LIVESTOCK RESEARCH GROUP

newsletter





From the Co-Chairs

It's been another very busy, productive year for the Group. The LRG have developed three exciting projects to collaborate with Alliance partners that directly deliver on several of the goals that were set in the last Council meeting in Uruguay, in June 2013.

First, Harry Clark has been appointed to the Advisory Board of the Manure Management Project: a project developed jointly by the LRG member countries and other organisations and funded by the Climate and Clean Air Coalition. Second, a number of LRG member countries (China, Argentina, Italy, Ireland, Spain, the USA, and New Zealand) have offered in-kind funding to support the delivery of the FAO GLEAM project to improve and develop the FAO livestock emissions model and develop/test regionally appropriate mitigation options consistent with farm systems and broader development goals. It is not too late for countries interested in participating in this exciting project to contact the Alliance Secretariat. Third, it has been agreed that the Alliance partner with CCAFS (the Climate Change, Agriculture and Food Security initiative of the CGIAR) in a joint outreach event following the release of the report of Working Group III (mitigation) of the Intergovernmental

Panel on Climate Change. The outreach event, scheduled for April 2014, will discuss the IPCC's findings on mitigation potentials, opportunities and barriers to implementation for agriculture and the contributions that organisations such as CCAFS and the Alliance can make towards reducing the emissions intensity of agriculture while ensuring food security and climate resilience. Updates on these partnership opporunities will feature in future editions of the newsletter.

In this edition, we present an article on the successful proposals submitted into the multi stakeholder mitigation fund coordinated by FACCE_JPI (see page 5) which has resulted in funding of a number of projects which are specific to the LRG work plan. There is also an article about a PhD project in Norway which is studying the rumen of the Giraffe (see page 4) and the livestock emissions mitigation research currently underway in Sweden (see page 8). The second and third FONTAGRO funded projects across Central America and the Andean region of South America are also featured on page 7.

Enjoy reading over the festive season.

Happy New Year 2013

Martin and Harry



Engagement workshop for the Alliance and the LRG Warsaw, Poland 8 and 9 April 2014

The Polish Ministry for Agriculture and Rural Development (MARD) welcomes the organisation of an engaging workshop on the Alliance in Poland. The workshop is planned for 8/9 April 2014; invitations will be sent to interested policy makers and researchers from institutions across central Europe. The LRG will organise the workshop and will call on many of its members to be involved when the agenda has been developed.

If you would like to be included on the invitation list please contact Dr Jac Meijs (jac.meijs@wur.nl).

AnimalChange

An integration of mitigation and adaptation options for sustainable livestock production under climate change

The LRG were invited to participate in the recent meeting of the ANIMALCHANGE 'Knowledge Interaction, Training and Dissemination module'.

Dissemination of outputs is a key part of ANIMALCHANGE to reinforce economic and environmental competitiveness of animal production systems under climate change and support the implementation of the EU policy on reducing the environmental impact of livestock systems.

The 'Knowledge Interaction, Training and Dissemination module' will:

- Provide Web based eLearning material for scientists, policy makers and students.
- Deliver face to face training on GHG measurement techniques and the integration of mitigation and adaptation strategies.

- Provide methodologies for National inventories and Life Cycle Analysis of Livestock emissions in selected countries.
- Deliver a Website and leaflet to explain the project and disseminate outputs.
- Provide a dissemination strategy to ensure relevance.
- Organise Annual International Symposia/ Workshops and a Final Conference to discuss future research needs and implementation plans.

The LRG will work closely with ANIMALCHANGE over the coming months to contribute where appropriate to the development of the web based e-learning material and ensure there is alignment between the two organisations for the delivery of face-to-face training on GHG measurement techniques.

Livestock, Climate Change and Food Security Open science conference

19-20 May 2014, Hotel Miguel Angel, Madrid, Spain

This scientific meeting will attract speakers and delegates from around the globe and will provide a platform for discussions on the challenges faced by the livestock sector in an effort to efficiently enhance its contribution to sustainable food supply in the context of climate variability.

Call for abstracts:

The call for abstracts will open on January 13th 2014. Details on submission guidelines will be available soon.

Proposed deadlines for on-line registration and abstract submission:

- Early bird registration: from 28th of January to 31st of March 2014
- Late registration: from 1st of April to 28th of April 2014
- Deadline for abstract submission: 15th of April 2014

To register your interest in the conference please send your details to irini.carpusca@paris.inra.fr

AnimalChange is funded by the European Framework 7 programme. Funding for this programme will, for the first time, provide a vision of the future of the livestock sector under climate change in Europe, Africa and Latin America.

