



## ***Round 7 Call for Student Applications: Capability Building through Research Stays for Low Emission Agriculture***

The CLIFF-GRADS Programme invites applications from PhD students from developing countries <sup>1</sup> for short term (4-6 months) scientific training and research on the measurement, modelling quantification and mitigation of greenhouse gas emissions, or carbon storage in agricultural systems relevant to developing countries (this may be in the context of enhancing food security).

***The deadline for Round 7 CLIFF-GRADS student applications is Sunday 11 January 2026 at 11:59 p.m. GMT***

Grants of \$14,000 USD will be awarded to PhD students from developing countries for research stays that will be started before the end of 2026.

### **Eligibility**

Individuals applying for the Programme must be **citizens of developing countries<sup>1</sup>**, be undertaking their **PhD in a University based in a developing country** and must not have previously been awarded a CLIFF-GRADS grant.

Preference will be given to students applying for opportunities outside their home country/ country of study to encourage the building of global networks and connections through this programme.

### **Background**

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), the Global Methane Hub (GMH), and CGIAR Climate Action Science Program. CLIFF-GRADS builds capability in early-career scientists from developing countries to conduct applied research in agriculture greenhouse gas emission quantification and mitigation.

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<sup>1</sup> Applicants with passports from countries listed as “low-income economies”, “Lower-middle-income economies”, “upper-middle income economies” and “Latin America and the Caribbean” by the World Bank [here](#)

In the first six rounds of CLIFF-GRADS, over 200 PhD students received grants, furthering their research skills and strengthening international agriculture emission research networks.

Additionally, the Global Methane Hub is offering up to 30 scholarships across two rounds through the Enteric Fermentation R&D Accelerator, with up to 15 available this round. Key research topics include: methane inhibitors, genetics, vaccines, measurement tools, and the rumen microbiome, animal behaviour, and physiology.

### **Application instructions**

Applicants must complete the [CLIFF-GRADS Round 7 online application form](#) and submit the following necessary documentation merged into a single PDF file. Applications must be in English and applications that are in any other language will not be accepted.

- a. 1 page motivation letter (*described below*)
- b. 1-page academic curriculum vitae (CV / Resume) that includes your contact details
- c. Letter of support from your PhD supervisor at your current university

### **Motivation Letter**

Your motivation letter should be no more than one page (A4, 11 – point Calibri, single spaced with 2.54 cm margins on either side), and must include the following:

1. Your name, nationality and your PhD country
2. Objectives of your graduate research
3. The specific research opportunity or opportunities (up to 3) in order of preference to which you are applying (*see list below*). Please list the research stay name and number.
4. Your qualifications to conduct research on greenhouse gas emissions and/or soil carbon storage in agricultural systems, relevant to the research opportunity for which you are applying.
5. A description of how scientific training received under the CLIFF-GRADS Programme will improve your graduate research and contribute to your career.

### **Selection process**

Successful applicants will demonstrate the relevance of their PhD research for the project for which they are applying. Successful applicants will be matched with a project and notified by email by **Tuesday 21 April 2026**.

Applicants are selected based on three criteria:

1. Overall level of research experience,
2. Relevance of PhD thesis topic or other research experience to CLIFF-GRADS objectives, and;
3. The clarity of description of how the CLIFF-GRADS experience will improve the student's scientific capability and contribute to their career.

### **Duration**

CLIFF-GRADS research stays are expected to be a minimum of 4 months and a maximum of 6 months. Students and research supervisors are welcome to extend the stay by mutual agreement if additional funding is available to support a longer stay.

### **Related Opportunities**

The GRA, may organise webinars, workshops and other activities for capacity building. These opportunities will provide professional experience and serve as networking and communication platforms for CLIFF-GRADS students to share research and experiences with each other. CLIFF-GRADS students are not expected to use their funding for these opportunities.

### **Funding**

Funding for this CLIFF-GRADS call is provided by the New Zealand Government through the Ministry for Primary Industries, in support of the Global Research Alliance on Agricultural Greenhouse Gases (GRA), and by the Global Methane Hub. Contracts are administered by Randstad Ltd, New Zealand.

### **Additional information**

Programme coordinator: all enquiries relating to this call for applications should be directed to the [cliffgrads@globalresearchalliance.org](mailto:cliffgrads@globalresearchalliance.org) email address.

#### **More information**

CLIFF-GRADS: [https://globalresearchalliance.org/library/cliff\\_grads-fellowship/](https://globalresearchalliance.org/library/cliff_grads-fellowship/)

GRA: <https://globalresearchalliance.org/>

Global Methane Hub: <https://www.globalmethanehub.org/>

CGIAR Climate Action Science Program:

<https://www.cgiar.org/cgiar-research-portfolio-2025-2030/climate-action/>

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# **SOILS**

## **1. Assessing the Role of Rainfed Pecan Orchards in Mitigating Soil Nitrous Oxide (N<sub>2</sub>O) and Methane (CH<sub>4</sub>) Emissions**

**Keywords:** pecans, GHG mitigation, soil, N<sub>2</sub>O, CH<sub>4</sub>

### **Brief research stay outline:**

Fruits systems, particularly nuts, are generally associated to a low estimated carbon footprint, derived from their relatively low net greenhouse gases (GHG) emissions. This characteristic positions them as suitable platforms for designing integrated agricultural systems with reduced environmental impacts. However, only a limited number of studies have evaluated GHG emissions in nut orchards based on field measurements, leaving important knowledge gaps. Among these crops, pecan (*Carya illinoensis* [Wangenh.] K. Koch) stands out as a rapidly expanding species in Argentina, with currently ca. 14000 ha implanted at national level. Beyond nut production, pecan tree trunks growing on such surface represents the opportunity for sequestering carbon dioxide as in the soil as well as in the trunk biomass but also to offset GHG emissions due that the area below tree canopy can eventually have negative fluxes of GHG, as they were documented in previous research. Soil microenvironment under the canopy influence area may present conditions of soil temperature, moisture, organic carbon and nitrogen able to promote a net uptake of either N<sub>2</sub>O or CH<sub>4</sub>, in contrast to soils outside the canopy's influence.

Therefore, this project focuses on determining N<sub>2</sub>O and CH<sub>4</sub> in a rainfed pecan orchard considering the soil under the canopy area in the soil under the pasture in between tree lines. The experiment will be located at the Balcarce research station (Argentina). The student will conduct a field experiment aiming to evaluate GHG emissions but also will take dasometric measurements in the pecan orchards. Our results will provide new knowledge about N<sub>2</sub>O and CH<sub>4</sub> fluxes and their drivers under a pecan orchard.

This proposal includes both field and laboratory work.

### **Preferred student skills or experience:**

- Hands on experience with research field work
- Critic thinking and ability to resolve problems
- Organized and meticulous
- Basic Spanish skills are desirable but not essential

**Host institution and location:** Instituto Nacional de Tecnología Agropecuaria, INTA Balcarce, Balcarce, Buenos Aires, Argentina.

**Research supervisor:** Sebastian Cambareri, INTA Balcarce

**Preferred dates for research visit:** October 2026 to March 2027.

## 2. Biochar-Based Strategies for Carbon Sequestration and AMR Mitigation in Agricultural Systems

**Keywords:** Greenhouse gas emissions, soil microbial ecology, manure management, antimicrobial resistance, horizontal gene transfer.

### Brief research stay outline:

This CLIFF-GRADS opportunity supports research within the Sinograin III and SiNorAMR projects, conducted in partnership with leading Chinese institutions: Chinese Academy of Agricultural Sciences (CAAS in Beijing), Nanjing Agricultural University, and China Agricultural University, as well as Norwegian University of Life Sciences (NMBU). The projects are sponsored by the Norwegian Ministry of Foreign Affairs (Sinograin III) and the Research Council of Norway (RCN) (SiNorAMR). The student will contribute to the measurement and mitigation of greenhouse gas (GHG) emissions and the enhancement of carbon storage in agricultural systems, with a focus on biochar derived from agricultural wastes. In Sinograin III, the student will assess biochar's role in improving soil fertility and reducing methane and nitrous oxide emissions across diverse soil types. In SiNorAMR, the student will investigate biochar's potential in soil remediation, targeting the reduction of antibiotic resistance genes (ARGs) and antimicrobial resistance (AMR) in manure-amended soils. Activities include soil sampling, GHG flux measurement, and molecular analysis of ARGs, contributing to case studies in China and Norway. The research aligns with the goals of the Global Research Alliance on Agricultural Greenhouse Gases (GRA), CGIAR Climate Resilience Initiative, UN SDGs, One Health Initiative and Global Microbial Health (GMH).

### Relevant links:

- Sinograin III Project: <https://www.nibio.no/en/projects/sinograin-iii?locationfilter=true>
- SiNorAMR Project: <https://www.nibio.no/en/projects/sinoramr?locationfilter=true>

### Desired technical skills and experience:

- Microbial analysis – PCR, qPCR, and sequencing for ARG detection.
- GHG monitoring – Experience with soil gas flux measurements.
- Biochar application – Knowledge of biochar use in soil systems.

**Host institution and location:** Norwegian Institute of Bioeconomy Research (NIBIO)

**Research supervisors:** Dr. Thiago M. Inagaki, Researcher at NIBIO and Dr. Jihong Liu Clarke, Research Professor at NIBIO

**Start and end month of research stay:** From April 2026, 4 to 6 months.

**Languages available at the host institution:** Norwegian and English.

### **3. Spatial Modeling and Targeting of Soil Organic Carbon Sequestration and Greenhouse Gas Mitigation through Agronomically Optimal Practices in Mixed Farming Systems**

**Keywords:** Soil organic carbon, greenhouse gas mitigation, sustainable intensification, crop modelling, precision agronomy, food security

#### **Brief research stay outline:**

Meeting global food security targets requires a significant increase in agricultural production, yet this must be achieved without exacerbating greenhouse gas (GHG) emissions or degrading soils. This research stay will develop and validate agronomic strategies that simultaneously boost crop productivity and enhance soil organic carbon (SOC) sequestration in mixed farming systems. Building on ongoing CGIAR and Global Research Alliance work on climate-smart agriculture and low-emission farming, the fellow will integrate field experimentation with modelling to quantify productivity–SOC synergies. The work will involve:

- Field-based SOC and yield monitoring under contrasting management practices (e.g., residue retention, cover cropping, diversified rotations, optimized nutrient management).
- Use of modelling tools (e.g., RothC, APSIM, DNDC, or equivalent) to assess management effects on yields, SOC stocks, and associated GHG emissions.
- Scenario analysis to identify site-specific, agronomically optimal recommendations that deliver both yield and SOC targets.

The fellow will gain hands-on experience with SOC sampling and analysis, agronomic field trials, and model calibration/validation. The output of this research stay will be Manuscript/paper and policy brief.

Results will inform policy and extension recommendations for climate-smart intensification strategies relevant to developing countries, directly linking to the CGIAR initiatives ([Sustainable Farming - CGIAR](#), [Multifunctional Landscapes - CGIAR](#)). The project's emphasis is not only on understanding the interaction between agronomic management, SOC, and yield, but also on generating actionable, spatially explicit recommendations for the right practices in the right places.z

During the research stay the scholar will actively participate in fieldwork and receive support for data extraction, analysis, and modeling using R and Python, as well as for visualizing and communicating results to scientific and policy audiences. She/he will also take part in capacity-building activities on data management, modeling, and visualization, and engage in thematic discussions and supervision related to carbon sequestration. This experience will strengthen the scholar's understanding of state-of-the-art methods and current scientific discourses in the field.

#### **Desired technical skills and experience:**

- Ability to work independently and in team
- Good scientific writing skill for high impact journals
- Modelling experience using large spatial dataset
- R (or python) programming

**Host Institution and Location:** Alliance of Bioversity International and CIAT, Accra, Ghana (alternatively, Addis Ababa, Ethiopia)

**Research supervisor:** Dr. Wuletawu Abera, Senior Scientist

**Start and end month of research stay:** Jan 2026 to July 2026 (or later)

**Languages Available at the Host Institution:** English

## 4. Effects of Greenhouse Gas Emissions on Grassland Compared to a Rotation with an Arable Crop

**Keywords:** greenhouse gases, DayCent, grassland, arable crop

### **Brief research stay outline:**

The production of greenhouse gases from agricultural soils is a significant environmental concern due to its role as a potent greenhouse gas (GHG) of the 21<sup>st</sup> century and its contribution to the depletion of the ozone layer. Crop production accounts for approximately 50% of emissions from agriculture. In this trial we will be assessing how greenhouse gas emission of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) can be reduced by the introduction of a grassland in a rotation compared to a rotation with an arable crop (wheat) only. The role of the student in this research is to formulate the methodology that will be used in the trial. The student will conduct the trial, do laboratory analysis. She will then do data analysis, report and discuss the results from the trial. In this project we will measure the different soil variables before and after the experiment to know the status of the soil. We will then use the static chamber method for gas sampling. Gas sampling will be done two times a month, weekly after fertilizer application and once a month after the crop has been harvested. We will collect the soil samples from the plot. We will determine the water filled pore spaces (WFPS). Then we will conduct the incubation experiment using the Denitrification Incubation System (DENIS). The gas samples will be analysed in the laboratory using gas chromatography model 107. The daily fluxes will be used for cumulative emissions calculations. Data will be input in the DayCent model to simulate N<sub>2</sub>O, CH<sub>4</sub> and CO<sub>2</sub> emissions in no-till and conventional tillage.

The knowledge gained on the trial that we will be conducting in Rothamsted, will be of great benefit because results that we will get from the trial will increase knowledge and understanding of how the inclusion of a grassland in a rotation will reduce greenhouse gas emissions that have high global warming potential. It will also help the sector understand the benefits of a no-tillage cropping system in grasslands, and how it is beneficial in yield improvement. The knowledge that we will get from this trial, we be extended to the communities by conducting workshops and lectures on how inclusion of a grassland reduces greenhouse gas emissions. We will also disseminate the knowledge to teach farmers in different communities and attending and presenting the findings in workshops. We will also publish and write reports and articles with the findings from this trial. The project is part of the European Joint Programme of EJP Soil 'The effect of conservation agriculture interventions on greenhouse gas emissions' grant number EJP SOIL/108/CropGas/2022. Rothamsted Research's contribution to this study were funded by the UK Research and Innovation Research Council, Biotechnology and Biological Sciences Research Council (UKRI-BBSRC) under the award BB/X002993/1 (2022–2024).

### **Desired technical skills and experience**

- Gas sampling and modelling of gas emissions using DayCent model
- Field testing and research skills
- Soil analysis
- Data analysis and interpretation
- Problem solving ability

**Host institution and location:** Rothamsted Research, North Wyke, United Kingdom

**Research Supervisor:** Dr Laura Cardenas, Rothamsted Research, and Dr Lindsay Banda, University of the Free State.

**Email address of host supervisor:** [laura.cardenas@rothamsted.ac.uk](mailto:laura.cardenas@rothamsted.ac.uk)

**Start and end of research stay:** April to September 2026

**Language available at the host institution:** English

## 5. The Effect of Green Ammonia on GHG Emissions and Soil Nutrients

**Keywords:** Green ammonia, N fertilizer, Inhibitor, Greenhouse gas emissions, Soil nutrients

### **Brief research stay outline:**

N fertilizer production is currently highly energy-intensive and largely dependent on fossil fuels, making it a major contributor to global greenhouse gas (GHG) emissions. While N fertilizer is indispensable for global food production, its use is highly inefficient. This inefficiency not only wastes energy but also generates environmental pollution. A major technological innovation—producing ammonia from renewable energy, commonly referred to as green ammonia—presents both transformational opportunities and potential risks. Green ammonia could play a key role in addressing inefficiencies and reducing environmental losses. Anticipating the agricultural consequences of green ammonia is therefore essential to ensure improvements in both food production and the efficient management of N in agri-food and energy systems.

This project will be based at Rothamsted Research (UK) and will evaluate how the application rate and timing of green-ammonia-derived fertilizer products affect environmental and economic outcomes. Two experimental sites—grassland and arable—will be established in England. Treatments will include innovative green ammonia fertilizers and conventional fertilizers applied at typical rates, along with unfertilized controls. Key measurements will include: GHG emissions using static chambers, NH<sub>3</sub> emissions using ammonia tunnels, and soil nutrient dynamics.

The early-career researcher will have full access to field and laboratory facilities and will work within an international network of soil and atmospheric scientists. This research is directly linked to: The Global Nitrogen Innovation Center for Clean Energy and the Environment (NICCEE), supported by the NSF (US), NSERC-CRSNG (Canada), and UKRI-EPSC (UK) (<https://niccee.org/>), and the GRA flagship project on 'Reducing N<sub>2</sub>O emissions and improving accounting' (<https://globalresearchalliance.org/flagship-projects/n-fertilisers/>).

### **Desired technical skills and experience:**

- Background in greenhouse gas and ammonia emissions
- Background in soil science
- Background in plant science

**Host institution and location:** Rothamsted Research, North Wyke, UK

**Research supervisor:** Dr. Yafei Guo (Rothamsted Research), and Dr Laura Cardenas (Rothamsted Research)

**Start and end month of research stay:** March to August 2026 (flexible)

**Languages available at the host institution:** English

## 6. Evaluation of the ability of *Plantago lanceolata* to reduce nitrogen losses through biological nitrification inhibition

**Keywords:** N<sub>2</sub>O, field experiment, incubation, nitrogen cycling

### **Brief research stay outline:**

Biological nitrification inhibition (BNI) covers different mechanisms through which plants reduced the nitrification rate in soils, leading to reduced nitrogen leaching and nitrous oxide emissions. This trait has been found in many species, grassland species as well as food crops. Previous work suggests that secondary metabolites that the plants produce and exudate through their roots, actively inhibits soil nitrifiers. However, much is still unclear regarding how this can be used in practice on farms. At the Rhizosphere Management Agroecology Laboratory at Université Libre de Bruxelles, Brussels, Belgium, the work on BNI currently focuses on *Plantago lanceolata*, ribwort plantain, a herb that can be used in grasslands and also has potential to be used as a service crop in annual cropping systems. However, the skills learned can be easily adapted to study other plant species as well, or to study other systems.

The project covers both a field experiment and a soil incubation study with soil from plants growing in the greenhouse. Methods to measure nitrous oxide emissions both in laboratory incubations and in field will be employed, alongside measurements of nitrogen pools and microbial communities. The lab is one of the partners in the newly established GRA flagship on BNI. In the field experiment, different seeding time of *P. lanceolata* will be tested, while the incubation study assesses the buildup of BNI compounds over time.

### **Desired technical skills and experience:**

- Good knowledge of soil science
- Experience of working in a laboratory
- Ability to work both independently and in a team

**Host institution and location:** Université Libre de Bruxelles, Brussels, Belgium, potentially also with our partners at Gembloux Agro-Bio Tech in Gembloux, Belgium

**Research supervisor:** Dr. Elsa Lagerquist, Université Libre de Bruxelles, Brussels, Belgium & Prof. Cécile Thonar, Université Libre de Bruxelles, Brussels, Belgium

**Start and end month of research stay:** May to September 2026

**Languages available at the host institution:** English and French (English is a requirement)

## 7. Oxic–Anoxic Rhythms and Their Role in GHG Dynamics of Volcanic Soils: Who Is the Winner?

**Keywords:** N<sub>2</sub>O, CO<sub>2</sub>, CH<sub>4</sub>, agriculture, NO<sub>3</sub> leaching

### **Brief research stay outline:**

Volcanic temperate soils (Andisols) in south-central Chile (38°–40° S, 1,200–5,000 mm/year) represent over 60% of national agriculture (~1.2 million ha). Rich in poorly crystalline minerals (e.g., ferrihydrite, allophane), these soils experience fluctuating oxic–anoxic conditions due to drying–wetting cycles. The Ferrous Wheel Hypothesis (FWH) suggests that reductive environments can transform mineral nitrogen (e.g., nitrate from fertilizers) into stable organic forms, reducing leaching and greenhouse gas (GHG) emissions (N<sub>2</sub>O, CO<sub>2</sub>, CH<sub>4</sub>). Yet, GHG fluxes under these redox shifts remain unquantified.

This research will quantify CO<sub>2</sub>, N<sub>2</sub>O, and CH<sub>4</sub> emissions through controlled oxic/anoxic incubations experiments using undisturbed soil cores from agricultural systems (native forest as control). It will assess Fe(III) reduction–nitrogen dynamics interactions and partition microbial versus abiotic contributions to GHG emissions. Methods include gas chromatography, redox-sensitive probes, and <sup>15</sup>N isotopic labelling.

Complementary fieldwork will deploy static chambers to measure in situ GHG fluxes during seasonal with static chambers. Results will clarify how redox-driven FWH processes influence GHG dynamics in volcanic soils, informing emission models and climate change mitigation strategies.

The work aligns with the project *Ferrous wheel coupled to nitrate reduction as a mechanism for nitrogen retention in temperate rainforest soils* (FONDECYT N° 1220786, ANID Chile), running until April 2026, with a renewal request for December 2025 as *Where did the nitrogen go? Tracing abiotic and biotic immobilization pathways in Chilean volcanic soils* (FONDECYT N° 1260846). Hosted at the Laboratory of Conservation and Dynamics of Volcanic Soils (<https://laboratoriodesuelosvolcanicos.cl/>), it also supports the GRA flagship project *Development of context-specific emission factors from nitrogenous fertilisers* (<https://globalresearchalliance.org/flagship-projects/n-fertilisers>).

### **Desired technical skills and/or experience:**

- Soil science lab experience,
- Basic knowledge of laboratory management,
- use of scales, pipettes, titrations etc.

**Host institution and location:** Universidad de La Frontera, <https://www.ufro.cl>, Department of Chemical Sciences and Natural Resources <https://csquim.ufro.cl>

**Research supervisor:** Prof. Dr. Francisco J. Matus, Director of Ph.D. Program of Natural Resources Sciences, Universidad de La Frontera. Director of Laboratory of Conservation and Dynamics of Volcanic Soils.

**Start and end month of research stay:** April to September 2026

**Languages available at the host institution:** Spanish, English

## 8. Effects of livestock grazing pattern on soil carbon sequestration

**Keywords:** soil carbon sequestration, natural climate solutions, carbon ranching, livestock

### **Brief research stay outline:**

Rangelands are the most widespread terrestrial biome in the world but little is known about how livestock management decisions (e.g. timing and intensity) affect soil carbon sequestration. We have initiated a factorially designed field experiment testing the effect of grazing intensity (moderate, severe) with grazing season (June, October/November). Experimental paddocks (60 × 30 m, 20 total paddocks) were arranged in a grid in a randomized complete block design with 5 block replications ([2 grazing intensities × 2 grazing seasons × 5 replications] + 5 ungrazed controls = 25 sampled areas) in a northern mixed-grass prairie. Cattle (*Bos taurus*) grazing intensities approximated recommended (i.e. moderate; 1 AUD/ha) and severe (1.5 AUD/ha) stocking rates, with an estimated 656 and 309 kg/ha of post-grazing residual standing biomass, respectively. Soil cores were collected in 2013 (pretreatment), 2018, and will be collected in 2026. Samples will be used to estimate soil organic carbon (kg/m<sup>2</sup> to 60 cm depth), test for treatment effects, and guide recommendations to land managers. Previously, we reported short-term effects of grazing season and grazing intensity treatments on soil carbon sequestration (<https://www.sciencedirect.com/science/article/pii/S0016706122003688>).

