

Project Newsletter

Winter 2025

Project updates and activities
Meet more partners



Welcome to the 6th newsletter!

The **quantiAGREMI** project has officially ended with final reporting underway. Project deliverables that are public access will be on the project website, as will links to research papers that have been accepted and published in journals.

Philip Dunn

WP4 leader
Philip.dunn@lgcgroup.com

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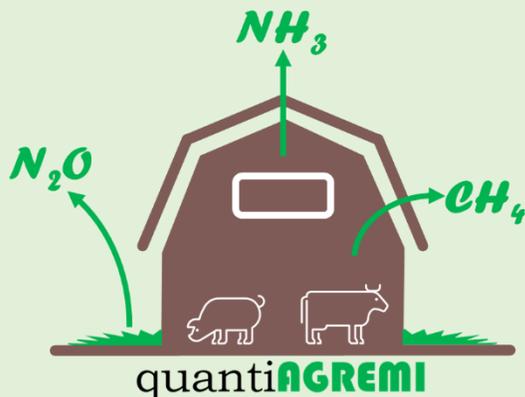
EUROPEAN
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 Co-funded by
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The project has received funding from the European Partnership on Metrology, co-financed from the European Union's Horizon Europe Research and Innovation Programme and by the Participating States.

METROLOGY
PARTNERSHIP





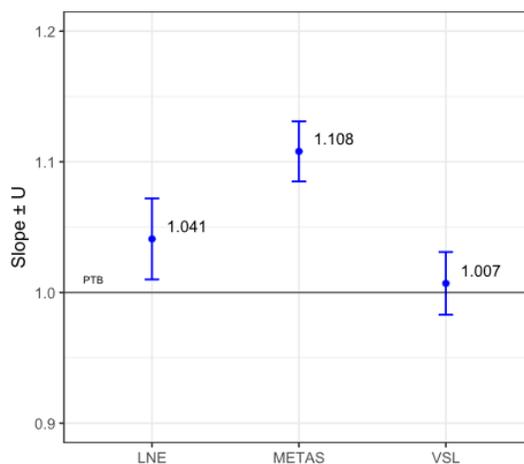
Project updates and activities

Results from comparisons of wet and dry ammonia gas reference mixtures

As part of the **quantiAGREMI** project a comparison of dry and wet NH_3 reference gas mixtures (RGMs) at $nmol \cdot mol^{-1}$ (ppb) levels was performed with four traceability chains:

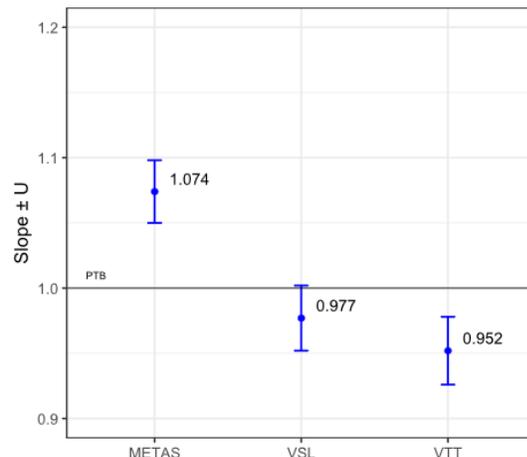
- (1) dynamic dilution of gravimetric gas mixtures,
- (2) dynamic reference gas mixtures generated by the permeation method,
- (3) a laser based spectral method, and
- (4) dynamic reference gas mixtures generated using the evaporation method.

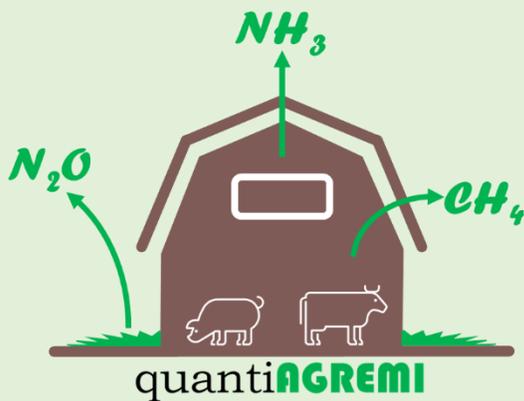
The obtained results showed that, overall, the generators are operating correctly with a good reproducibility (better than 0.8% in dry and wet air) and a good linearity on the measurement range from 0 to 400 $nmol \cdot mol^{-1}$ in dry and wet air. The expanded uncertainties (0.023 to 0.031) on the slope of the regression line between the amount fractions of the generated gas mixtures and spectroscopic measurement results are consistent for all gas generators. However, while the generators agreed pairwise, overall agreement was absent. The sources of this discrepancy are being tracked down by the participating NMIs



Average slopes of PTB spectroscopic measurement results and associated uncertainties determined for the NH_3 generators of METAS, VSL and LNE in **dry** air

Average slopes of PTB spectroscopic measurement results and associated uncertainties determined for the NH_3 generators of METAS, VSL and LNE in **wet** air.





