Short Term Scientific Mission – COST Action FA1302 – METHAGENE
Large-scale methane measurements on individual ruminants for genetic evaluation.

Friday March 18, 2016 – Thursday March 24, 2016
Swedish University of Agricultural Sciences (SLU), Department of Agricultural Research for
Northern Sweden, Umeå

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Getting more acquainted with the GreenFeed system

Introduction
The aim of my PhD-project is to test different (feeding) strategies with the aim of reducing the
methane emissions of dairy cattle. One technique we use for measuring the methane emissions
of cattle are individual open circuit chambers. In addition to these chambers we use two
GreenFeed units. These automated concentrate feeders were installed in the free stall barn of
ILVO in January 2015 and they register the CH_4 and CO_2 emissions when the cattle visit this
feeder. As we want to translate scientific research output into practice, the GreenFeed system is
a very promising technique to assess the cattle emissions in field conditions. We are currently
comparing both techniques (open circuit chambers and GreenFeed) present and used at ILVO,
but still a lot can be learned in this regard.

Purpose of the STSM
In Umeå they have a lot of experience and expertise in measuring methane emissions with the
GreenFeed system. By doing this STSM we could gain insights in the methane measuring trials
carried out by Mohammad Ramin and his colleagues in Umeå and in their way of processing the
large amounts of data that are typically generated with this kind of high throughput systems.

As the liaison between the host and home institution is rather new, visiting the research facilities
in Sweden will facilitate collaboration in both directions and strengthen networks of similar
research groups in Europe.

Work carried out
Currently an experiment is running in the barn (SLU Röbäcksdalen) to test the effect of an
industrial by-product on the methane emissions and the milk production of their Swedish Red
dairy cattle. The cattle is housed in a loose house barn with fully automated feed delivery (TMR)
and individual registration of the feed intake. Methane emissions are measured with a GreenFeed
system in the barn.

The experiment is a switch-over design with 3 periods of 21 days and two groups of 12 cows
(control and treatment). The last 7 days of each period is the registration week in which milk
samples, fecal samples and feed samples are taken. Also only the dry matter intake (DMI) and
methane emissions of these days are taken into account.

The practical work that has been conducted is on the one hand related to follow-up of the
automated feed delivery system and on the other hand related to the follow-up of the
GreenFeed system.

Weekly on Monday feed samples need to be taken to determine the dry matter (DM) content of the different feed stuffs because the total mixed ration (TMR) that is made relies on the DM content of the constituents. Samples of approximately 500g are taken in duplicate and are placed in the oven at 60°C. On Wednesday the remaining weight of the samples is determined and the DM content is calculated. When there are changes in DM, the new values are entered in the system. **I helped both on Monday and on Wednesday.**

Besides the determination of DM in order to get the desired TMR (treatment and control), monitoring of the making of the TMR is appropriate on a regular base. During a trial it is of major importance that the component to be tested is delivered in the amount asked by the researcher, as it is of major importance that the counterpart in the control TMR is also delivered in the right proportion to have an iso-energetic and iso-nitrous control diet. **The monitoring of the making of both TMR mixtures was conducted on Wednesday.**

The feed delivery is divided over 5 to 7 meals per day. The cribs should be regularly monitored too in order to be sure an *ad libitum* feed intake can be ensured on the one hand and on the other hand the cribs may not be filled with too large quantity of feed to avoid fermentation and spoilage. On Wednesday the feed cribs were too full and needed to be emptied before the next fresh meal was delivered. **I helped with emptying the cribs and also with cleaning underneath the cribs** in order to avoid spoiled feed that could interfere with the weighing cells of the cribs.

GreenFeed system

The GreenFeed unit needs regular cleaning, calibration and refreshing of the air filter. Calibration is typically carried out at day 11, 16 and 21 of each experimental period, a CO_2 recovery test is done at day 16 and cleaning needs to be done weekly. Refreshing of the air filter is necessary as soon as the air flow in the system becomes too low, regular monitoring of this air flow via the online GreenFeed interface is thus required. **On Monday a first time the air filter was changed and cleaned and the manifold was quickly cleaned with a moist towel. On Thursday the air filter was changed and cleaned again and the manifold was more thoroughly cleaned by rinsing with warm water.**

In theory the first calibration of this period only needed to be carried out on March 27, 2016, but it was performed three days earlier now on Thursday March 24, 2016. **I performed some of the calibration steps myself and we checked the resulting values afterwards online.**
The CO_2 recovery test was done one day earlier, way ahead on schedule, but it needed to be shown. **I helped with performing this recovery test too and also these values were verified online.**

Of major importance in order to get reliable data are the cow visits to the GreenFeed. In Belgium this can be a major issue sometimes, but with the advice from Mohammad Ramin we hope to obtain better visit data. Adjustments were already made during the stay in Sweden and it seems this is already better now.

Because I am already familiar with the web interface of GreenFeed, I monitored the GreenFeed units in Belgium rather than those in Sweden, but regular discussion moments took place with regard to the data we obtain in Belgium.

Results
The days I was in Umeå, were non-registration days, in this way there are no relevant scientific data or results obtained.

With regard to the trials in Belgium, we gained new insights in conducting calibrations and CO_2 recovery tests and learned more about the way good visit data can be achieved. Also the way of processing the data is now clearer for us. Data from Belgium were processed during the visit in Sweden and were confirmed by Mohammad Ramin to be good data. It was suggested to make a three day rolling average data for methane and CO_2.

Benefits for the COST Action-network
The experience built up in Umeå will help to generate good and reliable methane data with the GreenFeed units in Belgium. All gathered information can be of interest for the COST Action.

Future collaboration
There is certainly interest in future collaboration between host and home institution with regard to methane data obtained with the GreenFeed system in Belgium and Sweden.

Foreseen publications
- Not applicable -

Confirmation by the host institution of the successful execution of the STSM
We hereby confirm that Dorien Van Wesemael gained additional knowledge regarding conducting research experiments and working with the GreenFeed method to measure CH_4 and CO_2 from dairy cows.

Mohammad Ramin