

# **Verification of emission-reduction procedures in naturally ventilated cow houses by using optimised measurement methods**

## Revision of the VERA test protocol “Housing systems”

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# What does VERA do?

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✓ Verification = confirmation that a test has been performed according to a **standard** (= VERA test protocol).

**NO certification**

**NO expert opinion**

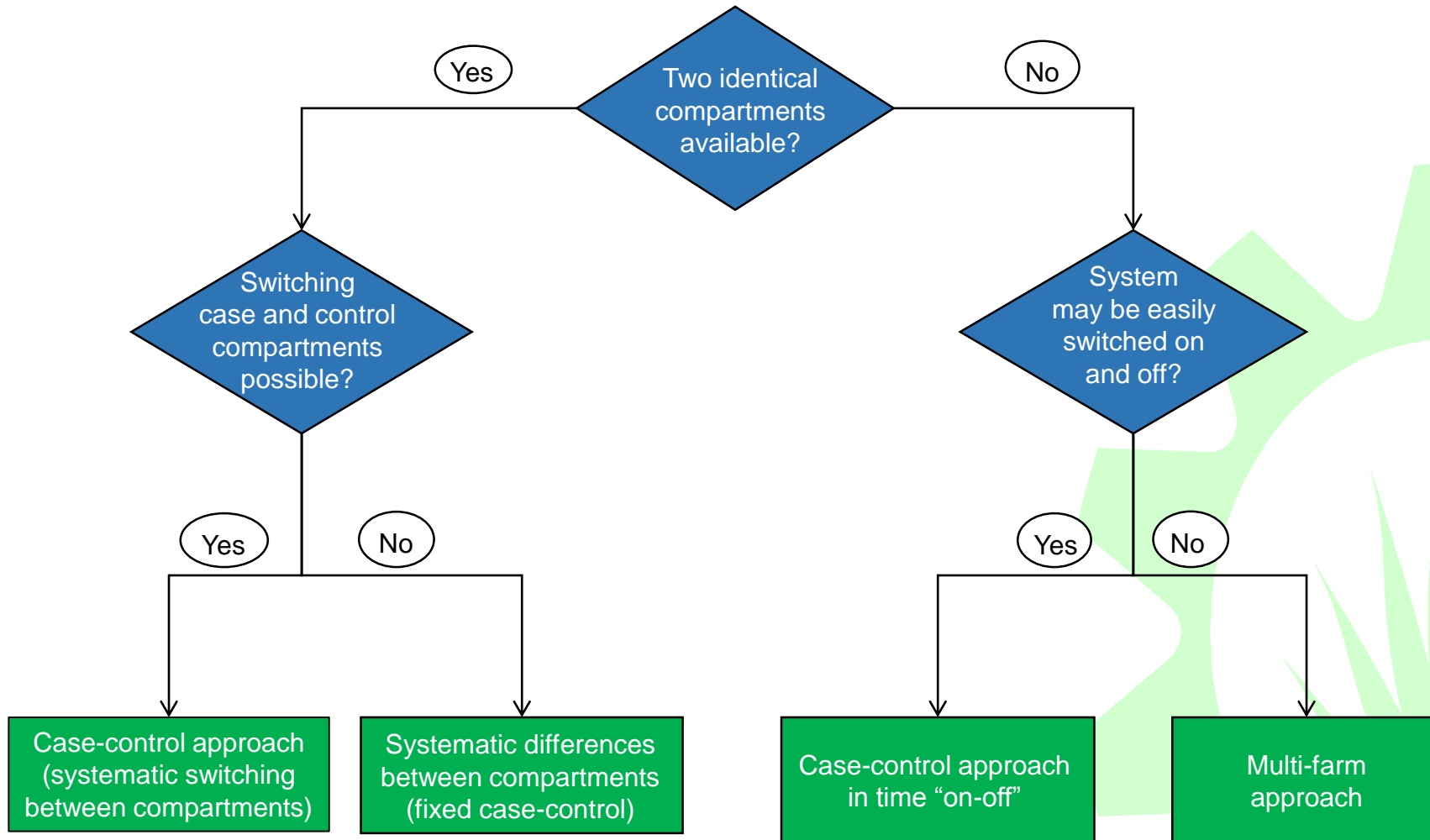
**NO national approval!**

✓ National requirements or general recommendations can **ONLY** be given as an information to the applicant!