Scholar will be closely mentored and will learn relevant experimental design and sampling issues related to soil carbon studies. They will gain hands-on experience with field sampling, sample processing (e.g. measurement of roots, soil organic/inorganic carbon), sample/data management/analysis, and/or assist with manuscript preparation. Scholar will have opportunities to visit with a diversity of welcoming range and livestock scientists and learn about regional livestock industry practices.

### **Desired technical skills and experience:**

- background in soil science (or related fields),
- field sampling and/or laboratory sample processing (e.g. sieving, grinding, basic chemistry),
- data entry and/or data analysis,
- pro-active attitude

**Host institution and location:** USDA-ARS, Fort Keogh Livestock & Range Research Laboratory, Miles City, MT USA

**Research supervisor:** Dr. Kurt Reinhart

**Start and end month of research stay:** between April 2026 and December 2027 (or later depending on needs).

**US visa application support:** In coordination with a partnering university's Office of International Programs, we will help the visiting scholar secure a US J-1 visa.

**Languages available at the host institution:** English

## 9. Assessing the role of nitrification in nitrogen dynamics and sustainability of land-use systems in Argentina's dry Chaco region

**Keywords:** Greenhouse gas mitigation, Land use efficiency, Nitrogen cycle

### **Brief project outline:**

Agricultural intensification in Argentina's Dry Chaco is vital for national development (Chalco Vera & Acreche, 2024), but current management practices—especially those influencing nitrogen (N) cycling—can lead to high emissions of nitrous oxide (N<sub>2</sub>O), a potent greenhouse gas. Improving the environmental sustainability of these systems requires a better understanding of nitrification and its role in N dynamics (Sadhukhan et al., 2022; Meng et al., 2021).

This project proposes to assess how nitrification influences both productivity and environmental outcomes across major land-use systems in the Dry Chaco. The objective is to understand how different systems affect N cycling and to generate evidence-based recommendations for sustainable N management that optimize productivity while reducing GHG emissions.

Supported by INTA's national strategy to mitigate GHG emissions in agricultural systems (<https://cartera.inta.gob.ar/proyectos/2023-PD-L02-I097/es>), the Instituto de Investigación Animal del Chaco Semiárido (IIACS) invites a young researcher to collaborate with its Biogeochemical Cycles team (Leales, Tucumán). The selected candidate will design and implement a pilot study comparing at least three land-use systems, evaluating in situ and laboratory-based nitrification rates.

The trial will also measure related variables such as above- and below-ground biomass, N<sub>2</sub>O emissions, soil respiration, and key edaphoclimatic parameters (e.g., moisture, temperature, texture, and organic matter). This exploratory research will contribute valuable insights to improve nitrogen use efficiency (NUE) and GHG mitigation strategies in the Dry Chaco. Results will support the efforts of INTA's Integrative and Croplands Research Groups.

### **Desired technical skills and experience:**

- Good skills in field and laboratory experiments
- Effective teamwork and interpersonal skills
- Familiarity with Microsoft Excel and statistical approaches
- Independent and reflective thinking
- Skills in writing science
- Basic Spanish skills are desirable but not essential

**Host institute and location:** Instituto de Investigación Animal del Chaco Semiárido (IIACS), Centro de Investigaciones Agropecuarias (CIAP), Instituto Nacional de Tecnología Agropecuaria (INTA) - Chañar Pozo s/n, (T4113), Leales, Tucumán, Argentina.

**Research supervisor:** Dr. Jorge Chalco Vera and Dr. Natalia Banegas, INTA

**Start and end the month of research stay:** March 2026 - September 2026 (flexible)

**Languages available at the host institution:** English and Spanish

## 10. Reducing greenhouse gas emissions from managed peatlands in Norway

**Keywords:** CH<sub>4</sub>, organic soils, grass cultivation, machine learning model, Arctic region

### **Brief research stay outline:**

In Norway, GHG emissions from cultivated peatlands is equivalent to ~7% of net national emissions. The student will join the project “Is paludiculture a solution for reducing greenhouse gas emissions from cultivated peatlands in Norway” funded by the Agricultural Agency of Norway. The project aims to estimate greenhouse gas (GHG) emission reduction potential through elevating water tables and cultivating different species as compared to traditional management practices. NIBIO is running two experimental sites in western and northern (Arctic) Norway to test how different water and fertilization managements affect the GHG emissions. The project combines field measurements with state-of-the-art technique and machine learning modeling to investigate the climate mitigation potential and feasibility of paludiculture for sustainable food/feed productions. The topic is relevant to regions with large peatland distribution globally, including many developing countries.

The CLIFF-GRADS student will be involved in carrying out automatic flux observations as well as photosynthesis-related physiological measurements at field sites. At the same time, the student will also have hands-on opportunities to process relevant GHG flux datasets from the field observations and analyze data using machine learning and causal models. The project also allows the student to build connections with other scientists at NIBIO and collaborators across Europe.

### **Desired technical skills and/or experience:**

- Experience of measuring gas flux using chambers.
- Basic knowledge of boreal peatland ecosystem
- Good English writing and speaking skills
- Familiar with program R

**Host institution and location:** Norwegian Institute of Bioeconomy Research, Ås, Norway

**Research supervisor:** Dr. Junbin Zhao, Research Scientist, Norwegian Institute of Bioeconomy Research

**Start and end month of research stay:** May 2026 – October 2026

**Languages available at the host institution:** English, Norwegian, Chinese

## 11. The impact of copper concentrations on complete denitrification in pasture soils

**Keywords:** Copper, Complete denitrification, nitrous oxide, greenhouse gas mitigation, isotope pool dilution

### **Brief research stay outline:**

Nitrous oxide (N<sub>2</sub>O) consumption, or complete denitrification (N<sub>2</sub>O → N<sub>2</sub>), represents the only known pathway to remove N<sub>2</sub>O from soils, transforming it into environmentally benign dinitrogen. Enhancing complete denitrification is a potential N<sub>2</sub>O mitigation strategy, which could occur via reduced N<sub>2</sub>O emission, enhanced N<sub>2</sub>O consumption, or a combination of the two to reduce net N<sub>2</sub>O fluxes from managed soils. The conversion of N<sub>2</sub>O to N<sub>2</sub> is an enzymatic reaction catalysed by N<sub>2</sub>O reductase (N<sub>2</sub>OR) encoded by prokaryotes possessing the *NosZ* gene. Several important enzymes in the nitrogen cycle rely on metal cofactors. The N<sub>2</sub>OR enzyme requires 12 atoms of copper (Cu) per functional enzyme unit. It is hypothesised that pasture soils that have become replete in Cu could emit more N<sub>2</sub>O than those that are within the optimal range. This project will explore the impact of Cu amendment on gross N<sub>2</sub>O production and consumption from livestock urine and fertiliser nitrogen, within incubation experiments. There will be opportunity to learn cutting edge techniques in <sup>15</sup>N<sub>2</sub>O isotope pool dilution to quantify gross production and consumption of N<sub>2</sub>O via laser-based N<sub>2</sub>O isotopomer analysis, as well as quantification of greenhouse gas fluxes via laser-based (MIRA Aeris) and traditional gas chromatography approaches. This research stay will be hosted within the dynamic and active research group within the Environment Centre Wales at Bangor University. The appointed Cliff-Grad student will integrate within the team and work with the supervisor and visiting academics to complete this work, which will contribute new knowledge on N<sub>2</sub>O quantification and mitigation.

### **Desired technical skills and/or experience:**

- Greenhouse gas emission monitoring and analysis e.g. gas chromatography
- Isotopic techniques
- Soil science e.g. characterizes physical and chemical properties of soils

**Host institution and location:** Bangor University, Environment Centre Wales, Deiniol Road, Bangor, Gwynedd, LL57 2UW

**Research supervisor:** Dr Karina Anne Marsden, Lecturer in Soil and Environmental Science, Bangor University

**Start and end month of research stay:** April 2026 – September 2026

**Languages available at the host institution:** English, Welsh

## 12. Monitoring of Soil Carbon and Greenhouse Gas Emissions in Grasslands, Pure or Integrated Croplands, and Forests

**Keywords:** Methane, Nitrous Oxide, Carbon, Decarbonization, Sustainability

### **Brief research stay outline:**

The agricultural sector is essential for food security and sustainable development, but it is also a significant source of greenhouse gas (GHG) emissions. In Brazil, it accounts for 26.7% of emissions, while in Rio Grande do Sul state, this figure rises to 46%, with enteric fermentation (39.9%) and rice cultivation (16.7%) as the main contributors.

This project aims to improve emission inventories by considering the specific characteristics of the state's production systems, which are currently treated generically. It involves 34 researchers from 13 institutions, organized into 5 Component Projects and 22 subprojects, covering key productive environments: agricultural, livestock, forestry, integrated systems, and native areas.

The cliff-grad student will be working with measurements of GEE from soil and animals in a diverse set of sites (experiment and farming). The activities will be conducted by the Grazing Ecology Research Group (GPEP) from the Federal University of Rio Grande do Sul, Brazil. The project will measure CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O emissions, focusing on characterizing these emissions and identifying mitigation strategies, such as sustainable practices and efficient technologies, aligned with FAO guidelines. The data collected will be part of the database from experiments conducted in grazing systems in southern Brazil, through Aliança SIPA (<https://www.aliancasipa.org/>), aiming to calculate carbon balance in temperate and subtropical conditions, reflecting the specific soil and climate conditions of southern Brazil.

### **Desired technical skills and/or experience:**

- Team working
- Writing scientific publications
- R software skills are appreciated

**Host institution and location:** Federal University of Rio Grande do Sul (UFRGS), Porto Alegre, RS, Brazil

**Research supervisor:** Paulo Cesar de Faccio Carvalho, Professor and Dr. Lais Leal da Cunha, Postdoctoral Research

**Start and end month of research stay:** June 2026 – October 2026 (could be extended until December 2026)

**Languages available at the host institution:** Portuguese, Spanish and English

### **13. Impact of Crop Diversification on GHG Emissions Mitigation Through Changes in Soil Biological and Physicochemical Properties**

**Keywords:** Crop diversification, soil N<sub>2</sub>O and CO<sub>2</sub> emissions, rainfed cereal cropping systems, soil biology, soil structure

**Brief research stay outline:**

Research aimed at mitigating climate change in agriculture focuses on the role of soils as both a sink and a source of greenhouse gas (GHG) emissions. In Mediterranean rainfed cropping systems, dominated by cereal monocultures and long fallow periods, there is a growing interest in understanding how crop diversification practices, such as the introduction of cover crops, can enhance soil health while reducing GHG emissions. However, empirical evidence on how these practices affect the relationship between soil biological processes and soil emissions remains limited. Knowledge in this area is particularly relevant for improving carbon storage and soil health supporting food security across climate sensitive regions.

In this context, the project *DIVERSOIL* (funded by the *Spanish Ministry of Science and Innovation, ref. PID2024-161114OB-I00*), will assess how crop diversification influences soil biota, soil structure, carbon sequestration, and GHG emissions in semi-arid arable systems in Spain. The CLIFF-GRADS fellow will contribute by quantifying N<sub>2</sub>O and CO<sub>2</sub> emissions using static chambers and evaluate soil health indicators such as soil biological activity and mycorrhizal fungi. These data will be interpreted alongside management practices, soil carbon changes, and crop productivity.

This CLIFF-GRAD project supports the goals of the Global Research Alliance on Agricultural Greenhouse Gases (GRA) by advancing measurement and mitigation strategies in low-input cropping system, and aligns with the GRA reducing N<sub>2</sub>O emissions Flagship and CGIAR's Climate Resilience and Sustainable Agroecosystems initiatives. Hosted at the EEAD-CSIC (Spanish National Research Council), the CLIFF-GRAD fellow will join a multidisciplinary team under the supervision of Dr. Laura B. Martínez García and Dr. Jorge Alvaro Fuentes, both with expertise in soil biogeochemistry and prior experience mentoring CLIFF-GRADS fellows.

**Desired technical skills and/or experience:**

- Background in soil science, agronomy, environmental science, or a related field.
- Interest in greenhouse gas emissions and soil biogeochemical processes.
- Experience with field or laboratory work in agriculture or environmental science: soil sampling, GHG emission and soil carbon measurements
- Basic data analysis skills and good communication in English.

**Host institution and location:** Aula Dei Experimental Station, Spanish National Research Council (EEAD-CSIC), Zaragoza (Spain)

**Research supervisors:** Dr. Laura B. Martínez García and Dr. Jorge Alvaro Fuentes

**Start and end month of research stay:** March 2026 to August 2026 (flexible)

**Languages available at the host institution:** Spanish and English

## **14. Testing different cost-effective mitigation strategies to increase soil carbon storage in organic rainfed almond orchards under semiarid conditions**

**Keywords:** Rainfed woody crops; cover crops management; tillage; soil carbon sequestration efficiency; semiarid conditions; food security

### **Brief research stay outline:**

Agriculture releases about 25% of global greenhouse gases emissions into the atmosphere, which exacerbates climate change. Since soils account for the majority of agricultural emissions, the adoption of climate-smart agricultural practices like reducing tillage, growing cover crops, and pruning residues retention, can be a powerful mitigation strategy by capturing carbon and decreasing greenhouse gas emissions. The European Common Agrarian Policy (CAP) will subsidy those farmers that adopt agricultural practices that preserve soil resources while capturing CO<sub>2</sub> from the atmosphere through the so-called eco-regimens, such as growing vegetation covers managed by a brush-cutter to avoid tillage operations. However, to date, the cost-effectiveness of this vegetation cover management practice has not been tested in semiarid calcareous soils, as it is the case of South-eastern Spain, where occasional tillage is sometimes necessary to ensure crop performance. IFAPA-Camino de Purchil is currently involved in different regional and national projects focused on assessing the climate change mitigation potential and other environmental benefits of different vegetation covers (spontaneous or seeded; annual or perennials) and their termination method (i.e., by using a brush-cutter and leaving them on the soil surface as mulching or incorporating them into the soil using a cultivator) while avoiding yield penalties under current and future climatic scenarios in SE Spain, one of the largest areas in the world for the production of rainfed organic almonds.

The student will conduct measurements of soil carbon storage, functional carbon pools, soil CO<sub>2</sub> emissions, crop residue decomposition dynamics and related C and N losses by photodegradation, and crop yields, in 3 representative organic almond orchards where different cover crop management practices have been established. The outcomes of the project will help to update emission values and to identify the most cost-effective cover crop management strategies under semiarid Mediterranean conditions. This proposal includes both laboratory and field work as well as training on different methodologies to estimate soil CO<sub>2</sub> emissions, carbon sequestration rates and carbon balance assessments from the agricultural sector. The stay will enable the candidate to interact with most relevant research groups working in greenhouse gas emissions mitigation strategies and soil carbon storage in agricultural systems in Spain. The CLIFF GRAD project proposed here will contribute to the GRA Research Flagships "Agricultural greenhouse gas inventories" and "Soil carbon sequestration".

### **Desired technical skills and/or experience:**

- Hands on experience with field and laboratory work, particularly with soils & plant material
- Data management and analyses, and good team player
- Basic Spanish skills and driving licence are desirable but not essential

**Host institution and location:** Institute of Agricultural Research and Training, Fishing, Food and Organic Farming of Andalusia (IFAPA Camino de Purchil)

**Research supervisor:** Dr. María Almagro Bonmatí

**Start and end month of research stay:** April 2026 - October 2026 (flexible)

**Languages available at the host institution:** Spanish (preferably) and English

## 15. Carbon-Sequestering Cropping Systems for Resilient and Food Secure Farming in Kenya's Highlands

**Keywords:** Soil health, Carbon sequestration, cropping system, resilience, mitigation

### **Brief research stay outline:**

Enhancing food security in sub-Saharan Africa requires urgent strategies that simultaneously address climate vulnerability, soil degradation, and rising population pressure. Cropping systems research offers opportunities to bundle interventions that mitigate greenhouse gas (GHG) emissions, strengthen resilience, and improve productivity. Central to this is understanding how crop combinations and management practices influence soil health and carbon dynamics. This research stay will focus on measuring the carbon sequestration potential of diverse cropping systems by sampling and analysing soils to assess their capacity to build soil organic carbon stocks. Such evidence is critical for identifying and scaling climate-smart systems that enhance both productivity and resilience. The work will be anchored in the Central Highlands Ecological Foodscape (CHEF) use-case under the CGIAR Sustainable Farming program [Sustainable Farming Program: Full design document - CGIAR](#) which spans 11 counties in Kenya.

### **Desired technical skills and/or experience:**

- A good agronomy/ soil science knowledge
- Data analysis capacity in R or Python
- PhD topic/ objective relevant carbon sequestration/loss mitigation in different cropping systems

**Host institution and location:** Alliance of Bioversity International and CIAT (ABC), Nairobi - Kenya

**Research supervisor:** Dr Michael Kinyua and Dr Job Kihara, Alliance of Bioversity International and CIAT.

**Start and end month of research stay:** March 2026 – August 2026 (flexible)

**Languages available at the host institution:** English, Swahili

## 16. Trends in soil organic carbon stock associated with time, land use and agricultural management techniques

**Keywords:** Soil carbon sequestration, Spatial and temporal analysis, agricultural systems, modelling, spatial analysis.

### **Brief research stay outline:**

In past decades many regions in the world have suffered permanent SOC loss. These changes in land use have been responsible for about 140 Pg C being released between 1850 and 1990. In recent decades, [carbon sequestration in soil](#) has been promoted to mitigate CO<sub>2</sub> emissions. One of policymakers' objectives in [4per1000 project](#) is to implement soil management techniques to increase organic C inputs and to reduce soil organic carbon losses, such as application of organic waste, reducing tillage intensity, leaving crop residue, including crop rotation and cover crops, and proper irrigation management. On the other hand, land abandonment has been indicated as the main potential to carbon sequestration in soil, but this potential for carbon sequestration is a finite process.

The main goals of this Research Stay Proposal are i) analyse the spatial variability of soil organic carbon in relation to the influence of land use and land management on entire surface of the Community of Madrid (CAM); ii) assess the temporal changes in soil organic carbon in agricultural soils after 20 years under Mediterranean climate and iii) evaluate the influence of the soil sampling protocol in the total Soil Carbon Stock. Soil sampling and sample analysis protocols could be decisive in order to properly estimate soil carbon stock and CAM presents a great variability in edaphic characteristics that can be a reference. Supported by those projects, the student could increase his/her knowledge about Mediterranean agricultural systems, soil sampling and laboratory analysis.

This proposal includes field sampling, laboratory analyses and geostatistics modelling work.

### **Desired technical skills and/or experience:**

- Basic experience with large databases
- Basic experience in field and laboratory.
- Basic experience geographic information systems and spatial analysis
- Independent thinking and ability to resolve problems
- Effective teamwork and interpersonal skills
- Basic Spanish skills are desirable but not essential

**Host institution and location:** Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria, INIA-CSIC, Madrid, Spain.

**Research supervisor:** José A. RODRÍGUEZ MARTÍN and José L. GABRIEL, INIA-CSIC

**Start and end month of research stay:** 6 months, adaptable from April 2026 to October 2026

**Languages available at the host institution:** English and Spanish

# **RICE**

## **17. Farm-level measurement and modelling of GHG emissions from rice cultivation in India: Evaluate mitigation strategies and their effects on profitability**

**Keywords:** greenhouse gas emissions, rice, sustainability, mitigation strategies, farm-level data

### **Brief research stay outline:**

Rice cultivation is one of the largest contributors to agricultural greenhouse gas (GHG) emissions in India, particularly methane from continuously flooded fields. With growing water scarcity and the mounting pressures of climate change, there is an urgent need to ensure sustainable rice production that reduces emissions without compromising farmer profitability.

This project addresses that challenge by measuring and modelling GHG emissions from rice cultivation systems in India, with a specific focus on mitigation practices already in use or partially adopted by Indian farmers.

The study will assess a range of mitigation strategies, including:

- *Water-saving techniques:* Direct Seeded Rice (DSR), Alternate Wetting and Drying (AWD)
- *Improved fertilizer management:* Urea Deep Placement (UDP), slow-release fertilizers
- *Soil carbon enhancement:* Crop residue incorporation, reduced or no-till farming, cover cropping, agroforestry, compost or biochar application
- *Cropping systems:* Crop rotation and diversification
- *Residue management:* Sustainable alternatives to burning and inefficient disposal

Each of these strategies will be evaluated individually to determine their effectiveness in reducing GHG emissions and their economic impact on farm-level returns. A core objective is to ensure that environmental sustainability aligns with economic viability for farmers.

A critical innovation of this research is its use of regional emission coefficients in combination with primary farm-level survey data on inputs, irrigation, residue, and management practices—rather than relying on costly and resource-intensive field measurements. This makes the approach both feasible and scalable across India's diverse rice-growing regions.

The findings will be used for sustainability scenarios, highlighting how transitions in cropping systems and practices can reduce emissions per hectare and per ton of rice produced.

By integrating environmental and economic analysis, this project will generate robust evidence on the feasibility, cost-effectiveness, and scalability of GHG mitigation at the farm level. It will also provide insights into barriers to adoption and offer actionable recommendations for promoting sustainable rice cultivation.

The research aligns closely with the goals of CGIAR's Transforming Agrifood Systems in South Asia (TAFSSA) initiative and the Global Methane Hub (GMH) by focusing on low-emission rice production pathways that are both scalable and sustainable. Ultimately, the project aims to identify the most cost-effective mitigation options and support India's commitments under its Nationally Determined Contributions (NDCs), ensuring that rice farmers can achieve both profitability and long-term environmental sustainability.

The scholar will be involved in farm-level data collection, data collection from farmers through surveys for the measurement of GHG emissions from rice cultivation, data analysis, and modelling of mitigation strategies to assess their impact on both emissions and farm profitability. The scholar will also contribute to preparing technical reports and scientific outputs from the project.

**Desired technical skills and experience:**

- Basic Knowledge of rice crop regarding input and common cultural practices
- Expertise in GHG emission measurement at the farm level in rice cultivation systems with familiarity with IPCC guidelines
- Experience in conducting and analysing socio-economic field surveys
- Knowledge of econometrics/statistics with advanced knowledge of Excel and R for Data analysis, Data visualization and presentation
- Independent, proactive, and capable of leading interdisciplinary research.
- Strong English writing and communication skills; ability to draft scientific and policy publications (experience with peer-reviewed publications would be an advantage).

**Host Institution and Location:** International Food Policy Research Institute (IFPRI), with the research stay based in India under IFPRI's ongoing project. The scholar will work closely with IFPRI's India team for fieldwork, data collection, and analysis.

**Research Supervisor:** Dr. Suresh Chandra Babu, Head of Capacity Strengthening, International Food Policy Research Institute (IFPRI), Washington, DC, USA

**Start and end month of research stay:** Flexible (must be before end of 2026)

**Languages available at the host institution:** English (and Hindi/local dialects for field surveys).

## 18. Sequencing-Guided Identification and Characterization of Methane-Reducing Microbes from Rice Paddy Field

**Keywords:** Rice, methane emission, methanotrophs, methane reducing microbes

### **Brief research stay outline:**

Rice cultivation contributes approximately 10% of global methane (CH<sub>4</sub>) emissions. Flooded rice fields create anaerobic conditions that favor the proliferation of methanogens, microorganisms that produce methane as a metabolic byproduct. However, methanotrophs, bacteria capable of oxidizing methane, can counteract methane emissions by consuming methane before it escapes into the atmosphere.

