

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

Revision of the VERA test protocol “Housing systems”

A.P. Adamsen, B. Bjerg, E. Gallmann, E. Grimm, E. Hartung, P. Kai, J. Mosquera, N. Ogink, S. Hempel, P. Robin, I. Beckert

What does VERA do?

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

NO certification

NO expert opinion

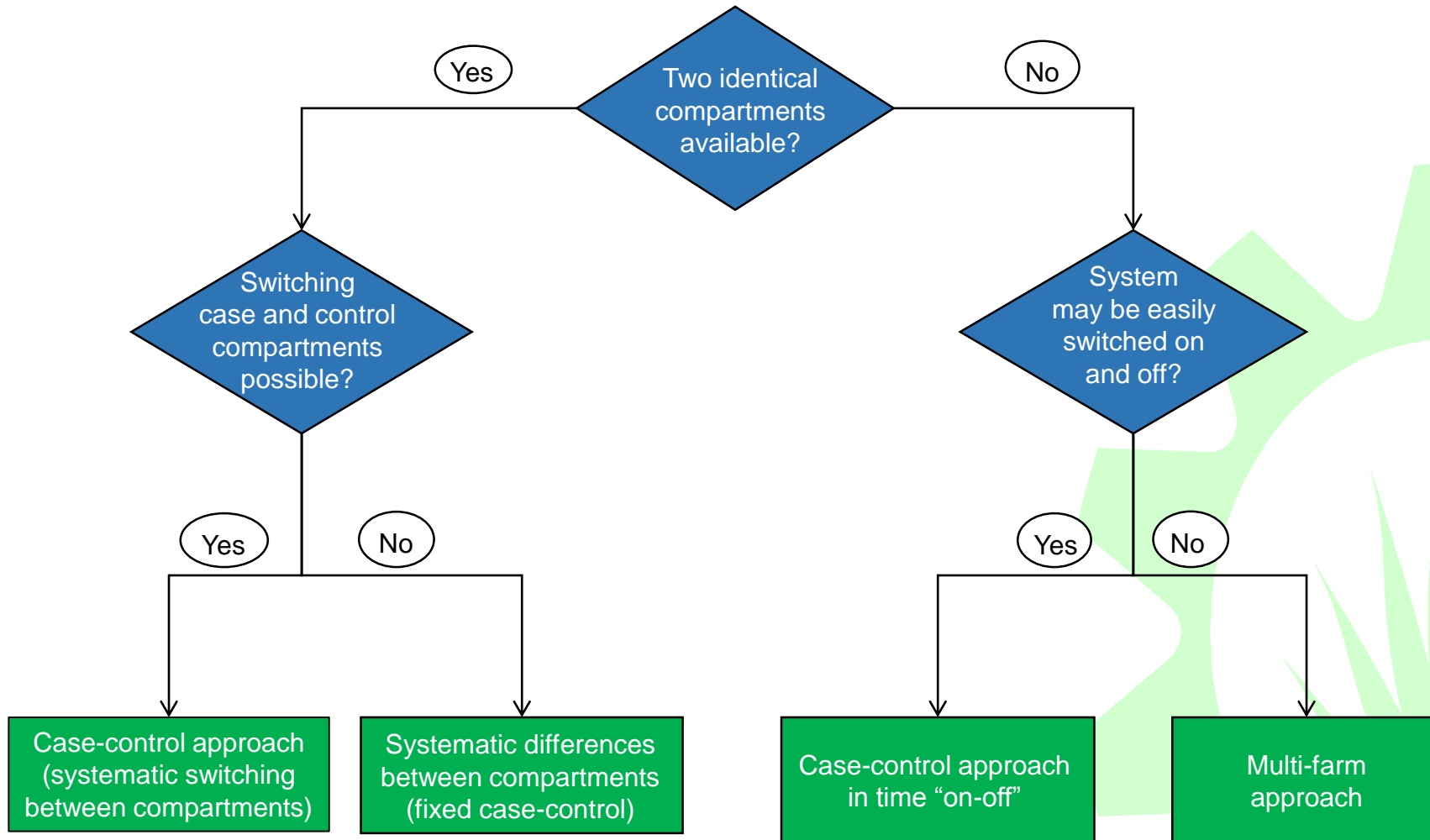
NO national approval!

