

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

## ASGGN: making the whole bigger than the sum of the parts.



Of the agricultural GHG inventory, approximately 60% is enteric methane (CH<sub>4</sub>) produced by ruminant livestock. Methane therefore makes a significant contribution to the carbon footprint of milk, meat, and fibre production. This is likely to increase even further as projected global requirements for food production rise.

Between animal variation in enteric CH<sub>4</sub> emissions per unit of intake exists, is heritable, and can be selected for. Selecting animals that are productive and farming them using systems that ensure a high utilisation of feed, offers a means of lowering CH<sub>4</sub> emissions per unit of product. Breeding and selection to improve growth rates, reproduction and feed conversion efficiency, can therefore reduce the CH<sub>4</sub> emission intensity of the livestock industries.

The issues for finding breeding solutions that lead to lower enteric CH<sub>4</sub> emissions from farmed livestock include: trait definition; estimating relevant genetic parameters and repeatabilities in the species of interest; methods for measuring the trait and their cost; establishing genetic correlations between CH<sub>4</sub> emissions and other production traits, the cost of the emissions and how that cost is signalled to the breeder and farmer.

A further challenge to delivering animal breeding solutions specifically for managing CH<sub>4</sub> emission is the lack of an accurate measurement technology to phenotype large numbers of pedigree progeny in order to establish the genetic parameters for a methane trait. Addressing these issues to a level sufficient for industry implementation requires large data sets and realistic breeding objectives.

The science behind genetic and genomic technologies requires a significant animal and research resource. This presents the challenge that individual research programmes, and even countries, working in isolation will struggle to find the resources (and time) to make significant progress.

Genomic selection for reducing enteric CH<sub>4</sub> emissions will require phenotyping and genotyping thousands of animals per species. International collaboration offers the potential to reduce per country research costs and the time to delivery of animal breeding tools for managing enteric CH<sub>4</sub> emissions.

The Animal Selection, Genetics & Genomics Network of the Global Research Alliance on Greenhouse Gases Livestock Research Group is developing a coordinated international research effort around animal genetics and genomics to reduce methane emissions from ruminant livestock.

The Network's contact points are:

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## Portable Accumulation Chambers for measuring methane in sheep

In order to expand their PGgRc and NZAGRC programmes identifying low emission ruminant genetics in NZ Livestock, AgResearch scientists in New Zealand have developed a trailer-based Portable Accumulation Chamber (PAC) unit for measuring methane emissions from large numbers of sheep, without the animals ever having to leave the farm.

The trailer collapses for transport, and carries its own portable yards. In its transport configuration, the unit, which weighs in at almost 2 tonnes is just 20mm inside the 2.4m maximum width allowed for towed vehicles in NZ.

Currently, methane emissions from sheep are measured in respiration chambers located in the North Island of New Zealand at AgResearch's Grasslands campus. Respiration chambers are considered the "Gold Standard" for methane measurement in ruminants and are housed in a dedicated facility supported by sophisticated measurement equipment. Including habituation and 2x 24 hour measurements, it takes almost 3 weeks to collect data from 96 animals. Using the portable system, and short (<1hr) measurement periods, 72 animals a day can be measured. The portable unit is currently being validated using animals that have already been, or will be measured in respiration chambers



The innovative solution of sealing the base of the chambers in a water trough, was the turning point in the project. It adapted an Australian design where the chambers had a rubber seal on the base. This required each chamber to be raised vertically before being placed over the animal and then ratcheted down to seal it (a process that required a block and tackle above each chamber). A major design criterion for portability was to eliminate the use of a fragile bottom seal. The portable chambers are simply tilted by hand to let the animal walk in or out, (see photo above) and are lowered into the shallow ~2.5cm deep water trough to seal them.

In order to validate the portable unit, animals will be measured repeatedly at different times of the year directly off pasture, as well as being fed indoors and measured in respiration chambers. The data will be used to compare ranking animals grazing pasture and ranking the same animals using indoor observations. It will also estimate the repeatability of PAC measurements.

Once the animals are in the individual chambers, the change in CH<sub>4</sub>, CO<sub>2</sub> and O<sub>2</sub> concentration in the chamber's atmosphere is measured over time using an RKI Instruments Eagle 2 gas detector.

Time off pasture, ambient temperature, air pressure, mob grazing intakes and pasture quality are also measured and rumen samples collected.

Assuming it is successful, the PAC unit will allow NZ sheep researchers to gather the large number of phenotype measurements that are required to identify low methane emitters, and to support genomic selection for this trait.