Working towards improved quantification of NH_3 footprint around a livestock building

Following on from a successful **quantiAGREMI** field campaign in Graswang, Germany in 2023 for WP3, a second campaign was conducted in Middenmeer, Netherlands from September to October 2024. **quantiAGREMI** project partners from both WP2 and WP3 (TNO, WUR, UKCEH, TI, VSL, KIT), alongside the National Institute for Public Health and the Environment, Netherlands (RIVM), Healthy Photon Ltd., China and OnePlanet Research., Netherlands joined forces to evaluate methodologies in determining the ammonia (NH_3) emissions (WP2) and deposition footprint (WP3) around a livestock building.

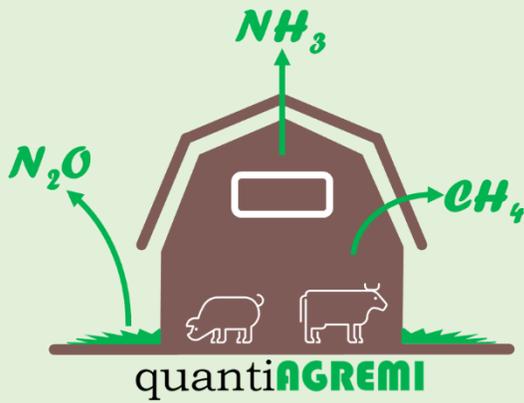
A network of passive UKCEH ALPHA® samplers was set up in the surrounding area to measure NH_3 concentrations, map the footprint around the building and compare in-situ performance with high resolution measurements. Following an open call, OnePlanet joined the campaign and co-located their NitroSense sensors within this network.



Passive samplers
(OnePlanet NitroSense,
UKCEH ALPHA®)

Photo: Karen Yeung

High temporal resolution NH_3 measurements were carried out using a suite of instruments (UKCEH, open-path analyser HT8700, Healthy Photon; TI, UKCEH, with and without passivation QCL systems, Aerodyne; RIVM, miniDOAS and LIDAR) located downwind of the livestock building to measure NH_3 concentrations and test the applicability of flux methodologies.



High resolution equipment set-up. Photo: Karen Yeung

Remote sensing (mobile plume chase) measurements (TNO, HT8700) were taken to quantify emissions to compare to in-house methodologies - long term passive NH_3 concentration measurements taken inside the livestock building.

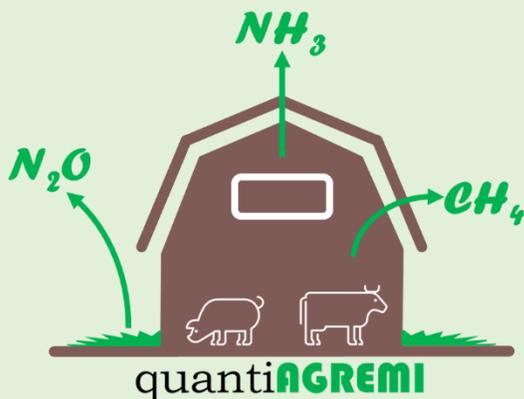
The Healthy Photon and Aerodyne QCL high resolution and plume chase instruments underwent NH_3 calibration testing using a system developed and tested for field application during the **quantiAGREMI** project.



NH_3 calibration system set up. Photo: Karen Yeung

During the study, soil samples were collected from various locations for determination of N isotopic composition in the laboratory. The information will be used to assess if N isotopic composition can be used as a proxy for the spatial extent of the near field N deposition footprint from a livestock building.

This study will provide essential data to improve understanding of the fate of NH_3 and to develop best practice guidelines for quantifying the NH_3 footprint around livestock buildings, as there is currently no standard guidance or approach.