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

Current VERA Test Protocols



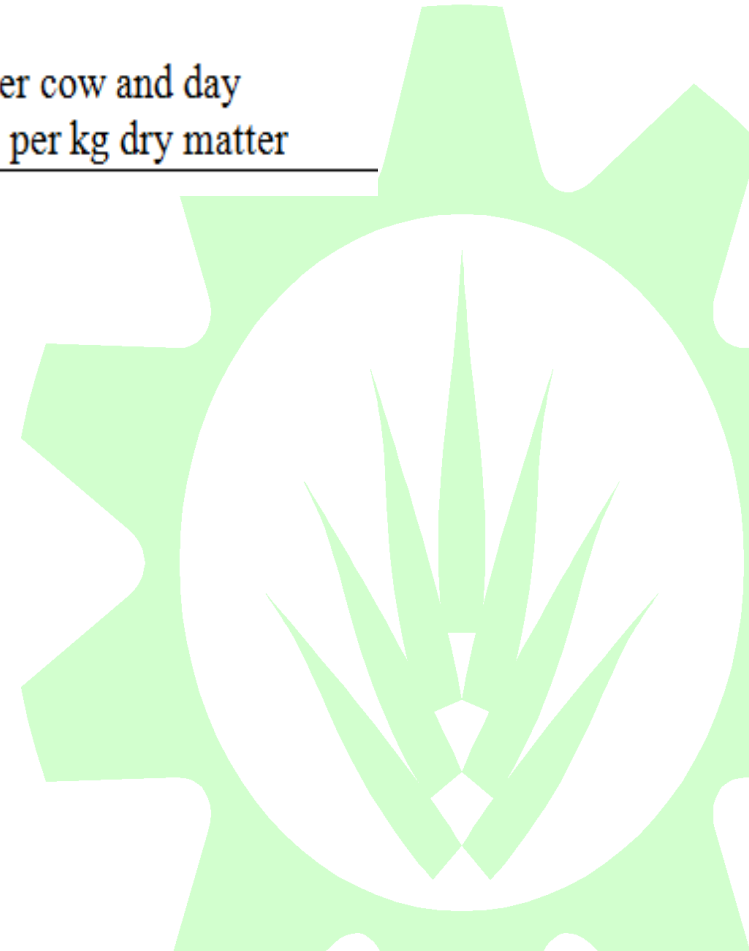
Test design



Agronomic requirements



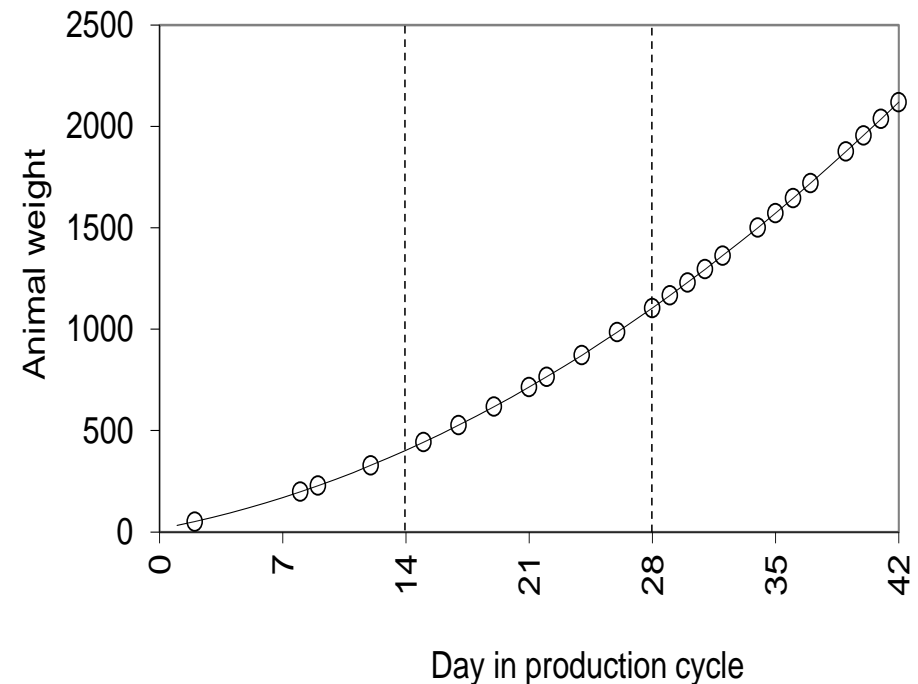
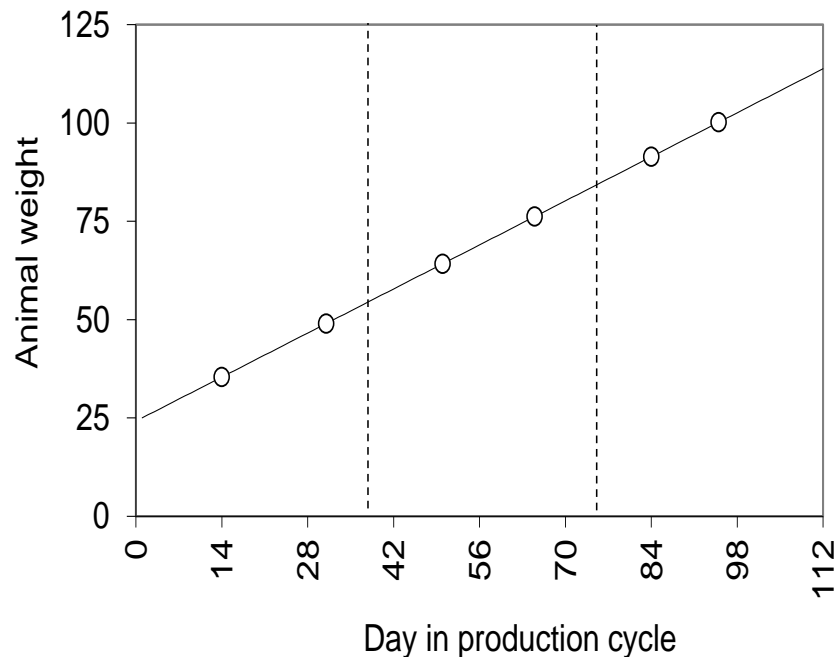
Criterion	Example: Dairy cows
Animal occupation rate	90–100%
Herd composition	>70% of house must be occupied by cows
Housing system in use before test	>2 months
Production level	≥ 25 kg energy corrected milk per cow and day
Feed composition	$\geq 50\%$ roughage, 160–180 g CP per kg dry matter