Animal welfare was a crucial component of the design process and every effort is made to ensure that the welfare requirements of the animals are met during the measurement period.

Because the chambers are made from clear material the animals can see out and see each other. Several thousand animals have now been measured in these chambers and similar chambers used in Australia (Goopy *et al* Animal Feed Science and Technology 166–167: 219–226).

The animals remain remarkably calm and settled during the measurement period.

*The project is funded by the Pastoral Greenhouse Gas Research Consortium and the New Zealand Agricultural Greenhouse Gas Research Centre. The validation animals are sourced from a project supported by Beef+Lamb NZ.*

For more information, please contact:  
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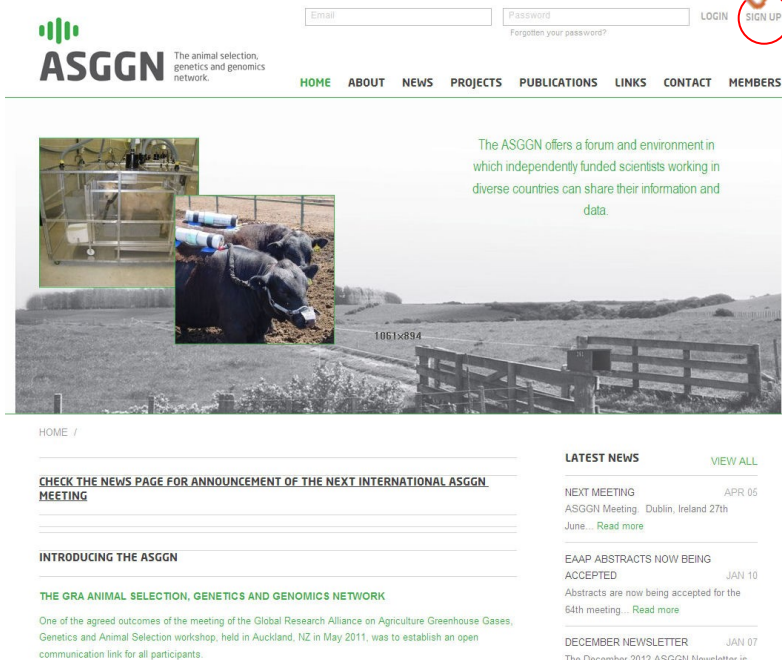
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## About ASGGN

The Network website is at [www.asggn.org](http://www.asggn.org)



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](mailto: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 to 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 your project is not there, and you would like it to be contact Grant Shackell at [asggn@agresearch.co.nz](mailto:asggn@agresearch.co.nz).

## Where do ASGGN members come from?

ASGGN Membership at 8 May 2013			
Argentina	2	Korea	2
Australia	35	Malaysia	2
Austria	2	Mexico	6
Belgium	6	Nigeria	1
Brazil	7	Netherlands	9
Canada	6	Norway	3
Chile	3	NZ	32
China	2	Peru	3
Colombia	3	Philippines	2
Costa rica	1	Poland	3
Czech Republic	1	Scotland	3
Denmark	11	Slovenia	1
England	7	South Africa	3
Finland	2	Spain	5
France	9	Sweden	4
Germany	1	Switzerland	3
Ghana	1	Thailand	20
Indonesia	2	Uruguay	5
Ireland	6	USA	18
Italy	9	Vietnam	2
Japan	1	Wales	1
Kenya	1		

Since the last newsletter issued on 14th December 2012, the ASGGN mail list has increased from 204 to 248 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 (eg 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 of buffalo, cattle, goats and sheep.**

If you have colleagues who are not yet members, please encourage them to join by directing them to the Network website:...[www.asggn.org](http://www.asggn.org) or by emailing Grant Shackell...[asggn@agresearch.co.nz](mailto:asggn@agresearch.co.nz)

## GGAA Conference 2013



## GREENHOUSE GASES & ANIMAL AGRICULTURE

CONFERENCE • 23-26 JUNE 2013 • DUBLIN • IRELAND

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

Please visit [www.ggaa2013.ie](http://www.ggaa2013.ie) for more information about the conference venue, accommodation, social programme, sponsorship opportunities and contact details.