ANIMALCHANGE aims to:

- Reduce uncertainties concerning GHG emissions from livestock systems.
- Include climate variability as part of impact assessment.
- Develop cutting-edge technologies for mitigation and adaptation to climate change.
- Assess economic and societal costs of business as usual and of adaptation and mitigation scenarios.
- Assess the vulnerability of livestock to climate change and feedbacks on GHG emissions.
- Provide direct support to set up policies for mitigation and adaptation to climate change for the livestock sector.
- Reach out to stakeholders by organising symposia, training of scientists, technicians and policy makers and forming a network to alert stakeholders of project outputs and events.



Reflecting on soil carbon: innovative measurements of biochar

Bambang Kusumo is mid-way through his LEARN funded postdoctoral fellowship at the New Zealand Biochar Research Centre based at Massey University.

From the Faculty of Agriculture at the University of Mataram in Indonesian, Bambang is studying the use of visible near infrared reflectance spectoscropy (Vis-NIRS) for the on-site monitoring of stable Carbon (C) in soil (including biochar) and the environmental factors controlling the denitrification potential in soil. The results indicate that the Vis-NIRS technique has the potential to monitor soil properties that control carbon dynamics in soil and greenhouse gas emissions.

The project uses partial least square regression (PLSR) calibration models of selected Vis-NIR regions (780-1200 & 2100-2500 nm) and reference biochar data, to predict the condensed aromatic C and molar ${\rm H/C}_{_{\rm ora}}$ ratio of biochar; which are the properties related to the stability of C in biochar. A high coefficient of determination (R²) between spectral data measured using Vis-NIRS and data measured using a conventional technique for aromatic C (R² = 0.926) and atomic $\rm H/C_{\rm org}$ (R2=0.933) has been obtained. This technique also allows the prediction of other biochar properties such as fixed C, fraction of aromaticity (fa), content of H, O, and N, ash content, volatile matter content, and pH.

When a selected Vis-NIR region is used, the concentration of biochar in soil is successfully quantified within a wide range of concentrations (from < 2% to > 20%). The accuracy of prediction improves when this



technique is applied to a single type of soil to which a specific biochar is added to, rather than pooling all combinations of soils and biochars. Interestingly, Vis-NIR is also able to:

- detect the existence of biochar in field soil, in situ, using a linear discrimination analysis (LDA) soil core technique;.
- quantify the content N of total C of the soil cores;
- determine N and root density; and
- potentially identify, *in situ*, denitrification enzyme activity (DEA).

Dr Kusumo is presenting the results of his work at the international meeting of 'Soil Spectroscopy: the Present and Future of Soil Monitoring' in Rome, Italy, December 3-6 2013. Prof. Mike Hedley (Massey University), Associate Prof. Marta Camps Arbestain (Massey University), and Dr. Carolyn Hedley (Landcare Research) are Bambang's supervisors.

The digestive system of the Giraffe (Giraffa camelopardalis) is under the microscope at Aarhus University

Giraffes are the largest ruminants in the world.

In the wild, they feed solely on a variety of African savanna browse. Males can grow as tall as 5.8 m, weigh up to 1,900 kg and consume a whopping 30 kg of browse dry matter on a daily basis. In captivity, providing a diet of 100% fresh browse is not feasible, neither in terms of costs nor logistics. Instead, giraffes are typically fed a diet of alfalfa hay, a pelleted compound and varying amounts of produce and browse. Giraffes have a reputation of being difficult to feed in captivity and unfortunately have a history of dietary problems to show for it. It has been speculated that the giraffe is unable to properly handle a "cow diet" because of anatomical differences in their digestive system which is adapted to an allbrowse diet in the wild. Although we know a great deal about ruminant digestion, this knowledge is generally derived from our grazing domesticated ruminants, and little information exists about the digestive anatomy of giraffes.

Cathrine Sauer Jørgensen, a PhD-student from Aarhus University in Denmark, is currently working with Copenhagen Zoo on a research project trying to fill this gap in our knowledge. In South Africa, she has examined and sampled the gastrointestinal tract of 21 wild-caught giraffes that were euthanized after being part of the Danish Cardiovascular Giraffe Research project (DaGIR). Furthermore, seven captive giraffes are included in her study. These have all come from various Danish zoos, where they had to be euthanized for medical or managerial reasons. Preliminary results of the study indicate that the digestive system of the giraffe is comparable in both anatomy and function to that of other browsing ruminants, such as moose and roe deer.



