MARÍA DE BERNARDI

Bachelor's degree in Environmental Technology, CONICET Scholarship PhD degree

Hi, I'm María De Bernardi. I was awarded with the CLIFF-GRADs scholarship program in which I completed a 6 month research stay in Osorno, Chile. This program is addressed to students from developing countries currently enrolled in PhD programs. I'm taking a doctor's degree in Applied Science, specializing in Environment and Health (*Doctorado en Ciencias Aplicadas, mención Ambiente y Salud*) in UNCPBA (Universidad Nacional del Centro de la Pcia. de Buenos Aires), and I have a doctoral scholarship from CONICET (National Scientific and Technical Research Council - *Consejo Nacional de Investigaciones Científicas y Técnicas*-).

I was beneficed with a 6 month stay to collaborate in the project "Nitrous oxide emissions from pastures using novel fertilizer formulation", directed by PhD. Marta Alfaro. The objective of this research project is to evaluate the effect of foliar nitrogen fertilization, including nanoparticulate fertilizers, on greenhouse gases and on N cycle system, and its efficiency in a productive system. During my stay, I collaborated to assess the first aim of this project: to determine the nitrogen balance using different formulations of nitrogen fertilizers. This was carried out in the group of *Medioambiente y Ganaderia* in Agricultural Research Institute, Remehue Regional Research Center (INIA Remehue, Osorno, Chile). It was a very enriching experience. During my stay I could learn from PhD. Marta Alfaro and PhD. Francisco Salazar, leaders of the research group, and from Sara Hube and the rest of the partners of research group. They were always there for my questions and requirements. Also, a meeting with a statistic expert was concerted during my stay.

I have participated in two series of essays to measure ammonium (NH₃) with the dynamic chamber technique and methane (CH₄) and nitrous oxide (N₂O) with the static chamber technique in samples of soil with two-years pasture, and also with measurements of soil and plant parameters. The first task I have was developed a "dry run" which was carried out to test and learn the techniques previously mentioned that were used in principal study. This essay was carried out for 21 days testing five N fertilizer treatments: control (without fertilization), water dissolved urea, ammonium nitrate, commercial fertilizer (SOQUIMICH S.A.) and N nano-particulate fertilizers (formulations from INIA Remehue group). The second and principal essay was developed during 60 days, testing seven N fertilizer treatments: control with plant (without fertilization), control without plant (without fertilization), granular urea, water dissolved urea, ammonium nitrate, commercial fertilizer (SOQUIMICH S.A.) and N nanoparticulate fertilization) from INIA Remehue group). In both essays, 25 kg N/ha were applied. The results of this research are still in process and we are working in a research paper to publish them

I found that this experience was very useful as a Doctorate student because I could experiment a different research group dynamic and learn new research techniques. The dynamic chamber technique for measurement of NH₃ is a novel technique often not used in Argentina. This is why, it's a great gain and advance for my research group (Fisicoquímica Ambiental Group (CIFICEN, Tandil, Argentina), to incorporate this technique into our studies, since it only requires lab instruments that we already have. Fisicoquímica Ambiental Group is one of the main greenhouse gases research group in Argentina.

I'm really grateful with CLIFF-GRADs because through them I could learn different approaches for greenhouse gases research and generate international bonds with a main greenhouse gases research group 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 experiment different costumes, local folklore and places that I could visit.

FLORENCIA GARCIA

Research Supervisors and Host Institution: Dr. Emilio Ungerfeld and Dr. Camila Muñoz – INIA Remehue (Osorno, Chile)

My stay in Osorno (Chile) was beautiful. I had the opportunity to meet very nice people, both at INIA and outside of work. Chilean people received me and my family very well.

This experience exceeded my expectations. My supervisors, Emilio Ungerfeld and Camila Muñoz, gave me a lot of support from the very beginning (before going to Osorno) till the present time. It was a pleasure to work alongside them, creating a very pleasant work atmosphere. The relationship with other researchers from INIA was also excellent. I felt very welcome by everyone.

The aim of research was to investigate the effects of inhibiting methanogenesis on nitrogen and fatty acids metabolism in the rumen and its consequences to digestion, metabolism and performance of lactating dairy cows. The focus was to integrate different aspects of hydrogen metabolism, as many processes that take place in the rumen are mediated by the dynamic of hydrogen and can be altered when methane is inhibited. Understanding the interface of ruminal energy and nitrogen metabolism is of vital importance for the evaluation of mitigation strategies to be as comprehensive as possible. However, it is an area that has received comparatively little attention.

In this training I put in practice techniques that I have not used before, as for SF₆ for methane determination, N_{15} enrichment for estimation of microbial protein, etc. As well as other techniques that I already know, but that by doing it in other place there are always new things to learn. There were many enriching discussions about methodology and how to carry out the experiment, driving my training as a young researcher. It was a great opportunity to use the SF₆ technique which is fundamental to study methane production from ruminants, one of the most emitted greenhouse gases from livestock.

To date, the samples obtained during the experiment are being processed, so there are not results yet available. Beyond the experiment itself, the most tangible result so far is the opportunity to interact with researchers from neighboring country, with which I share similar interest in the study and development of mitigation strategies for the livestock sector. This enables to create and strength networks to abate climate change at regional and global scales.

One aspect I think that could be taken into consideration is that it is a scholarship program that could also be suitable to postdocs or young researchers in training.

I am very grateful for the opportunity that the CLIFF-GRADS gave me, as this experience has enhanced my expertise, broadened my knowledge as an animal science researcher and has set the foundation for future collaborations between our research teams.