Pre-Conference Workshops Saturday 22<sup>nd</sup> 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:

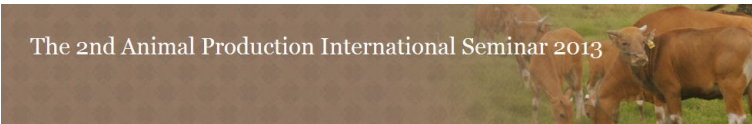
The Manure Management Network, Feed Nutrition Network and the & ASGGN will meet on 27th June

The LRG will meet on the 28<sup>th</sup> - 29<sup>th</sup> June

## Animal Production International Seminar 2013

The 2<sup>nd</sup> Animal Production International Seminar (2<sup>nd</sup> APIS) will be held on 29<sup>th</sup> Aug – 1<sup>st</sup> Sept 2013 in Malang, Indonesia.

**Theme: Sustainable Livestock Production Based on Local Resources in the Global Climate Changes Era: Prospects and Challenges.**



The 2nd Animal Production International Seminar 2013

The seminar will be held in the exotic tourism and educational city of Malang, East Java Province, Indonesia. Malang or its surrounding areas are also as livestock production center where small, medium, and large scale of livestock production and industries are present including dairy cattle, beef cattle, goat, sheep, pigs and poultry.

The seminar program will be composed of two days paper presentations by keynote speakers as well as participants in all aspects of animal production and two days field trip (Livestock Research Station University of Brawijaya; Artificial Insemination Centre; Beef Cattle Research Station; Dairy Farms, Cooperative and Milk Processing Plant) and technical tour to Bromo, Tengger, and Semeru volcanoes complex, where the participant can enjoy the beauty of the volcanoes complex, climbing to the top of Bromo volcano, enjoying beautiful sun-rising, and exploring savanna as well as visiting traditional Tengger tribes, their cultures and farms.

On behalf of the Organizing Committee, it is our great honors and pleasures to invite you to participate in the seminar.

We strongly expect your active support and participation for the success of the seminar. Finally, we are looking forward to seeing you in the most interesting city of Malang and enjoying our wonderful traditions, cultures, cuisines, and scenery.

For more information, please visit our seminar web at <http://www.apis.ub.ac.id>

Dr. Gatot Ciptadi, DESS                      President

Dr. Marjuki, M.Sc.                              Secretary

The imperative for the network, which was initiated at a May 2011 workshop in Auckland; NZ and endorsed by the Livestock Research Group of the Global Research Alliance on agricultural greenhouse gases, is an ability to debate and reach agreement on a variety of topics including:

- common protocols for measurement of CH<sub>4</sub> emissions (and associated traits) or at least calibrations of measurement differences between countries
- co-measurement of appropriate correlated and productive traits
- formalised protocols for collection and storage of DNA from all animals measured and also protocols for collection and storage of rumen samples from all animals measured
- criteria for data sharing and analysis (including meta analysis) among all contributing parties

**The next international meeting of the ASGGN will be as a satellite immediately following the [Greenhouse Gases and Animal Agriculture Conference](#) in Dublin.**

The meeting will consider:

#### **Morning – Science**

- Methane Phenotype Working Group Report Back:  
*This will cover aspects of the white paper currently being prepared by the MPWG.*
- Issues around implementing selection and genomics tools in different production systems and/or countries:  
*This will cover the need for genetic improvement infrastructure within country, species and production systems*

#### **Afternoon – Business**

- Nature of the ASGGN - It's role in GRA and LRG and expectations
- A formal structure for the ASGGN - Do we need one?
- IP - How do we handle it?
- A process for sharing - How do we handle data?
- Succession planning and Handover

To register your interest please click [here](#)



## Rumen Microbial Genomics



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**The next meeting of the RMG Network** is scheduled to be held in Dublin, Ireland on 22<sup>nd</sup> June 2013 immediately prior to the [Greenhouse Gases and Animal Agriculture](#) (GGAA) meeting. It will be a one-day workshop jointly organised with the RuminOmics consortium.

The workshop is entitled 'Harmonisation of techniques associated with ruminal genome, microbiome and metagenome analysis'. The workshop is divided into two main sessions as outlined in the agenda below. Further information on the rationale for this workshop can be found at [www.ggaa2013.ie/workshops.html](http://www.ggaa2013.ie/workshops.html)



## CT scanning; rumen characteristics of low and high CH<sub>4</sub> emitters



The rumen, the largest of the adult ruminant's four stomachs, is the major source of ruminant methane (CH<sub>4</sub>) production.

Methane is produced from CO<sub>2</sub> by rumen micro-organisms using H<sub>2</sub> as an energy source.

The ruminant digestive system has been well characterised in terms of its anatomy. However, little is known about how the physical shape or characteristics of the rumen vary between animals, and particularly between low and high emitters of methane.

