

Minutes, Thursday, June 25<sup>th</sup>, 2015

Reading UK

Network on Feed and Nutrition in Relation to GHG emissions (FNN)

Chair: Dr. Alex Hristov

**Introductions; research updates by country representatives or FNN members**

**1. Argentina**

Methane mitigation research: tannins supplementation

**2. Chile**

Methane mitigation research: tannins and algae supplementation

**3. Denmark**

Methane mitigation research: modeling and nitrate supplementation

**4. Finland**

Area of methane mitigation research: genetics and rumen microbes

**5. Germany - absent**

**6. New Zealand**

Area of methane mitigation research: most studies are done using sheep; palm kernel expeller, different forages, vaccines and inhibitors

**7. Norway – absent**

**8. Poland**

Area of methane mitigation research: saponins supplementation

**9. Sweden**

Area of methane mitigation research: development of empirical linear models, non-linear models, dynamic mechanistic modeling

**10. UK**

Area of methane mitigation research: a method to estimate methane emissions on-farm (Garnsworth method) and feed efficiency

**11. U.S.**

Area of methane mitigation research: novel compounds and simulation models

**Research presentations:**

**1. Belgium: Methane mitigation research in Belgium**

Presenter: Dehareng

The focus of methane mitigation research by the Belgium group are: summer and winter feeding strategies, the use of grassland as a potential carbon sink, early life programming, and Exergetic Life Cycle Assessment (ELCA).

**2. Colombia: Research updates: feeding and nutritional strategies to improve productivity of beef and dual-purpose cattle in Colombia**

Presenter: Flores

The presentation focused on problems faced by Colombian farmers, such as: pasture degradation (50% of the grassland area), changes in climate due to El Niño and La Niña, low stocking rates and a dry season during winter. The strategies proposed to improve animal productivity were: forage consortium (grasses/legumes), sweet sorghum with high productivity and more resistant to drought, supplementation programs during the dry season, integration systems to increase stocking rates and ADG (tree-crop-grass-livestock).

### **3. France: Focus in INRA ongoing research programs and methodologies related to FNN**

Presented: Eugene/Martin

INRA has 3 core objectives: 1) to understand the metabolic pathways and rumen microbial environment involved on enteric methane production (build basic knowledge), 2) quantify emissions and 3) predict methane emissions by the identification and validation of biomarkers. Some of the ongoing research projects at INRA are: the validation of a laser methane detector (LMD), to evaluate the additive effect of nitrate and fat supplementation, and investigate metabolites related to enteric methane emissions (metabolites in urine, plasma, and milk).

### **4. India: Effect of climate change on livestock production in India**

Presenter: Bhatta

India has 70 million dairy farms and agriculture represents 29.5% of the country GDP. The focus of the Indian methane research are on the effects of stress (feeding, heat and walking stresses) on productivity and methane emissions, and on the study of different types of forages and the effects of these plants on methane production in vitro.

### **5. Netherlands: An overview of current Dutch enteric methane research**

Presenter: Dijkstra/Bannink

The Dutch methane research focuses are on the improvement of the automated pressure evaluation system (APES). The APES is an in vitro system with 12 time-points and capable of estimating hydrogen dynamics. In the future, the group would like to have an in vitro system capable of predicting the same outcomes observed in vivo. In addition, the group has evaluated the effects of maize quality (maturity at harvesting, starch content and fermentation rate) on methane emissions, and has investigated the presence of markers in milk, such as milk fatty acids, and non-volatile and volatile metabolites. In the future, their goal is to integrate the data from ANCA (Annual Nutrient Cycling Assessment) from Dutch farms into their model, improve the mechanistic model and conduct further research on indicators in milk.

### **6. Spain: Methane-mitigation work in Spain**

Presenter: Yanez-Ruiz

Spain is characterized by different climate zones and livestock production systems. The focuses of the Spanish research group on methane mitigation are on: draught

resistance, tannins, and different types of feed additives. A Spanish methane research network, REMEDIA, was created in 2012. The main research focuses of this group are on: diet manipulation strategies, sustainability analyses, modeling and pasture management. At this moment, funding sources are mainly from international and private organizations.

**7. Sri Lanka: Digestibility and methane emission of growing cross-bred goats fed with TMR based diets with rice straw treated with exogenous xylanase**

Presenter: Thakshala

Like other tropical countries, Sri Lanka has a dry season that affects forage quality and animal performance. In order to find solutions to improve forage digestibility, the group has focused their research on the use of enzymes to improve straw digestibility. The results presented at the meeting, reported that exogenous xylanase improved forage digestibility and animal performance, however, it did not have an effect on enteric methane emissions.

