



THE GLOBAL STANDARD
FOR LIVESTOCK DATA

Network. Guidelines. Certification.

Validation of Methane Recording Devices

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WUR: Yvette de Haas, Lisa Büttgen

December 10, 2025

Outline of webinar

- Introduction – Martin Burke
- Background – Yvette de Haas
- Validation procedure – Lisa Büttgen
- Questions & Answers

ICAR'S MEMBERS AROUND THE WORLD

142 members

92 Full members + 50 Associate members in +55 countries.



Countries (in dark blue) with at least one organization as ICAR Member

Mission:

ICAR is the Global Provider of independent Guidelines, Standards and Certification service

Vision:

ICAR, the universal language for sustainable animal production.

Certification Service:

ID, MRSD, Milk Analysers, CoQ ,DNA Labs, Proficiency Test on cow, sheep, goat milk proficiency test on Bull semen

Validation Service:

Sensor devices not yet described in the ICAR guidelines or for different purposes than DHI

CERTIFICATION

<https://www.icar.org/certifications/>

ICAR certification (verification) of a device refers to the performance evaluation conducted according to ICAR's established testing and verification protocols by an ICAR-appointed Test Centre. A successful verification demonstrates that the device (e.g. milk meters for cows and sheep/goats, automatic milking system (AMS) device, milk analysis device, on farm at/in line milk analyzer) can produce data as described in the test report and **complies with the relevant ICAR guidelines**. ICAR certification represents the final stage of the verification process for a milk analyzer (system) and results in an official ICAR statement confirming the device's suitability **for use in official milk recording**.

VALIDATION

AD2 <https://www.icar.org/icar-validate-sensor-systems/>

Beyond official milk recording, obtained with ICAR certified devices, results from devices also support farm management by providing insights into production, animal health, welfare, and sustainability, often enhanced by mathematical models and algorithms. Given the diversity of applications, a single evaluation protocol is impractical; instead, ICAR offers claim validation for solutions **outside official milk recording** to ensure user trust while allowing flexibility in development. ICAR validation ensures that a device (e.g. milk meters for cows and sheep/goats, automatic milking system (AMS) device, milk analysis device, on farm at/in line milk analyzer, sensor device) **meets the manufacturer's performance claims** through ICAR-approved test plans conducted by a qualified ICAR Test Center. Successful validation confirms that the system can reliably deliver quality data when used correctly, leading to the award of an ICAR Certificate of Validation.