The isolation and identification of methane-reducing microbes from rice paddy fields offer a promising strategy for mitigating methane emissions in a sustainable and biological manner. Conventional methods primarily rely on culturing methanotrophs on media supplemented with methanol, which limits the discovery to only a small subset of microbial communities. This approach overlooks other important microbial groups that interact synergistically to suppress methane, including sulfate-reducing bacteria and certain facultative anaerobes.

Recent shotgun metagenomic analyses of rice field soils at the International Rice Research Institute (IRRI), combined with in-field methane flux measurements, have identified specific microbial taxa correlated with lower methane emissions. In this project, a CLIFF-GRADS student will:

- Develop tailored media formulations to isolate these promising microbial species from IRRI fields.
- Test the isolated strains for their methane-reducing efficacy through in vitro, greenhouse (GH) experiments.
- Be involved in evaluating previously identified beneficial microbes for their capacity to mitigate methane emissions in pot and field trials.

By integrating high-resolution metagenomics, targeted culturing, and functional screening, the study will contribute to the development of microbial consortia suitable for field application and climate-resilient rice farming.

### **Preferred student skills or experience:**

- Basic Knowledge in plant microbiome and microbiology
- Expertise in GHG emission measurement at the field or greenhouse
- Basic knowledge in R studio
- Excellent scientific writing skills
- Good English writing and speaking skills

**Host institution and location:** International Rice Research Institute, Philippines

**Research supervisor:** Dr. Van Schepler-Luu, lead plant pathology and Host plant resistance group

**Start and end month of research stay:** July 2026 to December 2026 (Preferred duration: 6 months)

**Languages available at the host institution:** English

## 19. Validating AI-Powered Digital MRV and Farming Assistant to Promote Sustainable Rice Production in Vietnam

**Keywords:** Artificial intelligence, rice, digital MRV, validation, farmer advisory

### **Brief research stay outline:**

Rice farming in Asia faces multiple environmental, technical, and market challenges, especially in the context of sustainable agriculture production. Further, rice is a major source of methane emissions. Recent advances in artificial intelligence (AI), particularly computer vision, offer promising tools to support monitoring, reporting, and verification of sustainability standards, early detection of pests/diseases, and large language models (LLM) can provide tailored farm advisories. This research project will focus on testing and validating the accuracy of a monitoring tool that uses computer vision models to classify rice fields as wet or dry from images.

This study aims to answer:

1. How accurate and reliable are the AI computer vision models for detecting field conditions (wet vs. dry) and assessing rice crop health using mobile phone imagery?
2. How accurate and usable are the app's recommendations and training materials in encouraging sustainable rice farming practices among Vietnamese farmers?
3. How can participatory validation and ground truthing methods be integrated to improve AI model accuracy and ensure inclusive knowledge exchange?

Research Objectives:

- Validate the AI-powered monitoring tool through field-based ground checks in key rice-growing regions in Vietnam.
- Conduct participatory validation workshops with farmers to assess the relevance, clarity, and applicability of the app's recommendations and training materials provided in both Vietnamese and English.
- Identify key bottlenecks and opportunities in integrating AI tools into local agricultural systems and policy frameworks.

Output

- Working paper or draft manuscript including the methodology for the machine learning programming and validation process, accuracy of results from AI/ML compared to ground-truthed data, and application to different use cases.

Capacity building and skill development:

- Join local MRV workshops, stakeholder engagement sessions, and/or tool development workshops.

**Desired technical skills and experience:**

- Familiarity with field-level agricultural data collection.
- Background in sustainable rice cropping systems, preferably with knowledge of Vietnam's agricultural context.
- Qualitative research skills, including stakeholder engagement and participatory validation techniques.
- Preferred: experience with AI/machine learning, particularly image classification and validation analysis.
- Fluency in English and Vietnamese (preferred but not mandatory).

**Host institution and location:** International Rice Research Institute in Hanoi, Vietnam

**Research Supervisor:** Vu Hong Trang - IRRI, Quan Le – University College Dublin

**Start and End Month of Research Stay:** April 2026 – October 2026 (flexible)

## 20. Quantifying benefits and risks of precision irrigation and amendments on rice yields and net C removal

**Keywords:** methane, nitrous oxide, carbon dioxide, irrigation, AWD, yield, silicate rock, soil C

### **Brief research stay outline:**

Emerging climate-smart practices such as alternate wetting and drying irrigation (AWD), cultivar selection and silicate rock amendments have been extensively investigated for sustained yield performance in irrigated rice. Many studies reported variable results on yield penalty and GHG emission reductions and nutrient losses because of the inability of practices to suit farmers' fields.

The incumbent will participate in the on-going field research located in Northeast Arkansas USA (6 months: starts in April) in quantifying the multiple benefits and risks of adapting AWD, hybrid rice, and silicate rock amendments on yield, grain quality, and net C reductions. CH<sub>4</sub>, N<sub>2</sub>O and CO<sub>2</sub> effluxes throughout crop cycle will be measured using vented flux chamber method and gas chromatography. Other ancillary variables such as soil C, plant elemental uptake, yield, grain quality metrics and water use will be measured using published plant and soil methods. Grain yields will be estimated from the harvest area using manual method and machine harvester.

This study will compare yield, GHG emissions, water use, grain quality and iAs, Cd, Zn, B and Si grain contents between conventional and integrated crop practices. Results are critical in the development of integrated conservation practices for local rice growing environment. The incumbent will learn flux chamber method, hands-on training on automated gas chromatography, flux data analytics using Dasig model software, post processing of rice samples for elemental and quality of grain analyses. Also, s/he will interact with international scientists working in the field of irrigation, rice agronomy, soil fertility, and high throughput measurements.

### **Desired technical skills and experience:**

- Background in crop research, soil fertility, and environmental sciences

**Host institution and location:** Delta Water Management Research Unit, United States Department of Agriculture-Agricultural Research Service, Jonesboro, Arkansas USA

**Research Supervisor:** Dr. Arlene Adviento-Borbe (DWMRU, USDA-ARS)

**Start and end month of research stay:** May to October 2026

**Languages available at the host institution:** English and Filipino

## **21. Measuring, modelling and mitigation of GHG emissions from rice cultivation through agronomic strategies**

**Keywords:** Greenhouse gas emissions, GHG measurement procedure, GHG modelling, mitigation and anaerobic rice

### **Brief research stay outline:**

Greenhouse gas (GHG) emissions from agriculture sector play an important role for global warming and climate change. Thus, it is necessary to find out GHG emissions mitigation strategies from rice cultivation. The efficient agronomic strategies could mitigate GHG emissions and reduce environmental pollution. This project contributes to GRA/Mitigate project “Measuring, modelling and mitigation of GHG emissions from rice cultivation through agronomic strategies”. The aim of the project is to measure the GHG emissions from rice field, modelling for future prediction/sustainability, identify the most cost-effective options for farm-level GHG mitigation strategies and provide evidence-based policy recommendations. A detailed measuring, modelling, calibration and mitigation strategies of agricultural GHG remains a challenge in global climate research. The costs of implementation, measuring, analysis and realization of GHG mitigation strategies at the farm level are not yet well-known. Furthermore, the data needed to calibrate model is often not available or not comparable. Countries urgently need data to make decisions on climate mitigation measures and funds required for best implement their nationally determined contributions (NDCs). This project aims to measuring, modelling and mitigation of GHG from rice fields to tackle burning climatic issues. It will investigate the feasibility and cost-effectiveness of GHG mitigation strategies at the farm level. It aims to identify the most cost-effective agronomic strategies, technology options and to reduce possible barriers to adopt evidence-based policy recommendations on GHG mitigation strategies.

The host supervisor offers hands-on training on DSSAT, Cool Farm Tool, DNDC, WaNuLCAS models every year with German Partners, the scholar will be encouraged to participate in the training to fine tune his/her abilities in simulation studies for his/her future endeavors.

The scholar will take part in the post graduate course “AGR-715 Crop Modeling in Agriculture” as his capacity building and skill development activities in addition to his/her planned work under the fellowship.

### **Desired technical skills and/or experience:**

- Expertise in GHG emission measurement at the farm level in rice cultivation systems
- Modeling for GHG emissions
- Expertise in statistical analysis, excel, data collection, data manipulation, data visualization
- Writing science and policy publications
- Effective leadership and teamwork skills
- Good English writing and speaking skills

**Host institution and location:** University of Agriculture, Faisalabad Pakistan

**Research supervisor:** Dr. Khalid Hussain, Associate Professor at Crop modelling and Climate change Lab., Department of Agronomy

**Start and end month of research stay:** June 2026 - December 2026 (preferably), along the year is also possible

**Languages available at the host institution:** English

## 22. Mitigation Actions to meet Methane Reduction Pledge Targets in Asian NDCs and GHG Inventories

**Keywords:** Nationally Determined Contributions, Asia, agriculture methane mitigation actions, rice and livestock, GHG inventory, increasing ambitions

### **Brief research stay outline:**

Asia's agricultural sector is a major contributor to greenhouse gas (GHG) emissions, especially methane from flooded rice cultivation and livestock rearing. Livestock methane emissions primarily arise from enteric fermentation and manure management, representing a significant and rapidly growing source of GHGs in the region. A significant catalyst for methane production in rice is the amount and timing of organic amendment application. Straw is often burned or incorporated into the soil, which are both sources of methane emissions. National Determined Contributions (NDCs) under the Paris Agreement set the ambition for climate mitigation, but the translation of these ambitions into GHG inventories and national reporting varies significantly. Many countries currently rely on conservative default emission factors and omit organic amendments, including straw incorporation, in their baseline GHG accounting because of methodological and practical complexities. Similarly, livestock methane emissions are often underestimated due to limited data and simplified assumptions. However, as we progress towards 2030 to meet the NDC's and short-term climate goals of the Methane Reduction Pledge, many countries must expand mitigation activities. Although there is significant mitigation potential that can be realized from improved straw management and enhanced livestock methane reduction practices, which can be translated into increased ambitions, countries would be required to reset their GHG inventory baselines to reflect the higher emissions of current practices. Integrating such measures into official GHG inventories can enhance mitigation transparency but may require difficult choices about resetting emissions baselines—which would initially raise reported national GHG totals and prompt political hesitation. This project contributes to the [GMH AcceLER project](#), the [CGIAR Climate Action program](#), [GRA funding for MRV development](#), and the [ASEAN-Korea Cooperation for Methane Mitigation](#) project.

This study seeks to answer:

- How are GHG inventories from the top 10 major agricultural producing Asian nations addressing agricultural methane mitigation?
- What technical, institutional, and political barriers exist for the inclusion of methane mitigation measures, and how can policies and reporting frameworks be adjusted to encourage integration while maintaining credibility and transparency?

**Expected Output:** Report including the analysis of methane emissions and quantification processes for 10 Asian countries' agricultural GHG inventories; methane mitigation actions in agricultural sector and mitigation potential through varied interventions.

**Capacity building and skill development:** Participation in local agriculture mitigation and MRV workshops, support tool development for GHG quantification, stakeholder engagement.

**Desired technical skills and experience:** Excellent research and writing, qualitative analysis tools (e.g., NVivo), familiarity with IPCC calculation for GHGs, familiarity with rice and livestock systems

**Host institution and location:** International Rice Research Institute, Hanoi, Vietnam

**Research supervisor:** Dr. Katherine Nelson, Climate change scientist, IRRI

**Start and end month of research stay:** March 2026-September 2026 (Flexible)

**Languages:** Fluency in English

# **LIVESTOCK SYSTEMS**

## **23. How does diet affect GHG emissions of livestock systems in tropical areas?**

**Keywords:** GHG, integrated crop livestock farm; GLeam-i;

### **Brief research stay outline:**

Mixed crop-ruminant production systems are a case of integration where nutrient circularity is put forward. To increase circularity of nutrients (i.e. C, N) within agricultural systems, the range of solutions will vary from individual, specific measures, to more holistic and integrated approaches.

Environmental assessment of tropical integrated farm (GHG balance approach) by modelisation using FAO tool (GLEAM-i) and others tools in a tropical region, will be developed. Models for predicting daily methane emission at animal level based on simulated or measured feed properties and feed intake will be of particular interest, including models developed in the tropics or in Africa sub-Saharan region. Collaboration with partners of GRA-FNN group who are interested in GHG mitigation and adaptation in Sub-Saharan Africa will be developed.

The student will participate in the Environmental assessment with special focus on integrating statistical methane prediction models from different agroclimatic zones and production system types based on measurement data or estimation. The work is done in collaboration with research institutes INRAE (France) and African partners institution of MiPCLAN network (TSARA Initiative). The work involves research group France and if possible, a visit to an African partner. This project is partially funded by INRAE and GRA and supports the GR-FNN group and TSARA MiPCLAN network.

### **Desired technical skills and experience:**

- Skills on simulation model or statistical model development
- Experience on programming with either scripting or compiled languages
- Good teamwork skills

**Host institution and location:** INRAE, UR ASSET, Guadeloupe, France .

**Research supervisor:** Maguy EUGENE, senior researcher, INRAE UR ASSET, Guadeloupe 97170 FRANCE;

**Preferred duration of research visit:** 6 months.

**Preferred dates for research visit:** Mar 2026 to Sep 2026 (or later)

**Languages available at the host institution:** French and English and Créole

## 24. Measurement of manure methane potential from pastoral farming systems

**Keywords:** Nutrition, methane, manure, diet, modelling, cattle

### **Brief research stay outline:**

This research stay will focus on improving the measurement and modelling of manure methane (CH<sub>4</sub>) emissions from livestock in New Zealand farming systems, using a standardized global protocol for determining the biochemical methane potential (B<sub>0</sub>) of cattle manure. The project supports the goals of the Global Research Alliance on Agricultural Greenhouse Gases (GRA) Manure Management Network and the CGIAR Livestock and Climate Initiative, contributing to global efforts to reduce uncertainty in agricultural greenhouse gas (GHG) inventories.

The research will focus on New Zealand's unique pastoral livestock systems, which are characterized by seasonal calving, grazing-based diets, and low-intensity housing. Trials will be conducted across representative cattle farming systems to collect data on diet composition and manure characteristics. B<sub>0</sub> measurements will be performed to quantify methane emissions from different diets.

This work will generate regionally relevant B<sub>0</sub> values that reflect the influence of New Zealand-specific diets and species, thereby improving the accuracy of Tier 2 national GHG inventory emission factors and supporting CH<sub>4</sub> mitigation modelling tailored to local conditions.

The project will also contribute to capacity building by transferring technical knowledge and standardized methods to partner countries. This will enhance the capability to measure and interpret manure CH<sub>4</sub> emissions consistently across regions. All resulting data will be stored in the open-access Dataman database ([www.dataman.co.nz](http://www.dataman.co.nz)), supporting transparency and global data sharing.

The outcomes will inform livestock management strategies, support methane mitigation efforts, and contribute to food security and climate resilience globally.

### **Desired technical skills and experience:**

- Knowledge of animal nutrition and the effects on productivity, enteric methane or manure methane
- Experience with animal trials. Including feed collection and characterization.
- Practical laboratory experience, including proficiency in conducting analytical experiments, operating and maintaining laboratory instruments, and adhering to established protocols.
- Experience with sample preparation, data recording, and quality assurance procedures. A strong understanding of laboratory health and safety standards, including the safe handling of biological and chemical materials, is required.

**Host institution and location:** Bioeconomy Science Institute. 10 Bisley Road, Ruakura, Hamilton New Zealand.

**Research supervisor:** Marianne Hull Cantillo, Scientist, Bioeconomy Science Institute

**Start and end month of research stay:** August 2026-November 2026

**Languages available at the host institution:** Spanish and English

## 25. Improvement of the measurement of manure methane potential

**Keywords:** Nutrition, methane, manure, diet, modelling, cattle

### **Brief research stay outline:**

This research stay will focus on improving the measurement and modelling of manure methane (CH<sub>4</sub>) emissions from livestock through the application of a standardized global protocol for determining the biochemical methane potential (B<sub>0</sub>) of manure from cattle. The project aligns with the Global Research Alliance on Agricultural Greenhouse Gases (GRA) Manure Management Network and the CGIAR Livestock and Climate Initiative (<https://livestock.cgiar.org>), contributing to global efforts to reduce uncertainty in agricultural GHG inventories.

During the research stay, the student will conduct trials to collect data from different farming systems in Argentina. This includes setting up trials to characterise diet and manure. B<sub>0</sub> measurements will be conducted to quantify the methane from the manure of these farming systems. This work will generate regionally relevant data on the influence of diet and species on B<sub>0</sub> values, which are critical for improving national GHG inventory emission factors (Tier 2) and supporting more accurate CH<sub>4</sub> mitigation modelling.

The project will also contribute to capacity building by transferring technical knowledge and standardized methods to laboratories in participating countries, enhancing their capability to measure and interpret manure CH<sub>4</sub> emissions. All resulting data will be stored in the open-access Dataman database ([www.dataman.co.nz](http://www.dataman.co.nz)), supporting transparency and global data sharing. The outcomes will influence livestock management and methane mitigation strategies while improving food security.

### **Desired technical skills and experience:**

- Knowledge of animal nutrition and the effects on productivity
- Experience with trials including feed collection and characterization
- Practical laboratory experience, including proficiency in conducting analytical experiments, operating and maintaining laboratory instruments, and adhering to established protocols.
- Experience with sample preparation, data recording, and quality assurance procedures. A strong understanding of laboratory health and safety standards, including the safe handling of biological and chemical materials, is required.

**Host institution and location:** Instituto nacional de tecnología agropecuaria. Estacion experimental Rafaela. R. 34 km 227. Rafaela (Santa Fe). Argentina

**Research supervisor:** Veronica Charlon, Agricultural Engineer. INTA EEA RAFAELA. Rafaela Argentina.

**Start and end month of research stay:** June 2026-December 2026

**Languages available at the host institution:** Spanish and English

## 26. Digital MRV for high-integrity GHG emission reduction estimation from manure biodigesters

**Keywords:** Digital GHG MRV, manure, biodigester, methane, IPCC Tier 2

### **Brief research stay outline:**

Household manure biodigesters convert livestock manure into biogas and digestate and are widely promoted in low and middle-income countries as climate mitigation and circular economy solutions. Some biogas programs seek carbon credit financing. However, carbon market participation is limited by insufficient evidence on actual biodigester usage, methane leakage and venting, and methane emissions from digestate storage under real household conditions. Addressing these data gaps is critical to improving the robustness of GHG measurement methodologies, ensuring high-integrity carbon crediting, and providing training to reduce methane losses.

This project will design and validate a digital twin for household biodigesters to support robust MRV of GHG emission reductions. The digital twin will represent system operations by integrating sensor data on biogas flow and pressure, stove use, methane leakage, and digestate emissions with household activity logs. Baseline emissions will be estimated using the IPCC Tier 2 approach for conventional manure management and traditional energy use. By combining project-level data from the digital twin with baseline estimates, the MRV system will generate credible emission reduction values and support issuance of high-integrity carbon credits. The project is linked to the CGIAR Climate Action Science Program ([cgiar.org](https://www.cgiar.org)) and builds on ILRI's Biogas MRV effort funded by the Environmental Defense Fund (EDF) in the United States. The research stay will provide technical and hands-on training in GHG measurement, modeling, and mitigation relevant to food security and low-emission livestock development.

### **Desired technical skills and experience:**

- Livestock manure management GHG accounting with IPCC Tier 2.
- Programming in R or Python for time series modeling and uncertainty analysis.
- Experience with sensors, gas analyzer, GHG flux measurement and data QA QC.
- Excellent communication skills.
- Experience in writing scientific articles will be an added advantage.

**Host institution and location:** International Livestock Research Institute (ILRI), Nairobi

**Research supervisor:** Akiber Chufo Wachemo (PhD, Associate Professor at Wolaita Sodo University, Ethiopia and Visiting Scientist at ILRI), Daniel Girma Mulat (PhD, Environmental Researcher and Lab Manager at ILRI, Nairobi, ILRI) and Scientists from Environmental Defense Fund (EDF), USA.

**Start and end the month of research stay:** March 2026 – August 2026 (or later)

**Languages available at the host institution:** English

## **27. Assessment of enteric methane emissions from local cattle breeds according to farming practices and improvement options in Benin (West-Africa)**

**Keywords:** Greenhouse gas, feeding practices, GreenFeed, productivity, mitigation strategies

### **Brief research stay outline:**

Enteric methane (CH<sub>4</sub>) is a major greenhouse gas (GHG) emitted by ruminants, with a global warming potential (GWP) 28 times greater than CO<sub>2</sub> over a 100-year horizon. Despite the importance of cattle farming in Benin for food security and rural livelihoods, direct data on methane emissions from local cattle breeds are still lacking. This knowledge gap limits the accuracy of national GHG inventories and the design of mitigation strategies adapted to local production systems. The proposed study aims to assess enteric methane emissions from indigenous cattle breeds in Benin, considering the influence of seasonal feeding practices and management systems. Feeding regimes typically vary across the year, combining natural forages, crop residues, and agro-industrial by-products, which may differentially affect methane output and feed efficiency. We hypothesize that emission levels differ significantly according to seasonal diets and husbandry practices, and that improved feeding strategies can reduce CH<sub>4</sub> emissions without compromising productivity. Methane fluxes will be quantified using the GreenFeed system for direct in vivo measurements coupled with data on feed intake. The study will establish baseline emission factors for local breeds, provide comparative insights into the impact of seasonal feeding strategies, and identify feasible mitigation options. The findings are expected to contribute to the refinement of national GHG inventories, inform sustainable livestock policies, and advance climate-smart cattle production systems in West Africa. The student will conduct the experimental field measurements, which include animal feeding, collecting methane emission data using the GreenFeed system, and analyzing the gathered data.

### **Desired technical skills and experience:**

- Hands on experience with field and laboratory work,
- Knowledge of ruminant nutrition and livestock production systems
- Be able to work independently
- Ability for creative problem solving
- Data management and statistical analyses
- Experience in writing scientific articles will be an added advantage

**Host institution and location:** Faculty of Agronomy (FA), University of Parakou (Benin)

**Research supervisor:** Dr Alassan Assani Seidou, Senior Lecturer, Faculty of Agronomy (FA), University of Parakou (Benin)

**Start and end month of research stay:** From April to September 2026

**Languages available at the host institution:** French and English

## 28. Feeding Change: Land O'Lakes–Alliance Collaboration on Low-Emission Dairy

**Keywords:** enteric fermentation, evidence generation, participatory validation, capacity building

### **Brief project outline:**

Enteric methane is the largest contributor to greenhouse gas (GHG) emissions from livestock systems in sub-Saharan Africa, with smallholder dairy systems among the most emission-intensive. Feed quality improvements offer promising mitigation options, yet outcomes are highly context-specific due to the diversity of production systems. Over the past two years, [Land O'Lakes Venture37](#) has introduced improved feeding solutions with smallholder dairy farmers in Kenya and Ethiopia. To assess their mitigation performance, Venture37 has partnered with the Alliance of Bioversity-CIAT to build on detailed baseline and midline survey data.

