# ON AGRICULTURAL GREENHOUSE GAS o's counting? **MAY 2020**

#### **INVENTORIES & NDC NETWORK NEWSLETTER ISSUE 3**

**MRV** platform https://www.agmrv.org

**IPCC Emission factor** database https://www.ipcc-nggip.iges.or.jp/ EFDB/main.php

**IPCC Guidelines** https://www.ipcc-nggip.iges.or.jp/ public/2006gl

Inventories and NDC support https://globalresearchalliance.org/ research/integrative/networks/ greenhouse-gas-inventoriesnetwork

GRA https://globalresearchalliance.org

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Issue 3 of the Inventories and Nationally Determined Contributions (NDC) Support Network of the Global Research Alliance on Agricultural Greenhouse Gases (GRA) features an update on new hill slope emission factors, and articles on agriculture Inventory and NDC activities occurring in Africa, Spain, Argentina, Uruguay, Australia, New Zealand and the United States. This issue provides information on a new GRA scholarship programme called NZ-GRADS for PhD candidates to study at New Zealand institutions, and stories from PhD students in the CLIFF-GRADS programme.

Contributions and feedback are welcomed. Please contact one of the Network leads with any relevant research, opportunities or country inventory and NDC updates for the next issue.

# New method to calculate emissions from livestock excreta on hillslope pastures

An improvement to agriculture inventory reporting in New Zealand's 2020 National Inventory Submission (1990-2018) has resulted in a significant difference to reported nitrous oxide (N<sub>2</sub>O) emissions from livestock excreta deposited on pasture.

The new emission factor research is of relevance to countries where hill country farming is common practice due to the potential impact on total reported national agriculture emissions. New Zealand is the first country to incorporate country specific hill-slope N<sub>2</sub>O excreta emission factors

in its agriculture inventory. The reduction in reported emissions may have implications for farmers and policymakers in achieving emission reduction targets and directing mitigation.

In New Zealand, N2O emissions represent 22% of agricultural emissions and 11% of total national greenhouse gas emissions. Emissions from dung and urine on pasture are the single largest contributor to New Zealand's N<sub>2</sub>O emission profile and in 2017 contributed the equivalent of 6.6 million tonnes of CO<sub>2</sub> or 17% of total agricultural emissions.

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The research compiled results from over 1200 emission factors from 139 field experiments conducted over the past decade across a range of different slopes, seasons, and regions within New Zealand to provide the basis for the new emission factors.

New Zealand hill-country sheep and beef livestock are producing about half the amount of nitrous oxide ( $N_2O$ ) per unit of nitrogen from urine or dung than previously thought. For the 2017 reporting year, the new methodology of calculating these emissions, by industry lowered reported total sheep emissions by 10.6%, total beef cattle emissions by 5% and dairy cattle emissions by 1.4%. Further, results from the study showed that the excreta based  $N_2O$  emission factors for sheep are about half that for beef livestock.

AgResearch Scientist Dr Tony van der Weerden said the lower urine emission factor for sheep when compared to cattle could be related to the lower total volume of urine deposited by sheep, which in turn may result in greater urinary nitrogen utilization by plants but that this theory is not yet fully understood. A proportionately small reduction in dairy cattle emissions is because dairy farming is assumed to be on flat land where the new emission factor is not significantly different at 0.98% instead of 1%.

The study found urine emissions are higher for gentle slopes than for steeper slopes which Dr van der Weerden says, "is thought to be due to a combination of lower soil microbial activity and lower soil moisture contents on steeper slopes relative to low slopes. Under these conditions, smaller amounts of nitrous oxide are produced and released into the atmosphere."

Previously, New Zealand's agriculture inventory used a single emission factor for dung (0.25%) and urine (1%) across all livestock and slope types. The new method uses the Nutrient Transfer Model outlined by Saggar et al (2015) to allocate total faeces and urine deposited on land with different slopes.

Under the new emission factor recommendations as shown in Table 1, the faeces emission factor value decreases from 0.25% to 0.12% for all slopes and livestock types. Compared to the previous urine emission factor value of 1%, the recommended cattle urine emission values are now 0.98% on flat and low slopes and 0.33% on medium and steep slopes, and sheep urine emission factor values are now 0.50% on flat and low slopes and 0.08% on medium and steep slopes.