BANIRA LOMBARDI

Bachelor's degree in Environmental Technology, CONICET Scholarship PhD degree

I am Banira Lombardi, a PhD Student of Doctorate in Applied Sciences, specialising in Environment and Health at UNICEN, Tandil, Argentina. Currently, I'm studying greenhouse gas emissions from livestock manure, especially cattle in pasture and feedlots systems. I'm

trying to understand the effects of different diets and manure management and to observe which are the factors that influence these emissions. The aim of my work is to find mitigation options to our Argentinian typical production systems and to improve the measure of GHG on each establishment.

I am one of the awardees of the CLIFF-GRADS scholarship program 2018 in which I completed a 4-month research stay in the International Center of Tropical Agriculture (CIAT) in Cali, Colombia. The research stay was an incredibly enriching experience. It made me grow a lot personally and academically, since it tested my previous knowledge but also all my personal tools of adaptation, tolerance and open mind in a different workplace.

Interacting with experts from other countries allowed me to work with novel technologies, and taught me to research and produce knowledge in ways I didn't know before. In the project I worked on the determination of nitrous oxide fluxes from manure patches on different forages to evaluate if there was biological nitrification inhibition. I was directed by PhD. Ngonidzashe Chirinda and PhD. Jacobo Arango. I had to design and carry out the assays, which was a great challenge for me; with the help of my co-workers I learned about inorganic Nitrogen cycle, microbial community dynamics, lab determinations to analyse different parameters like nitrates, ammonium and potential nitrification rates. I'm still working with the results that I hope will be published soon and in order to the rest of the scientific community knows them. The final result is extremely positive and I am sure that it helps improve the quality of my current research and of my research group.

I think it's one of the best experiences that can be done in a PhD training. It could be difficult to make the decision, but we must not let time pass, or believe that it is impossible, we just have to look for these opportunities and enjoy them. Now I am back home, with my backpack full of learning, experiences, memories, friends and links that, without a doubt, are worth the effort.

I congratulate and thank the CLIFF-GRADS program for the support provided.

SEBASTIÁN VANGELI

INTA / CONICET, Institute of Climate and Water, INTA Castelar; University of Buenos Aires, Department of Management and Conservation of Soils.

Being a CLIFF-GRADS awardee allowed me to go on a research stay to Rothamsted Research's North Wyke site between June and December 2018. North Wyke (NW) is an agricultural research institute that is at the edge of knowledge in sustainable grazing livestock systems, with expertise in livestock production, soil science, grazing systems and environmental research. It has unique research capabilities; with distinguished scientists and advanced field and laboratory equipment. The site -and its visitor accommodation- is located in Devon (SW of England) in a 350 ha farm surrounded by gently rolling green grasslands where cows and sheep graze. The landscape is beautiful, with amazing views of the Dartmoor National Park. All this makes NW an extremely attractive place for visiting students and researchers from around the world, and a charming place to live and work.

The main objective of my research in NW was to improve the guidelines for estimating nitrous oxide emissions (N_2O , one of the main greenhouse gases produced in agriculture) in field experiments to obtain emission factors for inventory purposes, performing a full analysis of a large experimental database of the United Kingdom and Ireland. The project was especially centered in optimizing resources to generate N_2O emissions estimation at a lower cost, which is especially important for developing countries, especially when they have such a big and diverse agricultural area like Argentina.

Although most of the project was office based, I also had the possibility to collaborate with projects of other students and researchers of Rothamsted Research. Learning about their working methodology in the field and the laboratory helped me to reconsider some aspects of my experiments back home. I also had the opportunity to meet researchers from universities in the United Kingdom, such as Bangor University, where one of my CLIFF-GRADS supervisors works, and Aberdeen, where I got a brief training in the use of simulation models for the estimation of N_2O emissions, which I need to use for one of the objectives of my PhD. On the other hand, in the visitors residence of NW, I shared a lot of time with young researchers from different parts of the world who were visiting the site, which was a very rewarding experience.

In terms of scientific production, the work carried out during my CLIFF-GRADS will result in a chapter of my PhD thesis and (hopefully) in 2 research papers, apart from a collaboration in another PhD student's paper. Apart from that, working in one of the most prestigious research centers on my field, being supervised by leading scientists in the subject and collaborating with them in scientific publications at an early stage of my career is extremely important. From a more personal point of view, having the opportunity to spend a 6 months in another country, living with young people from different countries and with different cultures, makes the experience extraordinary.

I highly recommend any PhD student from Argentina (or other developing countries) who is working on the measurement or management of greenhouse gases or carbon storage in agricultural systems to apply to the CLIFF-GRADS scholarship, so they could have a training and living experience as good as mine.



Sebastián Vangeli: measuring N2O emissions in an experiment near North Wyke.



the Broadbalk Experiment, one of the longest-running agronomic experiments in the world, started in 1843.



Banira Lombardi: Sampling greenhouse gases from Brachiaria pastures with cattle manure, the International Center of Tropical Agriculture (CIAT), Cali, Colombia.



Banira Lombardi: ready to sample greenhouse gases from a cassava field with colleagues at CIAT, Cali, Colombia.



Florencia Garcia: feeding experimental cows at the unit of Digestion and Metabolism at INIA Remehue, Osorno, Chile



Florencia Garcia: preparing material for rumen sampling with Emilio Ungerfeld at the Unit of Digestion and Metabolism at INIA Remehue, Osorno, Chile.



María De Bernardi: collecting soil and pasture cores for the study of GHG Emissions, INIA Remehue, Osorno, Chile.



to collected pasture cores, INIA Remehue, Osorno, Chile.