AD1

Diapositiva 4

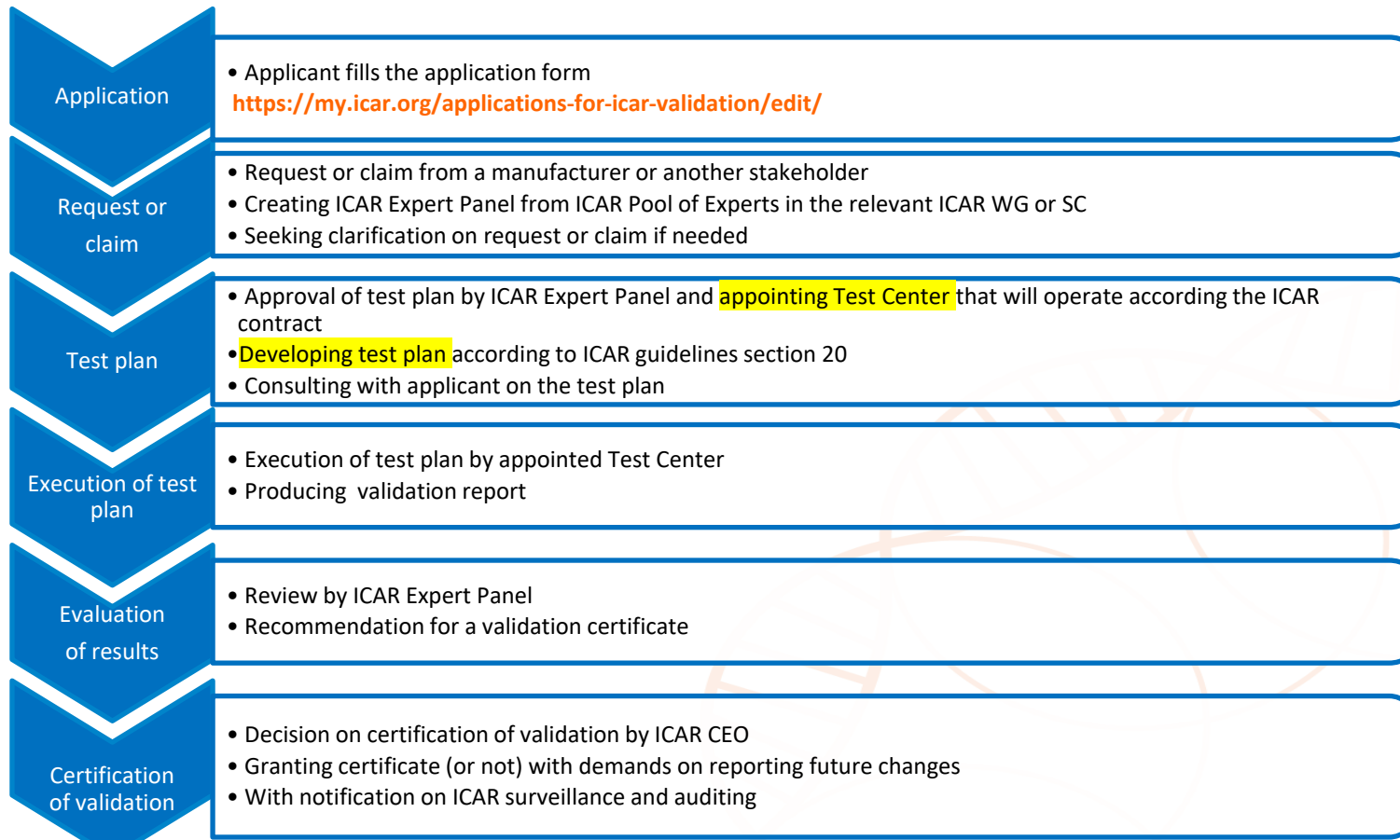
AD1 We should be very clear that to get the certificate the test must be 100% successful, meaning that the results of all tested devices have met the manufacturer's claims as per their application.

Andie; 2025-12-05T14:47:45.555

