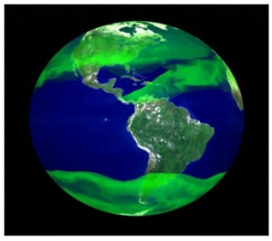
asggnment

The Animal Selection, Genetics and Genomics Network newsletter



The science behind genetic and genomic technologies that contribute to animal selection tools to mitigate methane emissions from ruminant livestock, requires a huge resource of animals of different breeds and species, and access to unique skills.

The ASGGN (Animal Selection, Genetics and Genomics Network) offers a forum and environment in which scientists from all over the world can share information and data. The network will facilitate a coordinated international research effort to achieve progress

The next ASGGN meeting: June 27th 2013, Dublin,

The next meeting of the Network is scheduled to be held in Dublin, Ireland on the 27th of June 2013.

A 1-day workshop is planned, and this will take the form of a satellite to the Greenhouse Gases in Animal Agriculture Conference being held immediately prior (see p3 for GGAA details). The agenda will cover a combination of science and business.

Tentatively, the workshop is titled 'Measurement of methane in individual animals for the purposes of establishing the parameters to permit genetic selection'. This will complement a short workshop on 'new/ alternative techniques' (session 7) within the main Conference programme.

During the meeting there will also be a business/planning session. At this we propose that the management of the network will change.

Currently, the ASGGN is coordinated jointly by Australia and New Zealand. The management group consists of Dr Hutton Oddy (Australia), Grant Shackell (New Zealand), Natalie Pickering (GRA Post-DOC, New Zealand), and country representatives Dr Yvette De Haas (Netherlands), Dr Eileen Wall (UK), Dr Steve Miller (Canada), Dr Tad Sonstegard (USA) and Dr Marcos da Silva (Brazil).

Nominees (or volunteers) to take over managing the ASGGN will be called for prior to the meeting.

What is the ASGGN?

The Animal Selection, Genetics and Genomics Network operates under the umbrella of the Livestock Research Group of the Global Research Alliance on Greenhouse Gases (see p2).

The network is the outcome of a meeting hosted in Auckland, New Zealand in May 2011. That meeting was attended by 29 delegates (+ 7 apologies) from 10 countries.

There are now 204 members on the Network's group email lists. These members come from 40 countries and include researchers, advisers and policy makers. The members are affiliated to 99 organisations including Universities, National Research organisations, Private Research organisations, Consultancies and Government Departments and Agencies.

A Sub-group of the ASGGN (the Methane Phenotype Working Group) is currently preparing a positioning paper for publication in a peer reviewed journal. This paper will identify current methodologies and recommend future directions for measuring methane emissions and feed intake in ruminants.

The paper will serve as the positioning document for the Network's science direction.

Network website: www.asggn.org

ASGGN
The animal selection, genetics and genomics network.