The Alliance will feed these datasets into an automated R loop, guided by the [I-CLEANED framework](#), to quantify feed-based mitigation outcomes. The early-career scientist will receive I-CLEANED training, finalize the [R code](#), convert survey datasets into JSON-readable formats, run analyses across all samples, validate findings with farmers and policymakers, and co-author a peer-reviewed paper. Importantly, this collaboration will also provide Venture37 with a practical tool to assess the mitigation potential of future dairy projects and interventions.

The project supports the [GRA Enteric Fermentation Flagship](#) by delivering context-specific, scalable evidence on feed interventions, while building local analytical capacity. It is conducted with support of CGIAR's [Sustainable Animal and Aquatic Foods program](#), area of work 2 (climate and environment), and contributes to the [Global Methane Hub's Enteric Fermentation R&D Accelerator](#) by generating actionable evidence, strengthening capacity, and linking results to financing opportunities for low-emission dairy transitions.

### **Desired technical skills and experience:**

- Background in agricultural, environmental or animal science
- Proficient in R programming

**Host institution and location:** Alliance of Bioversity International and CIAT, Nairobi, Kenya

**Research Supervisors:** Ms. An Notenbaert and Dr. Peter Steward

**Start and end month of research stay:** February to July 2024 (flexible)

**Languages available at the host institution:** English

## 29. Robust dry matter intake estimation from feed & animal data

**Keywords:** dry matter intake, large ruminants, cattle, methane, feeding characteristics, bodyweight, IPCC, Africa

### **Brief research stay outline:**

Accurate estimation of dry matter intake (DMI) is the foundation for quantifying enteric methane emissions under IPCC protocols. The IPCC approach relies on activity data combined with generalised intake equations largely derived from temperate dairy and beef systems (e.g. Europe, North America, New Zealand). However, recent evidence shows that these equations can deviate by up to **20%** when applied to African livestock systems, where breeds, feed resources, and management conditions differ markedly.

This project will address this gap by developing DMI prediction equations for large ruminants in African livestock systems. This project will extend a pre-existing database of DMI and other experimental data collected by CIAT in the ERA ([Evidence for Resilient Agriculture](#)) database to derive DMI equations appropriate African cattle systems. The early career scientist will: (1) Expand the existing database of DMI measurement experiments by screening & extracting data from additional published studies, (2) Estimate best-fitting regression equations (linear or non-linear regression combined with mixed effect regression) for DMI.

The work will be desk-based, using R statistical software and Windows-based applications (e.g. Excel). Ideally the work will culminate in the publication of a journal article (lead by the applicant) detailing the work. The applicant will benefit from participation in ILRI-hosted data science training sessions (R focus) during their stay.

### **Desired technical skills:**

- Background in animal sciences (ruminant nutrition or physiology).
- Solid knowledge of statistics, including commonly used regression techniques
- Experience in R statistical software (preferred)

**Main supervisor:** Dr. James Hawkins, Postdoctoral Research Fellow, ILRI (Livestock, Climate, and Environment)

**Contributing supervisors:** Dr. Claudia Arndt, Senior Scientist, ILRI (Livestock, Climate, and Environment); Dr. Peter Steward, Scientist, Alliance Bioversity CIAT

**Host institution:** International Livestock Research Institute (ILRI), Nairobi, Kenya.

**Start and end month of research stay:** February to July 2026 (flexible)

**Languages available at the host institution:** English

## **LIVESTOCK - ENTERIC METHANE**

### **30. Mitigation of enteric methane emissions using methane suppressing feed additives in grazing cattle**

**Keywords:** Livestock, greenfeed, grazing, methane inhibitors

#### **Brief research stay outline:**

This project at AFBI contribute to the GRA flagship projects “Technical guidelines to develop feed additives to reduce enteric methane emissions”

(<https://globalresearchalliance.org/flagship-projects/feed-additives/>) and “Expansion, analysis and exploitation of the Hungate rumen microbial culture collection”

(<https://globalresearchalliance.org/flagship-projects/mining-rumen-data/>). The aim of the project is to evaluate novel methane suppressing feed additives, and to generate new knowledge on the rumen microbiome to reduce enteric methane emissions from ruminant livestock.

Recent research at AFBI has shown the potential for promising strategies to reduce methane emissions in ruminants reared indoors; however, these technologies need to be incorporated into pasture-based systems. In Ireland, grazing management is an important part of cattle management during spring and summer as animals graze for more than 6 months/year. Whilst grazing systems can sequester carbon, it is essential to explore alternative technologies to reduce methane emission in grazing systems to achieve GHG targets. The development of slow-release smart boluses, that can control, sustain, and prolong the release of methane inhibitors, are promising technologies to mitigate methane emissions in cattle under grazing pasture systems.

This project aims to assess the use of methane-suppressing feed additives under grazing management. The project will evaluate the effects that the slow-release ruminal boluses have on animal performance (i.e. feed intake, growth, milk production, etc.), GHG, rumen fermentation and microbiome in grazing cattle. The CLIFF-GRADS student will have full access to the field work facilities and will interact with an international network of scientists focused on ruminant feed and nutrition issues in relation to greenhouse gases.

The role of CLIFF-GRADS student includes conducting applied research in agriculture greenhouse gas emission quantification and mitigation strategies. The student will be exposed to expertise and scientific training at AFBI Hillsborough, where she/he will have access to equipment and methodologies used to measure greenhouse gases in ruminants. The student will learn specific techniques to measurement of greenhouse gas emissions in grazing lactating dairy cows. The research stay is expected to be for 6 months.

#### **Desired technical skills and experience:**

- English writing and speaking skills
- Background in ruminant nutrition and rumen fermentation
- Knowledge of methane emissions measurements in cattle production systems would be desirable but not essential

**Host institution and location:** Agri-Food and Biosciences Institute (AFBI), Hillsborough, Northern Ireland, the United Kingdom

**Research supervisors:** Dr. Omar Cristobal Carballo and Dr. Tianhai Yan (Senior Scientists, AFBI Hillsborough)

**Start and end month of research stay:** March to October 2026 (flexible)

**Languages available at the host institution:** English, Spanish, Chinese, Persian, Japanese, Hindi.

## 31. Simplifying Rumen Microbiota Toward Minimal Active Cellulolytic Consortia

**Keywords :** microbes, isolation, cellulose degradation

### **Brief research stay outline:**

The rumen microbiota plays a pivotal role in fiber degradation, which is essential for ruminant nutrition. Yet, the complex interactions among microbial species in the rumen remain poorly understood. With the global imperative to improve feed efficiency and reduce methane emissions from ruminants, identifying minimal, high-performing cellulolytic consortia offers a promising research avenue.

This study aims to isolate such minimal consortia using a top-down approach. We will explore microbial diversity and interactions in rumen communities under different dietary conditions, focusing on fiber degradation and fermentation efficiency. This work aligns with the GRA flagship project RumenGateway, which seeks to unlock the potential of rumen microbes to enhance livestock performance and sustainability.

Microbial communities will be collected from animals fed diets with varying forage-to-concentrate ratios. The Cliff-Grad scholar will carry out serial dilutions in cellulose-based media until the capacity for cellulose degradation is extinguished. We hypothesize that native rumen microbiota harbors several consortia capable of cellulose degradation, differing in efficiency and fermentation profiles, including methane production. The scholar will measure the optical density of these minimal consortia as a proxy for microbial growth and the production of volatile fatty acids (VFAs) and methane as proxies for fermentation efficiency. The scholar will analyse these fermentation parameters with the aim to identify the most effective consortia for cellulose degradation that produce or do not produce methane. In addition, the scholar will work on maintaining and characterizing the most highly specialized consortia using multi-omic approaches.

This research will pinpoint key microbial consortia driving efficient fiber degradation and fermentation, providing new insights for sustainable livestock management and methane mitigation strategies.

**Desired technical skills and experience:** background in rumen fermentation and microbiology

**Host institution and location:** Herbivores research unit, INRAE Auvergne Rhône Alpes, Site de Theix, 63122 Saint Genès Champanelle, France

**Research supervisor:** Dr. Milka Popova and Dr Diego Morgavi

**Start and end month of research stay:** February to July 2026 (or later)

**Languages available at the host institution:** French and English

## 32. Integration of Behavioural Sensors and Blood Biomarker Profiling to Improve Methane Mitigation Strategies in Transition Dairy Cows

**Keywords:** Methane emissions; Dairy cows; Transition period; Precision livestock farming; Behavioural monitoring

### **Brief research stay outline:**

This research stay will focus on integrating behavioural sensor data and blood biomarker profiling to improve methane mitigation strategies in transition dairy cows. Methane (CH<sub>4</sub>) emissions from ruminants are a major contributor to agricultural greenhouse gases, with the transition period (three weeks before to three weeks after calving) representing a critical phase of physiological and behavioural change. Building on recent findings from Lithuanian trials (Life, 2025, 15, 760), this project will combine RumiWatch noseband sensor data (rumination, feeding, drinking patterns) with haematological and biochemical indicators (e.g., glucose, chloride, haematocrit, platelets) and laser methane detector (LMD) measurements to identify early predictors of methane yield. The research will validate these methods against gold-standard techniques (e.g., respiration chambers, GreenFeed) available at the host institution. The project aligns with the Global Research Alliance on Agricultural Greenhouse Gases (GRA) Livestock Research Group priorities, particularly in precision livestock farming and methane mitigation. Outputs will contribute to CGIAR's Livestock and Climate flagship, providing farmer-ready decision tools for sustainable dairy production. Expected outcomes include a predictive model integrating behavioural and physiological data, guidelines for targeted nutritional and management interventions, and strengthened collaboration between EU and international research networks. This research stay will accelerate the translation of advanced monitoring technologies into practical, climate-smart dairy farming strategies, supporting both environmental and productivity goals.

During the research stay, the scholar will play an active role in data collection and analysis, particularly in monitoring cow behaviour using RumiWatch sensors and conducting blood sampling and laboratory assays. The scholar will also assist in methane measurements using the laser methane detector, participate in data integration and statistical modelling, and contribute to the preparation of scientific outputs, including data visualization and manuscript drafting. This hands-on experience will strengthen the scholar's skills in precision livestock research, biochemical analysis, and climate-smart agriculture applications.

**Desired technical skills and experience:** Experience in precision livestock farming technologies, particularly animal-mounted sensor systems (e.g., RumiWatch, accelerometers, rumen boluses). Skills in animal physiology and behaviour monitoring, especially during the dairy cow transition period. Proficiency in biochemical and haematological analysis of blood samples, including interpretation of metabolic profiles. Familiarity with methane emission measurement techniques, such as laser methane detectors (LMD), respiration chambers, or GreenFeed systems. Strong background in data management and statistical analysis (e.g., SPSS, R, Python), including correlation analysis, regression modelling, and multivariate techniques (PCA). Knowledge of dairy nutrition and feeding management, particularly dry matter intake (DMI) measurement and dietary formulation. Experience working with international research collaborations and contributing to multi-institutional projects. Understanding of global climate change mitigation initiatives in livestock (e.g., GRA, CGIAR, FAO strategies).

**Host institution and location:** Large Animal Clinic, Veterinary Academy, Lithuanian University of Health Sciences, Tilžės Str. 18, LT-47181 Kaunas, Lithuania

**Research supervisor:** Ramūnas Antanaitis, Professor, Lithuanian university of health sciences

**Start and end month of research stay:** April – August 2026 (flexible to align with program requirements)

**Languages available at the host institution:** English

### 33. Investigating novel Hydrogen-utilising bacteria from the rumen

**Keywords:** Livestock, rumen, methane, hydrogen, microbiology, phage

**Brief research stay outline:**

The hydrogen produced by rumen fermentation is primarily used by methanogenic archaea, however some other gut-associated bacteria have also been shown to use this pool of hydrogen as a substrate for growth. These bacteria are a current source of interest, for understanding their role in modulating rumen fermentation, particularly electron flow and for their potential to be used in microbial (probiotic) strategies to reduce enteric methane emissions. Little is known of the biology of these organisms, therefore this project will work with existing and newly isolated strains of hydrogen-utilising bacteria, to characterise their growth rates and hydrogen-utilising potential, and identify factors influencing their survival in the rumen (e.g. ability to form biofilms, spores and susceptibility to phage infection).

The project will use anaerobic microbiology techniques for microbial isolation and characterisation, as well as tools for gas and methane measurement. The student will have access to the lab facilities and interact with technicians and scientists, with extensive experience in rumen fermentation and microbiology. The activity is directly linked to other international projects, such as the Future Foundation for Food and Agriculture, Greener Cattle Initiative (FFAR-GCI). It also addresses the Global Methane Hub Enteric Fermentation R&D Accelerator Priority, to better understand the rumen microbiome, undertaking underpinning research.

**Desired technical skills and experience:** Background in rumen microbiology and rumen fermentation preferred.

**Host institution and location:** Microbial Ecology Group, Department of Primary Industries, Queensland Government. EcoSciences Precinct, 41 Boggo Road, Dutton Park, 4102, Qld Australia.

**Research supervisor:** Dr Rosalind Gilbert, Principal Scientist (Microbiology), Department of Primary Industries, Queensland Government, Queensland, Australia.

**Start and end month of research stay:** March to July 2026 (start date flexible until end of July 2026)

**Languages available at the host institution:** English

## **34. Effect of methane mitigation strategies on vitamin B12 synthesis and milk vitamin B12**

**Keywords:** Methane mitigation, milk quality, vitamin B12

### **Brief research stay outline:**

The importance of vitamin B12 in human health and nutrition is well documented. Humans can only acquire vitamin B12 through the consumption of dairy and meat products, which contain vitamin B12 produced by bacteria and archaea in the rumen of cattle. Feeding strategies have been developed with the aim of reducing methane emission by altering microbial fermentation and reducing archaea abundance in the rumen. However, there is a risk that these strategies at the same time will change rumen microbiota and fermentation pattern in the rumen and reduce the production of certain B-vitamins. The purpose of the proposed research project is to clarify the risk of compromising vitamin B12 synthesis and milk vitamin B12 content as a detrimental side effect of methane mitigation feeding strategies.

As part of this research stay, the scholar will be actively involved in conducting experimental trials, analyzing rumen microbiota and fermentation profiles, and assessing vitamin B12 concentrations in milk samples. The scholar will also contribute to data interpretation and dissemination of findings through scientific publications and presentations.

### **Objectives:**

- To study the effect of methane-reducing feed additives on ruminal synthesis of vitamin B12 and vitamin B12 content in milk
- To clarify the role of specific rumen microbial population on synthesis of vitamin B12
- To study the correlation between milk B12 content, methane production, rumen microbial synthesis of B12 and plasma B12

**Desired technical skills and experience:** Background in ruminant nutrition and rumen fermentation, data analysis, familiar with intensive digestibility trial with multi-fistulated cows.

**Host institution and location:** Aarhus University-AU Viborg, Denmark

**Research supervisor:** Saman Lashkari, Assistant professor, Department of Animal and Veterinary Sciences

**Start and end the month of research stay:** starting date can be adjusted from April 2026

**Languages available at the host institution:** English, Danish

## 35. Explore the syntrophic relationships of rumen methanogens and bacteria in lignified forages

**Keywords:** Microbiota, methane emission, in-vitro, 16S rRNA, polysaccharides

### **Brief research stay outline:**

Most ruminants are in grazing and mixed crop-livestock systems from tropical and subtropical regions. In these systems, often extensive, the current methane mitigation strategies are poorly adapted. A key aspect of these extensive systems is the high proportion of lignified forages in the diet. Lignin, a structural plant polysaccharide, develops as the plant matures and prevents the access to cellulose by rumen microbiota. It also slows down the passage rate of feed, thus favouring the growth of microbes that produce hydrogen, which is used for methanogenesis. Recent studies have highlighted the high abundance of Christensenellaceae, particularly *C. minuta*, in ruminants fed highly lignified diets. In addition, their syntrophic relationship with *Methanobrevibacter* species has been shown in pure culture but such a syntrophic relationship has never been demonstrated in the rumen. The objective of the internship will be to test whether such relationship exists and if it is associated with higher methane production. The student will set up *in-vitro* experiments of pure cultures and also cultures of rumen fluids incubated with different levels of lignified substrate for enrichment of syntrophic communities that efficiently degrade recalcitrant forages. These enriched communities will be characterized by next-generation sequencing to identify syntrophic taxa and their functional characteristics will be compared with the *C. minuta* and *Methanobrevibacter* sp. co-culture.

This work will provide a better understanding of the microbial processes leading to methane emission in animals reared in extensive systems. Ultimately, such knowledge would pave the way for the design of targeted microbial strategies to reduce methane emissions. This project will contribute to the GRA flagship project RumenGateway, which aims to unlock the potential of rumen microbes for improved livestock performance and sustainability.

### **Desired technical skills and experience:**

- meticulous and organized
- hands-on experience in classical microbiology
- basic experience with R appreciated
- integration in multi-cultural work environment

**Host institution and location:** Herbivores Research Unit, INRAE Auvergne Rhône Alpes, Site de Theix, 63122 Saint Genès Champanelle, France

**Research supervisor:** Dr. Simon Roques, Herbivores Research Unit

**Start and end month of research stay:** February to July 2026 (ideally starting by April, flexible)

**Languages available at the host institution:** French and English

## **36. Assessing the direct effects of anti-methanogenic compounds on rumen protozoa: An in vitro approach**

**Keywords:** rumen, methane, additives, protozoa, in vitro

### **Brief project outline:**

The use of anti-methanogenic feed additives is one of the most promising strategies to reduce enteric methane emissions. While these additives primarily target methanogens, their effects on other microbial groups, particularly the eukaryotic community are poorly understood. Protozoa, which can account for up to 50% of total rumen microbial biomass, are thought to have a substantial influence on the overall rumen microbiome. Recent findings indicate strong interlinkages between protozoal and prokaryotic community (Kobel et al., 2025), suggesting that changes in one group could affect overall microbial community. However, the in vitro study of protozoa remains challenging, as they show limited viability and persistence under laboratory conditions.

This study aims to investigate protozoal activity under in vitro conditions and to identify key parameters that support their viability during in vitro incubations. It will also evaluate the effects of selected anti-methanogenic feed additives on protozoal community composition, activity, and associated fermentation pathways. Since bacteria outcompete protozoa under in vitro conditions, the protozoal fraction will be separated from the prokaryotic community. Incubations will be conducted separately for the protozoal fraction, the prokaryotic fraction, and the whole inoculum, using different substrates supplemented with selected anti-methanogenic agents. Changes in protozoal activity, community structure, and fermentation profiles will be assessed. In addition, the feasibility of cryopreserving protozoa for future experimental use will be explored.

The early-career scientist will have full access to laboratory facilities and will collaborate with researchers and PhD students working on methane mitigation and rumen microbial modulation. Training will include in vitro fermentation techniques, molecular analyses, and protozoal handling and preservation.

Reference : Kobel, C.M., Leu, A., Vera-Ponce de León, A. *et al.* Protozoal populations drive system-wide variation in the rumen microbiome. 2025. *Nat Commun*: **16**, 6238. <https://doi.org/10.1038/s41467-025-61302-2>.

### **Desired technical skills and experience:**

- Background in rumen fermentation and microbial ecology
- Basic laboratory skills (e.g. pipetting, use of basic lab equipment's)

**Host institution and location:** Department of animal sciences and aquatic ecology, Ghent University, Belgium.

**Research supervisors:** Prof. Veerle Fievez and Dr. Jeyanathan Jeyamalar

**Start and end month of research stay:** January to June 2026 or September 2026 to February 2027

**Languages available at the host institution:** English

## 37. Exploring the Potential of Plant-Derived Bioactive Compounds in Reducing Methane Emissions from the Rumen of Dairy Cattle

**Keywords:** livestock, CH<sub>4</sub>, rumen, phytosterol, microbial fermentation, agroforestry, GHG mitigation

### **Brief research stay outline:**

This research practice aims to explore the potential of various plant-derived bioactive compounds—such as phytosterols, saponins, flavonoids, and other secondary metabolites—in reducing methane emissions from the rumen of dairy cattle. As a major greenhouse gas in livestock production, methane plays a significant role in global climate change. By comparing extracts from different plant sources, the project evaluates their regulatory effects on rumen microbial fermentation pathways and their ability to suppress methane production, with the goal of identifying efficient, eco-friendly, and sustainable feed additives. Building on recent findings related to phytosterols, the study will expand the range of tested extracts and integrate rumen microbiome sequencing with in vitro fermentation gas measurements to systematically assess the anti-methanogenic efficacy of these additives. The project will be closely aligned with the GRA Flagship Initiative and the NSFC-CGIAR Joint Research Project, sharing data and methodological frameworks to promote global collaborative research and technology transfer in livestock greenhouse gas mitigation. It aims to contribute a Chinese perspective and scientific strength to the pursuit of sustainable agriculture and climate goals.

Given the interdisciplinary and cross-regional nature of this initiative, scholars are expected to contribute across five key dimensions:

#### 1). Scientific Researchers: Uncovering Mechanisms and Identifying Effective Compounds

- **Fundamental Research:** Investigating how plant bioactives (e.g., tannins, saponins, essential oils) influence rumen microbial communities and inhibit methanogenesis.
- **Compound Screening and Optimization:** Utilizing in vitro rumen simulation and in vivo trials to identify bioactives that are effective, safe, and stable.
- **Formulation and Process Development:** Supporting extraction process optimization, stability testing, and feed additive formulation.

#### 2). Strategic Planners: Guiding Project Direction and Technical Pathways

- **Technical Roadmap Design:** Aligning the latest scientific insights with industry needs to shape a coherent development strategy.
- **Cross-disciplinary Integration:** Bridging animal nutrition, microbial ecology, and environmental science to enable systemic solutions.
- **Policy and Standards Advisory:** Contributing to the development of industry standards and regulatory frameworks for methane mitigation and feed additive use.

#### 3). International Collaborators: Facilitating Global Partnerships and Local Adaptation

- **Global Cooperation:** Engaging with international research institutions to access cutting-edge technologies and promote knowledge exchange.
- **Localized Trial Design:** Tailoring experimental protocols to regional cattle breeds, farming systems, and available plant resources.
- **Cultural and Policy Alignment:** Assisting stakeholders in navigating local regulations and

facilitating technology deployment.

#### 4). Data Analysts: Evaluating Impact and Environmental Performance

- Methane Reduction Assessment: Designing robust evaluation frameworks to quantify mitigation outcomes.
- Life Cycle Analysis (LCA): Assessing the carbon footprint across the full value chain—from cultivation and extraction to application.
- Economic Feasibility Analysis: Evaluating cost-effectiveness based on feed costs, milk yield, and overall farm performance.

#### 5). Project Coordinators: Bridging Research, Industry, and Policy

- Research-Industry Interface: Supporting the translation of research into practice through collaboration with feed companies and dairy farms.
- Policy Engagement: Providing scientific evidence to inform government programs, subsidies, and carbon credit mechanisms.
- Public Outreach: Promoting awareness of methane mitigation and plant-based solutions through science communication.

