

Tech comparison of methane measurements devices and alternative predictors in dairy cows

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This study compares methane measurement approaches used for phenotyping in dairy systems across countries and describes their implementation and use in national breeding programmes.

As part of the Brian Wickham Young Professional Exchange (BWYPEX) program I conducted a comparative review of methane measurement options in dairy cows via site visits and technical meetings in North America, Europe, and Oceania, plus virtual meetings with European scientists. Evidence from demonstrations, interviews and documents was assessed. Across programmes, there was no single method universally adopted. Appropriateness depended on infrastructure, climate, staffing, and tolerance for operational disruption.

- Sniffer sensors run under a standardised quality-control pipeline and aggregated to weekly traits in automatic milking systems or herringbone parlours delivered repeatable, genetics-grade phenotypes and have been implemented at multi-herd scale.
- Milk MIR provided a scalable population proxy when anchored to a reference group and standardised across laboratories.
- GreenFeed and Respiration Chamber are best retained as anchors and for targeted cohorts rather than broad deployment.
- The SF₆ and Portable Accumulation Chamber can yield valid phenotypes in structured campaigns, but both are operationally demanding.
- Laser methane detector can support field phenotyping in low-infrastructure settings when measurements are repeated under standardised protocols.
- Wearable methane-sensing devices (e.g. ZELP and other systems under development) and rumen-microbiome predictors are currently under validation and are being evaluated in pilot implementations alongside established reference methods.

Across countries, different methane metrics are used for breeding and management purposes: emphasis is on production-independent traits (e.g. efficiency or residual measures), and total methane production (g/day) and intensity (CH₄ per kg milk) are generally the most interpretable measures. Overall, current international implementations demonstrate multiple viable pathways for methane phenotyping in commercial dairy systems. The choice of method reflects national infrastructure, breeding objectives, validation status, and cost structure rather than a single universally preferred approach.