Table 1: Old and new emission factor values (%) for livesto	ck by
excreta type and slope.	

LIVESTOCK TYPE	EXCRETA TYPE	TOPOGRAPHY	
		Flatland & low slope (<12°)	Medium & steep slope (>12°)
OLD VALUES			
All livestock	Dung	0.25 (all slopes)	
All livestock	Urine	1.00 (all slopes)	
NEW VALUES			
All livestock	Dung	0.12 (all slopes)	
Dairy & non- dairy cattle	Urine	0.98	0.33
Deer	Urine	0.74	0.20
Sheep	Urine	0.50	0.08

For more information on the inventory improvement, emission factors and related methodological changes, see the agriculture chapter of **New Zealand's National Inventory Report** and a link to the **meta-analysis**.

# **Inventories and NDC Network Activities**



## Notes on Country Agriculture Inventory Improvements to 2020 Submissions

As per the UNFCCC reporting guidelines on annual inventories, Annex I Parties to the Convention were required to provide their annual **GHG Inventory Submissions** by 15 April 2020 which includes the national inventory report and common reporting format (CRF) tables.

#### COLOMBIA

For their 2020 submission, Colombia have transitioned to the IPCC 2019 refined reporting guidelines meaning they have implemented the updated default emission factors where relevant and some refined methodologies in particular to the enteric fermentation and manure management categories.

#### URUGUAY

As part of Uruguay's agriculture **inventory improvement plan**, a significant improvement to emission reporting to AFOLU sector was made in the 2020 inventory submission and GHG emissions/removals from the LULUCF (category 3.B) were estimated entirely for the first time.

To do this, a consistent representation of land uses for the period 1970-2017 was developed, using FAO's tool Collect Earth, combined with national statistics. Approach 2 was applied for land use representation in Uruguay and based on the LU and LUC matrices that were developed, estimation of the entire inventory time series (1990-2017) was conducted (Approach 2 is one of 3 approaches to develop consistent representation of lands in Chapter 3, Volume 4 of the 2006 IPCC Guidelines). Most of the carbon stock changes were calculated for the main land-use categories and land-use conversions in the IPCC 2006 Guidelines.

Country specific parameters (SOCref,) and default values for Change factors (Flu, Fmg, Fi) were combined. A group of soil experts (scientist and technical staff), members of the country's main institutions in these issues was convened to discuss the availability of country specific data and the adequacy of IPCC default values to national circumstances.

Further information on this improvement can be found in the **Uruguay's Third Biennial Update Report** presented in December 2019.

## Spanish Network for Updating Emission Values in Agriculture (NUEVA)

NUEVA (Network for Updating Emission Values in Agriculture) is a three-year project (2018-2021) funded by the Spanish Government. The main objectives are to analyse the state of GHG emission factors in the Spanish agricultural sector and to propose measures that improve the accuracy of their estimation.

Following the Paris Summit Agreement, in Spain, there is a clear need to improve the Spanish inventory system so it adequately reports GHG emissions and uptake according to the productive reality of the country, and eventually the computation of mitigation strategies applied in any activity. This is clearly limited by the heterogeneity of agricultural production systems in Spain and the lack of a coordinated effort to address the peculiarities of these systems, at a national level. NUEVA is coordinated by David Yáñez-Ruiz and has a multidisciplinary team of 9 research organizations that study GHG emissions and uptake, crop management, C and N cycles in agricultural soils, animal feeding, excreta management, agroforestry systems, inventory calculation and integration and modelling at different scales. The main activities of the network include:

- Supporting an international training school. The first training school (co-organized with the **COST Action LivaGE** in April 2019, Lugo, Spain) provided practical demonstration in the use of a range of GHG measurement techniques in crop and animal sciences. A second training school will be held in September 2020 in Elche, Spain to provide practical training on GHG measurements, data processing and calculation of emissions factors.
- Developing decision trees to support comprehensive decisionmaking criteria to identify the best measurement techniques in different research or commercial scenarios.
- Developing a range of communication and dissemination material (including that from the training schools) made available in the project website: www.rednueva.es

For more information: david.yanez@eez.csic.es





### **Re-aligning Institutional Arrangements for Argentina's Agriculture Inventory** Andrés Said, Technical Advisor on Climate Change, Ministry of Agriculture, Argentina

It was during a 3-day-basic GHG inventory course for Latin American countries, in July 2016, when I discovered my interest for working on emission inventories. At that time, I was working in the Ministry of Agriculture of Argentina as a technician on international agro-environmental negotiations. The 2nd Biennial Update Report (BUR) was being prepared by a team of external consultants and coordinated by the Argentinean Ministry of the Environment and Sustainable Development, with little interaction with the Agriculture, Livestock and Fishing Ministry.

