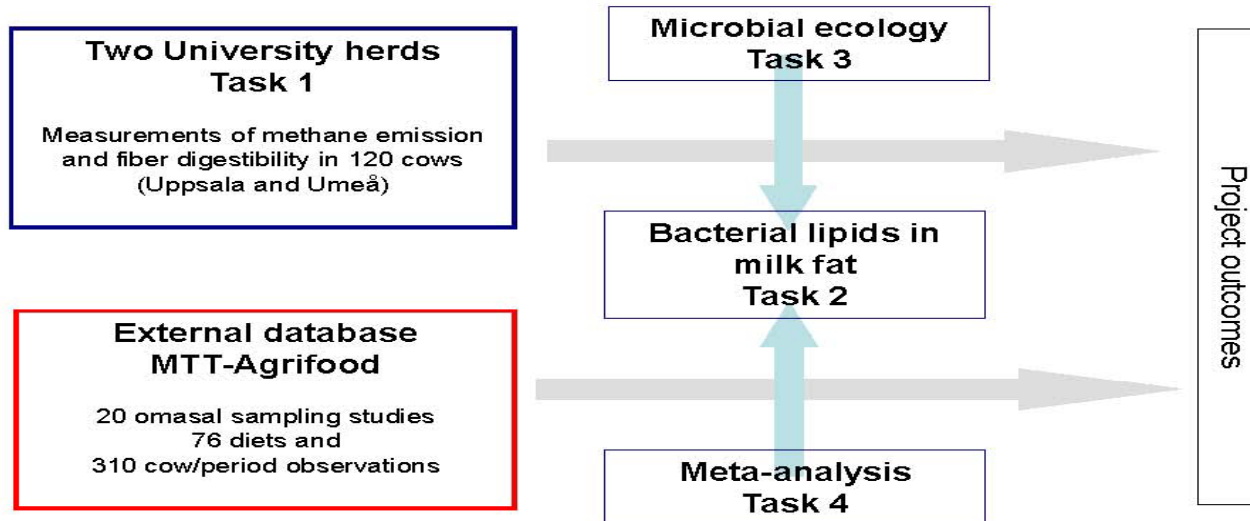


New projects

Formas-project (2012-2014):

SLU; HUV, NJV, Mikrobiol, MTT Finland, Nottingham university, UK

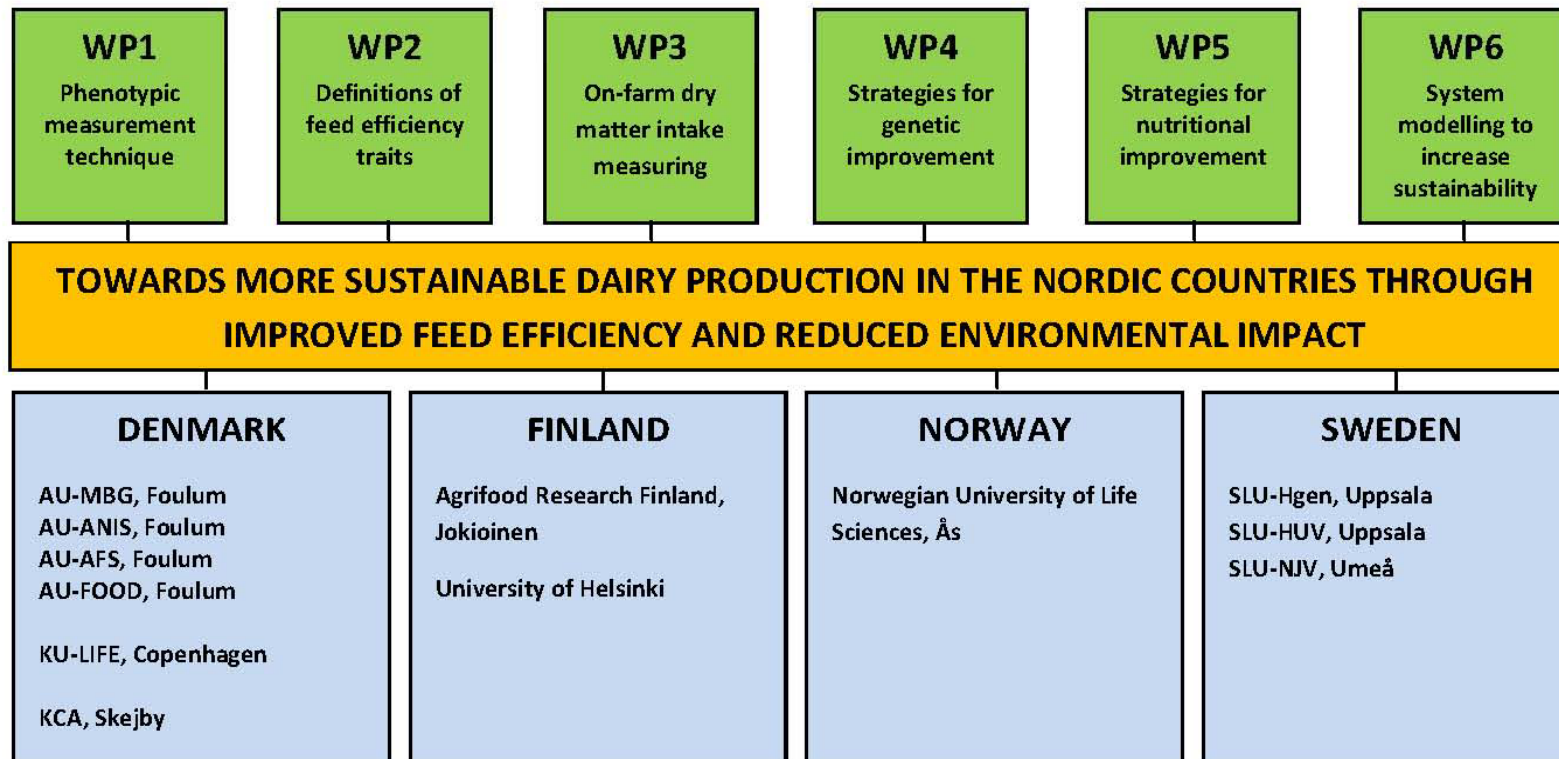
Mitigating methane emissions from dairy cows –
a mission impossible?





Combined with project on **Feed efficiency** (SLF founded)

Figure 1: Organization of the research across the participating countries





Projects starting in October 2012

Uppsala:

- ~ 80 cows
- 90-180 days in lactation (3 measurement periods; 90, 135 and 180)
- AMS system
- Forage:Concentrate 60:40



Sampling of data:

All 80 cows

- Measuring methane production in AMS
 - Dry matter intake (DMI)
 - Feaces collection
 - Milk production
- Calculation of CH_4 /kg DMI and kg milk produced

Extremes: 30-40 cows

- Sample rumen fluid
 - Milk fat
- Correlations between microbial population, digestibility and CH_4 produced



Aim: To mitigate methane from cows without impairing the cow's ability to feed on grass

