

STSM report: Training in use of GreenFeed

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STSM dates: 13-10-2014 to 18-10-2014

Purpose of the STSM

Agroscope ILS is about to acquire the GreenFeed[®] system (C-Lock, Inc. Rapid City, USA) for field/barn measurements of CH₄ and CO₂ release from unconstrained cattle. In order to profit from experience collected at an institution already using the system, and potentially also promoting the use of common application and data evaluation procedures, this STSM was proposed and kindly accepted by the Institute of Nutritional Physiology 'Oskar Kellner' at the Leibniz Institute for Farm Animal Biology in Dummerstorf. The objective was to learn about - possibly assisting in ongoing experiments - and discuss the handling of the equipment, data collection, validation, analysis and interpretation.

The GreenFeed System

GreenFeed can, in a simplified way, be characterized as a nonintrusive (free choice by the animal, as compared to chamber respiration) system to quantitatively, episodically measure respiration gas release in unconstrained cattle. It consists of an automatic concentrate feeder equipped with a ventilation system that quantitatively aspirates the mix of respiration and surrounding air from the muzzle of the animal while it eats its feed. The ventilated air quantity is determined with a mass flow meter, then sampled and analyzed for CH₄ and CO₂ using Non Dispersive Infrared Sensors. The gas analysers are calibrated manually or automatically in regular intervals with zero and span gases; gas flow measurement integrity is cross-checked using a tracer gas (propane); CO₂ recovery of the whole system is checked regularly using an artificial source.

A visit of an animal to the feeder should last about 3 to 4 minutes for a valid calculation of gas release to be possible. The resolution of the measurement allows rumen gas burps to be detected, which is an important feature of data validation. Between visits, background gas concentrations are measured. A number of data validation procedures are used to process the data and integrate the episodic data to 24 hour estimations of CH₄ and CO₂ release.

The system is designed to be used in-barn or as a mobile feeder on pasture, even with an option of running on solar power. It has built-in computing power and data storage capacity and can be interfaced by wireless or mobile phone.

Activities during the STSM

It happened that the GreenFeed system at Dummerstorf was out of service at the beginning of the STSM because of a technical failure. A planned experiment comparing GreenFeed measurements with respiration chamber trial data determined on the same animals (dairy cows) under the same experimental treatments at different time points in lactation had not yet started. Therefore no actual data could be collected and compared. On the other hand,

the fresh start-up of the system after some time of no use allowed observation of the initial visiting behaviour of the cows to the feeder. Although not pretending to be sufficiently systematic and comprehensive to allow clear conclusions, this highlighted one crucial point of correct operation of the GreenFeed system which is its dependence on regular and sufficiently frequent visits by the animals. Without special training or attracting used, very few cows visited the feeder straight away during the first two days. This emphasizes the importance of finding the right "baiting" feed (in terms of quality and quantity) without interfering too much with the basic or experimental ration.

As respiration chamber measurements remain the reference of choice to compare against for the GreenFeed system too, a comprehensive introduction into chamber respiration measurements at Dummerstorf was greatly appreciated by the STSM trainee. The experience with and knowledge about respiration measurement at this Institute and its staff as well as the quality of the equipment and procedures is overwhelming. Dr. Michael Derno has to be mentioned especially and thanked for his valuable advice and the interesting discussions.

A mutual interest to continue the exchange once the GreenFeed system is running at Agroscope was expressed.

Confirmation by the host institution of the successful execution of the STSM

(See letter attached)



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Letter of confirmation

To whom it may concern

We hereby confirm that Dr Andreas Münger has performed a Short-term Scientific Mission (STSM) in framework of the COST action 'Methagene' (FA1302). He successfully executed his Mission on methane measurement by Greenfeed technology from October 13th – 17th 2014 at the Institute of Nutritional Physiology 'Oskar Kellner' at the Leibniz Institute for Farm Animal Biology.

We are looking forward for future collaboration with Dr Münger and Agroscope.

Yours sincerely

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