Only a few months later, I had the opportunity to change my position to become the Sustainable Production Director of the Agriculture Ministry, where we first considered developing the GHG inventory team internally. At the National Climate Change Cabinet, the Agriculture Ministry expressed our interest, which enabled our active participation in the 3rd BUR, published in November 2019. We established that Ministry of Agriculture's responsibilities include the provision of agriculture sector activity data and participation in activities aimed at defining emission factors and methodological assumptions. Institutional Arrangements surrounding the agriculture sector reporting process have been developed with continuing support of the Global Research Alliance on Agricultural Greenhouse Gases (GRA).

Re-aligning our institutional arrangements to participate in the process of reporting emissions from within Argentina's Ministry for Agriculture was not easy. It involved significant capacity building, such as numerous hours



reading the IPCC Guidelines. Our first task was to build a historical activity data series for the dairy and non-dairy cattle sector with the livestock groups classified by subgroup categories. I remember having the first meeting with the technicians, who work in livestock production, and being told that the information was not available as detailed as it was needed. We persisted and managed to collect information on the necessary activity data and required emission factors.

In my view, the internalization of the GHG Inventory in the Ministry of Agriculture provides some key benefits for government and all involved stakeholders. The inventory provides the knowledge to identify the drivers and trends of emissions which are essential not only for the developments of public policies for mitigation strategies and their monitoring, but also for international negotiations such as the UNFCCC. In fact, emission reporting information is fundamental for the development of Argentina's Long Term Strategy to reduce emissions and the successive National Determined Contribution.

Furthermore, the GHG Inventory can benefit from the Ministry of Agriculture's involvement by: (i) developing the necessary institutional arrangement to allow access to activity data; (ii) building institutional knowledge in contrast to consultants that frequently change; (iii) developing a long term plan to improve the inventory; (iv) guiding scientists on gaps of the inventory that could benefit from further research. We created a team of several technicians from different disciplines (Livestock, Agriculture, and Forestry) that are involved in the accounting and reporting process. What I enjoy the most as coordinator of this group, is learning from these experts on the agriculture production specificities in Argentina. We are continually consolidating the group to enable GHG Agriculture Inventory improvements including the adoption of the biennial transparency report requirements and to provide policy relevant advice for Argentinian problems linked to mitigation and adaptation to climate change.

I would strongly encourage other National Ministries of Agriculture that are not yet well connected with the body in charge of their country's agriculture emission reporting, to start participating actively in the Agriculture Sector of the GHG Inventories. Although it is not an easy project, the benefits are profound.

## USA, New Zealand and Australia exploring a collaborative program in the NDCs area

As part of the GRA Integrative Research Group meeting at Wageningen in early March 2020, a side meeting was held between delegates from the USA, Australia and New Zealand, to explore potential for further collaboration and alignment between various GHG inventory and NDCs capacity building initiatives. The three countries have separately invested in NDC projects in a number of developing countries and are currently looking at improving collaboration through a number of co-investments. The meeting concluded that there was significant benefit to sharing information, coordinating in-country workshops and sharing of tools. It is hoped that this will develop into a multi-country collaboration, and that the GRA Inventories and NDC network could have a role in providing coordination between these various projects in the future.

# Sampling length for "developing" N<sub>2</sub>O emission factors for agriculture Sebastian Vangeli, 2019 CLIFF-GRADS Recipient

Most developing countries do not have reliable data on direct N<sub>2</sub>O emission from agricultural systems. This causes difficulties in improving GHG inventories, the main tool to link local scientific emission mitigation developments with policy. Generating reliable data on N<sub>2</sub>O emissions that can be used to calculate Tier 2 emission factors (EF) involves conducting field experiments/measurements with an appropriate methodology.Meeting all the methodological requirements can be expensive and challenging, especially for developing countries.