# Current VERA Test Protocols



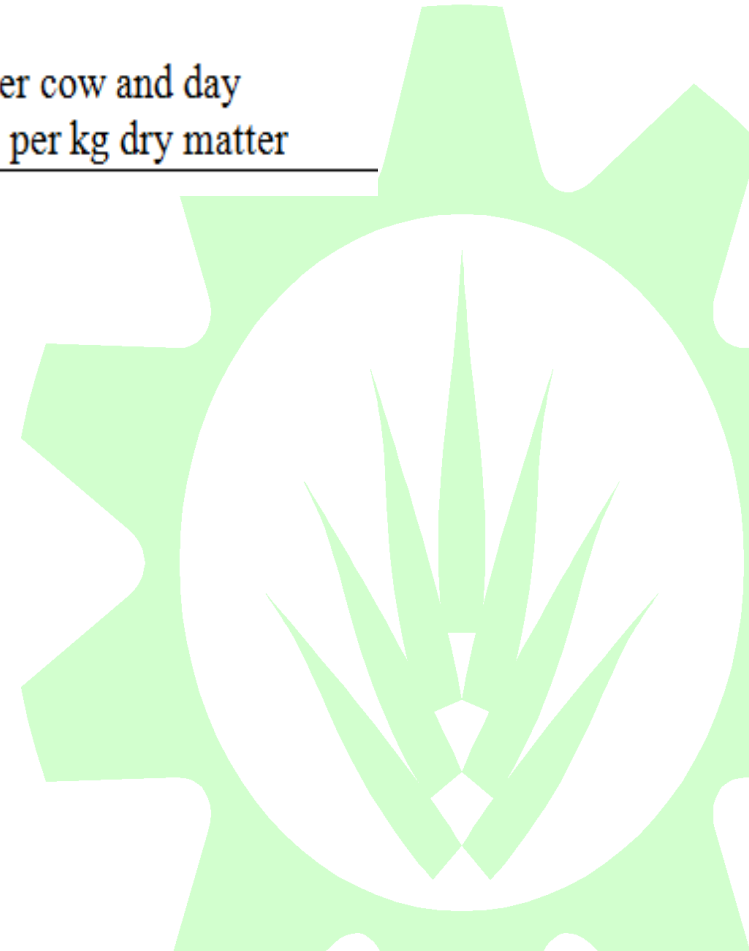
# Test design



# Agronomic requirements



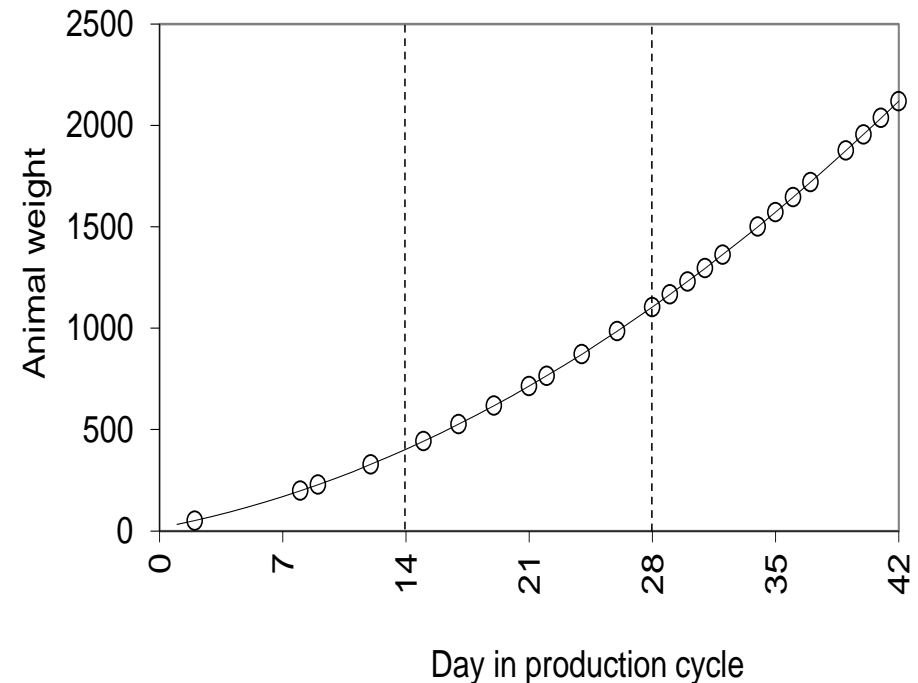
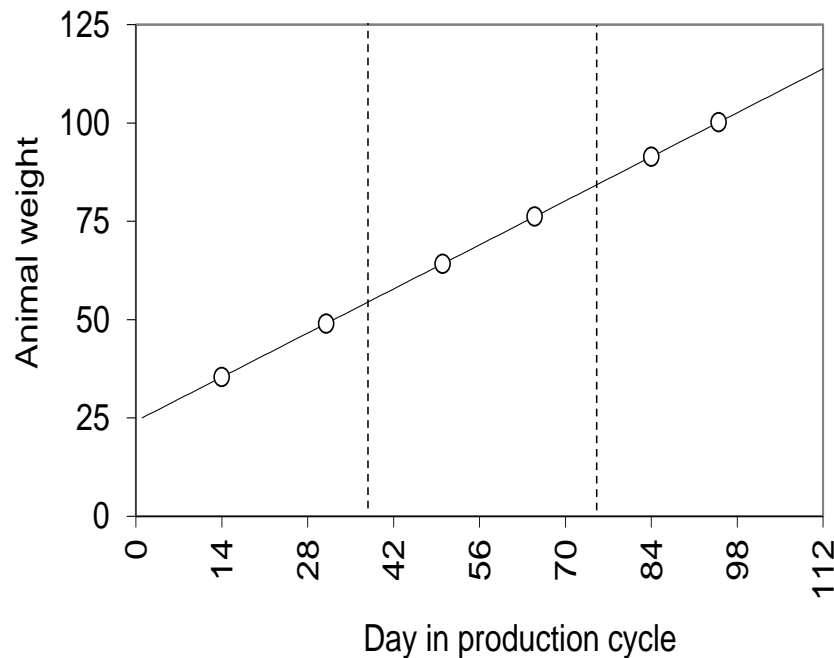
Criterion	Example: Dairy cows
Animal occupation rate	90–100%
Herd composition	>70% of house must be occupied by cows
Housing system in use before test	>2 months
Production level	≥ 25 kg energy corrected milk per cow and day
Feed composition	≥ 50% roughage, 160–180 g CP per kg dry matter



