

STSM Report

Improving the estimation of methane emissions and mitigation potentials

General info:

Grantee: Dr M. Eugène. Dr EUGENE

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Home institution: INRA mixed research unit on herbivore (UMRH-Vetagro Sup), France

Host institution: Institute Biological, Environmental and Rural Sciences, Aberystwyth University in UK

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STSM goal: Improving the quantification of GHG mitigation potentials.

Brief recap of the project description (described in the STSM-report of Eli Saetnan – previous STSM grantee within METHAGENE that started the collaboration)

The body of peer-reviewed papers on enteric methane mitigation strategies in ruminants is rapidly growing and allows for better estimation of the true effect of each strategy through the use of meta-analysis methods. However, the great diversity in methane measurement techniques makes meta-analysis of published results challenging. There is therefore a need to find strategies to harmonise these measurements across studies and across animal and production systems in order to better understand the potential effectiveness of different mitigation options. The collection of data on methane, feed nutrient and animal production is requested in order to evaluate the relationship between methane and mitigating strategies, as well as the effect of moderators (e.g.: level of intake, nature or type of the basal diet etc.) on the previous relationship.

At Aberystwyth University, we have recently developed the MitiGate on-line database (<http://mitigate.ibers.aber.ac.uk/>) as a tool for quantitative estimation of mitigation potentials under varying animal production systems. Colleagues at INRA UMRH have been working on similar issues, using different meta-analysis approaches. The focus of the METHAGENE network includes harmonisation and improvements of protocols for future collection of data on methane emissions in ruminants, sharing of the data and is particularly relevant for the accurate quantification of methane mitigation potentials. In particular, the METHAGENE COST action aims to discuss and agree on 1) protocols to harmonise large-scale methane measurements using different techniques; 2) easy to record and inexpensive proxies for methane emissions to be used for genetic evaluations; and 3) approaches for incorporating methane emissions into national breeding strategies. An important aspect of this work will be to merge data from very different techniques and measurement strategies, develop systems for database management and strategies for data analysis. The proposed STSM has addressed these issues with particular focus on the measurement and quantification of methane mitigation strategies.

The aims of this STSM project are to

1. expand the available data by merging our existing databases
2. improve methods for evaluation of mitigation potentials to include aspects of productivity
3. address challenges of scaling up studies from animal to farm scale
4. develop methods for quantification of uncertainties at different scales.

Progress made in January 2015

The partner Dr. Maguy Eugène, based at INRA Theix in France, visited Aberystwyth for one week from Sunday 11th to Sunday 18th January 2015. During this exchange, we discussed 2 topics in particular:

1. Create a joint database for model comparison, in order to explore the methodological differences between meta-analyses developed at Aberystwyth and at INRA.

The contents of the available databases at the two institutes were merged with complementary information on available published data as the primary input. We manually brought the two databases together, to form a new and much more complete database for our model comparison exercise and for future meta-analysis efforts. A glossary was prepared with agreed common vocabulary and descriptions of the content and unit used for each variable in the database. The two methodological approaches were discussed once more and detailed procedures will be applied following Sauviant and St Pierre (Meta-analyses of experimental data in animal nutrition, 2008 *Animal*), St Pierre et al (Journal of Dairy Science, 2001), Guyader et al (*Animal*, 2014).

2. The web server of Mitigate: How can people access this webpage? What data is available and how can they retrieve information? What about the advertisement in Animal Change website?

We discussed with Dr. Amanda Clare (Department of Computer Sciences, Aberystwyth University) and Dr. Martin Vickers (Institute Biological, Environmental and Rural Sciences, Aberystwyth University) about access to the Mitigate web interface. A consortium agreement will be written concerning the exchange of non-published in the development of the on-line database, where we will agree on the accessibility of data for the shared database between our two institutions. Once the database is established, meta-analysis results will be made available to a wider audience through the web-interface. A web interface has been developed (Linux, R free software) by Aberystwyth to fill in the dataset with new data, and an approval process will be developed to validate (by some kind of webmaster) the quality of the data provided.

We also proposed a working plan for the next steps, with the help of students working on:

- a) The completion and updating of the database: to finish filling up the gaps (production data) of the common dataset and to standardize inputs according to the agreed glossary across the existing data
- b) The computational aspect of the database (scripts and on-line stakeholder tool).

- c) Joint publication on meta-analysis of methane mitigation potential and production implications of a range of methane mitigation strategies in dairy and meat production systems
- d) We will also address the accessibility for other partners for developing new projects. Eli Saetnan will also ask about the advertisement made in the project Animal Change.

Agenda for next phase – January to May 2015

Further progress in the project will be maintained through video conferences (e.g. skype) over the coming months. In particular, discussions will focus on:

1. Methods of uncertainty analysis: The intention is to develop a method which conforms to the recommendations set out by the IPCC (using Monte Carlo approaches for instance).
2. Identification of stakeholders for the web-tool: This discussion will be used to inform the development of the on-line stakeholder tool and the visual illustration of meta-analysis and uncertainty analysis outcomes.