Sampling length must be taken into account when estimating N<sub>2</sub>O emissions. The IPCC and GRA N<sub>2</sub>O chamber methodology guidelines traditionally recommended taking measurements throughout the year and preferably over a series of years "to reflect differences in weather conditions and inter-annual climatic variability". However, in the 2019 IPCC "refinement" to the 2006 guidelines, these requirements/ recommendations seem to have become more relaxed. For example, experiments with a sampling period much shorter than a year were included in the default Tier 1 EF calculation. Although it is expected that a large part of the emissions attributable to the application of a fertilizer/excreta occurs in the first weeks after the application/excretion. the data available to make a rational decision regarding sampling duration is currently insufficient.

Being a CLIFF-GRADS recipient and during my PhD in Argentina, I found myself involved in the planning of several experiments in which we had to make trade-offs between the sampling length and other relevant methodological aspects which assure the



accuracy of the N<sub>2</sub>O fluxes estimation. To take measurements during an entire year while maintaining an adequate sampling frequency, to have sufficient chambers to capture the spatial heterogeneity and enough air samples per chamber to assess linearity demand resources that are not usually available. On the other hand, conducting experiments with a short sampling length could allow estimating N<sub>2</sub>O fluxes correctly during this short period (with higher frequency, more chambers and air samples per chamber) but could also lead to a poor estimation of the annual N<sub>2</sub>O emission, generating datasets that are not reliable for inventory purposes. Therefore, scientific information regarding sampling duration to calculate accurate EF is highly relevant to design future experiments.

In 2018, I was awarded a CLIFF-GRADS (GRA/ CCAFS) fellowship, which allowed me to conduct research at North Wyke, Rothamsted Research (UK). The main purpose of my work in North Wyke was to analyze available data from plot experiments in the UK and Ireland to develop further guidance regarding the length of the sampling period that would be required to obtain accurate N<sub>2</sub>O EF's. Along with researchers from different institutions from the UK and Ireland, we compiled and analyzed a database of around 100 "IPCC compliant" manure and excreta plot experiments with sampling periods of around one year. Using that database, we evaluated whether it was possible to accurately estimate EF's by measuring during shorter sampling periods after the manure application or excretion.

We are currently in an advanced state of the investigation and, hopefully, we will be able to share the results soon. The results of that work should contribute to establishing recommendations regarding the sampling duration to calculate Tier 2 EF in the UK and Ireland. This could be one of the first efforts to establish clear guidelines regarding the sampling duration to estimate Tier 2 EF's, relevant to countries worldwide.



# ACIAR: Fiji and Vietnam NDC Project

The Australian Centre for International Agricultural Research (ACIAR) has invested in a project titled "Agriculture based emission-reduction options to support NDCs in Vietnam and Fiji", managed by Prof Peter Grace, Queensland University of Technology and Prof Richard Eckard, The University of Melbourne.

The specific aims of the project are to:

- review emission-reduction options appropriate to Vietnam and Fiji;
- develop a governance checklist enabling partner countries to identify, adopt and manage locally appropriate emission-reduction options

# **News and Resources**

towards their NDC commitments;

• identify potential co-benefits, capacity building needs and gender issues in relation to the implementation of emission reduction options in Fiji and Vietnam, in delivering to their NDC commitments.

Following workshops with key stakeholders and collaborators in both Fiji and Vietnam, the project has developed a comprehensive review of potential mitigation and sequestration options within the agricultural sectors of both partner countries.



#### Meta-analysis of N<sub>2</sub>O emission factors for excreta deposited onto pasture

New EF3 emission factors have been incorporated in New Zealand's 2020 inventory based on a meta-analysis undertaken by van der Weerden et al. (2019) based on field studies undertaken in the past decade (de Klein et al., 2014; Hoogendoorn et al., 2013; Luo et al., 2013, 2016, 2019; and Saggar et al., 2015).

The research collectively shows:

- a statistically significant difference in urine; emission factors between cattle and sheep
- emissions from sheep, beef cattle and dairy cattle excreta deposited on low (between o degrees and 12 degrees), medium (between 12 degrees and 24 degrees) and steep (greater than 24 degrees) sloped land are significantly lower than corresponding emissions on land that is flat or of a low gradient.