New Zealand's PGgRc and NZAGRC programmes that are identifying low emission genetics in NZ ruminants are being expanded to identify whether sheep that have different CH<sub>4</sub> emissions also have differences in their rumen anatomy.

Individual animal CH<sub>4</sub> emission levels are measured in enclosed chambers and expressed on the basis of gCH<sub>4</sub>/KgDM (grams of methane per kilogram of Dry Matter ingested). Differences between low and high emitting animals can vary by up to 36% depending on diet (Pinares-Patiño et al 2011, *Animal Feed Science and Technology* 166).

Computerised tomography (CT) is a non-destructive "dissection technique" that allows the volume, density and weight of regions of the body or its organs to be calculated from consecutive scanned 'slices' of a sedated, live animal.

Scientists at AgResearch Invermay in New Zealand are using CT scanning to measure a range of parameters within the rumen compartments and the reticulum; including total volume, volume of rumen digesta, average digesta density, distribution of digesta density values, and headspace (gas) volume.

The experimental treatment is comparing low to high methane emitting animals. The animals are part of a methane selection line, and have previously been identified as either high or low methane emitters using calorimetric chamber measurements at AgResearch's Grasslands facility.

For CT scanning, the animals are sedated with Xylase20 at a dose rate of 0.25 - 0.05mg/kg of body weight. They are scanned in a prone position with their back legs extended and their forelegs secured under the chest (see photo above).

Feed allowance, time removed from pasture and time to scan are all recorded. The animals are CT scanned using Cavalieri's theorem, with a random starting position approximately prior to the diaphragm (6/7 thoracic vertebrae). A total of 30-32 images per animal are collected at 15 mm intervals continuously through to the end of the rumen (approximately the 7<sup>th</sup> lumbar vertebrae).

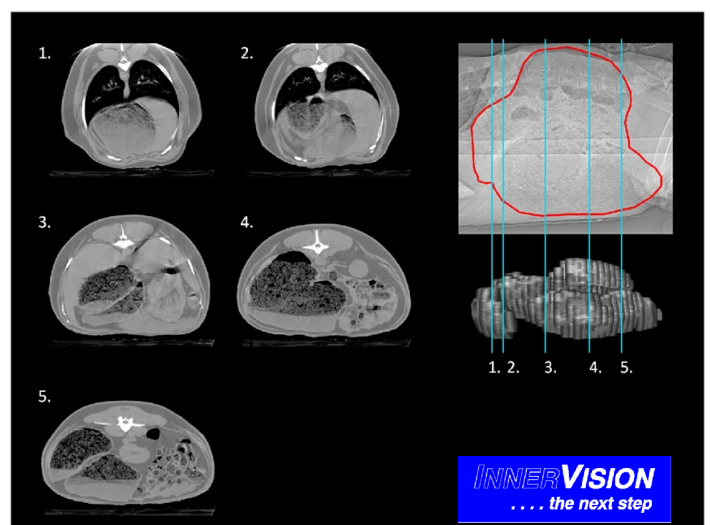
The rumen compartments (reticulum, rumen and atrium; ventral sac of the rumen (rostral), dorsal sac of rumen and ventral sac of rumen) are measured for volume, surface area and raft, liquid and gas volume and weights.

*This project is funded by the Pastoral Greenhouse Gas Research Consortium and the New Zealand Agricultural Greenhouse Gas Research Centre.*

*The animals are sourced from a project supported by Beef+Lamb NZ*

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**CT scanning allows detailed measurement of body composition parameters be recorded *in vivo*.**



## 2013 Interbull Meeting; 23-25 August



The 2013 INTERBULL Meeting will take place in Nantes, France, from the 23rd to the 25th of August 2013, just before the 64th Annual Meeting of the EAAP. Interbull will be celebrating 30 years of history and therefore it is expected to be a very special meeting.

The meeting is organized by France Génétique Elevage (France Livestock Genetics), which represents France in Interbull, in collaboration with the Institut de l'Elevage (French Livestock Institute). The Interbull annual meeting is the leading event for research on bovine genetic and genomic national and international evaluations and nearly 200 scientists and industry representatives from 35 countries are expected to attend.

Interbull open sessions welcome scientific reports related to the following themes:

- National and international genetic evaluations
- Advances in genomic selection
- Monitoring genetic variability of livestock populations
- Maternal traits in beef cattle (session jointly organized with Interbeef )

The title submission deadline is the same as the early registration: **May 31, 2013.**

You can find more information, as well as submission and registration forms at this meeting website:

[http://www-interbull.slu.se/jib/index.php?option=com\\_seminar&task=3&cid=11&Itemid=39](http://www-interbull.slu.se/jib/index.php?option=com_seminar&task=3&cid=11&Itemid=39)

## 64th EAAP meeting; 26-30 August 2013



The 64th Annual Meeting of the EAAP will take place in Nantes from the 26th to the 30th of August, 2013.

