COST LivAGE, project WG 1 meeting

Mélynda Hassouna, Sabine Schrade

All WP1 partcipants

Aims of WP1
Monitoring indoor climate and gaseous emissions from animal production buildings

Objectives: Definition of guidelines/standards on experimental protocols/ sensors used to assess environmental and air quality for different animal production buildings; data analysis; development of emission factors

Contents WG1 meeting

* Overview and aims WG1 (Mélynda)
* Presentations (all)
* Summary tables (Sabine)
* Open questions and discussion (all)
* Working plan (all):
  Activities and output 1st year, following years
* STSM positions/possibilities (all)
* Informations: Conferences etc. (all)
* Preparing presentations Friday (all, Mélynda, Sabine)

Content of the presentations

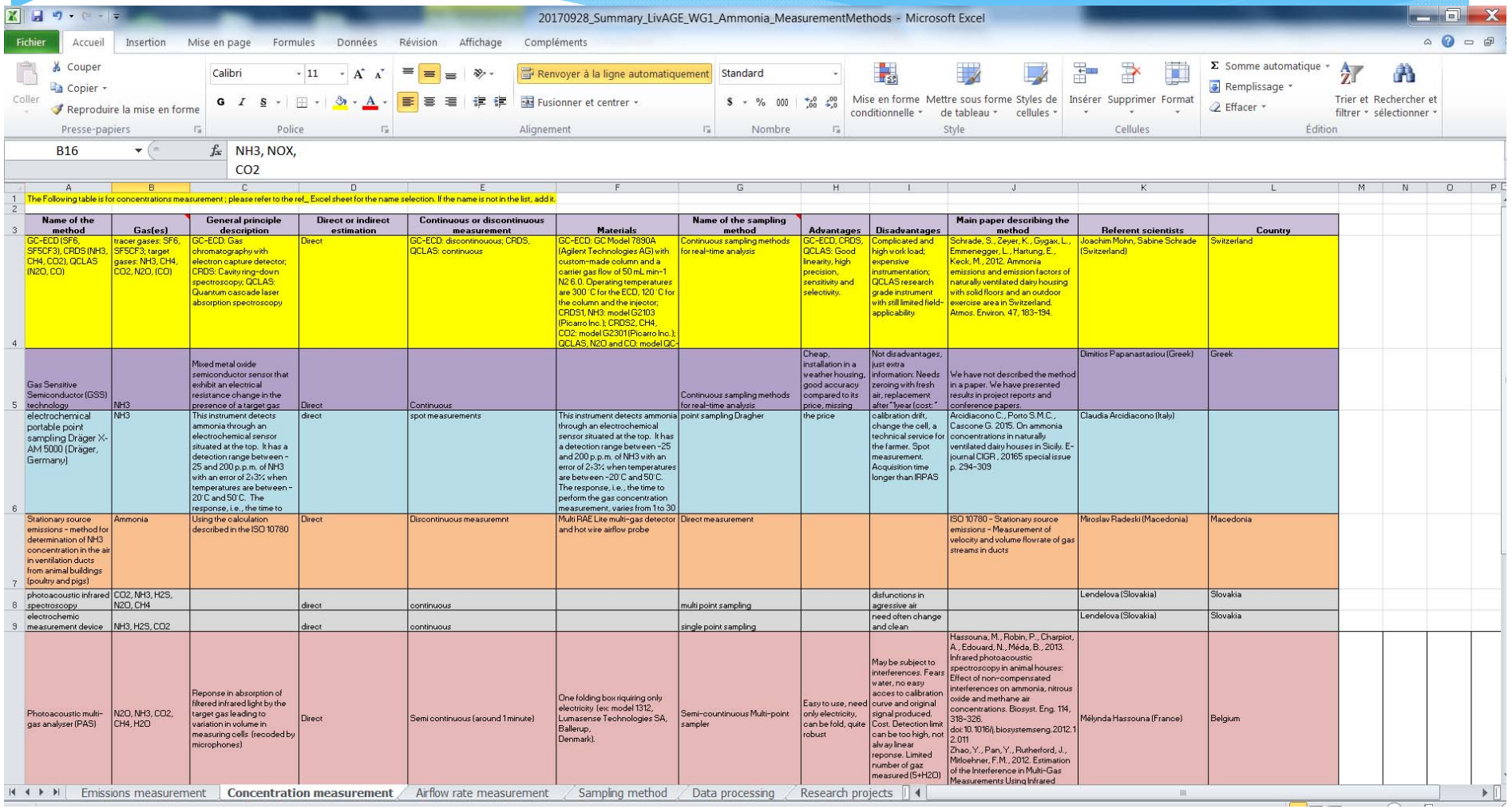
* Research activities
* National contacts concerning WP1
* International contacts concerning WP1
* Relevant topics/questions