#### **Desired Technical Skills and Experience**

- Experience in animal nutrition and husbandry management
- Skills in rumen microbiome analysis or fermentation modeling
- Capability in greenhouse gas measurement and data analysis (SPSS or R)

**Host institution and location:** International Joint Research Center for Animal Gastrointestinal Nutrition, Nanjing Agricultural University, Nanjing, China

**Research supervisor:** Professor Yanfen Cheng International Joint Research Center for Animal Gastrointestinal Nutrition, Nanjing Agricultural University

**Start and end month of research stay:** From March to September 2026 (flexible)

**Language Provided by Host Institution:** Chinese and English

## **38. Optimization of mitigation and measurement technologies for livestock methane emissions**

### **Brief research stay outline:**

ZELP is developing breakthrough technologies to address one of the most pressing challenges in agriculture: methane emissions from livestock. Methane is a potent greenhouse gas, and reducing its release is critical to meeting global climate targets. Our work spans both mitigation and measurement, with the aim of delivering scalable, cost-effective solutions that support farmers, researchers, and industry stakeholders in reducing emissions while improving productivity.

A central project in our portfolio is the development of ZELP Sense, a wearable device designed to continuously monitor methane (CH<sub>4</sub>) and carbon dioxide (CO<sub>2</sub>) emissions from cattle. The device fits comfortably on the animal and captures breath samples with high temporal resolution, transmitting data wirelessly to a farm-wide gateway for real-time analysis on a digital dashboard. Unlike traditional measurement systems such as GreenFeed or respiration chambers, which are costly, complex, and limited in scale, Sense offers a practical, affordable alternative that can be deployed across herds. Importantly, the device can also be used with animals in grazing systems, enabling large-scale measurements in real-world production environments. This allows precise quantification of emissions at the individual animal level, supporting genetic selection, feed optimization, and more accurate emissions inventories.

During the placement, ZELP would require the candidate to support on the drafting of necessary protocols to support continuous improvement and validation of our technologies, assist in the execution of trials (across breeds, systems, diets, etc.), support in collection and analysis of data to ensure scientific rigor and statistical significance across studies, and collaborate with engineers and scientists in-house to assist product-level decision to improve usability/operability/quality of ZELP products.

**Desired technical skills and experience:** Animal physiology, familiarity with gas measurement techniques, data analysis skills (R, SAS, Python), study design, attention to welfare and ethics.

**Host institution and location:** ZELP Ltd., London, UK

**Research supervisor:** Dr. Riccardo Bica, Lead Animal Scientist, ZELP Ltd.

**Start and end month of research stay:** April 2026 - October 2026 (flexible)

**Languages available at the host institution:** English

### **39. Phenotyping novel rumen bacterial isolates: potential direct-fed microbials (DFM) candidates to re-direct H away from methanogenesis.**

**Keywords:** hydrogen, methane, propionate, bacteria

#### **Brief research stay outline:**

Enteric methane emissions from ruminants represent a major environmental challenge, contributing substantially to global agricultural greenhouse gas outputs. A promising mitigation strategy involves redirecting hydrogen (H<sub>2</sub>) away from methanogenesis toward alternative metabolic sinks such as propionate.

The Rumen Gateway project ([RUMEN Gateway | Global Research Alliance](#)) has cultured hundreds of novel rumen microbial isolates, many of which remain poorly characterised. Identifying strains capable of redirecting H<sub>2</sub> away from methanogenesis is a priority in the search for microbial solutions to methane reduction. Characterising and testing these isolates as potential direct-fed microbials (DFM) could open new pathways to improve fermentation efficiency while lowering methane emissions.

This work is a separate but linked to the Department of Agriculture, Environment and Rural Affairs (DAERA) PhD project *“Expanding rumen microbial diversity: phenotypic and metabolic characterisation of novel isolates for methane mitigation and direct-fed microbial applications”*, starting at Queen’s University Belfast in September 2025. The planned research stay will coincide with the shift from initial bacterial candidate selection based on the isolates VFA profile and H<sub>2</sub> production, with attention to functional diversity among strains, to their *in vitro* / co-culture evaluation under simulated rumen conditions.

The activity will therefore contribute to the Rumen Gateway project, which is a flagship project of the GRA funded by the GMH, on its mission to find potential candidates as DFM to re-direct H<sub>2</sub> away from methanogenesis.

**Desired technical skills and experience:** Background in microbiology and rumen fermentation

**Host institution and location:** School of Biological Sciences / Institute of Global Food Security, Queen’s University Belfast, Belfast, United Kingdom

**Research Supervisor:** Prof. Sharon Huws

**Start and end month of research stay:** September 2026 to February 2027

**Languages available at the host institution:** English

## 40. Learning anaerobic techniques and genetic tools to manipulate anaerobic rumen bacteria and methanogens to mitigate enteric methane emissions

**Keywords:** rumen bacteria, methanogens, cultivation, genetic tools

### **Brief research stay outline:**

Since CH<sub>4</sub> is ~80 times as potent as CO<sub>2</sub> on a mass basis at trapping heat in the atmosphere over a 20-year period, it makes a significant contribution to global warming. Thus, reducing enteric CH<sub>4</sub> emissions will make an enormous contribution for addressing the negative impacts of climate change. Major knowledge gaps are the lack of understanding of the composition, adaptation and function of the rumen microbiome and their direct and major impact on ruminant performance and efficiency. The development and deployment of genetic toolkits for key rumen bacteria and methanogens will enable global research initiatives to understand carbon and electron flow in the rumen and will lead to new and innovative approaches for methane mitigation.

The proposed training activity is directly linked to 3 funded projects in the PI's lab namely, the Greener Cattle Initiative funded by GCI-FFAR, "Development of Genetic Toolkits for Anaerobic Rumen bacteria and Methanogenic Archaea" funded by GMH, and the recent GMH funded "CH<sub>4</sub>IEF: animal trial for Methane (CH<sub>4</sub>) Inhibition and Electron Flow". The funded PhD student or Postdocs will engage with and use the research platform provided by the above three funded proposals to develop and enhance their knowledge and skills that are critical for translation and implementation of these fundamental research tools across the world. The trainee will have full access to the lab, bioinformatic, genomic and metabolic infrastructure at UIUC and will interact with an international network of scientists working in the field of manipulating rumen microbial fermentation to mitigate enteric methane emissions.

**Desired technical skills and experience:** Background in microbiology and/or biochemistry, cultivation and physiology of gut anaerobes, and desire to learn new genetic techniques for rumen bacteria, acetogens and methanogenic archaea

**Host institution and location:** Institute for Genomic Biology, University of Illinois Urbana-Champaign, IL 61801, USA

**Research Supervisor:** Prof Roderick I. Mackie, Department of Animal Sciences and Institute for Genomic Biology, University of Illinois Urbana-Champaign, IL 61801, USA

**Start and end month of research stay:** February to July 2026 (flexible)

**Languages available at the host institution:** English. The Institute for Genomic Biology is experienced in hosting and providing support for visiting PhD students and Postdocs <https://www.igb.illinois.edu/resources>.

## 41. Towards rumen microbiome engineering for reduced enteric methane emissions and improved animal production efficiency

**Keywords:** Microbiome, rumen, engineering, methane, genetics

### **Brief Research Outline:**

Modulating the rumen microbiome offers a promising strategy to reduce enteric methane emissions from ruminants. Methane is generated as by-product of ruminal fermentation, where microbes convert recalcitrant fiber into short-chain fatty acids (SCFAs) essential for animal growth. Understanding the ecophysiological roles of these microbes is critical for engineering communities that promote efficient fermentation — high feed conversion with low methane output. Yet only few rumen microbes are cultivable and none of those are genetically tractable, limiting mechanistic insights, particularly for organisms that redirect electron flow toward alternative sinks such as acetogens. Hence, to gain deeper physiological insights into these microbes, this project aims to isolate and characterize hydrogen-utilizing microbes that employ alternate hydrogen sink. The work includes comprehensive genomic analysis and phenotypic characterization to investigate their electron transfer pathway for H<sub>2</sub> consumption and to assess their genetic tractability for toolkit development. The work will leverage BiomEdit's high-throughput anaerobic platforms for microbial isolation, cultivation, and characterization, coupled with *ex vivo* rumen batch cultures to evaluate microbial effects on community structure, methane emissions, SCFA profiles, and feed digestibility. These activities align with the Gates Foundation-funded BiomEdit's Methane Emissions Reduction (MER) program and GMH-supported initiatives at BiomEdit, including the RUMEN Gateway and Genetic Toolkit projects. The CLIFF-GRAD fellow will receive advanced training in strict anaerobic cultivation and characterization and automation technologies, while engaging with international experts and early-career peers across these collaborative networks.

The project is part of BiomEdit's ongoing research and partnerships as described below. BiomEdit Methane Emissions Reduction research program is funded by the Gates Foundation (Sept 2023 – Dec 2026) <https://www.gatesfoundation.org/about/committed-grants/2023/10/inv-062437> and we receive a subaward funding from the Genetic Toolkit Development of rumen bacteria and methanogens project (May 2025 - April 2027, funded by the GMH – the Windward Fund to the University of Illinois at Urbana Champaign led by Dr. Roderick Mackie). In addition, BiomEdit is the only for-profit partner of the RUMEN Gateway project <https://globalresearchalliance.org/flagship-projects/mining-rumen-data/> (led by University of Queens at Belfast, led by Dr. Sharon Huws).

### **Host institution**

BiomEdit, Inc.

2710 Innovation Way, Greenfield, Indiana, USA 46140

Phone : +1-317-315-3663

### **Desired technical skills and experience**

2+ years' experience working in General Microbiology (preferably anaerobic microbiology) and/or Molecular Biology fields. Preferably with a background on rumen fermentation and livestock animals.

**Research Supervisor:** Dr. Dwi Susanti – Senior Director and Head of Microbial Discovery and Methane Emissions Reduction Research at BiomEdit, Inc.

**Start and end month of research stay:** January – June 2026 (flexible)

**Languages available at the host institution:** English

## 42. Microbial Signatures of Feed Efficiency and Methane Mitigation in Beef Cattle: Insights from 16S rRNA Meta-analysis

**Keywords:** Rumen microbiota, feed efficiency, methane mitigation, meta-analysis

### Brief project outline

Lower methane emissions have been linked to greater feed efficiency, underlining their dual importance for productivity and environmental sustainability. A key measure of efficiency is residual feed intake (RFI), defined as the difference between an animal's actual and predicted feed intake for maintenance and growth, which can vary by 15–34% among cattle with similar performance. This variation is driven by differences in metabolic and digestive efficiency, processes strongly influenced by the rumen microbiome. By shaping nutrient utilization, the rumen microbiota contributes to inter-animal variation in both feed efficiency and methane emissions. Previous studies suggest that microbial profiles differ between extreme RFI phenotypes, raising the possibility of identifying microbial signatures for RFI prediction. However, results remain inconsistent, likely due to limited sample sizes and heterogeneous bioinformatic or statistical approaches.

This project aims to conduct a meta-analysis of publicly available 16S rRNA datasets to identify microbial biomarkers associated with feed efficiency and methane emissions in beef cattle. The PhD student will mine, curate and analyse 16S rRNA data and metadata, building a robust database. Our team offers strong expertise in omics data analysis, feed efficiency, and methane emissions, providing early-career scientists with the opportunity to train in advanced omics data analysis methods and modelling, as well as the chance to collaborate with other partners. This proposal aligns with the GRA flagship project RumenGateway, which is aimed towards improving livestock sustainability by leveraging the potential of rumen microbiota.

**Desired technical skills and experience:** Experience in biostatistics applied to animal science. Experience in using R software is required, and a background in omics data analysis is desirable but not exclusive.

**Host institution and location:** Herbivores Research Unit, INRAE Auvergne Rhône Alpes, Site de Theix, 63122 Saint Genès Champanelle, France

**Research Supervisor:** Abimael Ortiz-Chura and Paul Dou

**Start and end month of research stay:** March to August 2026 (flexible)

**Languages available at the host institution:** French, English and Spanish

### **43. Developing standard operating procedures for GreenFeed methane measurement in pasture-based systems**

**Keywords:** Livestock, CH<sub>4</sub>, enteric fermentation, pastoral systems, measurement tools

**Brief research stay outline:**

GreenFeed (GF) emission monitoring systems offer a valuable tool for measuring enteric methane emissions under pasture-based grazing conditions. However, consistent challenges in these systems include variable animal visitation, data quality, and adaptation time, particularly in open grazing environments. This project seeks to develop and validate improved Standard Operating Procedures (SOPs) to enhance the efficiency and reliability of GF use in New Zealand's pasture-based livestock systems.

With two new GF units being deployed at Massey University, this project will systematically investigate animal training timelines, unit placement strategies, and bait protocols to increase sampling frequency and data integrity. The CLIFF-GRADS scholar will contribute to animal behaviour monitoring, methane data analysis, and field trial design, working with sheep and/or cattle in real grazing settings.

The research aligns with the GRA's Livestock Research Group goals of standardising GHG quantification methodologies. Findings will benefit international partners by generating transferrable SOPs for pasture-based methane measurement in similar environments.

**Desired technical skills and/or experience:**

- Background in animal science, ruminant nutrition, or GHG research
- Interest in climate-smart livestock systems ...
- Familiarity with data analysis software (e.g., SAS, Excel, R)

**Host institution and location:** Massey University, Palmerston North, New Zealand

**Research supervisor:** Dr Amelia Almeida (Senior Lecturer, Massey University) & Dr Natalia Martín (Lecturer, Massey University)

**Start and end month of research stay:** February to July 2026 (Flexible)

**Languages available at the host institution:** English, Spanish and Portuguese

#### **44. Determining the long-term efficacy of methanogen-inhibiting additives to reduce enteric methane emissions in non-lactating cows fed a constant diet**

**Keywords:** rumen, enteric methane, methanogen-inhibiting additives, *in vitro*, *in vivo*, cow, respiration chamber

**Brief research stay outline:**

Some recent research has suggested that CH<sub>4</sub>-inhibiting additives might become less efficient in reducing CH<sub>4</sub> emissions when continuously used for a long period of time. However, other factors were not always constant or were unknown in those studies, such as changing lactation stage, feeding level, diet composition and stability/ bioactivity of the additive.

The objective of this project is to determine the long-term effect of two additives on CH<sub>4</sub> emissions in non-lactating cows fed a constant diet at a consistent feeding level.

The project will involve a cow study (including fistulated cows) in an intake facility with automated feed bins, wearable sensors, CH<sub>4</sub> measurements in respiration chambers, as well as *in vitro* feed and additive testing, at both AgResearch group, BSI and Massey University facilities in Palmerston North, New Zealand. The candidate will also be able to see other facilities, experience work in other projects and interact with other students and scientists from these organisations.

**Desired technical skills and experience:**

- Background in ruminant nutrition,
- Experience in working with cattle is desired,
- Interest in ruminant nutrition and CH<sub>4</sub> mitigation research,
- Good skills working with diverse people.

**Host institution and location:** AgResearch Group, Bioeconomy Institute, Palmerston North, New Zealand

**Research Supervisor:** Dr. Arjan Jonker (Animal Nutrition and Physiology Team, Grasslands Research Centre, AgResearch Group, BSI)

**Start and end month of research stay:** Project will run all of 2026

**Languages available at the host institution:** English

## 45. Evaluating the Impact of Using the SF<sub>6</sub> Tracer Technique in Enteric Methane Research

**Keywords:** Enteric methane; SF<sub>6</sub> tracer technique; Greenhouse gas mitigation, Livestock emissions

### **Brief research stay outline:**

The sulphur hexafluoride (SF<sub>6</sub>) tracer technique is widely used to quantify enteric methane (CH<sub>4</sub>) emissions from ruminants, especially grazing animals, providing valuable data to inform mitigation strategies. However, SF<sub>6</sub> is the most potent greenhouse gas known, with a global warming potential (GWP) of 23,800 times that of CO<sub>2</sub> (IPCC, 2007), raising concerns about its net impact on emissions when used in research. This proposal aims to evaluate the emission cost of using the SF<sub>6</sub> technique in CH<sub>4</sub> mitigation studies and its implications for national and regional greenhouse gas quantification.

Through a deterministic-analysis of published SF<sub>6</sub>-based studies, the research will quantify:

- The relative contribution of SF<sub>6</sub> emissions per study compared to enteric CH<sub>4</sub> emissions occurring in the same study
- The cumulative contribution of SF<sub>6</sub> emissions from CH<sub>4</sub> mitigation research to regional/national total greenhouse gases emissions
- The CH<sub>4</sub> mitigation threshold required to offset SF<sub>6</sub> emissions in experimental setups

This analysis will support more climate-responsible research protocols for methane mitigation livestock research.

In addition to the modelling work, the CLIFF-GRADS student will have the opportunity to learn the application of the SF<sub>6</sub> tracer technique in a grazing dairy cattle setting. If trials are ongoing during their stay, they will also participate in methane emission measurements in grazing ruminants and gain hands-on experience with field protocols, sample collection, and data interpretation.

### **Desired technical skills and/or experience:**

- Background in ruminant nutrition and livestock systems
- Interest in enteric methane measurements and protocols
- Experience with data analysis and systematic literature review
- Scientific writing and communication abilities

**Host institution and location:** Instituto de Investigaciones Agropecuarias, Centro Regional de Investigacion Remehue, Osorno, Chile.

**Research supervisor:** Dr. Camila Muñoz, Research Scientist (INIA Remehue); Dr. Emilio Ungerfeld, Research Scientist (INIA Carillanca); and Dr. Natalie Urrutia, Research Scientist (INIA Remehue).

**Start and end month of research stay:** July to December 2026

**Languages available at the host institution:** Spanish, English

## 46. In vitro evaluation of tropical forages for methane mitigation in ruminant systems

**Keywords:** Methane emissions, tropical forages, in vitro fermentation, climate-smart livestock, mitigation

### **Brief research stay outline:**

This research will evaluate the potential of tropical forages to mitigate enteric methane emissions from ruminants using in vitro incubation techniques. The project will focus on the collection and preparation of forage samples in the Amazonian region. In Lima, laboratory incubation assays to quantify methane production as well as related content of some secondary components and the comparative analysis of nutritional and fermentative characteristics among species will be conducted. In addition, using data from prior experiments plus those obtained during the training, initial modelling of NDF digestion and methane emission in the rumen will be conducted.

The proposed research directly contributes to the priorities of the Global Research Alliance on Agricultural Greenhouse Gases, particularly in the area of measurement and mitigation of agricultural emissions. It also aligns with CGIAR (CIAT and ILRI) initiatives promoting sustainable, low-emission livestock systems. By identifying forages with greater mitigation potential, this work will provide evidence to guide feeding strategies that improve productivity while lowering the environmental footprint of livestock in tropical regions, thereby supporting food security and climate resilience.

The host institution, Universidad Nacional Agraria La Molina in Peru, offers specialized laboratory facilities, equipment for gas measurement, and a collaborative scientific environment with strong international linkage. The selected student will strengthen technical skills in ruminant nutrition, in vitro fermentation methodologies, and greenhouse gas quantification. Additionally, the stay will promote capacity building, international collaboration, and the development of innovative solutions to reduce methane emissions from livestock.

### **Desired technical skills and/or experience:**

- Background in ruminant nutrition
- Basic experience with laboratory analytical techniques
- Knowledge of greenhouse gas measurement and mitigation strategies
- Data analysis and scientific writing skills

**Host institution and location:** Universidad Nacional Agraria La Molina, Perú. Main Campus: Lima; Field station: North Amazonian region

**Research supervisor:** Dr. Carlos A. Gómez Professor and Leader, Research Group on Livestock Mitigation and Adaptation to Climate Change (Department of Animal Nutrition, Faculty of Animal Science; Universidad Nacional Agraria La Molina, Lima, Perú)

**Start and end month of research stay:** February to July 2026 (flexible)

**Languages available at the host institution:** Spanish and English

## 47. Targeting the Rumen Microbiome: Cultivation and Characterization of Key Rumen Microbes for Improved Fermentation and Methane Mitigation

**Keywords:** rumen, methane inhibition, microbiomes, mitigation, ruminants

### **Brief research stay outline:**

One of the strategies for mitigating methane emissions focuses on inhibiting methanogens or stimulating competing non-methanogenic microbes. However, these approaches are limited by incomplete knowledge of the physiology, metabolism, and interactions of rumen microbes, largely due to the difficulties involved in culturing and genetically manipulating many strictly anaerobic microbes. This project aims to isolate and culture an expanded set of rumen microbes, characterize the genetic and physiological traits of selected microbial taxa from the 'most wanted' list (e.g., acetogenic bacteria), and investigate the metabolic roles of specific bacteria involved in hydrogen production/consumption, fibre degradation, and fermentation processes.

The project will utilize an in vitro anaerobic culture platform, which includes: the collection of ruminal samples from various animal species; protocols for the preparation of selective culture media and various solutions; roll tube techniques; phenotypic characterization; preservation of bacterial strains; and molecular techniques such as DNA extraction and quantitative PCR (qPCR). The PhD student will have full access to the lab and field work facilities and will interact with an interdisciplinary team of scientists at different INTA experimental stations where enteric methane measurements are conducted (SF6, respirometric chamber, Greenfeed). The activity to undertake is directly linked to the Rumen Microbial Genomics (RUMEN), [Global Methane Hub - Meet the Moment on Methane](#)

### **Desired technical skills and experience:**

- Laboratory experience may be preferred but not essential
- Knowledge on rumen fermentation
- Team collaboration
- Writing science publications

**Host institution and location:** Instituto de Patobiología, Instituto Nacional de Tecnología Agropecuaria, INTA Castelar (Hurlingham, Buenos Aires, Argentina).

**Research supervisor:** María Esperanza Cerón Cucchi, Dr., Instituto Nacional de Tecnología Agropecuaria, INTA Castelar, Buenos Aires, Argentina, [ceroncucchi.maria@inta.gob.ar](mailto:ceroncucchi.maria@inta.gob.ar)

**Start and end month of research stay:** February to July 2026 (flexible)

**Languages available at the host institution:** Spanish, English.

## 48. In Vitro Screening of Antimethanogenic and Digestibility Effects of Kenyan Dairy Cattle Feedstuffs

**Keywords:** methane mitigation, rumen fermentation, dairy cattle, Kenya, feedstuffs, digestibility, in vitro

### **Brief Project Outline:**

Livestock farming plays a vital role in the Kenyan economy, especially through dairy production, which is an essential source of livelihood, food security, and rural development. However, enteric methane emissions from dairy cattle, primarily resulting from rumen fermentation, pose significant environmental challenges by contributing to greenhouse gas release and climate change.

Recent research in animal nutrition has highlighted innovative strategies to mitigate methane production without compromising animal productivity. Incorporating locally available feedstuffs rich in bioactive compounds such as polyphenols can directly target rumen methanogenesis through various biochemical pathways. Moreover, the use of concentrates with slowly degradable starch may lower methane emissions by minimizing the extent of rumen fermentation.

This proposed research stay aims to support the scholar to systematically evaluate the antimethanogenic and digestibility properties of common feed ingredients and agro-industrial by-products utilized in Kenyan dairy cattle diets. Utilizing the *in vitro* gas production technique, the project will screen different forage types, feedstuffs, and cereal grains with differing starch compositions to identify promising candidates for methane reduction and improved nutrient utilization.

The findings will provide locally relevant recommendations to enhance sustainability and environmental stewardship in Kenyan dairy production systems.