Giraffe feeding on savanna browse. Photo by: Cathrine Sauer Jørgensen, 2010



Cathrine measuring the rumen size of a wild South African giraffe. Photo by: Carsten Grøndahl, 2010



a sample of digesta from the omasum. Photo by: Carsten Grøndahl, 2010



The inside of the rumen wall is evenly papillated in the giraffe. Photo by: Rasmus Buchanan, 2010

The rumen microbial community of the giraffe is largely undescribed at present. Therefore, samples of rumen fluid have also been collected for further analysis. Some of these samples are now part of the Global Rumen Census project, contributing new knowledge about a project under the Rumen Microbial Genomics (RMG) network of the LRG one of the most unique ruminants on the planet. To find out more about the Global Rumen Census go to the website www. globalrumencensus.org.nz/

Joint funding initiative promotes collaborative research

An ambitious set of collaborative projects research to better quantify and mitigate agricultural greenhouse gases has been agreed under the multi stakeholder call administered by FACCE JPI European Union's Joint Programming Initiative on Agriculture, Food Security and Climate Change (JPI FACCE).

This initiative brought together 14 countries; 11 JPI FACCE member countries plus Canada, New Zealand and the USA. After a two stage evaluation process, 11 proposals with a total value of 9.9 million Euros and 74 project partners from 14 countries were recommended for funding.

The projects recommended for funding include many activities that directly support and deliver on priorities identified in the work plan of the Livestock Research Group and its various Research Networks, and other Research Groups of the Alliance. Examples include intercomparisons of models for N₂O emissions and changes in soil carbon from pastures, crop lands and paddy rice; a global network to compile data and experiments to reduce methane emissions via feed and nutrition; a project to study the ability to influence enteric CH, emissions from individual animals through early-life interventions that change the rumen microbiome; and a study to better understand barriers to the adoption of apparent no-cost mitigation options which would improve understanding of the likely uptake of mitigation options currently under development.

A key feature of all the successful proposals is their collaborative nature and the funding model that supports this. All projects



bring together institutions from at least three different countries; however, each country is only supporting its own national researchers to participate in the project. This arrangement removes the need to create a common funding pool and reduces the administrative and governance issues that such common pools can create, especially when countries are located in different parts of the world. The projects will run for between 2 and 4 years and progress in those that are linked to priorities in the LRG work plan or directly support Research Networks of the LRG will be reported in future issues of this newsletter. Further details about the projects funded will be made available in early 2014 on the FACCE_JPI website: <u>http://www.faccejpi.com/FACCE-activities/International-Call-on-Mitigation</u>

A new Canadian – New Zealand collaboration

Dr. Leluo Guan, an Associate Professor of Functional Genomics and Microbiology in the Department of Agricultural, Food and Nutritional Science at the University of Alberta, Canada has recently taken up a GRASS award to enable her to study at AgResearch, New Zealand.

The GRASS award will enable Leluo to work with the Rumen Microbiology Team at AgResearch and be involved in greenhouse gas mitigation-based research projects such as the Global Rumen Census (www.globalrumencensus.org.nz) and the Hungate1000 aligned with the LRG work plan (www.hungate1000.org.nz).

In particular, Leluio will validate bacterial and archaeal taxonomic frameworks through the

examination of Canadian metagenomic and metatranscriptomic datasets. Alongside the team at AgResearch she will apply the large amount of data that has been generated from both New Zealand (sheep) and Canada (beef cattle), to improve the bacterial and archaeal taxonomic frameworks to provide robust rumen microbial community analyses.

This exchange will initiate a new collaboration to help address this deficiency and begin to provide outcomes that will reduce methane emission and improve the efficiency of ruminant production in New Zealand and Canada. The long term goal is to establish a lasting collaborative relationship between Canada and New Zealand, at the forefront of research on livestock efficiency and mitigation of the impact of livestock on the environment.



Dr Leluo Guan.

Links with Vietnam are strengthened

Vu Van is a researcher from the Department of Research for Livestock Environment at the National Institute of Animal Sciences (NIAS), Hanoi, Vietnam where her main responsibilities are:

- to assess the overall environment perspectives of using animal manure as a source of renewable energy through biogas production,
- (ii) carry out experiments on optional solutions for livestock waste management.

