BRIAN WICKHAM YOUNG PROFESSIONAL EXCHANGE · BWYPEX 2025

TECH COMPARISON OF METHANE *MEASUREMENT DEVICES AND ALTERNATIVE PREDICTORS IN DAIRY COWS*

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DairyBio AGRICULTURE VICTORIA

WHY THIS MATTERS

The phenotype is the bottleneck

Methane genetics is only as strong as the measurement system behind it.

Biological signal

CH_4 swings with cow, diet, lactation stage, intake and time of day.

Operational noise

Airflow, background gas, cow presence, visit timing and sensor drift can swamp the raw record.

Genetic requirement

Traits must be repeatable, production-aware and ready for routine evaluation.

THE CORE QUESTION

How do we turn noisy on-farm methane records into trusted breeding values?

THE EXCHANGE

Commercial systems, not just devices

Site visits, technical meetings and demonstrations across Oceania, North America and Europe.

10

COUNTRIES

engaged through visits or virtual meetings

10

METHODS

measurement devices & predictors compared

1

QUESTION

what actually scales into genetics?

EVIDENCE BASE

On-farm observations, demonstrations, shared SOPs and sensor documentation, plus direct discussions with **breeding organisations, universities and processors.**

HOSTS ACROSS THREE CONTINENTS

New Zealand · Australia · Canada · Italy · Denmark · Norway · Netherlands · United Kingdom · Switzerland · France

LIC · AgResearch · Lactanet · Guelph · ANAFIBJ · Tecnosens · Aarhus · VikingGenetics · Arla · NMBU · Geno · TINE · WUR · CRV · Roslin · ZELP · Qualitas · INRAE

THE TOOLBOX

10 methods, four jobs to be done

Each method earns its place by purpose, not accuracy alone. No single method wins everywhere.

ANCHOR
Accuracy & calibration

- **Respiration chambers**
- **GreenFeed**
- **SF_6 tracer**

SCALE
High-volume routine records

- **AMS sniffers / heated-electrode sensors**
- **Milk MIR prediction**

FIELD
Low-infrastructure options

- **Portable accumulation chambers (PAC)**
- **Laser methane detector**

EMERGING
An extra information layer

- **Wearable nosebands**
- **Rumen microbiome**
- **Multi-trait models**

Decision logic match the method to purpose, infrastructure, cost, labour and the intended use of the record.

HOW METHODS COMPARE

Accuracy, throughput and where each fits

Method	Accuracy	Throughput	Best setting	Genetics role
AMS sniffers / heated electrode sensors	Genetics-grade only with full pipeline	Very high	AMS herds; selected parlours	Official evaluation where validated
Milk MIR	Promising when strongly anchored; varies by reference population	Very high	Milk-recording populations	Prediction layer; operational clearest in Canada
GreenFeed	High, with regular calibration	Medium	Reference herds, bull tests, selected commercial herds	Anchor / routine in selected programmes
Respiration chambers	Reference standard	Low	Research hubs	Validation anchor only
SF_6 tracer	High, with background correction	Medium	Grazing / extensive herds	Research + cross-validation
Portable Accumulation Chambers (PAC)	Good when repeated	Medium	Pasture, heifer batches	Research + breeding support
Laser methane detector	Low–moderate; repeats help	Medium	Low-infrastructure / pasture	Screening, not routine EBV
Wearable nosebands	Promising; validation continuing	High	Barns / pasture, if tolerated	Early validation

Throughput *Low = few/day · Medium = tens/day · High = dozens-hundreds/day · Very high = herd / network-scale via automation.*

THE BOTTOM LINE

The unit of success is not a device.
It is an integrated **phenotyping system.**

Calibration, repeatability and governance and not a single preferred sensor.

THE SHARED PATTERN

From anchor measurement to breeding value

ANCHOR
GF · RC · SF_6

SCALE
sniffer · MIR

QC
align + edit

TRAIT
weekly record

OUTPUT
EBV + KPI

MAIN FINDING

Advanced programmes share a similar architecture: calibration, repeatability and governance, not a single preferred sensor.

KEY DESIGN CHOICE

Use high-quality reference measurement strategically, then let lower-disruption platforms carry the routine recording load.

WHAT CARRIES THE LOAD

Sniffers and milk MIR can carry routine records

Repeated, low-disruption records are the practical basis for commercial implementation.

AMS sniffers

STRENGTH	Repeated individual records with low on-farm disruption.
NEEDS	Placement, presence detection, time-sync, background correction, cleaning, calibration.
BEST USE	Weekly concentration or peak-based traits for genetic evaluation where validated.

Milk mid-infrared (MIR)

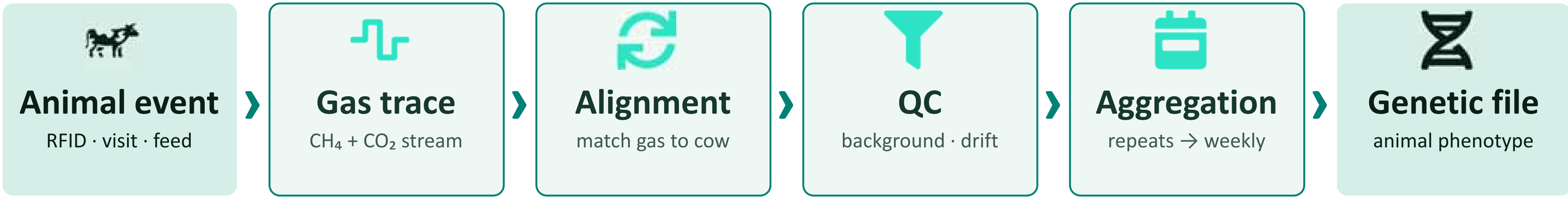
STRENGTH	Very high potential coverage through existing milk recording.
NEEDS	Strong reference populations, inter-lab standardisation and periodic recalibration.
BEST USE	Prediction layer where well anchored; strongest operational example currently Canada.