#### Enhancing NDC ambition through soil organic carbon sequestration: A science policy dialogue CCAFS SBSTA50 Side Event

"An estimated 18 to 37 billion tons of carbon could be sequestered in croplands globally over the next 20 years by implementing best practices for soil organic carbon (SOC) sequestration (Zomer et al. 2017). In addition, more than 380 billion tons of carbon are at risk of loss from carbon dense peatlands in the top 20 countries with the largest peatland stocks alone (Crump 2017). SOC protection and sequestration are therefore major greenhouse gas (GHG) mitigation options, especially to contribute to the negative emissions needed to achieve the 2050 global policy targets. Increasing SOC levels can also provide substantial additional benefits for adaptation, food security and biodiversity, including nutrient cycling and water availability."

#### FAO Livestock Activity Data Guidance (L-ADG); shifting to Tier 2 Inventories

The majority of developing country agriculture inventories use IPCC Tier 1 approach to emission reporting which is unable to capture management practices and productivity improvements that result in emission reduction. Taking a tier 2 approach requires activity data on livestock and feed characteristics which is often lacking, incomplete or of poor quality. Recent research found that of 140 developing countries, 92 incorporate livestock-related emissions. Measuring and reporting progress toward



these targets will not be possible without a shift to higher levels of emission reporting.

"The aim of the Livestock Activity Data Guidance (L-ADG) is to provide practical methods for countries to estimate the activity data used to compile livestock GHG inventories using the IPCC Tier 2 approach. The purpose is to support countries to improve the accuracy of the livestock emission estimates in national GHG inventories, and thus enable countries to measure and report progress towards their NDCs. Intended readers include inventory experts with no livestock expertise and livestock experts who may be unfamiliar with the IPCC Guidelines on GHG inventory compilation."

#### Vietnam Refinement to NDC as Outcome of CCAFS Work

Vietnam recently refined their Nationally Determined Contribution (NDC) based on CCAFS outputs on AWD in Paddy Rice and Agroforestry. Please see the report on Outcomes of CCAFS Work in Vietnam for more information.

#### A model-based carbon inventory for national greenhouse gas reporting of mineral agricultural soils

Wüst-Galley, C., Keel, S. G., Leifeld, J. 2019: A model-based carbon inventory for national greenhouse gas reporting of mineral agricultural soils. *Agroscope*. Zürich, Switzerland.

"A model based soil organic carbon (SOC) inventory for soils under permanent grassland and cropland in Switzerland has been developed, to be used for national greenhouse gas reporting under the UNFCCC. The inventory system is based on the soil carbon (C) model RothC and incorporates the management of the 19 most important crops and 6 grassland categories."

"The system is dynamic, capturing inter-annual variability in SOC changes due to, for example, meteorological conditions or herd sizes (which influence C inputs to soil through organic amendments). Furthermore, it is flexible allowing for continuous improvements as well as the representation of some future changes in management. Finally, the inventory system can also serve as a tool for sensitivity analysis or to explore specific GHG mitigation options that increase SOC stocks. In the National Inventory Report, the results are aggregated for three elevation zones and are reported separately for permanent grassland and for cropland. An initial uncertainty analysis based on Monte Carlo simulations considering uncertainty in

the input parameters reveals that the average relative uncertainty of year to year SOC stock changes is greater than 100%. This indicates that at the national scale, for the period 1990 to 2017 and across all crop and grassland types, mineral agricultural soils cannot be considered a statistically significant C sink or source."

#### Grazing related nitrous oxide emissions: from patch scale to field scale

Voglmeier, K., Six, J., Jocher, M., Ammann, C. 2019: Grazing-related nitrous oxide emissions: from patch scale to field scale. *Biogeosciences* 16(8):1685-703.

"Grazed pastures are strong sources of the greenhouse gas nitrous oxide ( $N_2O$ ). The quantification of  $N_2O$  emissions is challenging due to the strong spatial and temporal variabilities of the emission sources and so  $N_2O$ emission estimates are very uncertain. This study presents  $N_2O$  emission measurements from two grazing systems in western Switzerland over the grazing season of 2016."

#### California – Denmark – Netherlands Webinar: Dairy Methane Reduction Technologies

"There are many different new and existing technologies that are being utilized to reduce methane gas emissions and to capture and use dairy biogas. However, there are few places where this information can be shared broadly. This webinar will establish a platform for information sharing on new technologies to reduce emissions and capture and utilize methane. This joint webinar, between the State of California and Governments of Denmark and the Netherlands, will also highlight recent policy efforts to utilize dairy methane as a renewable natural gas and energy source."