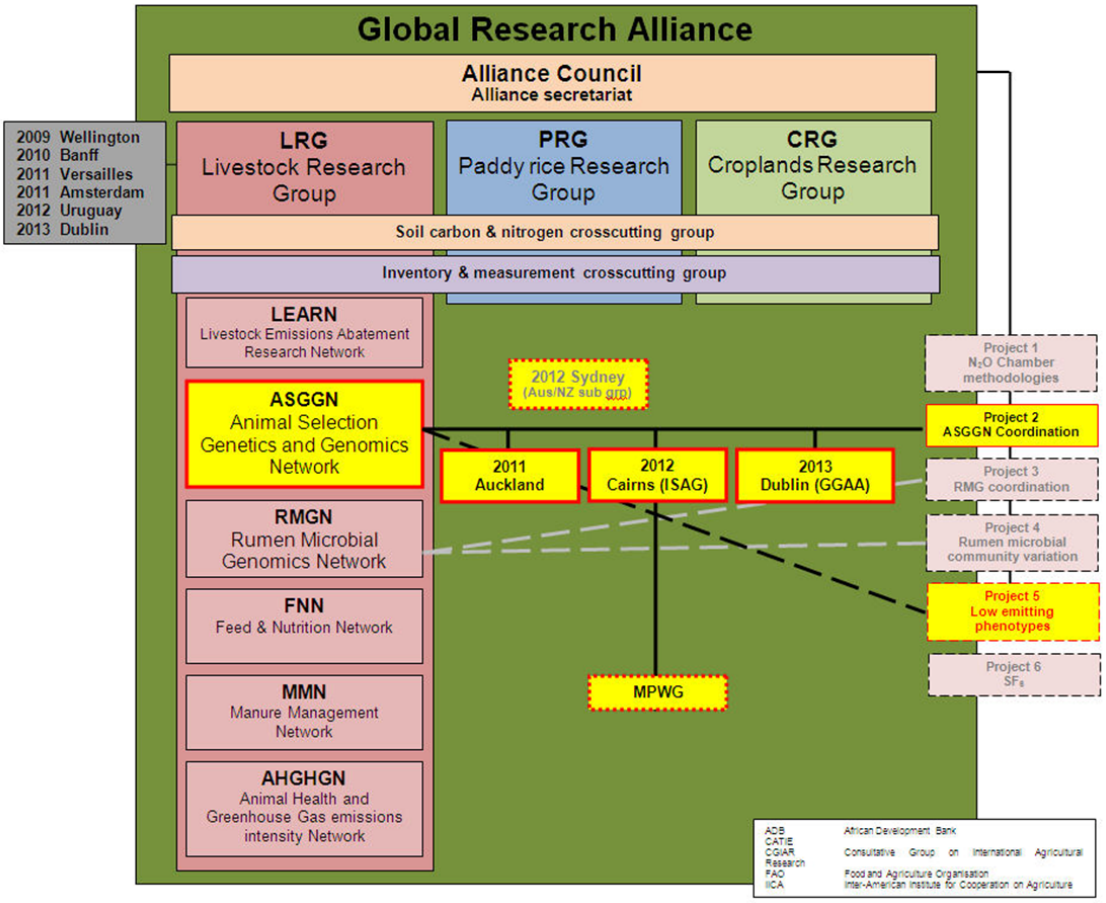
ASGGN and the Global Research Alliance

The Global Research Alliance on Agricultural Greenhouse Gases, which was launched in December 2009, is founded on the voluntary, collaborative efforts of more than 30 member countries.

The focus of the Alliance is research, development and extension of technologies and practices that will help deliver ways to grow more food (and more climate-resilient food systems) without growing greenhouse gas emissions.

The Alliance promotes an active exchange of data, people and research to help improve the ways that agricultural greenhouse gas research is conducted and to enhance participating countries' scientific capability. Alliance members work with farmers and farmer organisations, the private sector, international and regional research institutions, foundations and non-governmental organizations to improve the sharing of research results, technologies and good practices, get these out on the ground.

The Alliance aims to deepen and broaden mitigation research efforts across the agricultural sub-sectors of livestock, paddy rice, cropping and the cross-cutting themes of soil carbon and nitrogen cycling. The ASGGN is one of several networks and associated projects set up under the umbrella of the Livestock Research group.



Agriculture plays a vital role in food security, poverty reduction and sustainable development. The sector is particularly vulnerable to the impacts of climate change and faces significant challenges in meeting a dramatic increase in global food demand, while reducing its contribution to greenhouse gas emissions.

Agriculture currently produces 14 percent of the world's annual greenhouse gas emissions. Agricultural emissions are expected to rise by about 30-40% above 2005 levels by 2050.