Practical interpretation Sniffers can carry routine records. MIR has strong scaling potential, but remains a prediction layer that depends on direct-measurement anchors and continued validation.

THE HIDDEN PHENOTYPE

Raw records are not breeding records

A methane reading becomes a phenotype only after editing and aggregation.



MINIMUM CHECKS BEFORE A RECORD COUNTS

- Time-synchronise with milking and feeding logs
- Confirm cow present and valid visit windows
- Correct background during idle periods
- Monitor calibration, drift, blockage, purge
- Aggregate repeated records before evaluation
- Run automated edit reports to flag drift early

DEFINING THE TRAIT

Breeding and management need different outputs

Don't let the device define the goal. Define the biological trait first.

MANAGEMENT & REPORTING

MeP	Methane production, g/day
MeI	Intensity = MeP / ECM (CH_4 per kg milk)
MeY	Yield-based = MeP / DMI

Easy to interpret for farms, processors and sustainability reporting.

BREEDING METRICS

RMeP = MeP − f(DMI, ECM, $BW^{0.75}$, DIM)

Residual or efficiency-based methane traits may reduce the risk of inadvertently selecting against production.

Principle Define the biological trait first, then choose the best available measurement system, never the other way around.

SELECTED IMPLEMENTATION EXAMPLES

Different routes, shared principles

Four examples illustrate different implementation models; this is not a full country-by-country summary.

Canada

PUBLISHED EBV

Sniffer network + GF + MIR

One of the clearest operational examples of MIR-supported methane prediction.

The Netherlands

PUBLISHED EBV

AMS sniffers + GF anchors

CRV methane EBV from weekly CH_4 concentration and peak traits.

Denmark

SYSTEM DESIGN

AMS sniffers + CFIT intake

GEDA alignment, Saved Feed; processor climate signals show how data may link to milk price.

Norway

REFERENCE SYSTEM

GreenFeed + intake bins

Cow reference population; digital-twin simulations guide scale and weights.

Common thread anchors + scale + quality control + cautious trait communication.

MATCHING METHOD TO SETTING

Indicative options, not fixed rules

Adapt to local herd structure, climate, labour and recording infrastructure.

Setting	Likely routine source	Anchors / add-ons	Interruption
SMALL	One to three heated electrode sensors where individual records can be reconstructed.	Regional GF/chamber anchors; MIR once anchored; LMD for screening	Low → high
MEDIUM	Sniffers, with full QC and weekly aggregation	GF anchors on a subset; MIR for population scale	Low–medium
LARGE	Multi-bay or AMS sniffer network under one common pipeline; integrate MIR for evaluation	Central dashboard: uptime, drift, edit-retention; scheduled calibration	Low

Climate caveat PAC can overheat in hot climates and confines each cow 40–60 min, so it rarely scales. In warm conditions, targeted SF_6 or lower-disruption sensors may be more workable.

DON'T BREED IN ISOLATION

Methane belongs in a balanced objective

Methane traits should be considered with production, efficiency and fitness traits, not as a stand-alone target.

Methane
RMeP / MeI

Feed intake
DMI / RFI

+

Milk production
ECM / yield

Body size
BW^0.75

→

BALANCED BREEDING OBJECTIVE

+ Health & fertility safeguard
to avoid unwanted trade-offs

Key message: lower methane should be selected within a balanced objective, not by sacrificing production, efficiency or cow robustness.

Design principles for scalable phenotyping

1

Start with the use case

Breeding, management or both, decide before choosing hardware.

2

Anchor the scale

GF, chamber or SF_6 cohorts for calibration and bias checks.

3

Use low-disruption carriers

Sniffers, MIR and repeated routine records for volume.

4

Invest in the pipeline

Time alignment, presence, background handling, fault detection.

5

Aggregate before evaluation

Weekly or repeated traits to lift repeatability.

6

Separate the outputs

Breeding traits ≠ management metrics; communicate each clearly.

WHAT IT MEANS FOR ICAR & GLOBAL COLLABORATION

Methane phenotyping is entering its implementation phase

1

No single technology fits all

The right method depends on herd infrastructure, climate, labour and purpose.

2

Strong systems layer up

Anchors for accuracy, automated records for scale, strict QC for repeatability.

3

Match the trait to the audience

Production-independent traits may suit breeding; clear g/day and intensity for management.

The opportunity for ICAR harmonise SOPs, units and trait definitions so methane data can move across national systems, and build shared reference cohorts for cross-country validation.

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Thank you to the people and organisations behind this exchange

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BWYPEX and ICAR

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for farm visits and technical meetings

Host organisations and collaborators

LIC · Lactanet · University of Guelph · ANAFIBJ · Tecnosens · Aarhus University · VikingGenetics · Arla Foods · NMBU · Geno · TINE · WUR · CRV · Roslin Institute · ZELP · Qualitas · INRAE

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