Van was awarded a two-year LEARN postdoctoral fellowship in September, to work with scientists at the National Institute of Water and Atmospheric Research (NIWA), based in Hamilton, New Zealand. Her project looks at the use of "enhanced pond systems for the management of GHG emissions and nutrient loads from dairy farm effluent". In particular Van is investigating the benefits of treating dairy farm effluent by pretreating it in covered anaerobic ponds to reduce the nutrient concentrations of the effluent prior to irrigation treatment in high rate algal ponds to reduce GHG emissions.

NIAS is developing a programme on sustainable farm effluent treatment and would like to establish a relationship with NIWA through:

- (i) capacity building through on-thejob training in NZ and Vietnam with supervision supported by NIWA; and
- (ii) collaborating in projects focusing on an integrated food energy fertilizer system as a cost effective and environmentally sustainable option for farms.

Van is currently setting up experiments at a dairy farm in Orini, in the Waikato under the supervision of Dr. Rupert Craggs, manager of NIWA's aquatic pollution group.



Measuring biogas GHG emissions from a dairy farm effluent irrigation storage pond.

Livestock and Climate Change in Central America and the Andes

A new project funded through the FONTAGRO Bank in collaboration with the New Zealand Ministry for Primary Industries and the Ministry for Foreign Affairs and Trade will build capacity to measure GHG emissions from livestock under traditional and improved systems, and will facilitate the design of mitigation strategies and the formulation of policies to promote sustainable livestock systems in Central America and the Andes.

Livestock production is critical for the livelihood of small farmers in Central America and the Andean region but they are a major contributor to greenhouse gas (GHG) emissions so it is important they find strategies that result in higher productivity and better income for small farmers, better feeding and management practices and reduced GHG emissions (especially methane) from livestock. Present estimates of GHG emissions from livestock are not very precise in the region and countries rely on IPCC default emission factors for inventory reporting thus methods to estimate them need to be improved. The project has two parts:

1. SILVOPASTORAL SYSTEMS IN CENTRAL AMERICA. The main objective is to develop methodologies for estimation of GHG emissions and economic impact of different production systems in Central America. This component builds upon a FONTAGRO funded project in Panama, Costa Rica and Nicaragua. Honduras has joined the consortium and the initiative is coordinated by CATIE. 2. DAIRY SYSTEMS IN THE ANDEAN REGION. The general objective is to build institutional capacity on measurement of GHG emissions and improve dairy systems in the Andean region. This component will be implemented by institutions of four countries: Bolivia, Colombia, Ecuador and Peru. The technical coordination of the consortium is done by UNALM of Peru and the initiative is facilitated by IICA.



Research on livestock emissions in Sweden

Sweden is one of the most northern countries where agriculture takes place. Situated between 55 and 69 °N, less than 6 % of its' 450,000 km² is arable land and less than 1% of a population of 9.5 million are farmers. Despite this, agriculture contributes approximately 20% of the 70 million CO_2 -equivalents of emissions of greenhouse gases in Sweden. This is due mainly to the fact that most of the energy tons for industry, heating and lighting are from renewable sources that do not create emissions (hydro, nuclear, bio-energy).

The dairy sector is the most important part of Swedish agriculture. The 350,000 dairy cows are from two breeds, Holstein and Swedish Red, and distributed across less than 5,000 herds, i.e. ca 70 cows per herd. On average, milk production is around 9,000 kg milk per cow/year.

Enteric methane production from cattle accounts for around 20% of the emissions from the agriculture sector. It is only during the last 5 years however that research focused on finding a solution to the enteric methane emissions from ruminants has started. The goal of the current research programme is to provide evidence-based advice to farmers on mitigating greenhouse gases.

Current research includes:

 Using SF₆- tracer technique to measure enteric methane emissions. Introduced in Sweden by Dr Alan Iwaasa from Agriculture and Agrifood Canada, the SF₆ technique has been widely used across Scandinavia to develop region specific emission factors (EFs) to calculate enteric methane emissions from cattle. These EF's are now used in the dominating PC-based on-farm tool "Norfor" that is used to calculate enteric methane from specific feed rations.

- 2) The development of a gas in-vitro system. This is a method to screen feeds, feed rations and feed additives with potential to reduce methane losses in the rumen.
- 3) Large scale enteric methane emission measurement and rumen function. The "Nottingham technique" in Uppsala and the Greenfeed[™] technique in Umea have been used in conjunction with controlled feeding and milk production to rank cows as high or low methane emitters. We have used rumen samples taken over the lactation period to study how the feeding relates to microbial communities in the rumen. It has also been possible to compare Holstein and Red cows on the same diet.