#### New technical documents incorporated in Spain's Tier II estimation of agriculture livestock feed emissions

In the 2020 inventory submission, Spain have incorporated revisions to their methodology for livestock emissions (TIER II) from new research on the nitrogen balance of livestock feed by livestock types; poultry (broilers and layers), swine, cattle and sheep. The updated methodology for calculation is based on the IPCC (2006) and EMEP/EEA (2013) reporting guidelines and has resulted in recalculations to agricultural NH<sub>3</sub>, NO, NO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>, NMVOC, PM<sub>2.5</sub>, PM<sub>10</sub> and TSP emissions.





# **Events**

GRA Livestock Research Group Annual Meeting 18-19 September 2020, to be organised via videoconference

GRA Croplands Research Group Annual Meeting August 2020, date and conference details TBC

GRA Paddy Rice Research Group Annual Meeting November 2020, date and conference details TBC

# **Opportunities and Training**

# **GHGMI Alumni Registry Launched**

GHGMI has launched a GHGMI Alumni Registry to recognize the growing expertise and achievements of their esteemed alumni. The purpose of the registry is to facilitate job opportunities and networking connections within the growing GHG management profession. Click here to learn more.

# Graduate-level Diplomas through GHGMI

Among other online programs, GHGMI offer an instructor-led online course in IPCC methodologies in the Agriculture Sector. This course is strongly recommended to all practitioners dealing with Climate and agriculture issues, mitigation of GHG emissions from agriculture and reporting on GHGs from the agriculture sector. Financial aid is also available for qualifying applicants.



# **GRA** activities



# IRG Meeting, Wageningen University, Netherlands: Inventories and NDC Network Breakout Session

The 2020 meeting of the IRG was held at Wageningen University & Research on 2-4 March 2020, linked with the second CIRCASA annual meeting. The meeting was chaired by Australia, France and Canada. There was attendance by representatives from thirteen member countries, representatives from AGMIP, CGIAR and Madagascar, as well as several key scientists.

During the meeting a breakout session for the Inventories and NDC Network focused on two key issues:

- Transparency around agricultural inventory and NDC capability building work that has been done and what is still required.
- The advantage of having consistency in the tools, templates, mechanisms and expertise being used across the Network.

There is a lack of understanding across the Network of the sum of the work that has happened or is happening, across the world, to support capability building in NDCs and Inventory compilation. This is causing overlap in the scope of some projects, and opportunities are being missed. A stocktake of current and planned capability building efforts was proposed. The 4p1000 initiative offered to host this stocktake information on their website. It was noted that this could build on work already carried out by the UNFCCC.

The use of consultants to deliver inventories and shape NDCs was raised as an issue due to knowledge not being retained in inventory and NDC coordinating institutions. There is a missed opportunity to upskill people in-country and a loss of expertise when the consultant finishes. It was observed that the increase in frequency to biennial reporting might result in more countries establishing and upskilling permanent teams for NDC and Inventory management.

As a network activity, it was proposed that a library of tools is established that would be utilised by the Network in its activities. This would provide consistency between research activities led by Network members and enable capability building projects to know what form outputs of other projects would be in. This could include:

- The Basque Climate Change Centre (BC3) has produced decision mapping to help navigate inventory related requirements.
- The US EPA has a workbook template they designed to guide countries in development of more robust inventory systems (currently being updated).
- Colorado State University's Agriculture and Land Use Greenhouse Gas Inventory (ALU) Software, based on IPCC guidelines.

Additionally, the idea of creating an Inventory and NDC "support hub" has been considered by many meeting attendees. Potential formats could include a forum of experts, a mailing list, or FAQs based on IPCC message boards. The Livestock Research Group (LRG) are also considering something similar. Thoughts on how to design and fund this product in a way that is effective and links with other ideas being explored within the GRA are welcomed, please don't hesitate to contact one of the Network co-leads.



## Addressing livestock sector activity data gaps in Sub-Saharan Africa

The Global Research Alliance on Agricultural Greenhouse Gases (GRA) is seeking contributions of livestock activity data gaps by African countries for a regional collaboration to build capability of countries facing similar reporting issues.