This fellowship will give a PhD student the opportunity to:

- Apply in vitro batch culture and gas production techniques to screen Kenyan forages, feedstuffs, and agro-industrial by-products.
- Assess their antimethanogenic potential and digestibility characteristics.

### **Desired technical skills and/or experience:**

- Background in ruminant nutrition and rumen fermentation
- Experience with in vitro techniques (gas production or batch culture) would be an asset

**Host institution and location:** International Livestock Research Institute, Nairobi, Kenya

**Research Supervisor main:** Dr. Claudia Arndt with support by ILRI Mazingira Researchers

**Start and end month of research stay:** 6 months within 2026

**Languages available at the host institution:** English

## 49. Early development of the immune response to methanogens in ruminants

**Keywords:** rumen, methane, vaccines, early life, colonization

### **Brief research stay outline:**

Recent meta-analysis identified that the main intervention to reduce enteric methane production is by direct impacting methanogenic Archaea in the rumen. Vaccines offer a great potential since they don't require direct and frequent access to the animals as it is the case of feed additives. However, with vaccination, we are faced with diverse problems, the main one being our lack of understanding if and how rumen microorganisms, and more specifically methanogenic archaea, are detected and potentially controlled by the immune system of the animal. The rumen and the large intestine of ruminants are quickly colonized during and after birth by methanogenic archaea and the processes occurring during this colonization over the first weeks of life are critical to understand their recognition by the developing immune system of the animal. This major gap of knowledge needs to be closed before we can fully develop an immunization strategy.

The project will describe in detail the timeline of colonization of the microbiota in the digestive tract (rumen and hindgut) and the animal's immune development over the first 8- weeks of life (until weaning) of calves. The project will use recent developments of integrated multi-omics, histological and immunological approaches.

The early career scientist will have full access to the lab, research farm and bioinformatic computing facilities and will interact with an international network of scientists working in the field of rumen microbiology and immunology. The activity to undertake is directly linked to the projects 'Early development of the immune response to methanogens in ruminants' facilitated by the Global Methane Hub, led by CSIC and RVC and 'RumenGateway'-GRA Flagship Project in which CSIC is heavily involved in the isolation of novel Archaea.

### **Desired technical skills and experience:**

- Experience in rumen microbiology and physiology
- Basic technical skills in lab work and handling experimental animals
- Willingness to interact with an international, dynamic and multidisciplinary team

**Host institution and location:** Estación Experimental del Zaidin, CSIC, Granada, Spain

**Research Supervisor:** Prof. David Yáñez-Ruiz, Spanish Research Council (CSIC), and Dr. Ines Rivelli

**Start and end month of research stay:** start April 2026 or later if needed

**Languages available at the host institution:** Spanish and English

## **50. Isolation and characterization of rumen bacteria capable to use hydrogen-acceptor substrates**

**Keywords:** rumen fermentation, hydrogen acceptor, microbes, isolation

### **Brief project outline:**

Hydrogen metabolism plays a central role in the rumen ecosystem. It is the common currency in energy transactions within and between microbial cells. Whereas most rumen microbes produce hydrogen when growing, hydrogen utilization is predominantly done by methanogens, producing methane in the process. Other than methanogenesis, there are microbial processes that use hydrogen for producing other metabolites, such as acetate. However, these processes are not predominant in the rumen because of thermodynamics constraints, lower affinity for hydrogen, and/or absence of intermediate substrates. There are compounds, present in some diets or than can be supplied as an additive, which are intermediate substrates of fermentation processes consuming hydrogen. However, there is little information on these microbial guilds and their representative isolates.

The objective of the study is to isolate and characterise rumen bacteria that use natural hydrogen-acceptor compounds as a source of energy. The early career scientist will work in the design of culture media and isolation protocols, and will use anaerobic culture, biochemical and molecular biology techniques.

The host team specialises in ruminant nutrition and enteric methane mitigation, and the early-career scientist will have the opportunity to observe other ongoing laboratory and animal studies. This work aligns with the GRA flagship project RumenGateway, which aims to unlock the potential of rumen microbes for improved livestock performance and sustainability.

**Desired technical skills and/or experience:** background in rumen fermentation and microbiology

**Host institution and location:** Herbivores Research Unit, INRAE Auvergne Rhône Alpes, Site de Theix, 63122 Saint Genès Champanelle, France

**Research Supervisor:** Diego Morgavi and Milka Popova

**Start and end month of research stay:** February to July 2026 (flexible)

**Languages available at the host institution:** French and English

## 51. In Vivo Evaluation of LowMethane Forages in Sheep within the Low Methane Forage Project

**Keywords:** lowmethane forages, sheep, *in vivo*, methane emissions, enteric fermentation

### **Brief Research Stay Outline:**

Reducing enteric methane emissions through nutritional strategies is central to achieving climatesmart livestock systems. The LowMethane Forages (LMF) project, led by the Alliance of Bioversity International & CIAT in collaboration with ILRI, seeks to identify and deploy forage species enriched in antimethanogenic compounds (AMC) to sustainably cut methane emissions in smallholder systems [alliancebioversityciat.org+15ilri.org+15alliancebioversityciat.org+15](http://alliancebioversityciat.org+15ilri.org+15alliancebioversityciat.org+15).

This research stay will empower a PhD candidate to gain hands-on experience in in vivo methane measurement techniques using sheep as a model. The fellow will:

- Participate in the design and execution of an **in vivo feeding trial** using sheep to evaluate selected forage species or blends with high AMC content.
- Operate and manage **methane measurement chambers or portable accumulation systems**, gathering real-time emissions data.
- Record feed intake and animal performance metrics to assess both methane yield and productivity effects.
- Help analyze data to compare emissions across forage treatments and generate insights on potential climate-mitigation benefits of low-methane forages.

Gained experience will build the candidate's technical capacity in ruminant nutrition, methane measurement, and experimental design, while directly contributing to LMF's mission of delivering scalable, evidence-based solutions for enteric methane mitigation in the Global South.

### **Desired Technical Skills & Experience**

- Background in animal science, ruminant nutrition, veterinary science, or environmental science.
- Interest or experience in greenhouse gas measurement, animal handling, and experimental trials.
- Previous exposure to livestock research and data management is advantageous.

**Host Institution & Location:** International Livestock Research Institute (ILRI), Nairobi, Kenya

**Research Supervisors:** Dr. Edward Hernando Cabezas Garcia

**Start and End Month of Research Stay:** June to November 2026 (subject to LMF trial schedule alignment).

**Languages Available at Host Institution:** English

## 52. Climate-Smart Feeds: In vitro assessment of the anti-methanogenic potential of West African forages and fodder trees

**Keywords:** enteric methane emission, in vitro studies, plants, feed additives, livestock, methane mitigation

### **Brief research stay outline:**

Enteric methane production is a major source of greenhouse gas (GHG) emissions from ruminant livestock and a critical challenge for sustainable agriculture in sub-Saharan Africa. This research stay aims to evaluate the anti-methanogenic potential of locally available forage species, fodder trees, and natural feed additives from West Africa, with priority given to feed resources relevant to smallholder systems. The study will be conducted collaboratively by Prof. Serena Calabrò (University of Naples Federico II) and Prof. Ivan Koura (Université Nationale d'Agriculture, Benin).

Using the in vitro gas production technique at the Laboratory of Feed Analysis (DMVPA), we will assess methane emissions, fermentation kinetics, and volatile fatty acid profiles. Results will provide data to parameterize emission models and identify promising low-emission feed strategies. This work aligns with the GRA Livestock Research Group <https://globalresearchalliance.org/research/livestock/>, the Global Methane Hub (GMH) <https://www.globalmethanehub.org/enteric-fermentation-rd-accelerator/>, and CGIAR's Low-Emission Food Systems initiatives <https://www.cgiar.org/initiative/low-emission-food-systems/resources> on measurement and mitigation of agricultural GHGs.

Following the in vitro screening in Italy, the most promising anti-methanogenic feedstuffs will be prioritized, for follow-up in vivo validation trials in Benin (optional), ensuring locally adapted solutions and direct benefits for West African livestock systems. The outputs will contribute to climate-smart livestock feeding strategies and sustainable food security pathways.

### **Desired technical skills and experience:**

- Hands-on experience with *in vitro* gas production and rumen fermentation assays
- Skills in feed characterization and proximate/nutritional analyses (e.g., fiber fractions)
- Proficiency in experimental design, statistical analysis, and data interpretation
- Laboratory experience handling rumen inoculum and sample processing
- Scientific communication and reporting skills

**Host institution and location:** Department of Veterinary Medicine and Animal Production (DMVPA), University of Naples Federico II (UNINA, Italy).

**Research supervisor:** Prof. Serena Calabrò, Full Professor, Department of Veterinary Medicine and Animal Production (DMVPA), University of Naples Federico II (UNINA, Italy), Prof. Bossima Ivan Koura, Associate Professor, Ecole de Gestion et d'Exploitation des Systèmes d'Élevage, National University of Agriculture (UNA, Benin)

**Start and end month of research stay:** April to September 2026

**Languages available at the host institution:** English, Italian

### **53. Potential of urea molasses treated rice straw to reduce methane emission from dairy cattle**

**Key words:** in vitro, in vivo, respiration chamber, methane mitigation, crossbred

#### **Brief project outline:**

This study investigates the potential of urea-molasses treated rice straw (UMTRS) to reduce enteric methane (CH<sub>4</sub>) emissions from crossbred dairy cattle, addressing the global (especially in Asia) use of low-quality rice straw as feed and its contribution to high CH<sub>4</sub> yields due to poor digestibility. We hypothesize that UMTRS decreases CH<sub>4</sub> yield by disrupting lignocellulose structure, enhancing digestibility, shifting rumen fermentation patterns, and reducing retention time. The methodology comprises a two-phase approach. First, in vitro screening of five iso-nitrogenous, iso-energetic TMR diets (0, 25, 50, 75, and 100% UMTRS replacing untreated straw) will be conducted by fermenting each diet with ruminal fluid in an automated gas production system. Total gas production kinetics, CH<sub>4</sub> output, VFA profiles, and digestibility (DM, OM, NDF) will be measured to identify the two optimal UMTRS levels for methane reduction. Second, in vivo validation will assess three treatments including a control diet (0% UMTRS) and the two selected UMTRS levels. Nine crossbred dairy cows will be randomly assigned to these treatments with three cows per treatment. Each cow will complete one 14-day continuous period in an open-circuit respiration chamber per treatment. The first four days involve chamber acclimation using a standard diet. The subsequent seven days allow dietary acclimation to the assigned TMR. The final three days include continuous CH<sub>4</sub> measurement, daily dry matter intake recording, and total fecal collection to determine apparent digestibility. Data generated from treatments will be compared statistically. Validating UMTRS for methane mitigation will strengthen sustainable livestock solutions.

During the research stay, the scholar will contribute to the design, implementation, and analysis of in vitro and in vivo experiments assessing urea–molasses treated rice straw as a methane mitigation strategy in dairy cattle; collaborate with the host institution’s research teams on dietary formulation, gas production measurement, and data interpretation; assist in managing animal trials, including data collection from respiration chambers and statistical analysis of methane emissions and nutrient digestibility; Participate in research-oriented training programs to enhance technical competencies.

#### **Desired technical skills and experience:**

- Strong foundation in ruminant nutrition
- Proficiency in statistical analysis including experimental design
- Experience in dairy farm operations

**Host institution and location:** Gazipur Agricultural University, Gazipur 1706, Bangladesh

**Research Supervisor:** Dr. Md. Morshedur Rahman, Professor, Department of Dairy and Poultry Science, Gazipur Agricultural University, Gazipur, Bangladesh

**Start and end month of research stay:** September 2026 - February 2027

**Languages available at the host institution:** Bengali and English

## 54. Integrative Study of the Rumen Microbiome: Anaerobic Fungi, Bacteria and Bioinformatics Approaches

**Keywords:** Rumen microbiome, Anaerobic fungi, Rumen bacteria, Bioinformatics, Microbial interactions

### **Brief research stay project outline:**

The rumen microbiome is a key driver of ruminant productivity, health, and greenhouse gas emissions, and therefore represents an important research focus within international initiatives such as the Global Research Alliance on Agricultural Greenhouse Gases, CGIAR, and the Global Methane Hub. Within this framework, my group at Wageningen University & Research specializes in microbial ecology, functional genomics, and integrated omics approaches to study complex microbial ecosystems.

During this proposed short-term research stay, we aim to support the ongoing PhD research of Gizem Karakaya, who is registered at the University of Galway and currently performing research as part of the Rumen Gateway project. Her PhD focuses on the isolation and cultivation of pure cultures of rumen bacteria and anaerobic fungi from cattle and sheep in grazing systems. The collaboration will provide the opportunity to combine culture-based approaches with advanced genomic and bioinformatics tools available in my laboratory.

The project will specifically address:

- (i) Functional genomic analysis of anaerobic fungi to uncover their enzymatic potential and ecological roles,
- (ii) Investigation of microbial co-occurrence networks to map ecological interactions between fungi and bacteria,
- (iii) The development and application of bioinformatics workflows for the analysis of metagenomic and metatranscriptomic datasets.

Through this collaboration, we expect to generate new insights into the ecological functions of anaerobic fungi in the rumen microbiome. These outcomes will contribute to international efforts to enhance livestock sustainability and reduce methane emissions, directly aligning with the missions of GRA, CGIAR, and GMH.

### **5. Desired technical skills and/or experience:**

- Experience in anaerobic microbiology, particularly cultivation/handling of anaerobic bacteria or fungi
- Familiarity with microbial ecology and rumen microbiology
- Basic molecular biology skills (e.g., DNA/RNA extraction, PCR)
- Experience with or strong interest in functional genomics / omics approaches
- Bioinformatics skills, especially in managing metagenomic and metatranscriptomic data
- Ability to work independently and contribute effectively to collaborative research projects.

**Research host contact information:** Laboratory of Microbiology, UNLOCK microbiome research infrastructure, Wageningen University & Research, The Netherlands

**Research supervisor:** Professor Hauke Smidt, Wageningen University & Research, The Netherlands

**Start and end the month of research stay:** July 2026-October 2026

**Languages available at the research institute:** English

## 55. Mitigation strategies for enteric methane in Argentine livestock systems and emission monitoring in strategic nodes

**Keywords:** Livestock; CH<sub>4</sub>; mitigation; SF<sub>6</sub> tracer; diet management; in vitro fermentation

### **Brief research stay outline:**

Animal production is a major source of greenhouse gases (GHG), particularly methane (CH<sub>4</sub>) from ruminant enteric fermentation. A wide range of mitigation technologies exists, yet their feasibility, cost, and adoption potential differ across production contexts. Intensive systems may implement options that are impractical in pasture-based operations. This project will apply the sulfur hexafluoride (SF<sub>6</sub>) tracer technique to quantify enteric CH<sub>4</sub> emissions under Argentine livestock conditions and evaluate diet-based mitigation strategies. The evidence will inform an improved, country-specific livestock GHG inventory and identify viable reduction pathways for diverse production systems.

This research stay is part of broader efforts under two national projects:

- **CONICET PIP 11220220100318CO (2024–2026):** *Design and development of a platform for determining enteric CH<sub>4</sub> emission factors in representative livestock systems and potential mitigation strategies.* The main objective of the project is to design and develop a platform that integrates the information collected in our country regarding enteric methane emissions from the livestock sector and the possible mitigation strategies that have been evaluated in in vivo trials. In addition, the project aims to integrate data from several monitoring sites linked to an INTA integrative project, where trials are carried out periodically and continuously. Several trials are planned for 2026 at different experimental stations across the country.
- **UTN PID MSTCBA0008687 (2023–2026):** *Monitoring of GHG emissions in livestock systems and mitigation strategies.* This includes:
  - Implementation of in vitro and in vivo trials to evaluate the effect of diets supplemented with macroalgae from the Argentine coast on methane production in ruminal metabolism. Several in vitro screenings have already been conducted to assess antimethanogenic effects, and in vivo trials are expected to be carried out shortly. The in vivo experiments will be conducted on lambs, which, being smaller animals, require lower amounts of feed and therefore of additive (approximately 2% of dry matter intake).
  - Effect of ANAVRIN® on productive performance, digestive processes, ruminal fermentation, and methane emission in feedlot steers. ANAVRIN® is a natural additive (composed of essential oils and tannins) with potential to reduce enteric methane emissions in ruminants. An agreement has been established with the Faculty of Veterinary Medicine of UDELAR Uruguay to test this product in both beef and dairy cattle. Several trials have already been carried out, and within the framework of the project, technical assistance is provided for the setup and calibration of the SF<sub>6</sub> tracer technique for monitoring enteric methane emissions.

Within the research lines currently under development, emphasis is placed on the evaluation of natural feed additives for enteric CH<sub>4</sub> mitigation, as well as on active collaboration in the management of experimental nodes for the characterization of carbon balance in livestock activities across Argentina, with a particular focus on monitoring enteric CH<sub>4</sub> emissions. We will provide training to the CLIFF-GRADS student in: Measurement of enteric methane emissions (using the SF<sub>6</sub> tracer technique):

- Assembly and calibration of permeation tubes.
- Assembly and calibration of sample collection canisters and flow restrictors.
- Gas chromatography for CH<sub>4</sub> and SF<sub>6</sub> analysis.

- Evaluation of animal productive performance (growth, intake, or milk yield depending on the trial).
- Animal handling and management procedures related to CH<sub>4</sub> emission measurements.
- Collection of respiratory air samples over 5 consecutive days per measurement period.

**Desired technical skills and/or experience:**

- Ability to work both independently and as part of a multidisciplinary team.
- Hands-on experience with animals, including handling and management in research or production settings.
- Familiarity with general laboratory techniques, preferably related to animal nutrition, physiology, or gas analysis.
- Capacity for independent, critical, and reflective thinking, with problem-solving orientation.

**Host institution and location:** National Technological University, Buenos Aires Regional Faculty (UTN), Bs As, Argentina.

**Research supervisor:** Dr. José Ignacio Gere. National Technological University, Buenos Aires Regional Faculty. Researcher at National Scientific and Technical Research Council (CONICET), Argentina

**Start and end month of research stay:** April 2026 - December 2026

**Languages available at the host institution:** Spanish and English

## 56. Early Ruminant Microbiome Transfer for Improved Growth and Methane Mitigation in Colombian Beef Systems

**Keywords:** Livestock, ruminal microbiome, microbial transfer, methane mitigation, fermentation, animal nutrition, Colombia

### **Brief research stay outline:**

The livestock sector in Colombia, particularly in the Caribbean beef cluster, faces persistent challenges of low productivity, inefficient forage utilization, and limited technological integration. These constraints reduce competitiveness, increase production costs, and weaken the sector's ability to comply with sustainability and certification standards. Recent research has underscored the role of the ruminal microbiome in modulating fermentation efficiency and methane output, with delayed microbial colonization in calves limiting productive performance and contributing to higher emissions. This research stays, framed within the SATREPS Livestock Project ("Strengthening the Beef Value Chain through Rumen Microbiome Optimization and Forage Management Supported by a Digital Platform," funded by JICA-Japan and implemented by AGROSAVIA), will investigate early microbiome transfer as an innovative strategy for sustainable beef production. Evidence shows that inoculation of kids with fresh ruminal fluid from adult animals stimulates solid feed intake, enhances rumen fermentation (higher volatile fatty acids and  $\beta$ -hydroxybutyrate), and facilitates smoother weaning with fewer growth setbacks. Inoculation has also been associated with greater microbial diversity, enriched populations of methanogens, anaerobic fungi, and protozoa, and the establishment of a more mature ruminal ecosystem (Palma-Hidalgo et al., 2021). The fellow will focus on three components: (i) assessing preservation methods and protectants for microbial viability; (ii) evaluating the effects of microbiome transfer on in vitro fermentation (pH, VFA, CH<sub>4</sub>/CO<sub>2</sub>, degradability); and (iii) characterizing structural and functional microbial shifts through 16S rRNA sequencing and bioinformatics. This project aligns with the Global Methane Hub Enteric Fermentation R&D Accelerator and the Global Research Alliance (GRA) by advancing microbiome-based innovations for low-emission livestock. Expected outcomes include insights for probiotic development and scalable microbial interventions. The fellow will gain hands-on training in fermentation trials, microbial preservation, molecular methods, and bioinformatics, while contributing to collaborative publications and regional capacity building.

### **Desired technical skills and experience:**

- Background in animal nutrition, microbiology, or biotechnology
- Experience in rumen fermentation techniques and/or microbial ecology
- Skills in bioinformatics, data analysis (R/Python), and molecular methods

**Host institution and location:** AGROSAVIA – Corporación Colombiana de Investigación Agropecuaria, Dirección Centro de Investigación Turipaná: Km. 13 vía Montería - Cereté, Córdoba.

**Research supervisor:** Dr Lorena Angélica Aguayo, Associated Researcher in Sustainable Livestock, and Dr Olga Lucia Mayorga, Associated Researcher in Sustainable Livestock, AGROSAVIA.

**Start and end month of research stay:** March 2026 – August 2026 (or later)

**Languages available at the host institution:** Spanish and English

## 57. Development and calibration of a Laser Methane Detector-based model for estimating enteric methane emissions from grazing ruminants in West Africa

**Key words:** Methane emission factor, laser methane detector, rangeland, regional dataset

### **Brief research stay outline:**

Livestock systems in Sub-Saharan Africa (SSA) are mainly extensive and often described as highly emission-intensive, especially for enteric methane (eCH<sub>4</sub>), despite their modest global contribution. Yet, these claims rely on limited evidence and lack robust direct measurements that reflect the diversity of feeds, grazing practices, climates, and breed traits. GHG data under real grazing conditions are particularly scarce. West Africa hosts resilient indigenous breeds such as Shorthorn taurine, increasingly replaced or crossbred with exotics for productivity gains. It is hypothesized that taurine cattle emit less eCH<sub>4</sub> than Zebu or crossbreds, but no direct measurements have yet tested this assumption.

To address this gap, the Université d'Abomey-Calavi (UAC) in Benin has acquired a GreenFeed® system for direct eCH<sub>4</sub> measurement and is actively participating in the Global Methane Genetics Initiative (GMG - <https://www.wur.nl/en/project/global-methane-genetics-initiative.htm>). In parallel, the Laser Methane Detector (LMD) offers a portable, non-invasive alternative suitable for use with grazing animals, though it requires calibration against reference systems like GreenFeed® to ensure measurement accuracy.

This study aims to develop and validate a predictive model for estimating eCH<sub>4</sub> emissions from grazing ruminants using the LMD, calibrated through simultaneous GreenFeed® measurements. The project will generate reference eCH<sub>4</sub> datasets for Shorthorn taurine, Zebu, and crossbred cattle under wet season rangeland feeding conditions. Additionally, it will assess feed intake, digestibility and animal performance (milk yield, growth). The resulting model will serve as a practical tool for routine field monitoring of eCH<sub>4</sub> emissions in extensive livestock systems.