AD2 I highlighted yellow the crucial differences.

Andie; 2025-12-05T14:52:15.619

VALIDATION PROCEDURE



Publication on the ICAR website

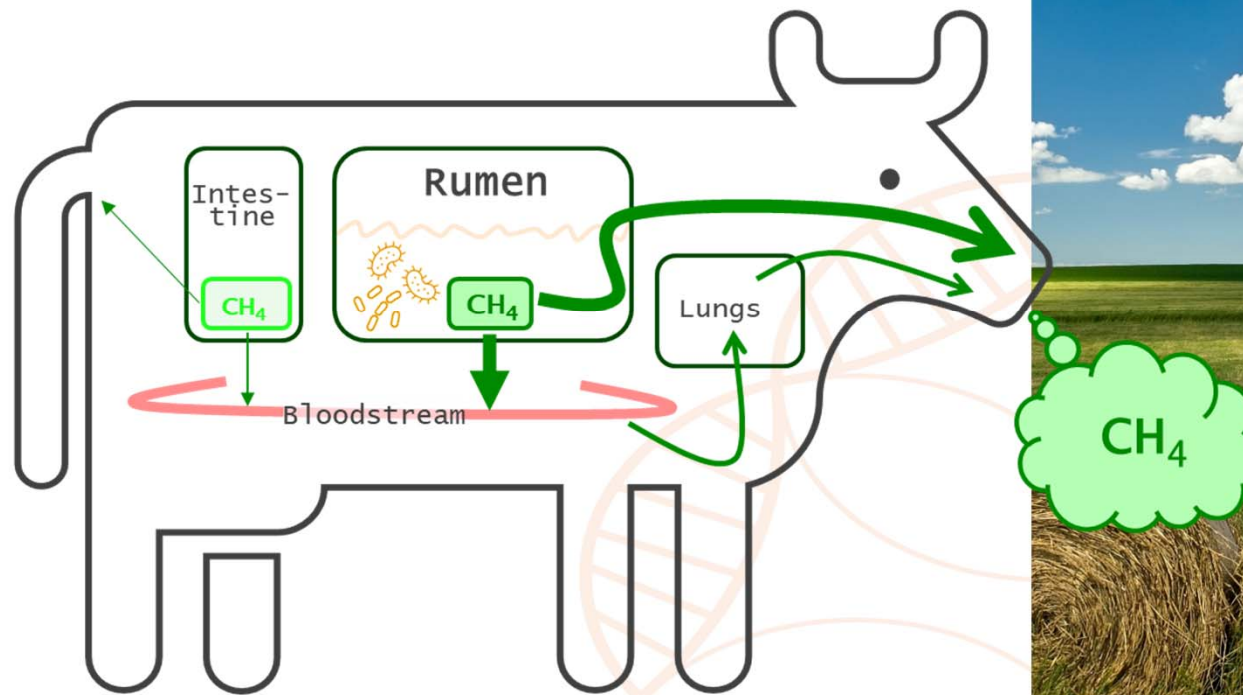
- Certificate
- Fact Sheet (Summary report)
 - Full report upon manufacture request