# Sampling frequency

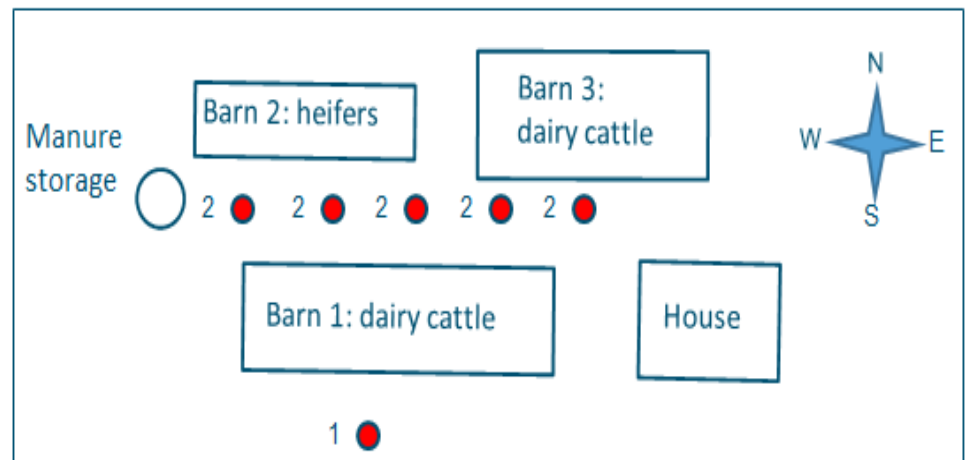
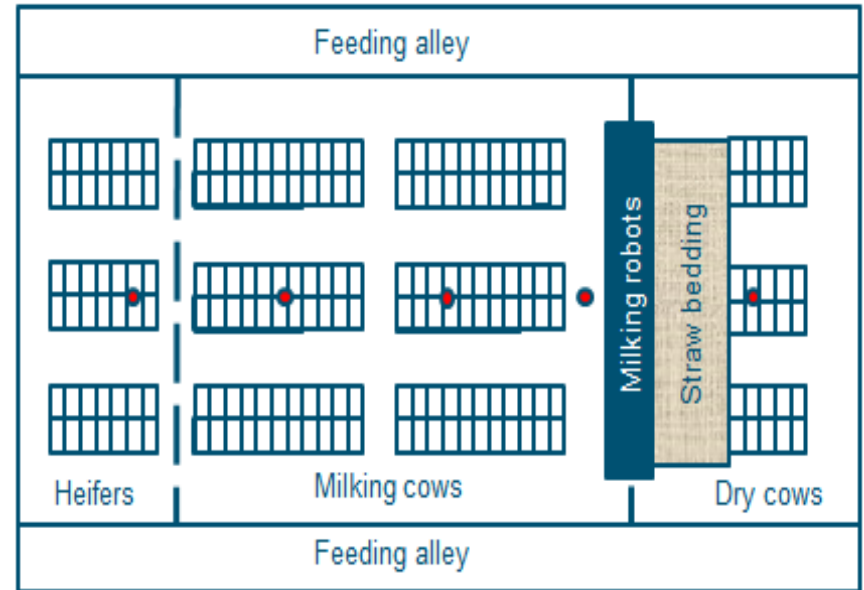
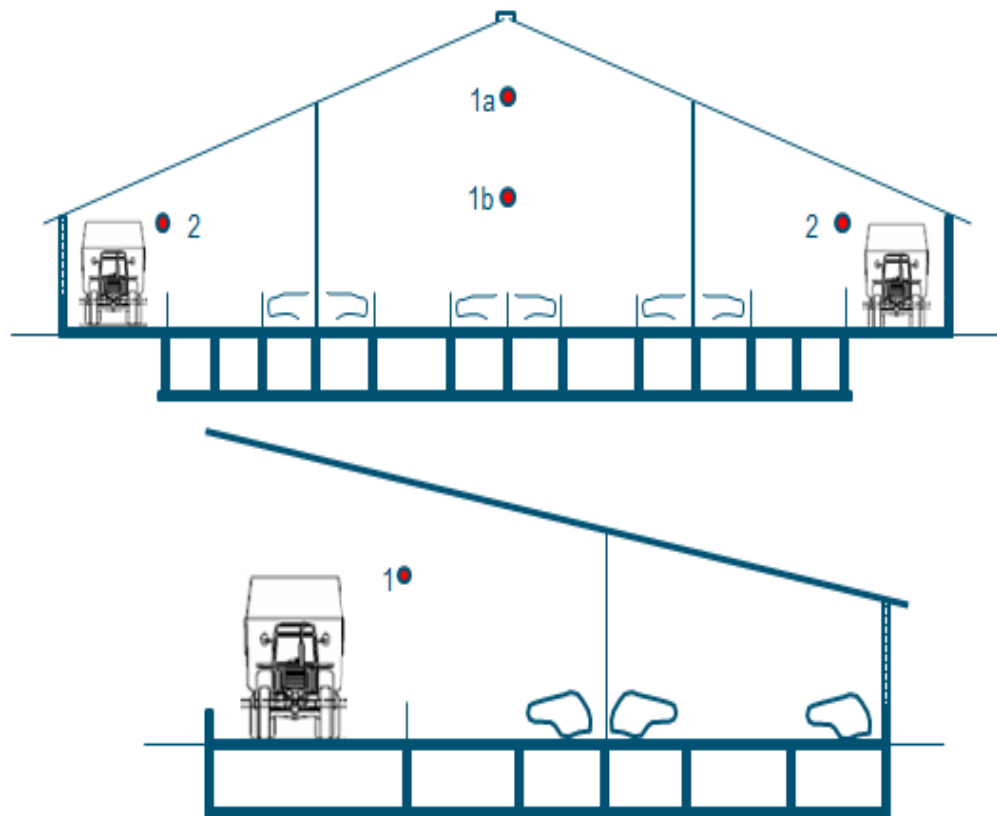
## Requirements:

- ✓ Per farm location, 6 periods of  $\geq 24$  h distributed over 1 year
- ✓ Distribution depending on emission patterns





# Sampling points



# Measurement equipment (reference)

- ✓ Ammonia: impinger system
- ✓ Odour: dynamic olfactometry (EN13725)
- ✓ Dust: EN standards
- ✓ Air volume: fan-wheel anemometer and tracer gas ratio methods

$$E_{\text{NH}_3} = P_{\text{tracer}} * \frac{[C_{\text{NH}_3}]_{\text{barn}} - [C_{\text{NH}_3}]_{\text{outside}}}{[C_{\text{tracer}}]_{\text{barn}} - [C_{\text{tracer}}]_{\text{outside}}}$$

- ✓ Calibration, validation, on-site verification (ISO 17025)



# Calculation of the emission value

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- ✓ Plausibility of measurements
- ✓ Statistical tests (outliers)
- ✓ Accordance to agronomic requirements, completeness of data
- ✓ CO<sub>2</sub>-tracer gas ratio method: [open Excel calculation tool](#)

# “Ring test” plans

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## Goals:

- ✓ Be able to estimate overall measurement uncertainty
- ✓ Distinguish instruments that are sensitive to interferences
- ✓ Take agricultural environment into account (without the variability of sampling yet)

## Plan:

- **Phase 1:** “Test bench” at institute in Rennes  
Mix of four gases under controlled relative humidity
- **Phase 2:** “Field test with 1 sampling point” (farm close to Rennes)  
4x 24h measurement with at least 1 data point per hour

# Questions or suggestions?



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