### **Desired technical skills and/or experience:**

- Practical experience with cattle handling
- Proficiency in statistical analysis
- Good English communication skills (writing and speaking)
- Knowledge of methane emissions measurements in ruminants
- Scientific writing and publication experience

**Host institution and location:** Université d'Abomey-Calavi (UAC, Benin)

### **Research supervisors:**

- Professor Luc Hippolyte Dossa, Lecturer-Researcher in Livestock Production Systems and Genetics, Faculty of Agronomic Sciences, University of Abomey-Calavi, Benin: [ORCID](#)
- Dr Mohamed Habibou Assouma, Senior Animal Scientist – Ruminant Feeding and GHG Emissions, CIRAD–UMR SELMET, hosted at ILRI Nairobi

**Start and end month of research stay:** February to July 2026 (or later)

**Languages available at the host institution:** English and French

## 58. Exploring Cowpea (*Vigna unguiculata*) Genetic Diversity for Reduced Enteric Methane Emissions in Support of the Development of Climate-Smart Livestock Nutrition

**Keywords:** methane, livestock feed, cowpea, genetic variation, genomic prediction

### **Brief project outline:**

Cowpea (*Vigna unguiculata*), a drought-tolerant legume widely cultivated in Africa, offers strong potential as a climate-smart livestock feed. Its high crude protein content (18–25%), low fiber fraction, and good palatability make it an excellent livestock feed. As a legume, cowpea also fixes atmospheric nitrogen, improving soil fertility and reducing the need for synthetic fertilizers. Feeding cowpea haulms and leaves to ruminants improves animal productivity while potentially lowering methane emissions per unit of animal product through improved digestibility and altered rumen fermentation patterns. The CGIAR genebanks at IITA and ILRI hold over 16,000 accessions, forming the world's largest and most diverse cowpea collection. Our project aims to unlock this diversity through integrated field evaluations and advanced breeding tools, including genotyping, QTL mapping, marker-assisted selection, and genomic selection supported by AI and machine learning. A representative subset of accessions is already under multi-location evaluation for forage biomass, feed quality, and drought tolerance. The project seeks to assess genetic variation for low enteric methane emissions, supporting the development of climate-smart livestock systems. The early career scientist will have full access to the lab and field work facilities and will interact with an international network of scientists working in the field of tropical forage diversity and animal nutrition. The planned activities are closely aligned with the Global Methane Hub's Anti-Methanogenic Feedstuffs ([Accelerator Research Strategy](#)), the CGIAR Climate Action ([Climate Action - CGIAR](#)) accelerator, and the CLIFF-GRADS initiative on Research for Low Emissions Food Systems.

The PhD student will work on cowpea improvement project aimed at assessing genetic variation for low enteric methane emissions, adaptation, forage biomass productivity, and feed quality traits to support the development of climate-smart livestock systems. Our research integrates multi-location field evaluations with advanced breeding tools. The student will be responsible for generating greenhouse gas (GHG) emission data, including CH<sub>4</sub> and feed quality parameters such as digestibility, crude protein, and other traits associated with fiber content for approximately 200 to 300 cowpea accessions. She/He will work on data analysis using R or Python to identify accessions with low methane emissions and higher feed quality and examine correlations between low methane emissions, feed quality traits, and other agro-morphological traits. Depending on time availability, the student may also analyse genomic data to identify genomic regions associated with low methane emissions.

### **Desired technical skills and/or experience:**

- Background in forage genetic diversity and livestock nutrition.
- Skills on molecular techniques, sequencing and bioinformatics tools.
- Statistical analysis, including R and Python.
- Skills on methane measurement techniques.

**Host institution and location:** International Livestock Research Institute (ILRI), Addis Ababa, Ethiopia.

**Research Supervisor:** Dr. Christopher Stephen Jones, Senior Principal Scientist, Livestock Genetics, Nutrition and Feed Resources program (ILRI) and Dr. Meki Shehabu Muktar, Scientist on forage diversity, Livestock Genetics, Nutrition and Feed Resources program (ILRI)

**Start and end month of research stay:** February 2026 to July 2026 (or later)

**Languages available at the host institution:** English and Amharic.

## 59. Methane emission from grazing dairy cows during day or night

**Keywords:** Methane, dairy, grazing

### **Brief research stay project outline:**

Recent research points towards a lower emission of greenhouse gasses from grazing dairy systems compared with indoor intensive feeding regimens. Currently, our department holds several projects in this area.

In the current project, the diurnal methane emission and milk production of dairy cows will be investigated in grazing systems applying either day- or night-time grazing. Indoor feeding will be a typical silage-based total mixed ration. The trial will be conducted during the grazing season, from mid April to late September 2026. The chemical and botanical composition of pasture sward will be assessed continuously during the entire experimental period.

Methods applied will be GreenFeed for measuring methane emissions both indoors and outdoors. Feed intake indoors will be measured using the Insentec feedbin system. Cows will be milked in a milking parlor. The pasture management and grass allowance will be planned using a platometer (GrassHopper). The research fellow will take part in all aspects of running the trial, such as final planning, continuous pasture management, grass sampling, GreenFeed maintenance, overseeing the dataflows, and finalising data sets. The project has relevance for developing countries in tropical regions in regard to the comparison of day - and night-time grazing as ruminants tend to graze more during cooler hours of a 24 h day.

### **Desired technical skills and experience:**

- MSc in animal science
- Experience with participating in experiments and sticking to procedures/protocols
- Experience with statistical analysis of data from controlled experimental designs
- Besides, it will be advantageous to have experience with data management and handling of bigger datasets. Further, it is an advantage being used to work with large ruminants (trial is with Holstein cows).

**Host institution and location :** Department of Animal and Veterinary Sciences, Research center Foulum, Aarhus University

**Research supervisor:** Dr Mogens Larsen, Senior researcher, Aarhus University, Denmark

**Start and end the month of research stay :** March/April 2026 to September 2026

**Languages available at the research institute:** English and Danish

## **60. Effects of orally administered spirulina methanolysins on milk production, energy utilization, rumen microbiome, and enteric greenhouse gas emissions in dairy cattle**

**Keywords:** Novel dietary inhibitors, antimethanogenic, rumen microbiome, energy utilization, dairy cattle.

### **Brief project outline:**

This project will evaluate the effects of orally administered spirulina methanolysins on milk production, nutrient utilization, rumen microbiome composition, and enteric greenhouse gas emissions in lactating dairy cattle. Spirulina methanolysins, developed by Lumen Bioscience, represent a novel dietary inhibitor with the potential to selectively suppress methanogens while safeguarding other rumen microbes. This innovation could deliver greater methane reductions than existing feed additives while maintaining or improving animal productivity. The graduate fellow will gain hands-on training in state-of-the-art methane measurement facilities at Cornell University, including the use of GreenFeed systems to quantify enteric methane. They will also be exposed to on-farm experimental design, dairy cow handling, and sample collection (milk, feces, rumen fluid), as well as laboratory techniques for composition and microbiome analyses. Complementary skills will include data management, statistical analysis, and interpretation of methane mitigation strategies in ruminant systems. The fellow will work within a multidisciplinary team of nutritionists, microbiologists, veterinarians, postdocs, and graduate students, building capacity in sustainable livestock research. This project aligns with the Global Research Alliance on Agricultural Greenhouse Gases (<https://globalresearchalliance.org>), CGIAR Climate Action (<https://www.cgiar.org/initiative/climate-action>), and the Global Methane Hub Enteric Fermentation R&D Accelerator (<https://www.globalmethanehub.org/enteric-fermentation-rd-accelerator/>) by advancing innovative feed-based strategies to mitigate enteric methane emissions while supporting productivity and food security.

### **Desired technical skills and/or experience:**

- Background in animal nutrition, physiology, or microbiology (ruminant focus preferred)
- Experience with dairy cattle research and sample collection
- Familiarity with methane measurement methods (e.g., GreenFeed) desirable
- Ability to work in a multidisciplinary, international team

**Host institution and location:** Cornell University, Department of Animal Science, Ithaca, New York, USA

**Research supervisor:** Dr. Joseph W. McFadden, Associate Professor, Cornell University

**Start and end month of research stay:** May 2026 – November 2026

**Languages available at the host institution:** English

## 61. Training in GreenFeed Data Integration, Predictive Modelling, and On-Farm Measurement Tools in Dairy Systems

**Keywords:** dairy cattle, methane measurement, GreenFeed system, predictive modelling, data analytics

### **Brief research stay outline:**

Reducing enteric methane emissions from dairy cattle requires both robust field measurements and data-driven tools to inform mitigation strategies. This project will train an early-career scientist to work with a global database of GreenFeed gas emission data, develop enteric methane prediction models, and gain hands-on experience with methane measurement tools, including GreenFeed and respiration chambers. This project directly contributes to the Global Methane Hub (GMH) Enteric Fermentation R&D Accelerator objectives.

The fellow will participate in integrating high-resolution GreenFeed gas emission data with contextual information, such as experimental design, diet composition and animal performance, from hundreds of existing dairy and beef cattle studies across diverse production systems. This effort aims to validate the increasingly popular GreenFeed system against the gold-standard respiration chamber measurements, as accurate methane quantification is critical for evaluating the effectiveness of mitigation strategies. The fellow will build models using feed intake and nutrient composition data to predict enteric methane emissions based on GreenFeed measurements, and this work will provide valuable insights for refining methane prediction models and supporting global mitigation initiatives. The fellow will acquire data analysis skills, including database management, statistical modeling, and visualization. In addition, the fellow will have the opportunity to participate in ongoing animal trials at Cornell University, gaining hands-on experience with both GreenFeed systems and respiration chambers in studies evaluating feed additives, such as *Asparagopsis* and spirulina, for reducing enteric methane emissions. This work aligns with the GRA Livestock Research Group's flagship goals on measurement technologies and the GMH Enteric Fermentation Strategy 2024–2030.

### **Desired technical skills and experience:**

- Background in animal science, ruminant nutrition, or agricultural/environmental engineering
- Experience in statistical/data analysis (preferably in R and Python)
- Interest in methane measurement technologies and dairy systems

**Host institution and location:** Bovi-Analytics lab/Cornell University, Ithaca, USA

**Research supervisor:** Miel Hostens, Robert and Anne Everett Endowed Associate Professor of Digital Dairy Management and Data Analytics, Department of Animal Science, Cornell University.

**Start and end month of research stay:** May to Nov 2026 (flexible)

**Languages available at the host institution:** English; Dutch; Chinese; French; Spanish; Nepali; Hindi

# **CROSS-CUTTING**

## **62. Reducing global agricultural greenhouse gas emissions**

**Keywords:** methane, nitrous oxide, agriculture, mitigation

**Brief research stay outline:**

The goal of the Ag Emissions Centre is to discover, develop and make available to New Zealand farmers and grower's tools and knowledge that enable the practical and cost-effective reduction of agricultural greenhouse gas (GHG) emissions. Understanding the international landscape of global GHG agricultural emissions, particularly in pastoral grazing systems, and continuously scanning for the latest research, technologies, and mitigation approaches are central to the work we do.

We are seeking an enthusiastic and motivated student to support our science programme. This opportunity will largely be a desktop analysis and will involve conducting literature reviews of selected mitigation solutions, performing desktop analysis of existing data and information from experimental/industry sources, and synthesizing findings into clear, easy-to-understand formats (e.g., tables, charts, brief reports, or visual summaries). The outcome of this activity is envisaged to be at least one peer-reviewed publication. While in New Zealand, the successful candidate will have an opportunity to be an integral part of the Ag Emissions Centre Science team helping to deliver scientific outreach such as attendance at National Fieldays (a major New Zealand agricultural exhibition and trade show) and New Zealand's Annual Agricultural Climate Change Conference (organised by AgEC). Working with the Ag Emissions Centre, the successful student will gain exposure to the intersection of science, funding, and policy that helps shape agricultural emissions research and implementation.

This is an excellent opportunity to gain experience and understanding of agricultural GHG emissions, contribute to climate change mitigation efforts in the agricultural sector, and build knowledge in a critical area of sustainability.

**Desired technical skills and experience:**

Background in agriculture, GHG mitigation, climate science, or a related field. Strong analytical, and writing skills. Ability to synthesize complex information clearly and concisely. Attention to detail and commitment to data accuracy.

**Host institution and location:** Ag Emissions Centre, Palmerston North, New Zealand

**Research Supervisor:** Dr. Sinead Leahy, with co-supervision from Dr. Harry Clark, Dr. David Pacheco and Dr. Mark Lieffering

**Start and end month of research stay:** Flexible but March to August 2026

**Languages available at the host institution:** English

## 63. Analysing the Key Barriers to the Adoption of Climate Change Mitigation Strategies in Southern Africa

**Keywords:** mitigation, adoption barriers, climate change, beef production

### **Brief research stay outline:**

Agriculture remains a cornerstone of Southern Africa's socio-economic fabric, contributing significantly to employment, rural livelihoods, and national food security. At the same time, the sector is a notable source of greenhouse gas (GHG) emissions, thereby exacerbating climate change. Addressing these emissions is critical for fulfilling both national and regional climate commitments while safeguarding agricultural productivity. The AgriDENZ project ([www.agri-denz.com](http://www.agri-denz.com)), a bilateral cooperation initiative between Germany and New Zealand, aims to advancing dialogue and facilitating knowledge exchange on agricultural GHG mitigation and adaptation in Southern Africa. Through this platform, scientific evidence, technological innovations, and policy insights have been shared across diverse agricultural contexts of the Global South. Building on this foundation, the proposed research stay seeks to analyze the principal barriers that hinder the adoption of agricultural climate change mitigation strategies in Southern Africa. The study will: 1). Identify constraints affecting the uptake of mitigation practices; 2). Examine the interplay of enabling and limiting factors, including economic, institutional, and social dimensions; 3). Assess the influence of policy frameworks and institutional capacities on mitigation outcomes.

A particular emphasis will be placed on socio-economic barriers, which are often decisive in the adoption of climate-smart agricultural practices. The *agri benchmark* Network of typical farms which analyzes and compares economic and environmental performance of animal production systems offers a unique dataset for this purpose. While the network includes data on typical beef production systems from several African countries, these datasets have yet to be integrated into systematic benchmarking of GHG emissions. Leveraging these data provides an opportunity to assess the economic implications of mitigation options at the farm level. The research will therefore complement stakeholder-driven inquiry with economic modeling and practice-change analysis. GHG information will be systematically added to the typical farm datasets based on peer-reviewed literature and empirical evidence.

### **Desired technical skills:**

- Background in socio-economic and policy analysis related to climate change,
- Expertise in beef production system,
- Experience in economic modeling and practice-change analysis

**Host institution and location:** Thuenen Institute, Braunschweig, Germany

**Research Supervisor:** Katrin Agethen

**Start and end month of research stay:** April to July 2026 (flexible)

**Languages available at the host institution:** English and German

## **64. Modelling Low Emissions Dairy Pathways in Ethiopia Using IPCC Tier 2 GHG Accounting and GACMO Tools**

**Keywords:** Low Emissions, Livestock, Mitigation, GHG modelling

### **Brief research stay outline:**

Ethiopia's dairy sector contributes 47 percent of agricultural GDP, yet average milk yield is 1.48 liters per cow per day. Feed deficits in dry matter, metabolizable energy, and crude protein, plus climate variability, constrain production and raise greenhouse gas emissions. Emission intensity is 44.6 kilograms CO<sub>2</sub> equivalent per kilogram of fat and protein-corrected milk, and absolute emissions and intensities may increase without action. Addressing these challenges necessitates the development of low-emissions dairy pathways without compromising productivity and climate resilience.

This project will develop a modeling framework to generate low-emission dairy pathways for Ethiopia by integrating the IPCC Tier 2 livestock GHG inventory approach with the Greenhouse Gas Abatement Cost Model (GACMO). The Tier 2 methodology provides detailed, context-specific emission estimates by accounting for herd structure, diet, and performance, capturing differences between production systems and management changes over time. GACMO complements this by analyzing the emissions-reduction potential and cost-effectiveness of mitigation options at the national level. Using Ethiopia's national inventory and ILRI datasets aligned with Ethiopia's Nationally Determined Contributions (NDCs) and Long-Term Low Emission and Climate Resilient Development Strategy (LT-LEDS), the student will quantify baseline emissions and simulate mitigation scenarios to identify economically viable low-emissions dairy pathways. The project is linked to the CGIAR Climate Action Science Program ([cgiar.org](http://cgiar.org)) and addresses GHG measurement, modeling, and mitigation in a developing country's agriculture sector, relevant to food security.

### **Desired technical skills and/or experience:**

- Experience with livestock GHG accounting (IPCC Tier 2)
- Familiarity with marginal abatement cost tools (e.g., GACMO)
- Strong data management and QA/QC skills
- Ability to work independently with minimal supervision.
- Excellent communication skills.
- Experience in writing scientific articles will be an added advantage.

**Host institution and location:** International Livestock Research Institute (ILRI), Nairobi

**Research supervisor:** Daniel Girma Mulat (ILRI), Claudia Arndt (ILRI), Endale Balcha Gurmu and Mokonnen Maschal Dept of Environment & Climate change management, Ethiopian Civil Service University)

**Start and end the month of research stay:** March 2026 – August 2026 (flexible)

**Languages available at the host institution:** English

## **65. Mitigating Carbon and Nitrogen Gas Emissions from Aerobic Composting Using Anaerobically Fermented Bioacid: Mechanisms and Field Application Potential**

**Keywords:** Composting, Greenhouse Gas Emissions, Methane, Nitrous Oxide, Ammonia, Bioacidification, Microbial Community

### **Brief research stay outline:**

This project aims to mitigate greenhouse gas (GHG) emissions ( $\text{CH}_4$ ,  $\text{N}_2\text{O}$ ) and ammonia ( $\text{NH}_3$ ) from aerobic composting, a critical issue for sustainable organic waste management in developing countries. We will employ anaerobically fermented acid liquor, a novel "bioacid," as an additive during composting. By leveraging local agricultural waste (apple pomace and manure), this approach provides a circular economy solution that mitigates emissions of carbon and nitrogen gases, enhances compost quality, and supports food security through improved nutrient retention in soil amendments.

The research will quantify gas emissions (using static chambers and GC), analyze physicochemical parameters (pH, DOC, nitrogen forms), and utilize metagenomics to elucidate microbial mechanisms (e.g., shifts in methanogens, nitrifiers, denitrifiers). This work directly supports the Global Research Alliance (GRA) by providing practical mitigation technologies for manure management and the Global Methane Hub (GMH) by exploring a promising strategy to reduce methane from waste sectors. The outcomes will include optimized protocols for low-emission composting, suitable for application in smallholder farming systems, contributing to climate-smart agriculture. This activity will be conducted in close collaboration with Wageningen University & Research.

### **Desired technical skills and experience:**

- Experience with operating and monitoring aerobic composting or anaerobic fermentation systems.
- Strong skills in measuring greenhouse gases (e.g., via Gas Chromatography) and performing related physicochemical analyses.
- Proficiency in molecular bioinformatics analysis.
- Ability to work independently, possess strong data analysis skills (e.g., using R).

**Host institution and location:** Chinese Academy of Agricultural Sciences (CAAS), Beijing, China

**Research supervisor:** Professor Hongmin Dong, Chinese Academy of Agricultural Sciences (CAAS)

**Start and end month of research stay:** March to September 2026 (or later)

**Languages available at the host institution:** Mandarin Chinese, English

## **66. Farm-Level Carbon Calculator Supported by Machine Learning within the Project: Innovations for Methane Mitigation in Colombian Livestock Systems.**

**Keywords:** Livestock, methane mitigation, carbon calculator, remote sensors, GHG quantification, modelling

### **Brief research stay outline:**

Livestock production in Colombia is a major source of greenhouse gas (GHG) emissions, particularly enteric methane and nitrous oxide from soils. The Fontagro project “Innovations to Reduce Methane Emissions in Livestock Systems” has identified promising mitigation strategies such as silvopastoral systems, natural feed additives, and alternative forages that also enhance productivity. Building on these advances, the proposed research stay will support the development of a farm-level carbon balance calculator tailored to Colombian livestock systems, designed to quantify emissions and removals in real time. The fellow will focus on three main components: (i) applying prediction models based on IPCC methodologies and digital carbon balance tools; (ii) quantifying enteric CH<sub>4</sub> using a hand-held laser methane detector and a portable Colombian prototype across farms with contrasting management practices; and (iii) validating and adapting the carbon calculator under Colombian conditions by integrating field measurements into the IPCC Tier 2 framework, supported by machine learning tools to estimate whole-farm balances, including livestock, manure, fertilizers, soil carbon sequestration, and tree biomass. This project aligns with the Global Methane Hub Enteric Fermentation R&D Accelerator and the Global Research Alliance (GRA) by advancing low-emission livestock solutions and delivering scalable digital tools for climate-smart farming. In doing so, it will empower livestock farmers and their organizations to adopt practical tools for quantifying farm-level carbon balances. The fellow will gain hands-on training in GHG quantification, modelling, and digital tool validation, while contributing to collaborative publications and regional capacity building.

### **Desired technical skills and experience:**

- Background in animal nutrition, environmental sciences, or agricultural engineering
- Experience in GHG measurement (CH<sub>4</sub>, N<sub>2</sub>O) and/or carbon accounting (IPCC methods)
- Skills in data analysis (R/Python), modelling, and digital tool validation

**Host institution and location:** AGROSAVIA – Corporación Colombiana de Investigación Agropecuaria, CI Tibaitata, Km 14 via Mosquera, Colombia

**Research supervisors:** Olga Lucia Mayorga (PhD Associated Researcher in Sustainable Livestock, AGROSAVIA); and Ronnal Ortiz (MSc in animal production and statistical analysis)

**Start and end month of research stay:** March – August 2026 (flexible)

**Languages available at the host institution:** Spanish and English

## 67. Documentation of low methane innovation for dryland Agro-pastoral systems

**Keywords:** low methane, livestock, innovation, modelling, inventory, drylands

### **Brief research stay outline:**

Methane (CH<sub>4</sub>) is a potent greenhouse gas with its significantly higher warming potential, poses a substantial concern. In dryland eco-systems its primary sources are enteric fermentation in livestock and manure mismanagement. Dryland agro-pastoral systems are highly vulnerable to climate change, water scarcity, and land degradation. Yet, they also offer opportunities to reduce CH<sub>4</sub> emissions through context-appropriate, low-cost, and farmer-led innovations. Documenting these practices in a systematic way is urgently needed to guide scaling strategies, inform national climate commitments (NDCs), and enhance farm productivity and resilience. This project aims to: (i) document existing and emerging low-methane innovations relevant to dryland agro-pastoral systems; (ii) evaluate co-benefits of these innovations on productivity, soil health, and adaptation and mitigation potential; (iii) generate a knowledge base of best practices that can inform extension, policy, and investment in sustainable low-emission agriculture.

Those objectives will be achieved through literature and secondary data-base review, field documentation and case studies, data analytics and simulation modeling. The young researcher will have the opportunity to interact with different experts and stakeholders, and to be available data set from the field experimentation and ET-network data of methane and CO<sub>2</sub> emission from different dryland countries. This project will directly be interlinked with two CGIAR science programs, i.e., Climate Action (AoW 3) [Climate Action - CGIAR](#) and Sustainable Farming (AoW 1) [Sustainable Farming - CGIAR](#). Also, this project will link with Low Methane Forage project [Low-Methane Forages \(LMF\) Project](#) which is implemented in Morocco.