Background – Yvette de Haas



Methane of the cow



Recording methane is difficult and costly

Respiration chamber



Sniffer



SF₆



GreenFeed



Masks

Laser methane detector



Portable accumulation chamber



Develop protocols for methane recording devices

- Establishing quality standards and setting up test facility (lab and on farm) for different *sniffer* types that will serve as guidelines when starting to collect methane records
 - Compare specifications of commercially available sniffers
 - Calibrate and validate a few of these in our Air Quality Lab
 - Set up a test facility on farm with different sniffer types
 - Validate these sniffers against the lung method* and a GreenFeed
 - Set up protocol for methane recordings with a sniffer device

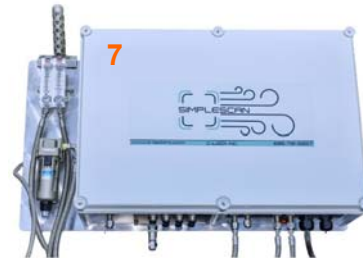


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* <https://edepot.wur.nl/536449>

Commercially available sniffers



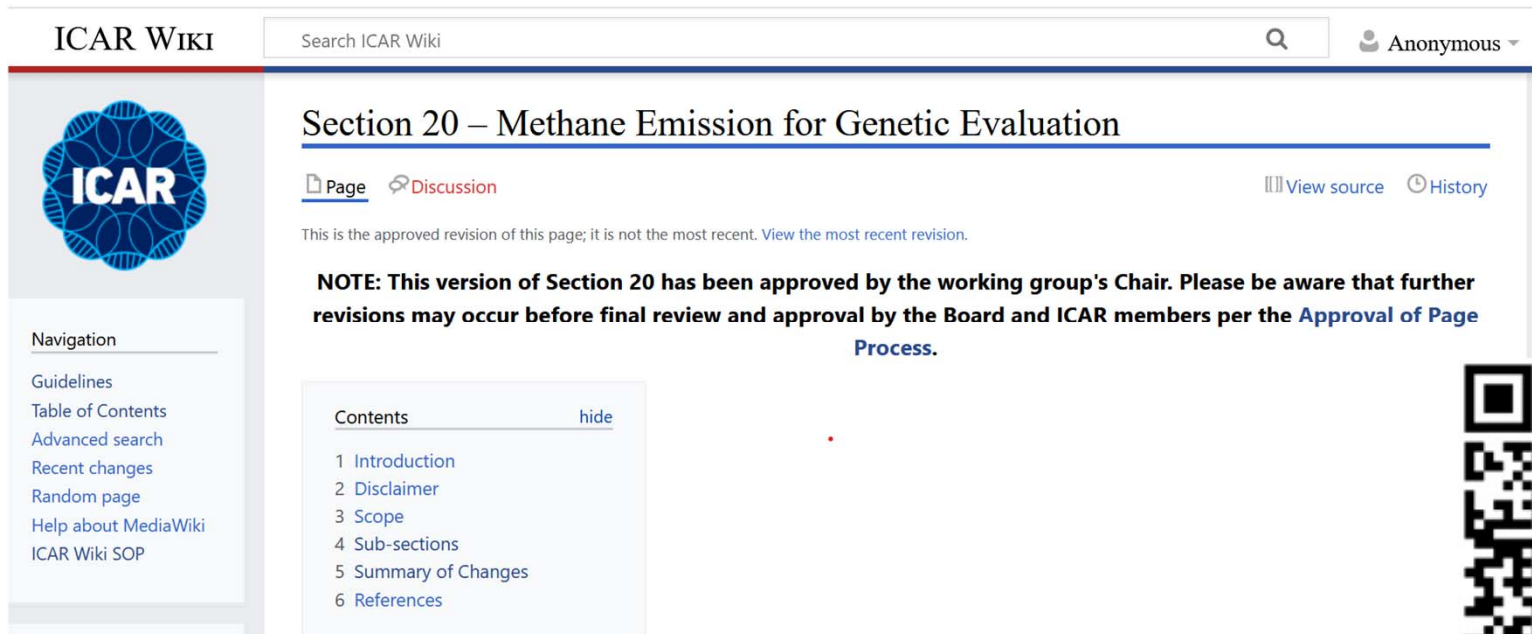
- <https://carltech.nl/en/products>
- <https://agscents.com/products/agscents-air/>
- <https://gasera.fi/product/gasera-one-pulse/>
- Arcoflex: <https://doi.org/10.1016/j.cej.2025.165629>
- <https://edinburghsensors.com/products/gas-monitors/>
- <https://www.tecnosens.it/en/Tecnosens-products/moologger>
- <https://www.c-lockinc.com/products/emissions-monitoring/simplescan>
- <https://www.gasmet.com/products/category/portable-gas-analyzers/gt5000-terra/>

Specifications

- Type of (infrared) sensors used
- Measured gas/gases
- Range of gas measurements
- Response time
- Repeatability
- Accuracy
- Internal data storage
- Interface
- Size & Weight
- IP value
- Price
- ...

Specifications on ICAR Wiki

ICAR Wiki: <https://wiki.icar.org/index.php/Guidelines>



The screenshot shows the ICAR Wiki interface. At the top left is the 'ICAR WIKI' logo. A search bar contains 'Search ICAR Wiki'. The user is logged in as 'Anonymous'. The main heading is 'Section 20 – Methane Emission for Genetic Evaluation'. Below the heading are links for 'Page' and 'Discussion', and options for 'View source' and 'History'. A note states: 'This is the approved revision of this page; it is not the most recent. View the most recent revision.' A prominent note reads: 'NOTE: This version of Section 20 has been approved by the working group's Chair. Please be aware that further revisions may occur before final review and approval by the Board and ICAR members per the Approval of Page Process.' A 'Contents' table of contents is visible, listing sections 1 through 6: Introduction, Disclaimer, Scope, Sub-sections, Summary of Changes, and References. A navigation sidebar on the left includes links for Guidelines, Table of Contents, Advanced search, Recent changes, Random page, Help about MediaWiki, and ICAR Wiki SOP.