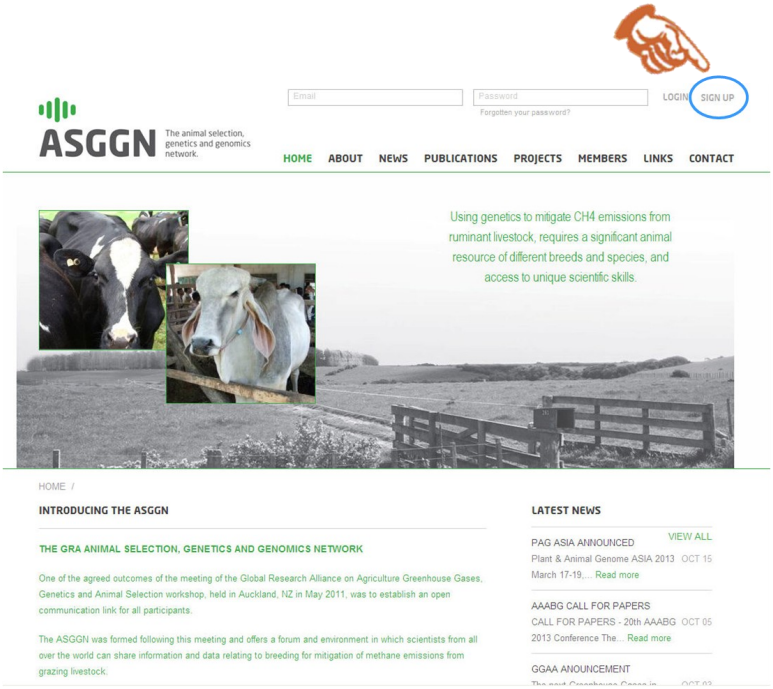
Many countries already have research underway to better understand, measure, and manage agricultural greenhouse gases emissions. By linking these efforts through the Alliance, faster progress can be made towards the solutions needed for improving agricultural productivity and reducing its contribution to climate change.

The ASGGN is a network for all persons (scientists, industry representatives, policy makers) who are interested in the use of animal selection, genetics and genomics for mitigating greenhouse gas emissions (especially ruminant methane) from livestock production.

New members are always welcome. You can join by signing up on the Network's website: **www.asggn.org**
or by emailing Grant Shackell at **asggn@agresearch.co.nz**

The ASGGN Website

The Network website www.asggn.org is now active.



Make a note to check it frequently. For example, current news about upcoming conferences is posted as soon as we get notification. While the site is updated regularly, it also needs your input in order to remain current.

Contributions, suggestions (and corrections) can be placed on the website by forwarding them to the administrator Grant Shackell at asggn@agresearch.co.nz.

This is your website. Please make use of it. The only way for the website to be successful is for the members use it - and to ensure that anything of interest is placed on it.

The first thing you should do is sign up as a member. This will give you access to the Members only pages where you will find the a members directory, minutes of meetings, Network documents and a Forum option.

One of the pages on the public website is a list of current projects. These are listed under countries. This list gives interested parties an indication of what work is going on around the world in the area of greenhouse gas mitigation using animal selection, genetics and genomics. If you would like your project(s) listed
Email: Grant Shackell at **asggn@agresearch.co.nz**

Where do ASGGN members come from?

ASGGN Membership at 14 December 2012			
Australia	32	**Mexico**	4
Austria	2	**Netherlands**	7
Belgium	6	**Norway**	3
Brazil	6	**NZ**	31
Canada	7	**Peru**	1
Chile	1	**Poland**	3
China	1	**Slovenia**	1
Colombia	1	**South Africa**	3
Czech Republic	1	**Spain**	3
Denmark	11	**Sweden**	3
Finland	2	**Switzerland**	2
France	10	**Thailand**	2
Germany	1	**UK**	1
Italy	9	**UK & Ireland**	12
Japan	1	**Uruguay**	1
LRG Contacts	23	**USA**	13

At the 14th December 2012, the ASGGN mail list has 204 members, including the LRG Country contacts.

The major recruitment is via workshops that are associated with international conferences, and with targeted invitations as opportunities present themselves and potential members are identified.

The animal genetics and genomics research community, of which many ASGGN members are part, has worked together previously and has a track record of very good network collaboration in research areas that are closely aligned to and underpin the ASGGN's objectives (e.g. SheepHAPMAP, Bovine genome sequencing and Ovine genome sequencing projects).

The outputs from these previous collaborations have been world-leading, and each has been highly effective.

The ASGGN strategy is to build on these previously successful relationships to address the question of mitigating livestock greenhouse gas emissions, and especially enteric emissions from ruminants.

The network would especially benefit from more members in developing countries and from people working on tropical and sub-tropical breeds.

If you have colleagues who are not yet members, please encourage them to join by directing them to the Network website: www.asggn.org

GGAA Conference 2013

The Greenhouse Gases and Animal Agriculture Conference 2013 will take place in Dublin, Ireland from Sunday 23rd to Wednesday 26th June 2013

GGAA 2013 will attract speakers and delegates from throughout the globe and will build on previous successful meetings in the series. The meeting will focus on advancements in the areas of animal derived GHG mitigation since the last meeting in Banff, 2010. The programme has been designed to address topics that are relevant to delegates from both developed and developing countries. We hope to be able to provide limited financial support for some delegates from least developed countries who have Summaries accepted for presentation at the meeting.