**8. Switzerland: Update of research in Switzerland on methane mitigation related to feed and nutrition**

Presenter: Schawrm

The focus of Swiss methane research has been on the establishment of Eddy covariance to access methane emissions using SF<sub>6</sub> and GreenFeed techniques. The group has also built new chambers and has conducted research with non-livestock animals, such as camels and pacas.

**9. Industry (USA), UCUSD/Cow of the Future (USA): The U.S. dairy sustainability commitment: assessing, measuring, mitigating, and communicating our environmental impact**

Presenter: Tricarico

Tricarico presented the Cow of the Future project from the Innovation Center for U.S. Dairy, participating organizations, and sister partners. The Innovation Center for U.S. Dairy has several committees linked to the dairy industry, as food safety, consumer confidence, globalization, health and welfare, and sustainability. The sustainability committee has worked with LCAs for several dairy products, such as milk, cheese, and yogurt.

**10. Industry (USA), C-Lock, Inc.: Sampling strategies for measuring enteric methane emissions**

Presenter: Zimmerman

Zimmerman presented the factors that might affect methane measurements (year, season, day, time, number of feedings) and the strategies to reduce the error with methane spot sampling.

**Update on the GLOBAL NETWORK project and review papers**

### **Review Paper: In vitro batch culture and methane production (David Yanez-Ruiz)**

The paper discusses the main factors involved with batch cultures and methane production in vitro. The format of the paper was discussed and suggestions were proposed. The paper is divided in 4 sections: 1) description of in vitro systems, 2) factors that might affect in vitro results (bicarbonate concentration, pH, etc.), 3) comparisons between in vitro and in vitro, and 4) final recommendations.

It was discussed that the paper is too long, and Hristov suggested publishing a full version of the paper at the FNN website, while a short version would be published in the selected journal. Several participants wondered which journal the paper would be published. Hammond suggested the paper could be published as a book, but as pointed out by others, this would reduce its accessibility. Arnld suggested the paper could be published in an open access journal.

### **Review Paper: In vivo paper (Chris Reynolds)**

This paper will present all methodologies, limitations, and applicability of in vivo methods for estimating enteric methane emissions, such as: respiration chambers, SF<sub>6</sub>, laser, GreenFeed, and rumen microbiology. The authors have received a lot of feedback. Scott Zimmerman expressed concerns about misunderstanding with GreenFeed system.

### **Update on the FNN methane mitigation database**

### **Membership and industry participation in FNN, Network leadership, Funding sources, 2016 meeting venue, and other issues**

SOP: SOP will be published at FNN website

Treatment means database: it has 1,042 treatment means from 224 publications from 1965 to 2015.

Hristov asked where we'd go from this database. Kebreab asked if SD and number of observation per treatments were included in the spreadsheet. Dijkstra asked if the database could be updated continuously. Reynolds asked if there is a reason to don't use data from before 1965. Bannink asked how much data is coming from developing countries, and Hristov said it's needed to review the data source.

Individual animal database: it has data from about 3,000 animals provided by 30 collaborators; more data to be added. At this point, the database doesn't have any data from NZ, but it was said that Clark agreed to provide data, except for genomic data.

The goal is to developed robust enteric methane prediction models. Bannink asked about N<sub>2</sub>O, and Hristov said the focus is only on methane at this point. Kebreab wondered if trade-offs between methane and N<sub>2</sub>O should be included. In addition, he asked when the analysis could be initiated. Hristov pointed out that we we still have to wait for Clark and other collaborators. Tricarico asked how the partners would deal with the data, and Hristov said it's not clear at this moment, but it probably won't be available to FNN members outside of the GLOBAL NETWORK consortium.

Membership and industry participation: several participants suggested the industry should be more present at the FNN network. Tricarico pointed out that it might lead to some competition, since companies would have the interested to have access to the database. Shingfield suggested the network should have a set of procedures/goals regarding industry participation and we should involve the industry as soon as we have obtained new research findings. Lund, Hristov, and Shingfield agreed with opening the network to the industry. Shingfield asked if the money from sponsorship would fund research or travels, and Hristov said it would be used for both.

2016 Meeting: everyone agreed to have the next FNN and Global Network meeting during the GGAA meeting in Melbourne on February 19<sup>th</sup>.

Network Coordinator: the participants agreed the chair and co-chairs should stay in charge for one more year to guarantee conclusion of the current projects.