Validation procedure – Lisa Büttgen



General setup for validation

1. Validation in Air Quality Lab of Wageningen University and Research
2. On farm validation on the innovation and research center DairyCampus



<https://edepot.wur.nl/536449>



<https://veeteelt.nl/huisvesting/250-koeien-fte-en-minder-staal-nieuwe-stal-dairy-campus>

Validation in Air Quality Lab



- I. Offering known concentrations of CH₄ and CO₂
- II. Testing sensitivity to moisture/humidity

Validation in Air Quality Lab



I. Offering known concentrations of CH₄ and CO₂

- CH₄ concentrations within a range of 100 ppm to 2,000 ppm
- CO₂ (if applicable) within a range of 1,000 ppm to 10,000 ppm
- Start with the lowest concentration going to the highest concentration and back
- Capture the capability of the device to record sinking gas concentrations and analyze the response time

Validation in Air Quality Lab



II. Testing sensitivity to moisture/humidity

- Offering a stable known concentration of CH_4 and increasing the moisture level of the gas
- Starting with 0%, dry gas, increasing in 5 steps up to 90-95% relative humidity

On farm validation on Dairy Campus

- The barn in which the test will be conducted has
 - Milking robot (DeLaval) with several sniffer devices connected
 - GreenFeed unit (C-Lock Inc.) measuring the gas fluxes of CH_4 and CO_2
 - Housing capacity for ~60 cows



On farm validation on Dairy Campus

- Slightly different approaches for sniffer and handheld devices
- **Sniffer** are compared to
 - Lung method
 - GreenFeed
- **Handheld and other devices** are compared to
 - GreenFeed
 - Sniffers

On farm validation on Dairy Campus

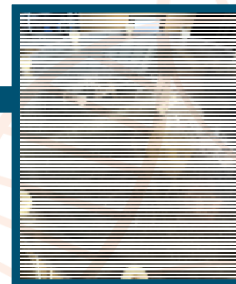


- 2 **sniffers** will be installed for 3 months continuously at the milking robot
- Once per month the lung method (<https://edepot.wur.nl/536449>) will be applied to validate the output from the sniffers in the field
- GreenFeed measures of the same cow on the same day available for comparison

On farm validation on Dairy Campus

Lung method

- Two gas collection bins next to the milking robot to collect air samples from the same tube as the sniffers



On farm validation on Dairy Campus



Lung method

- Once a month at three different times ~2h during the day, in duplo (duplicate of air sampling at the same time)
- Collected gas will be sent to the air-quality lab to be analyzed with gas chromatography
- The results will be compared to the average gas measurements from the sniffer over the same time period

On farm validation on Dairy Campus

Further analysis

- Correlation between the two sniffer devices
- Correlation with GreenFeed measurements on the same cow on the same day will be calculated
- Missing measurements will be documented
- The ranking of the animals from low to high emitters will be compared between the sniffer and the GreenFeed

On farm validation on Dairy Campus



- Testing of the **handheld device** on 3 days with a timewise distance of approximately one month
- The barn in which the test will be conducted has
 - GreenFeed unit (C-Lock Inc.) measuring the gas fluxes of CH_4 and CO_2
 - Milking robot with several sniffer devices connected to it measuring the gas concentrations of CH_4 and CO_2

On farm validation on Dairy Campus



- Testing of 2 handheld devices on approximately 50 cows (on same day)
 - 4 times per cow and for e.g. 30 seconds per measurement
 - Measuring the nose sides of the cow alternately
 - The value to consider as measurement will be taken according to the instruction of the manufacturer of the device (e.g., highest value, average value, software output)

On farm validation on Dairy Campus



- Analysis for handheld device
 - Correlation with GreenFeed and sniffer measurements on the same cow on the same day
 - Missing measurements will be documented
 - The ranking of the animals from low to high emitters will be compared with those obtained from the GreenFeed

Take home message

- Validation of sniffer and other methane recording devices with ICAR
 - I. Air Quality Lab of Wageningen University & Research
 - II. Innovation and Research Center DairyCampus
- Now manufacturers can request validation of their devices through ICAR for Ruminant gas production CH₄ and CO₂
<https://my.icar.org/applications-for-icar-validation/edit/>



THE GLOBAL STANDARD
FOR LIVESTOCK DATA

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Thank you for your kind attention

Q & A

11-12-2025

Questions

- Is the testing procedure clear to you? Any open questions?
- Is the testing procedure applicable to your methane measuring device or to the devices you are familiar with?
- What is the added value of ICAR validation for you?