We will send PDF to all

Questions/Topics

* Merging Animal Welfare assessment with the ELVs from farms
* Unified approach in measuring emissions
* How to share existing protocols ? Guidelines/standards
* How to validate the measurement methods?
* How to certify the measurements?
* Information about determining the airflow emission using a tracer gas(es), experiences with using of Drager gas detection
* New methods for measuring emissions
* How to calculate EF ?
* Inter-comparison measurements

Inventory of the used methods and on the going-on projects



20170928_Summary_LivAGE_WG1_Ammonia_MeasurementMethods - Microsoft Excel

B16: NH3, NOX, CO2

The Following table is for concentrations measurement ; please refer to the ref_ Excel sheet for the name selection. If the name is not in the list, add it.

Name of the method	Gas(es)	General principle description	Direct or indirect estimation	Continuous or discontinuous measurement	Materials	Name of the sampling method	Advantages	Disadvantages	Main paper describing the method	Referent scientists	Country
GC-ECD (SF6, SF5CF3), CRDS (NH3, CH4, CO2), QCLAS (N2O, CO)	tracer gases: SF6, SF5CF3; target gases: NH3, CH4, CO2, N2O, (CO)	GC-ECD: Gas chromatography with electron capture detector; CRDS: Cavity ring-down spectroscopy; QCLAS: Quantum cascade laser absorption spectroscopy	Direct	GC-ECD: discontinuous; CRDS, QCLAS: continuous	GC-ECD: GC Model 7890A (Agilent Technologies AG) with custom-made column and a carrier gas flow of 50 mL min−1 N2 6.0. Operating temperatures are 300 °C for the ECD, 120 °C for the column and the injector; CRDS1, NH3: model G2103 (Picarro Inc.); CRDS2, CH4, CO2: model G2301(Picarro Inc.); QCLAS, N2O and CO: model QC-	Continuous sampling methods for real-time analysis	GC-ECD, CRDS, QCLAS: Good linearity, high precision, sensitivity and selectivity.	Complicated and high work load; expensive instrumentation; QCLAS research grade instrument with still limited field-applicability	Schrade, S., Zeyer, K., Gygax, L., Emmenegger, L., Hartung, E., Keck, M., 2012. Ammonia emissions and emission factors of naturally ventilated dairy housing with solid floors and an outdoor exercise area in Switzerland. Atmos. Environ. 47, 183–194.	Joachim Mohn, Sabine Schrade (Switzerland)	Switzerland
Gas Sensitive Semiconductor (GSS) technology	NH3	Mixed metal oxide semiconductor sensor that exhibit an electrical resistance change in the presence of a target gas	Direct	Continuous		Continuous sampling methods for real-time analysis	Cheap, installation in a weather housing, good accuracy compared to its price, missing	Not disadvantages; just extra information: Needs zeroing with fresh air, replacement after "1year (cost:"	We have not described the method in a paper. We have presented results in project reports and conference papers.	Dimitios Papanastasiou (Greek)	Greek
electrochemical portable point sampling Dräger X-AM 5000 (Dräger, Germany)	NH3	This instrument detects ammonia through an electrochemical sensor situated at the top. It has a detection range between ~25 and 200 p.p.m. of NH3 with an error of 2÷3% when temperatures are between ~20°C and 50°C. The response, i.e., the time to	direct	spot measurements	This instrument detects ammonia through an electrochemical sensor situated at the top. It has a detection range between ~25 and 200 p.p.m. of NH3 with an error of 2÷3% when temperatures are between ~20°C and 50°C. The response, i.e., the time to perform the gas concentration measurement, varies from 1 to 30	point sampling Dragher	the price	calibration drift, change the cell, a technical service for the farmer. Spot measurement. Acquisition time longer than IRPAS	Arcidiacono C., Porto S.M.C., Cascone G. 2015. On ammonia concentrations in naturally ventilated dairy houses in Sicily. E-journal CIGR , 20165 special issue p. 294-309	Claudia Arcidiacono (Italy)	
Stationary source emissions – method for determination of NH3 concentration in the air in ventilation ducts from animal buildings (poultry and pigs)	Ammonia	Using the calculation described in the ISO 10780	Direct	Discontinuous measuremnt	Multi RAE Lite multi-gas detector and hot wire airflow probe	Direct measurement			ISO 10780 – Stationary source emissions – Measurement of velocity and volume flowrate of gas streams in ducts	Miroslav Radeski (Macedonia)	Macedonia
photoacoustic infrared spectroscopy	CO2, NH3, H2S, N2O, CH4		direct	continuous		multi point sampling		disfunctions in agressive air		Lendelova (Slovakia)	Slovakia
electrochemio measurement device	NH3, H2S, CO2		direct	continuous		single point sampling		need often change and clean		Lendelova (Slovakia)	Slovakia
Photoacoustic multi-gas analyser (PAS)	N2O, NH3, CO2, CH4, H2O	Reponse in absorption of filtered infrared light by the target gas leading to variation in volume in measuring cells (recoded by microphones)	Direct	Semi continuous (around 1 minute)	One folding box riquiring only electricity (ex: model 1312, Lumasense Technologies SA, Ballerup, Denmark).	Semi-countinuous Multi-point sampler	Easy to use, need only electricity, can be fold, quite robust	May be subject to interferences. Fears water, no easy acces to calibration curve and original signal produced. Cost. Detection limit can be too high; not alway linear reponse. Limited number of gaz measured (S+H2O)	Hassouna, M., Robin, P., Charpiot, A., Edouard, N., Méda, B., 2013. Infrared photoacoustic spectroscopy in animal houses: Effect of non-compensated interferences on ammonia, nitrous oxide and methane air concentrations. Biosyst. Eng. 114, 318–326. doi:10.1016/j.biosystemseng.2012.12.011 Zhao, Y., Pan, Y., Rutherford, J., Mkloehner, F.M., 2012. Estimation of the Interference in Multi-Gas Measurements Using Infrared	Mélynda Hassouna (France)	Belgium