Please visit **www.ggaa2013.ie** for more information about the conference venue, accommodation, social programme, sponsorship opportunities and contact details.

Call for One-page Summaries Now Open

You are invited to submit a one-page summary for review by the Scientific Committee. An example and template for the summary are available to download on the Greenhouse Gases & Animal Agriculture website – http://www.ggaa2013.ie/abstracts.html

Format and content guidelines are also available, along with a checklist for review. We strongly advise you to study this carefully before you start preparing your submission.

Summary Submission Deadline: **Friday 18th January 2013**

Please go to https://teagasc.conference-services.net/authorlogin.asp?conferenceID=3391&language=en-uk to enter the online submission system.

Note, *summaries will be published in the Cambridge University Press series 'Advances in Animal Biosciences' and must be suitable for use as a scientific reference. Submission of a summary is deemed a commitment to present the paper.*

The Scientific Committee will review all summaries submitted and contact you regarding your submission by Monday 4th March 2013.

The Scientific Programme will run from Monday 24th to Wednesday 26th June 2013, including a mix of invited and offered theatre presentations, as well as poster session presentations. You can review the preliminary scientific programme at http://www.ggaa2013.ie/programme.html

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Pre-Conference Workshops Saturday 22nd June 2013: *For more information go to: http://www.ggaa2013.ie/workshops.html*

1 Joint RuminOmics/Rumen Microbial Genomics Network Workshop. *Harmonization of techniques associated with ruminal genome, microbiome and metagenome analysis*

2 Measurement Techniques for Methane Emissions and Use of Methane Energy

3 Techniques for Measuring GHG from Soil and Manure

Post-Conference Workshops and meetings:

The Manure Management Network, Feed Nutrition Network and the & ASGGN will meet on 27th June

The LRG will meet on the 28th - 29th June

Innovative Technology: the Thai inspired ventilated hood

There are many innovative technologies being used in Alliance member countries. One such piece of technology is the indirect calorimeter with a ventilated hood, constructed at Khon Kaen Animal Nutrition Research and Development Center, Khon Kaen, Thailand.

First developed in 2005, after the Japanese 'face mask system' was found to be unsuitable for the climatic and feeding conditions particular to Thailand, the Hood is used to estimate the energy balance in the cattle. The Hood is a respiration trial system using a ventilated flow-through method and comprises five components: (a) a digestion trial pen, (b) head cage, (c) gas sampling and analysis unit, (d) behaviour monitoring unit, and (e) data acquisition and processing unit.

The ventilated hood system allows gas exchange measurements to be conducted during the day and even while the cattle are eating; it is less stressful for the cattle than more restrictive measurement approaches.

Tests conducted to date suggest that the ventilated hood respiration calorimeter is useful for the *in vivo* measurement of methane production and energy partition in ruminants.

For more information about the ventilated hood, contact Nishida Takehiro (nishtake@obihiro.ac.jp).

Reprinted from the LRG Newsletter, courtesy Victoria Hatton,

Rumen Microbial Genomics

RMG NETWORK
RUMEN MICROBIAL GENOMICS NETWORK

Contact:: Adrian Cookson
rmg.network@agresearch.co.nz

GLOBAL RUMEN CENSUS

Contact: Gemma Henderson
global.rumen.census@agresearch.co.nz

HUNGATE1000
A catalogue of reference genomes from the rumen microbiome.

Contact: Bill Kelly
hungate1000@agresearch.co.nz

The Rumen Microbial Genomics Network website is now live at www.rmgnetwork.org.nz.

Contributions and suggestions for items for inclusion on the website or future items for RMG Network newsletters are most welcome, as is permission to include links to your own websites that outline your own research areas. Items for posting may include short reports on conference visits, workshops, more general news items or publicity for future meetings.

Please send contributions to Adrian Cookson, the RMG Network Co-ordinator, through the website, or through rmg.network@agresearch.co.nz.