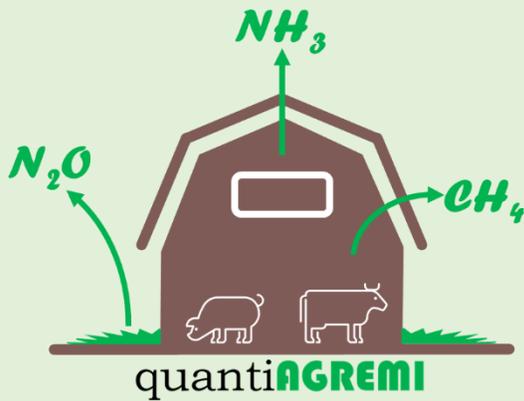
Stakeholder workshop (LNE, Paris, 30th October 2025)

LNE hosted project partners as well as key stakeholders for a workshop to present and discuss the **quantiAGREMI** project results and outcomes. Stakeholders present included

- The French National Institute for Industrial Environment & Risk
- The Bavarian Farmer Association
- The German State Agency for Agriculture
- The Hungarian Meteorological Service
- The Swiss Federal Office for the Environment
- The German Environmental Protection Agency
- The School of Agricultural, Forestry & Food Sciences, Switzerland
- The French Ministry of Environment
- The French Chamber of Agriculture
- Board of Trustees for Technology and Construction in Agriculture, Germany

The workshop began with a brief project overview from consortium leader Paola Fiscaro (LNE) followed by short sessions for each of the technical work packages following the schedule below:

Welcome		
General presentation of QuantiAGREMI		
9:00 (15 min)	Presentation of quantiAGREMI project	Paola Fiscaro
SI-traceable reference methods for estimation of livestock emissions		
Johannes Fritsche		
9:15 (40 min)	PTB's optical gas standard	Gourab Dutta-Banik, PTB
	New halogenated tracer gas as alternative to SF ₆ /SF ₅ CF ₃	Johannes Fritsche, METAS <small>(on behalf of Joachim Mohn, EMPA)</small>
	Mathematical models of gas dispersion from livestock housings: What can be learned?	Stefan Persijn, VSL
	Emission calculation: Comparison of 'CO ₂ balance' and 'Tracer ratio method'	Sabine Schrade, Agroscope
New sensors and measurement techniques		
Mehr Fatima		
9:55 (30 min)	Laboratory testing of new sensors and determination of uncertainty budgets	Gourab Dutta, PTB
	AMON datasheet and performances — currently being marketed by Anemon Sensors	Nathalie Redon, IMTelecom
	Field testing of new sensors	Tuula Pelikka, VTT
Reducing uncertainties of N₂O inventories and improving quantification of NH₃ deposition		
Benjamin Wolf		
10:25 (30 min)	Ammonia measurement techniques intercomparison	Nicholas Cowan, UKCEH
	Ammonia deposition close to livestock housings	Christine Braban, UKCEH
	Effect of N deposition on N ₂ O emissions around livestock housings	Leilee Chojnacki, KIT



Following a short break, there were then three topics for round-table discussion, each taken in turn. Within each topic, several questions were discussed amongst participants:

1 - The future of ammonia measurements in livestock farming

With specific questions including

- What are the current capabilities of measurement devices and are those devices suitable?
 - Are current monitoring methods able to determine the effectiveness of measures to reduce ammonia emissions?
 - Is there consensus on the acceptable levels of uncertainty for ammonia emissions from livestock housings?
 - Is modelling a viable alternative for determining the ammonia emissions from livestock housings?
 - What are farmers' expectations and concerns regarding ammonia monitoring in farm housings?
- 2 - Legal / industry requirements for ammonia emission and exposure in livestock farming in Europe
- Which legal requirements regarding ammonia emission, animal health, and deposition are currently in place?
 - Are any indoor ammonia exposure limits or critical levels applicable to livestock housings?
 - Which legal requirements applicable to ammonia in livestock farming are to be expected in the EU?
 - What would be the motivation for farmers to consider ammonia monitoring? Is ammonia reduction relevant for any food label?
 - Which standardization efforts are currently being pursued?
- 3 - Co-design of future research projects
- How could the interested, ultimately affected parties be involved? What are the communication channels for someone applying for a research project to involve stakeholders?
 - What are farmers expectations towards research projects?
 - How could input from stakeholders, especially farmers, companies, and authorities be considered?
 - How can research results be made available to stakeholders? Who summarizes the relevant literature and based on this recommends a specific measure (regarding effectiveness, but also practicability)?



Project participants at LNE for the final project meeting and stakeholder workshop