With commitments to the Paris Agreement and the Koronivia Joint Work on Agriculture (KJWA) decision in place, countries must move towards having detailed (at least Tier 2) baselines for livestock emissions to support their Nationally Determined Contributions (NDCs), tools to support Monitoring, Verification and Reporting (MRV) and context-specific plans and policies to access climate finance and to respond to climate change. Despite such obligations, accounting of GHG emissions and removals by countries who are signatories to the agreement, remains challenging. Shortcomings in livestock activity data have thus far also limited the development and application of Tier 2 MRV methods.

The GRA is committed to assisting countries build their capability in GHG inventory development, and New Zealand, as part of its contribution to the GRA, has instigated a regional research collaborative project on livestock sector activity data collection in 39 countries across Sub-Saharan Africa.

The project will contribute to improved estimates of national livestock emissions and mitigation at Tier 2 levels and decision-support for achieving NDCs and tracking NDC performance in the livestock sector, by increasing the understanding of the currently available and collected incountry activity data for Tier 2 estimates of livestock emissions.

Data collected through the project will also help generate region-specific emission factors based on the best available/collected data. If the available data is not deemed sufficient, this process will at least identify specific livestock activity data gaps that need to be filled. This will help countries to assess the appropriateness of the use of the IPCC Tier 2 or other available models in the development of livestock GHG inventories and the MRV requirements to progress to Tier 2 livestock sector GHG inventories.

"Access to reliable livestock activity data is the first major step in the progression towards Tier 2 livestock sector inventories", said Ackim Mwape, GRA Africa Programme Coordinator.

"In most sub-Saharan countries, data is available that, if systematized, provides a good starting point for compiling and maintaining livestock GHG inventories using the Tier 2 approach."

"Through this project, we will gain a better understanding of the currently available and collected in-country activity data and help indicate ways to invest limited resources to achieve major and costeffective improvements in filling data gaps and improving data quality".

Addressing data gaps in sub-Saharan Africa is a priority for the GRA, particularly as a lack of quality data hinders efforts to track progress on NDC performance and the designing of policies that could effectively respond to food security and climate change challenges in the region.

The project is funded by the New Zealand Ministry for Primary Industries and is being implemented by New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC) in partnership with the Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN) and the University of Pretoria.

African agriculture Inventory compilers or relevant experts may contact Ackim Mwape, GRA Africa Programme Coordinator, on **Ackim.Mwape@ mpi.govt.nz** for more information or to provide details of activity data gaps being faced in their country.

## **CLIFF-GRADS Round 4 Call for applications now closed**

Since 2017, 67 students from 23 countries have received CLIFF-GRADS awards. The **Round 4 Call** is now closed. Over 200 applications were received from 40 countries for the 54 research stay opportunities advertised. Winning candidates will be announced later this year.

The Climate, Food and Farming, Global Research Alliance Development Scholarships Programme (CLIFF-GRADS) is a joint initiative of the Global Research Alliance on Agricultural Greenhouse Gases (GRA) and

# **NZ-GRADS**

The Global Research Alliance on Agricultural Greenhouse Gases (GRA) is pleased to announce the launch of the New Zealand Global Research Alliance Doctoral Scholarship (NZ-GRADS) programme.

NZ-GRADS is a PhD scholarship offered to science students from **developing countries** to complete their PhD at a New Zealand university. The PhD research topics must be related to greenhouse gas emissions from agricultural systems, primarily livestock, but innovative and novel aspects of this will be considered, especially related to new technologies or new applications of existing technologies.

The GRA offers a wide range of capability building and research programmes through various partners within New Zealand and internationally. These PhD students would be actively supported through various extension and networking events hosted by the GRA and Education New Zealand.

Applications for the 2020 NZ-GRADS programme close on Monday 1 June 2020.

the **CCAFS Low Emissions Development** Flagship. CLIFF-GRADS builds capability in early career scientists from developing countries to conduct applied research in agriculture greenhouse gas emission quantification and mitigation.

During short research stays of up to 6 months, CLIFF-GRADS candidates are exposed to expertise and scientific training at their host institute that they would not otherwise receive during their PhD in their home country.