Sheet tabs: Emissions measurement | Concentration measurement | Airflow rate measurement | Sampling method | Data processing | Research projects

Topics and aspects

Mechanical ventilation
Natural ventilation

Different gases:
NH3, GHGs…

Housing
Outdoor exercise area
Storage?
Pasture?

Full scale
Partial area
Pilot plant scale
Respiration chamber

How to measure to have the correct level of accuracy in function of the situation/ the aim?
Sampling points, emission factor calculation, analytics, validation, management, accompanying parameters…

Cattle / Dairy cows
Pigs
Poultry
Small ruminants
Other animals e.g. rabbits

Emission factor
Mitigation/abatement technique
Feeding strategy
Monitoring/controlling

Modelling

Different climatic situations

Aims and output
For the 1st year

➔ Exchange measurement experience
(analytics, concept, installations in practice…)

➔ To know each other's activities

* Complete the table with information from other COST action participants
* Put relevant information from this inventory on the website
* Identify experts for some methods in order to share expertise, organize a training period for students/STSM
* Identify methods that could be of interest for a training school/workshop (next year?)
* Share existing protocols, reports, references within COST action members

Ideas for the next 3 years

* Training school and workshop
* Inter-laboratories comparisons
* The decision tree
* Analysis of existing data for uncertainty analysis

STSM topics ?

Interesting conferences

EurAgEng Conference:
8 – 10 of July 2018, Wageningen University, NL

https://ageng2018.com/

22-26/Apr/2018 The XIX CIGR World Congress 2018, Kyrenia, Northern Cyprus

Others?