The main theme of the meeting will be "New challenges facing animal production for diversified territories, market demands and social expectations". The programme will cover all aspects of scientific achievements within animal production, including genetics, physiology, nutrition, management and health.

There will be the opportunity to attend a number of selected oral presentations and to study posters from a great number of scientists from Europe and world-wide. You will also take part in workshops and discussions of the latest and most relevant research in the field of Animal Science. You will see good examples of successful partnerships of international teams bringing scientists and stakeholders together.

We will also pay attention to efficient and faster transfer of knowledge and life education of professionals in the livestock sector.

A productive meeting from a scientific point of view as well as social events, landscape, culture and hospitality in France can be expected.

For more information go to <http://www.eaap2013.org/>

## Preliminary Notice WCGALP 2014



The joint US-Canada organizing committee is proud to welcome you to the 10th World Congress on Genetics Applied to Livestock Production (WCGALP) being held from 17 – 22 August 2014 at the Westin Bayshore Conference Center situated on the bay in the gorgeous city of Vancouver, British Columbia, Canada.

This congress is the premier conference for researchers and professionals involved in genetic improvement of livestock. Delegates from around the world gather every four years to attend the scientific program and network with colleagues.

We're planning to share our passion for livestock genetics with more than 1,500 delegates.

Check this site for more information as the date approaches. <http://wcgalp.com/>



**LEARN is a collaborative, international network to facilitate the development of practical and cost effective agricultural greenhouse gas mitigation solutions.**

In line with its vision for LEARN, the New Zealand Government in support of the goals and objectives of the Global Research Alliance on Agricultural Greenhouse Gases provides training opportunities for emerging scientists from developing countries in New Zealand institutions to enable them to acquire skills in new/unfamiliar techniques and methods in livestock greenhouse gas emissions mitigation.

**Three LEARN funding opportunities are available:**

#### **LEARN Technician Award**

The LEARN Technician Award will provide funds for up to 6 months for a [Technician from a developing country](#) to travel to a New Zealand organisation to receive training on equipment, tools or methods that when applied in their home organisation/country will improve the measurement of and understanding of greenhouse gas emissions from agriculture. The award aims to build capacity amongst Technicians to facilitate their future or ongoing participation in research, development and extension activities or programmes directly related to the mitigation of livestock greenhouse gas emissions.

#### **LEARN Co-funded PhD Scholarship**

The LEARN co-funded PhD Scholarship will provide a stipend for a [PhD student from a developing country](#) to benefit from having supervision from a researcher based at a institution in New Zealand. The Scholarship is for a maximum of three years duration and the student can be enrolled in a PhD programme in their home country or at a New Zealand Institution to receive the Scholarship. The Scholarship aims to build capacity amongst emerging scientists to facilitate their future or ongoing participation in research, development and extension activities or programmes directly related to the mitigation of livestock greenhouse gas emissions. For those students enrolled in a PhD in their home country the Scholarship also provides a travel allowance for the PhD student to participate in a 12 month (maximum) PhD placement (note that this may be split into multiple visits over a 3 year period but must total no more than 12 months). The PhD placement must be taken in New Zealand.

#### **LEARN Postdoctoral Fellow Award**

The LEARN Postdoctoral Fellowship will enable an [emerging researcher from a developing country](#) to work on a research project mentored by a New Zealand researcher while being based at an institution in New Zealand. The award aims to build capacity amongst scientists to facilitate their future or ongoing participation in research, development and extension activities or programmes directly related to the mitigation of ruminant livestock greenhouse gas emissions in their home country, as well as build closer relationships with New Zealand. The Fellowship must be spent in New Zealand and last for a minimum of 12 months and a maximum of two years. The Fellow must be employed in a research post in their home country to receive the award.

**In addition, one senior scientist funding opportunity is available**

#### **Global Research Alliance Senior Scientist Award**

The GRASS Award will provide funds for [extended exchanges](#) between New Zealand scientists and scientists from other Alliance member countries in accordance with the mission and objectives of LEARN and the Alliance.

**For more information visit the LEARN website at <http://www.livestockemissions.net>**

**New Zealand Government**

## **Contact ASGGN**

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Website:		<a href="http://www.asggn.org">www.asggn.org</a>