Prediction of enteric methane emissions from dairy cattle by using milk mid-infrared spectra

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Livestock are considered to be the largest methane (CH_4) producer from anthropogenic sources. In Belgium, 37% of agricultural greenhouse gas production is enteric CH_4 resulting from ruminant methanogenesis. Of this, 93% comes from the bovine.

In dairy cows, animal variation in in CH_4 emissions can be influenced by many factors (i.e., genetics, age, species), as well as diet (i.e., intake level, composition) and milk production.

The "Methamilk" project is a study supported by the Agricultural Head Office of the Walloon Region - DGARNE DGO-3 (Belgium) and represents the work of a team split between two departments of the Walloon Agricultural Research Center (CRA-W) and one unit of the University of Liège Gembloux-Agro-Bio Tech (ULg-GxABT).

The aim of the project is to develop a tool for reducing CH_4 emissions from dairy cows. This requires an effective method of measuring CH_4 eructed by individual dairy cows and must be cheap, rapid, accurate, and easy to use.

Indirect relationships between milk composition and production of enteric CH_4 can be established, based on knowledge of the mechanisms of ruminal digestion and lactation. Therefore, the milk mid-infrared (MIR) spectra can potentially be used to predict enteric CH_4 emissions from individual dairy cows. Moreover, the MIR spectrum has the advantage of being easily obtained by milk recording. Currently, several spectral databases related to routine milk recording exist.

In vivo experiments were performed on Holstein cows receiving different diets. The CH_4 eructed over 24-h was measured on individual cows using the SF_6 method, and corresponding milk spectra data were recorded at each milking. The CH_4 measurements were performed in duplicate on each animal. Only averaged values with less than 5% CV between duplicates were used to build the equation.

A total of 165 daily CH_4 values were related to the corresponding milk spectra and the equations were built using PLS regressions to predict individual CH_4 emissions (g CH_4/ day and g CH_4/kg milk) from the MIR spectra. For the model in g CH_4/kg milk, the R^2 of calibration was of 0.84 with an R^2 of cross-validation of 0.74. The standard error of calibration (SEC) was 3.1 with a ratio of performance deviation of 1.96.

These statistics are very promising and clearly show that it is possible to predict the eructed CH_4 from the milk MIR spectra. Furthermore, during the experiments, the animal effect was greater than the feeding effect. This last observation tends to favor the fact that the CH_4 predictions need to be individual.

The equations are not yet robust enough and more measurements are needed. Therefore, we are seeking new collaborations with other research groups who work in this field. This will allow better evaluation of animal variation in CH_4 production for: genetically diverse animals, different breeds, different diets, diverse management strategies, *etc.*

There are multiple applications for these equations. Initially, the equations could be applied to existing spectral databases (e.g., related to regular milk recording) which also contain other information: pedigree, age of the animal, stage and number of lactations, milk production, date, location, herd, *etc*. This will allow us to study the link between enteric CH_4 emission by dairy cows and all these parameters (whether genetic or not), on small (e.g., intra-farm) and large (e.g., inter-farm, country) scales.

Finally, the equations could be used to develop management and selection tools for mitigating CH_4 emissions from dairy cows.

Contact : a.vanlierde@cra.wallonie.be

Maximum milk for Minimum Methane

By selectively breeding not only cows, but also their rumen bacteria, researchers from Aarhus University in Denmark intend to reduce the release of the greenhouse gas methane, whilst also increasing the effectiveness of the cow's milk and meat production.

Cows turn grass and other plant material – inedible to humans - into large amounts of human edible food such as milk and meat. Unfortunately there is a downside. As with all ruminants, cows release methane (CH_4), which is one of the greenhouse gasses with the greatest global warming potential to the atmosphere. .

Researchers from Aarhus University in Denmark are leading a new project focusing on reducing the CH_4 emission from cows whilst increasing its feed efficiency through modern breeding.

Some of the angles from which the researchers are approaching the matter are modern genetics, rumen microbiology and analysis of eructed air.

The methane from the cow is not its own

Micro-organisms that live in the rumen digest the otherwise indigestible grasses and roughage. Methane is a natural by-product of this microbial digestion. As well as CH_4-rich eructation affecting the environment, there is also an energy waste, with a direct, negative effect upon the animal's feed efficiency.