## 2020 CLIFF-GRADS Webinar Series

A 2020 CLIFF-GRADS webinar series will introduce new students to the Programme as well as enable collaboration between new and established CLIFF-GRADS Alumni, their supervisors and interested researchers as well as the wider GRA and CCAFS partner research networks. The 2019 webinar series had three sessions:

- Using modeling, life-cycle assessment, and trade-off analysis to understand low emission options (May 9, 2019)
- Direct measurement approaches to investigating mitigation options in livestock systems (May 15, 2019)
- Mitigating climate change through reduced food loss and waste (July 9, 2019)

Details for the 2020 webinar series will be included in the next newsletter.

# **CLIFF-GRADS** in Action

# Banira Lombardi, 2018 CLIFF-GRADS Recipient

In 2018, I completed my research stay at the International Center of Tropical Agriculture (CIAT) in Cali, Colombia. It was an incredibly enriching experience, it made me grow a lot personally and academically since it tested my previous knowledge but also all my skills of adaptation, tolerance and open mind in a different workplace.

My supervisors, Ngonidzashe Chirinda and Jacobo Arango, and the working group immediately made me feel part of the team. During the stay, I worked on the determination of nitrous oxide emissions from dung patches deposited on pastures with contrasting biological nitrification inhibition capacity. I had to design and carry out the assays, which was a great challenge for me, and I learned a lot of techniques that I have not used before. The outcome of the training is extremely positive and I am sure that it helps improve the quality of my current research and my research group.

Nowadays, I am studying for my PhD at UNICEN Tandil, Argentina. My research is about greenhouse gas emissions, specifically methane and nitrous oxide, from cattle excreta on typical Argentinian production systems, studying the effects of different diets and manure management. My work aims to find mitigation options for our typical production systems, to improve the measurement of GHG on each establishment and to contribute to National Inventories.



I am very grateful to have been part of the CLIFF-GRADS program, now I am back home, with my backpack filled with new knowledge, experiences, friends, and connections.

# Maria de Bernardi, 2019 CLIFF-GRADS Recipient

I was awarded a CLIFF-GRADS grant in 2018 to complete a 6 month research stay in Osorno, Chile. I'm currently in the final stage of my post doctorate degree in Environmental and Health Sciences at UNCPBA (Universidad Nacional del Centro de la Pcia. de Buenos Aires).

My CLIFF-GRADS research project was "Nitrous oxide emissions from pastures using novel fertilizer formulation", directed by Dr. Marta Alfaro. The objective of this research project is to evaluate the effect of foliar nitrogen fertilization, including nano-particulate fertilizers, on greenhouse gases and on nitrogen cycle, and its efficiency in production systems.

During my stay, we worked with Medioambiente y Ganaderia of the Agricultural Research Institute (INIA, Chile) to determine the nitrogen balance using different formulations of nitrogen fertilizers. I participated in two trials to measure ammonium (NH<sub>3</sub>) with the dynamic chamber technique and methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) with the static chamber technique in samples of intact soil cores with two-year pasture, and also with measurements of soil and plant parameters. The principal trial was developed during 60 days, testing seven N fertilizer treatments: granular urea, water dissolved urea, ammonium nitrate, commercial fertilizer (SOQUIMICH S.A.) and N nanoparticulate fertilizers (formulations from INIA Remehue group) as well as two unfertilized control plots with and without plant cover. In both trials, 25 kg N/ha were applied. Academically, it was a very enriching experience. During my stay my directors and partners were always very approachable. I participated in several conference presentations to share our results.

I learnt new research techniques and participated in a new research group. The dynamic chamber technique for measurement of NH<sub>3</sub> is a novel technique that is very uncommon in Argentina. This experience is therefore of great benefit to me and my research group in Argentina (Fisicoquímica Ambiental Group, CIFICEN, Tandil). We have now incorporated this technique into our studies, possible since it required lab instruments that we already had. Fisicoquímica Ambiental Group is one of the main greenhouse gases research groups in Argentina.



Right now, I've been awarded with a 2-year postdoctoral scholarship also from CONICET. My directors, Dr Elena Fernandez and Dr Paula Juliarena and I plan to use different lab techniques to intact soil cores to estimate  $CH_4$  soil diffusivity and  $CH_4$  flux in different texture soils under afforestation.

I'm really grateful for the CLIFF-GRADS Programme because through this I was able to learn different approaches for greenhouse gases research and establish international research connections with the main greenhouse gas research groups in Chile.

In a more personal way, I'm grateful because this experience made me grow, not only as a researcher, but also to develop social skills. Living in a different culture allowed me to experience different customs, and local traditions and many new places.