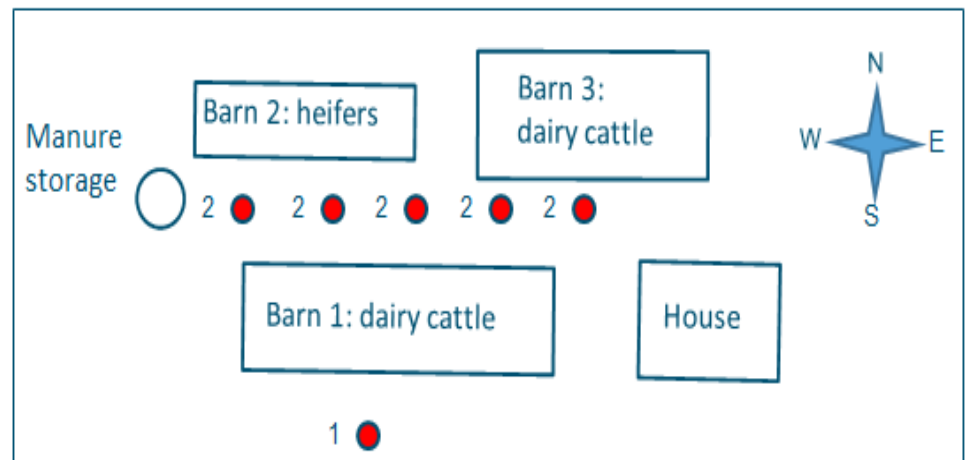
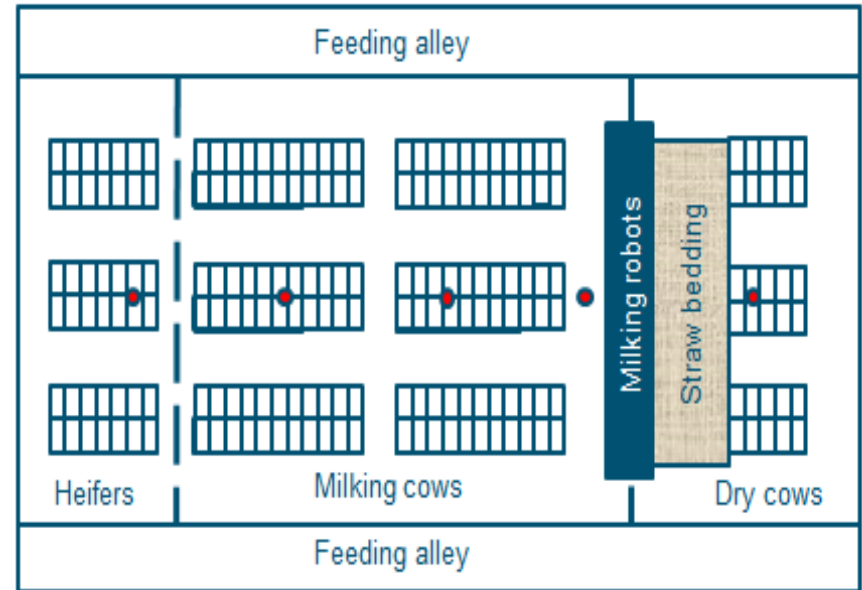
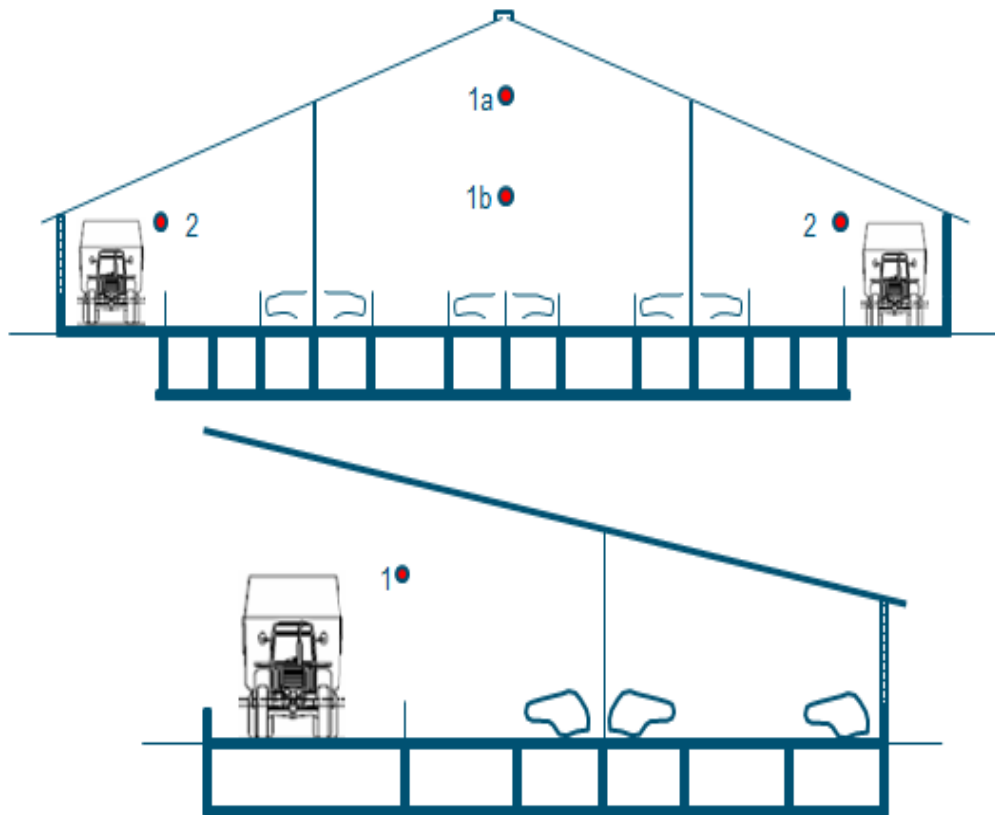
Sampling frequency

Requirements:

- ✓ Per farm location, 6 periods of ≥ 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

- ✓ Plausibility of measurements
- ✓ Statistical tests (outliers)
- ✓ Accordance to agronomic requirements, completeness of data
- ✓ CO₂-tracer gas ratio method: [open Excel calculation tool](#)

“Ring test” plans

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?



Take care of fresh air!

Contact:

**International
VERA Secretariat**
Max-Eyth-Weg 1
D-64823 Gross-Umstadt
+49-69-24788-639
**info@vera-
verification.eu**
www.vera-verification.eu