At present we tell the farmers that the best thing they can do is to have productive and healthy cows and avoid feeds with large carbon footprints.

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Key references

Danielsson, R., Schnürer, A., Arthursson, V. & Bertilsson, J. 2012. Methanogenic population and CH_4 production in Swedish dairy cows fed different levels of forage. Applied and Environmental Microbiology. 78(17): 6172-6179.

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Horacio Gonda is sampling rumen fluid from cows. Photo by: Jan Bertilsson



Research cows grazing in the outskirt of Uppsala with castle and cathedral in background. Photo by: Mikaela Patel



Swedish dairy production is mainly family farms. Photo by: Swedish Dairy Association

Capability Building Opportunities

Global Research Alliance Senior Scientist (GRASS) Award

Supporting research in Agricultural Greenhouse Gases

The New Zealand Government has announced funding for senior scientists 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
- Be fluent in English

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:

http://www.livestockemissions.net

Or Email the New Zealand Agricultural Greenhouse Gas Research Centre: enquiry@nzagrc.org.nz



Upcoming events



7th International Symposium on Non-CO₂ Greenhouse Gases (NCGG7)



Call for papers for the 7th Symposium on Non-CO, Greenhouse Gases.

The symposium will be held from 5-7 November 2014 in Amsterdam, the Netherlands. The subject of the conference is 'Non-CO₂ Greenhouse Gases, Innovations for a Sustainable Future'.

We are inviting proposals for paper presentations, workshops/interactive sessions or posters/exhibits. The abstract deadline is February 1st, 2014. Early submission of abstracts is encouraged.

To learn more about the conference, including speakers, papers, venue, registration, visit the NCGG7 website: www.ncgg.info

Plant and Animal Genomes XXII Location: San Diego, USA Date: January 11-15th 2014

Summary of event: The Plant and Animal Genome XXII Conference is designed to provide a forum on recent developments and future plans for plant and animal genome projects. Consisting of technical presentations, poster sessions, exhibits and workshops, the conference is an excellent opportunity to exchange ideas and applications on this internationally important project.

The 6th All Africa Conference on Animal Agriculture: Africa's Animal Agriculture -Macro-trends and future opportunities Location: Kenyatta International Conference Centre, Nairobi, Kenya Date: October 27-30, 2014.

Summary of event: The overarching aim of the conference is to provide an opportunity for African scientists and the broader stakeholder groups in the livestock sector to discuss the potential role of animal agriculture to improve the livelihoods of African people. The broader objective of this grand assembly will be met by attempting, through discussions of a series of papers, to answer the various questions rotating around the thematic areas. It is hoped that, at the end of the conference, there will be specific recommendations for the key questions.

4th International Conference on Asia Agriculture and Animal (ICAAA 2014) Date: June 9-11 2014

Location: Bangkok, Thailand Summary of event: The primary goal of

the conference is to promote research and developmental activities in Livestock Agriculture across Asia. Another goal is to promote the exchange of scientific information between researchers, developers, engineers, students, and practitioners working in Thailand and abroad.

African Livestock Conference and Exhibition (ALiCE 2014)

Date: May 28th – 30th 2014 Location: Speke Resort & Conference Centre Munyonyo, Kampala, Uganda

Summary of event: The conference will address the following among other important topics and issues;

- 1. World and Africa Livestock status
- 2. Livestock policies and economics
- 3. Animal health
- 4. Animal feeds and feeding
- 5. Animal genetics
- 6. Livestock farming technology
- 7. Livestock processing and marketing
- 8. Livestock management and Environment

THE 34th CONFERENCE of the International Society of Animal Genetics (ISAG)

Date: July 2014 Location: Xi'an, China

Summary of event: ISAG is devoted to the study of the immunogenetics, molecular genetics and functional genomics of economically important domesticated animals. It is a scientific society that promotes scientific research and facilitates communication and dissemination of knowledge among scientists worldwide. For the first time in its remarkable 60 years history, the conference is now moving to China.

The 10th World Congress on Genetics Applied to Livestock Production (WCGALP) Date: 17 – 22 August 2014

Location: The Westin Bayshore Conference

Centre, Vancouver, British Columbia, Canada Summary of event: A premier congress and gathering of researchers and industry professionals dedicated to genetic improvement of livestock. Every four years, this conference brings together delegates from around the world for a state-of-the art scientific program. Delegates can share their knowledge with the largest network of colleagues.

Contacts



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