**Desired technical skills and experience:** Research should have the following skills

- Expertise in literature review and data analytics
- Basic knowledge of simulation modeling
- Basic knowledge of statistical analysis
- Writing science publications
- Good English writing and speaking skills

**Host institution and location:** International Center for Agriculture Research in the Dry Areas (ICARDA), Rabat, Morocco

**Research supervisor:** Dr Mina Devkota Wasti, Senior Scientist (Dryland Agronomy) International Center for Agriculture Research Center in Dry Areas (ICARDA), Rabat, Morocco

**Start and end month of research stay:** January 2026 to June 2026 (or later)

**Languages available at the host institution:** English

## **68. A mixed-integer linear programming approach to optimize diet and crop planning for mitigating enteric methane and pesticide-related emissions in French mixed dairy cattle systems**

**Keywords:** Multi-objective optimization, animal diet optimization, enteric methane mitigation, crop rotation, pesticides.

### **Brief research stay outline:**

In agronomic research, crop planning and rotation have typically been studied separately from livestock diet formulation. Linear programming models have optimized crop rotations for profit and environmental goals, sometimes accounting for land suitability or yield uncertainty, while dairy cattle diet models aim to minimize feed costs or control methane emissions but often ignore on-farm feed production, despite most dairy cattle farms in France growing a significant portion of their own feed. Whole-farm models such as GAMEDE, RUMIN'AL and CNCPS integrate crops and feed or consider economic and GHG outcomes; however, they are generally limited to short-term optimization, strategy evaluation, or specific crops and livestock types. Consequently, few approaches provide actionable, integrated crop and diet optimization over multiple years for European dairy cattle systems, highlighting the need for models that simultaneously optimize crop production and beef diets to enhance sustainability and reduce emissions.

The aim of this project is to develop an integrated framework for optimizing diet and crop planning in French dairy cattle systems to mitigate enteric methane emissions and reduce pesticide-related environmental impacts. Using a mixed-integer linear programming (MILP) approach, the project will identify strategies that balance livestock nutritional needs, crop production constraints, and environmental objectives. By modeling both feed allocation and crop rotations simultaneously, the framework will provide insights into trade-offs and synergies, supporting the design of sustainable, low-emission dairy cattle systems. The outcomes will contribute to evidence-based recommendations for farmers and policymakers. This project contributes to the GRA flagship project “Ensuring long-term mitigation and adaptation co-benefits” (<https://globalresearchalliance.org/flagship-projects/mac-b/>).

The CLIFF-GRADS student will be involved in designing and coding the MILP model to optimize dairy cattle diets and multi-year crop rotations, with the goal of reducing enteric methane emissions and pesticide-related emissions. He/she will also participate in data collection from dairy farms to support model development and validation.

### **Desired technical skills and experience:**

- Modeling for GHG emissions at farm level.
- Expertise in dynamic modelling and programming (especially R and Python).
- Independent thinking and ability to solve problems.
- Data management and evaluation skills
- Writing scientific publications

**Host institution and location:** UMR Agroecology, 21000 Dijon, France

**Research Supervisor:** Dr. Ridha Ibdhi, INRAE

**Preferred duration of research visit:** 6 months

**Preferred dates for research visit:** May to October 2026 is preferable, but it could be moved to other dates during 2026, if necessary.

**Languages available at the host institution:** French, English

## 69. Integrating Remote Sensing and Feed Additive Strategies to Quantify and Mitigate Enteric Methane Emissions in Beef Grazing Cattle

**Keywords:** enteric methane, remote sensing, feed additives, rumen fermentation, tropical livestock

### **Brief research stay outline:**

This research stay aligns with the objectives of the Global Research Alliance (GRA) Livestock Research Group and the Global Methane Hub's Enteric Fermentation R&D Accelerator. The selected CLIFF-GRADS fellow will support integrated field studies conducted in tropical grazing systems in Colombia, under the ongoing GRA-funded initiative "*Innovations for Reducing Enteric Methane Emissions in Ruminants*" (<https://fontagro.minimalart.studio/en/proyectos/rumiantes>), led by AGROSAVIA in collaboration with INTA (Argentina), Universidad Nacional de Córdoba (Argentina), and Universidad de Los Andes (Colombia).

The project involves evaluating the effectiveness of a remote sensing system for quantifying enteric methane emissions and ingestive behavior in grazing cattle. This will include trials conducted in grazing systems at AGROSAVIA's El Nus research center evaluating the effect of a local feed additive on forage intake and digestibility, rumen fermentation parameters, alongside CH<sub>4</sub> emissions, parasitic load, and fecal and urinary nitrogen excretion assessments.

The fellow will also take part in platform-wide capacity building, including technical workshops and coordination meetings. Activities involve hands-on experience with CH<sub>4</sub> measurement, NIRS for predicting digestibility and dry matter intake, *in vitro* assays and scientific writing. The research stay will provide a hands-on opportunity to generate original data, enhance technical and analytical skills, and support co-authored publications relevant to climate-smart livestock systems in developing countries.

### **Desired technical skills and experience:**

- Basic experience in ruminants or forage field trials
- Background in ruminant nutrition
- Scientific writing and teamwork in multidisciplinary contexts

**Host institution and location:** AGROSAVIA – El Nus Research Center, San Roque, Antioquia, Colombia

**Research supervisor:** Dr. Yury Tatiana Granja-Salcedo, Associate Researcher, AGROSAVIA

**Start and end month of research stay:** February 2026 – July 2026 (flexible)

**Languages available at the host institution:** Spanish and Portuguese

# **CROPS**

## **70. Carbon Neutrality Pathways in Coffee Agroforestry Systems of Central Kenya**

**Keywords:** Coffee Agroforestry, Carbon stocks, Carbon footprint, Biodiversity, Net-zero

### **Brief research stay outline:**

Coffee agroforestry represents a key land-use system that can mitigate climate change, support biodiversity and improve rural livelihoods. However, coffee production is increasingly affected by two contrasting trends: (i) simplification towards monoculture systems to increase productivity, and (ii) diversification, which can enhance biodiversity and carbon storage. The ecological and socio-economic outcomes of these contrasting pathways are poorly documented, particularly in central Kenya, where coffee landscapes face additional pressures such as peri-urban expansion (conversion of coffee farms into housing estates), intensification with high-value crops and climate change. Low-input coffee systems are increasingly promoted as sustainable alternatives, although their impacts on carbon balance, biodiversity and income are poorly understood. This research evaluates the carbon neutrality and climate-smart potential of coffee agroforestry systems in central Kenya, with a focus on their contributions to carbon storage, biodiversity, and rural livelihoods.

The student will: (1) Assess the agronomic carbon footprint of coffee production under different management regimes; (2) Quantify species diversity and aboveground carbon stocks across a gradient of coffee agroforestry systems; (3) Collect and analyze soil samples to determine soil organic carbon stocks; and (4) Evaluate trade-offs and synergies between carbon balance, biodiversity outcomes and net household income.

### **Desired technical skills and/or experience:**

- Knowledge of smallholder farming systems in East Africa
- Knowledge of ecological surveys and/or measurement of greenhouse gases
- Excellent written and oral English language
- A team player with the capacity to work with people from different backgrounds...

**Host institution and location:** Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya

**Research supervisor:** Dr. Shem Kuyah, Jomo Kenyatta University of Agriculture and Technology

**Start and end month of research stay:** September 2026 - March 2027

**Languages available at the host institution:** English

## 71. Adaptation of maize crop to soil water deficiencies and reduction of N<sub>2</sub>O emissions through the application of Glomalina

**Keywords:** Water efficiency, N<sub>2</sub>O emissions, Glomalina

### Brief research stay outline:

Rainfed maize production is increasingly threatened by soil water deficiencies that limit yield potential. In regions such as Southeastern Buenos Aires, declining rainfall and greater atmospheric water demand during critical growth stages exacerbate this problem, especially in soils with limited water-holding capacity. While improving water availability to crops can stabilize yields, it may also enhance nitrogen losses to the environment, including nitrous oxide (N<sub>2</sub>O) emissions—a potent greenhouse gas with a global warming potential 273 times higher than CO<sub>2</sub>. This dual challenge highlights the need for management strategies that simultaneously sustain yield under water stress and mitigate greenhouse gas emissions.

Glomaline, a glycoprotein produced by arbuscular mycorrhizal fungi (AMF), has emerged as a promising soil amendment. By improving soil aggregation, water retention, and nitrogen use efficiency, glomaline may enhance crop resilience to drought while reducing conditions that favor N<sub>2</sub>O emissions.

This project aims to evaluate glomaline application as a management practice to (i) mitigate yield losses in maize under water deficit and (ii) prevent increases or even reduce N<sub>2</sub>O emissions.

Special emphasis will be placed on the accurate measurement of N<sub>2</sub>O fluxes under contrasting soil moisture regimes, the modeling of crop–soil–atmosphere interactions to predict emission responses, and the development of mitigation strategies that integrate soil amendments with sustainable agronomic practices.

*Results will provide actionable knowledge for climate-smart agriculture, supporting policies to reduce greenhouse gas emissions without compromising food production.*

During the research stay, the scholar will actively participate in ongoing experiments focused on greenhouse gas (GHG) measurements and soil biogeochemical processes. The scholar is expected to hold a degree in Agricultural Engineering, Biological Sciences, or a related field, ensuring a solid background for the proposed activities.

The scholar will gain practical experience in the full workflow of GHG measurement and data analysis. This includes:

- Assembling and maintaining GHG measurement chambers.
- Preparing vials and other materials required for field and laboratory experiments.
- Conducting GHG measurements in the field and laboratory using the static chamber methodology.
- Collecting soil samples and performing subsequent laboratory analyses.
- Recording and organizing field and laboratory data, ensuring chronological consistency in data sheets.
- Conducting data processing and statistical analyses using RStudio or similar software.
- Contributing to the preparation of a scientific paper for publication in a peer-reviewed journal as a key output of the stay.

The scholar will receive training and mentoring in GHG measurement techniques, data management, and advanced statistical analysis. They will have the opportunity to participate in research group meetings, training workshops, and scientific conferences, enhancing both their technical skills and professional network. Through these activities, the scholar will strengthen their capacity in experimental design, data interpretation, and scientific writing, contributing to both their personal development and the institutional objectives of the hosting team.

**Desired technical skills and experience:**

- Academic background in Agronomy, Environmental Sciences, Agricultural Engineering, or related fields, with solid knowledge of crop physiology and soil science.
- Experience with GHG measurement techniques (static chambers or equivalent).
- Ability to conduct field or greenhouse experiments, including soil and plant sampling.
- Competence in data processing and statistical analysis (using R, Python, or similar software).
- Strong teamwork skills and willingness to engage in intensive fieldwork.

**Host institution and location:** IPADS (Institute for Innovation in Agricultural Production and Sustainable Development), Balcarce, Argentina

**Research supervisor:** PhD. Nuria Lewczuk (IPADS)

**Start and end month of research stay:** 2026 November – 2027 April

**Languages available at the host institution:** English and Spanish.

# **AGROFORESTRY**

## **72. Modelisation of CO<sub>2</sub> sequestration and Green House Gaz balance in integrated livestock systems in Tropical area: A case study in Guadeloupe**

**Keywords:** CO<sub>2</sub> sequestration; agrosylvopastoral systems; plant production

### **Brief research stay outline:**

Mixed crop-ruminant production systems are a case of integration where nutrient circularity is put forward. To increase circularity of nutrients (i.e. C, N) within agricultural systems, the range of solutions should vary from individual, specific measures, to more holistic and integrated approaches. One strategy is to increase CO<sub>2</sub> sequestration and use leguminous trees in agrosylvopastoral systems.

Environmental assessment of a tropical integrated production system using GHG balance approach in a tropical region will be developed. Models for predicting daily methane emission at animal level based on simulated or measured feed properties and feed intake will be of particular interest, including models developed in the tropics or in sub-Saharan African region. In addition, the project will integrate herbaceous and woody biomass within agrosylvopastoral system. The nitrogen content and other chemical content of interest of forage species will improve the estimation of the nutrient cycling and methane emission potential. This dual biomass-nitrogen assessment will allow a more accurate evaluation of carbon sequestration models. Collaboration with partners of GRA-FNN group who are interested in GHG mitigation and adaptation in Sub-Saharan Africa will be developed.

The student will participate in the Environmental assessment with special focus on integrating statistical methane prediction models from different agroclimatic zones and production system types based on measurement data or estimation. The work is done in collaboration with research institutes INRAE and French University of Antilles UMR ECOFOG, in France. The work involves research group in France. This project is partially funded by INRAE and GRA and supports the GR-FNN group and TSARA MipCLAN network.

### **Desired technical skills and experience:**

- Skills on simulation model or statistical model development
- Experience in Ecophysiology and nutrition
- Good teamwork skills

**Host institution and location:** INRAE, UR ASSET, Guadeloupe, France .

### **Research supervisor:**

- Maguy DULORMNE, Université Antilles, Guadeloupe 97170 FRANCE
- Maguy EUGENE, senior researcher, INRAE UR ASSET, Guadeloupe 97170 FRANCE

**Preferred duration of research visit:** 6 months.

**Preferred dates for research visit:** Mar 2026 to Sep 2026 (or later)

**Languages available at the host institution:** French and English and Créole

### **73. UAV-based biomass and carbon assessment of shrub systems for sustainable agricultural landscapes**

**Keywords:** Agro-pastoral, Shrubs, UAV remote sensing, Biomass allometry, Deep-learning.

#### **Brief research stay outline:**

Shrub-based agro-pastoral systems play a crucial role in sustaining food security and rural livelihoods in semi-arid developing countries. In Morocco, *Ziziphus lotus* is a native shrub that provides fodder, improves soil fertility, prevents erosion, and supports household resilience under harsh climatic conditions. Despite its importance, the role of *Ziziphus lotus* in carbon sequestration remains poorly quantified, limiting its integration into national climate mitigation and agricultural sustainability strategies.

This project, linked to the EU-Horizon MAMBO project, aims to develop a robust UAV-based methodology for estimating shrub biomass and carbon stocks of *Ziziphus lotus*, using UK shrub systems as an experimental testbed. Field measurements (shrub species, shrub height and crown dimensions) will calibrate a U-Net model applied to UAV-collected imagery to extract individual shrub height and crown estimates, and convert these into biomass through Bayesian allometric equations. The study will compare this allometric model with models combining shrub dimensions with UAV-image spectral or texture metrics. The planned outcome is a UAV-based monitoring pipeline ready for testing on *Ziziphus lotus* in Moroccan agro-pastoral systems. It will include a UAV campaign protocol, data processing, and site-specific calibration for shrub biomass modelling.

The early career researcher will gain advanced training in UAV flying, field work planning, image processing workflows, and biomass modelling, while working in collaboration with international experts in remote sensing and carbon monitoring. The outcomes will provide a cost-effective and scalable methodology for quantifying carbon storage in shrub-based agricultural systems, with direct relevance to sustainable land management and food security in developing regions.

#### **Desired technical skills and experience:**

- Background in remote sensing, GIS, or environmental modelling.
- Knowledge of biomass and carbon assessment methods (including an interest in allometry).
- Experience with spatial data analysis and statistic tools (e.g., R, Python).
- An aptitude for programming.

#### **Host institution and location:**

The UK Centre for Ecology & Hydrology (UKCEH), UK

The student will be based at two locations over the course of their 4 months stay:

- 1 month at UK Centre for Ecology & Hydrology - Wallingford, Maclean Building, Benson Lane, Wallingford, Oxfordshire, OX10 8BB
- 3 months at UK Centre for Ecology & Hydrology - Edinburgh, Bush Estate, Penicuik Midlothian, EH26 0QB

#### **Research supervisors:**

- France Gerard, Dr (Senior Scientist – Earth Observation, UKCEH Edinburgh),

- Douglas Kelly, Dr. (Senior Scientist – Bayesian theory and Climate Modelling, UKCEH Wallingford),
- Charles George (Senior Remote Sensing technician, UAV pilot and UAV coordinator, UKCEH Wallingford)

**Start and end month of research stay:** April 2026 to July 2026

**Languages available at the host institution:** English / French

# **ANIMAL HEALTH**

## **74. Integrating Animal Health into Livestock Greenhouse Gas (GHG) Mitigation through Strengthened MRV Systems**

**Keywords:** Animal health, GHG emissions, disease prioritization, data systems evaluation, climate impact assessment

### **Brief research stay outline:**

Despite growing recognition of the link between animal health and greenhouse gas (GHG) emissions, livestock health is often underrepresented in national climate strategies due to weak or absent monitoring, measurement, reporting, and verification (MMRV) systems. Livestock diseases reduce productivity and increase emission intensities, yet their climate impact is rarely quantified or integrated into national GHG inventories.

This research stay will conduct an MMRV-focused review to identify priority livestock diseases for climate mitigation in a target country ("country X"), resulting in a report that outlines: (1) existing disease baselines (including identification of data gaps, with comparison to other countries where necessary), (2) existing solution sets that can be feasibly deployed, removing diseases for which no viable solutions exist, (3) evaluation of data systems to document interventions and track progress, and (4) assessment of climate impacts for diseases that can be solved and monitored using emerging frameworks and data insights. The methodology will involve mapping the MMRV environment, including GHG accounting tools, disease surveillance systems, and data quality, prioritizing diseases based on intervention feasibility and climate relevance, and validating findings through stakeholder consultations. Quantitative analysis will estimate both absolute and intensity-based GHG emissions for prioritised diseases, alongside productivity gains, trade-offs, and synergies of interventions. The student will benefit from direct interaction with ongoing collaborations between the GRA Animal Health and GHG intensity network, Environmental Defense Fund and Global Methane Hub

The expected outcome is a clear, evidence-based list of priority livestock diseases/conditions for a Country to address.

### **Desired technical skills and experience:**

- Knowledge of livestock disease epidemiology,
- Understanding of IPCC methodologies,
- Skills in data analysis or MRV evaluation,
- interest in climate policy related to livestock.

**Host institution and location:** University of Tuscia, Viterbo, Italy

**Research supervisor:** Prof Andrea Vitali, University of Tuscia

**Start and end month of research stay:** February-July 2026 (flexible)

**Languages available at the host institution: Italian-English**

## **75. Integrating Animal Health into Livestock Greenhouse Gas (GHG) Mitigation through Strengthened MRV Systems**

**Keywords:** Animal health, GHG emissions, disease prioritization, data systems evaluation, climate impact assessment

### **Brief research stay outline:**

Despite growing recognition of the link between animal health and greenhouse gas (GHG) emissions, livestock health is often underrepresented in national climate strategies due to weak or absent monitoring, measurement, reporting, and verification (MMRV) systems. Livestock diseases reduce productivity and increase emission intensities, yet their climate impact is rarely quantified or integrated into national GHG inventories.

This research stay will conduct an MMRV-focused review to identify priority livestock diseases for climate mitigation in a target country ("Country X"), resulting in a report that outlines: (1) existing disease baselines (including identification of data gaps, with comparison to other countries where necessary), (2) existing solution sets that can be feasibly deployed, removing diseases for which no viable solutions exist, (3) evaluation of data systems to document interventions and track progress, and (4) assessment of climate impacts for diseases that can be solved and monitored using emerging frameworks and data insights. The methodology will involve mapping the MMRV environment, including GHG accounting tools, disease surveillance systems, and data quality, prioritizing diseases based on intervention feasibility and climate relevance, and validating findings through stakeholder consultations. Quantitative analysis will estimate both absolute and intensity-based GHG emissions for prioritised diseases, alongside productivity gains, trade-offs, and synergies of interventions. The student will benefit from direct interaction with ongoing collaborations between the GRA Animal Health and GHG intensity network, Environmental Defense Fund and Global Methane Hub

The expected outcome is a clear, evidence-based list of priority livestock diseases/conditions for a Country to address.

### **Desired technical skills and experience:**

- Knowledge of livestock disease epidemiology,
- Understanding of IPCC methodologies,
- Skills in data analysis or MRV evaluation,
- Interest in climate policy related to livestock.

**Host institution and location:** Norwegian University of Life Sciences, Ås, Norway

**Research supervisor:** Prof Angela Schwarm (Norwegian University of Life Sciences/ GRA Animal Health Network)

**Start and end month of research stay:** February - July 2026 (or later)

**Languages available at the host institution:** English, Norwegian

## **76. Integrating Animal Health into Livestock Greenhouse Gas (GHG) Mitigation through Strengthened MRV Systems**

**Keywords:** Animal health, GHG emissions, disease prioritization, data systems evaluation, climate impact assessment

### **Brief research stay outline:**

Despite growing recognition of the link between animal health and greenhouse gas (GHG) emissions, livestock health is often underrepresented in national climate strategies due to weak or absent monitoring, measurement, reporting, and verification (MMRV) systems. Livestock diseases reduce productivity and increase emission intensities, yet their climate impact is rarely quantified or integrated into national GHG inventories.

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The expected outcome is a clear, evidence-based list of priority livestock diseases/conditions for a Country to address.

### **Desired technical skills and/or experience:**

- Knowledge of livestock disease epidemiology
- Understanding of IPCC methodologies
- Skills in data analysis or MRV evaluation
- Interest in climate policy related to livestock

**Host institution and location:** Scotland's Rural College (SRUC), Edinburgh, UK

**Research supervisor:** Dr Michael MacLeod, SRUC

**Start and end month of research stay:** February 2026 -July 2026 (flexible)

**Languages available at the host institution:** English

## **77. Integrating Animal Health into Livestock Greenhouse Gas (GHG) Mitigation through Strengthened MRV Systems**

**Keywords:** Animal health, GHG emissions, disease prioritization, data systems evaluation, climate impact assessment

### **Brief research stay outline:**

Despite growing recognition of the link between animal health and greenhouse gas (GHG) emissions, livestock health is often underrepresented in national climate strategies due to weak or absent monitoring, measurement, reporting, and verification (MMRV) systems. Livestock diseases reduce productivity and increase emission intensities, yet their climate impact is rarely quantified or integrated into national GHG inventories.

This research stay will conduct an MMRV-focused review to identify priority livestock diseases for climate mitigation in a target country ("Country X"), resulting in a report that outlines: (1) existing disease baselines (including identification of data gaps, with comparison to other countries where necessary), (2) existing solution sets that can be feasibly deployed, removing diseases for which no viable solutions exist, (3) evaluation of data systems to document interventions and track progress, and (4) assessment of climate impacts for diseases that can be solved and monitored using emerging frameworks and data insights. The methodology will involve mapping the MMRV environment, including GHG accounting tools, disease surveillance systems, and data quality, prioritizing diseases based on intervention feasibility and climate relevance, and validating findings through stakeholder consultations. Quantitative analysis will estimate both absolute and intensity-based GHG emissions for prioritised diseases, alongside productivity gains, trade-offs, and synergies of interventions. The student will benefit from direct interaction with ongoing collaborations between the GRA Animal Health and GHG intensity network, Environmental Defense Fund and Global Methane Hub. The expected outcome is a clear, evidence-based list of priority livestock diseases/conditions for a Country to address.

### **Desired technical skills and experience:**

- Knowledge of livestock disease epidemiology
- Understanding of IPCC methodologies,
- Skills in data analysis or MRV evaluation
- Interest in climate policy related to livestock

**Host institution and location:** Edinburgh Napier University, Edinburgh, UK

**Research supervisor:** Prof Nick Wheelhouse, Edinburgh Napier University/ GRA Animal Health Network

**Start and end month of research stay:** April 2026-September 2026

**Languages available at the host institution:** English