Considerable animal variation, both in feed efficiency and CH_4 emission have been identified. This variation could be due to the host animal's own genetic variations, their rumen bacteria population and interactions between the two.

As there are individual differences in which types of rumen bacteria the cow is hosting, there is the potential through breeding for shifting the composition of the rumen flora in the desired direction – not least because there seems to be a positive correlation between good feed efficiency and low CH_4 emission.

The hypothesis is that there is a quantitative variation in the microflora of the rumen which is partially controlled by the cow's genotype – i.e. her genetic make-up. The micro-flora can thus be considered an independent organism with a quantitative variation, which interacts with the cow as the other organism.

Sniffing machine and rumen probe

Approximately 1,000 cows from active farms and the Danish Cattle Research Centre are included in the project. The cows will be tested methane emissions and the composition of their rumen micro-flora populations.

Methane will be measured as the cows are being milked in an automatic milking machine. For this purpose, a CH_4 "sniffer" will be installed. The instrument is also used in Finnish hospitals to measure if incoming patients are intoxicated or have taken drugs.

Researchers will gain an overview of which bacteria the cow has in its rumen by taking samples of the rumen contents via a gavage probe passed down the throat of the cow. This is a normal, non-invasive action which is already routinely used by vets in a variety of situations.

Clarifying the complex connections between the cow's genetics, the genetics of her micro-organisms, the cow's feed efficiency and its CH_4 emission will clear the way for reducing CH_4 production whilst optimising feed efficiency. This will benefit both the farmer's budget and the environment and is an area subject to much international attention.

The four-year project has a collective budget of 14 million Danish kroner (€1.9m), of which the Danish Council for Strategic Research, Programme Commission for Health, Food and Welfare has provided 12.2 million kroner (€1.6m).

The project is a collaboration between a number of scientists from Aarhus University, the Technical University of Denmark, the Danish Cattle Research Centre and Viking Genetics. The project also involves researchers from the University of Vermont, USA, the Veterinary Medical University in Vienna and the United States Department of Agriculture, USDA.

The project is called "REMRUM: Reduction of methane emissions from dairy cows and concurrent improvement of feed efficiency obtained through host genetics and next-generation sequencing of rumen microbiome".

Further information: Senior scientist Peter Løvendahl, Department of Molecular Biology and Genetics, email: Peter.Lovendahl@agrsci.dk, telephone: +45 8715 7495.

Global Research Alliance Senior Scientist (GRASS) Award

Supporting research in Agricultural Greenhouse Gases

The New Zealand Government in support of the goals of the Global Research Alliance is funding senior scientists from Alliance member countries to participate in an exchange programme to enhance collaboration and the building of mutually beneficial research partnerships between New Zealand and other Global Research Alliance countries.

Focus areas

- Methane emissions from livestock and livestock wastes
- Nitrous oxide emissions from livestock wastes
- Enhancement of pastoral soil carbon sinks
- Integrated whole farming systems impacts at all scales as they relate to livestock emissions.
- National inventory development as it relates to livestock emissions

Eligibility

To be eligible, you must:

- Have a PhD or be a scientist with at least 5 years experience participating in/leading major projects that align to the priorities of LEARN, the Alliance or other relevant national strategies.
- Demonstrate impact and leadership in your professional field.
- Be able to contribute to scientific research and its application in your home region and the larger Alliance network, based on your networking record.
- Work in collaboration with a New Zealand research organisation.
- Be resident and normally employed on a permanent contract by a research organisation in an Alliance member country.

Funding

The exchange must be between 6 weeks and 6 months duration.

- Up to $30,000 for 6 months (pro rata for less than 6 months) will be provided to recipients to cover actual and reasonable living expenses.
- Up to $5,000 will be provided for economy airfares and travel/medical insurance.
- Up to $5,000 will be awarded for associated research costs.

For more details refer to the LEARN Website: www.livestockemissions.net or email the New Zealand Agricultural Greenhouse Gas Research Centre:
enquiry@nzagrc.org.nz

Contact ASGGN

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Co-convener	Grant Shackell	grant.shackell@agresearch.co.nz
Website:		www.asggn.org