

Scientific Report STSM

Detection of methane emissions from cattle by respiration chamber method

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1. General information

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Home institution: Austrian Research and Education Center Raumberg-Gumpenstein, Austria

Host institution: Leibniz Institute for Farm Animal Biology Dummerstorf, Germany

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2. Purpose of the STSM

Like many other industrialized countries, Austria has to find opportunities to lower greenhouse gas emissions. Agriculture should also contribute to the reduction of greenhouse gas emissions. One main interest is to find strategies to lower methane emissions from ruminants. Thus AREC Raumberg-Gumpenstein is just installing two respiration chambers to predict methane emissions from cattle. The purpose of this STSM was to get information and advices from experts at FBN Dummerstorf, who have already operated respiration chambers for many years.

3. Activities during the STSM

During my stay at FBN Dummerstorf I collaborated in respiration measurements. Feeding cows, taking samples from faeces and urine, cleaning the chambers as well as operation and control of the facility were some of the tasks I carried out. Additionally Dr. Derno, the head operator of the respiration facility in Dummerstorf, explained a lot of details concerning the design and function of the chambers. Especially important for me was to get an overview of the function of the airflow system and the detection and analysis of data, because there are a lot of things which have to be considered during operation to get reliable data.

4. Results of the STSM

I learned a lot of things concerning the whole process of respiration measurements from the customization of the animals to the chambers till the analysis of the data. It's important that animals are accustomed to the chamber to prevent nervousness, which would lead to incorrect data. Before the start of respiration measurements the function of all analyzers and the tightness of the chambers have to be tested. Also during measurements the function of the chambers has to be controlled from time to time so that possible errors in the system can be eliminated as fast as possible.

This STSM enabled me to understand the whole process of recording and analysis of data. Before measurements can start, it is necessary to calibrate the chambers as well as the gas analyzers. As a requirement for comparability of data, the gas volume measured by the air flow meter has to be corrected to standard temperature, air pressure and humidity. Only if these calibrations and corrections are considered, reliable predictions of methane emissions but also of heat production of animals are possible. Finally I also analyzed data of one respiration measurement. During this analysis I recognized which parameters are important to evaluate emissions of greenhouse gases and heat production of animals.

5. Future activities

Back at AREC Raumberg-Gumpenstein I am ready to plan our own respiration measurements in collaboration with my colleagues. The aim is not to copy the system at STSM Dummerstorf but to use the experiences and advices I got there to create our own respiration chambers and our own methods and programs to measure methane emissions and heat production of cattle. We expect that we can start respiration measurements in spring 2016.

If our respiration facility works, we will start an experiment on the impact of various cattle production systems (differing in genotype of the animals and feeding strategies) on methane emissions. We also want to find possibilities for further development of the respiration chamber method. Thus it is very important for us to collaborate with FBN Dummerstorf, but also with other institutions using the respiration chamber technology, in future. Professional exchange on the construction and function of such systems, which are built very rarely, could have great benefits for both sides following the slogan: "Only together we are strong".

This STSM will not directly lead to scientific articles, but it is the precondition for an effective operation of our respiration facility. That means that the results of my stay at FBN Dummerstorf will have an effect on every experiment we will perform in our respiration chambers. Many articles and publications will be published, which will be related to my STSM. These publications and also information about further developments of the respiration chamber technology will be shared within the METHAGENE network. Thus METHAGENE network will benefit from our respiration measurements and from the experience I got during my STSM at FBN Dummerstorf.

6. Acknowledgements

Finally I want to thank Dr. Kuhla, Dr. Derno and all people at FBN Dummerstorf I worked with, because they were very friendly and helpful, so that I could learn a lot from them. Further I am very grateful for the support by METHAGENE COST action that enabled me this stay at FBN Dummerstorf.

7. Confirmation by the host institution

For the conformation by the host institution, please see the pdf-document "Confirmation by the host institution" that is attached to the e-mail.