

The Regional Universities Forum for Capacity Building in Agriculture with support from the Global Research Alliance on Agricultural Greenhouse Gases have funded eight Graduate Research Grants (GRG) aimed at building the capability of graduate and post-graduate level students in Africa to conduct applied research on agricultural greenhouse gases. Each GRA-GRG supports a Principal Investigator (an individual senior lecturer of a RUFORUM member university) and two Masters Students to undertake research and training on topics related to the measurement and management of greenhouse gas emissions and removals in ruminant farming systems in Sub-Saharan Africa over a two-year period.

**Project Coordinator**  
Makerere University,  
Uganda

**Project ID:** RU/2020/  
GRG/05

**Project duration:**  
24 months

**Start date**  
16<sup>th</sup> November 2020

**Funding**  
RUFORUM

**Total budget:**  
US\$70,040.00

**Project partners:**

### Project title

**Developing equations for predicting feed intake by pastoral/agro-pastoral livestock: tackling uncertainty in Uganda's national enteric methane emissions inventory**

### Summary

Uganda calculates its national enteric methane (CH<sub>4</sub>) emissions inventory using the IPCC Tier-1 default emission factors (EFs) based on "kg CH<sub>4</sub>/head/year". However, uncertainty surrounds EFs based on "CH<sub>4</sub>/head/year" as these rates assume constant feed intake/availability. Such EFs misrepresent pastoral/agro-pastoral livestock, which contribute significantly to Uganda's ruminant herd. In practice, pastoral/agro-pastoral livestock face feed shortages during dry seasons, with ample availability during wet seasons. The lack of supporting data limits use of the more reliable EFs based on "CH<sub>4</sub>/unit feed intake". The few feed intake data available do not accurately represent Uganda's livestock production. They are collated from studies conducted predominantly under "western-like" feeding systems, excluding pastoral/agro-pastoral livestock. Mathematical modelling provides an opportunity to reliably predict feed intake by pastoral/agro-pastoral livestock, which would otherwise be expensive. However, developing appropriate equations/models requires availability of data/inputs linked to farming practices the equations/models are intended for.

### Objectives

**Overall:** To contribute to the development of nationally representative livestock activity data of Uganda's national enteric CH<sub>4</sub> inventory.

The specific objectives are:

1. To characterize feed availability and quality for pastoral/agro-pastoral cattle and goats during the dry and wet seasons
2. To evaluate faecal recoveries of acid insoluble ash (AIA) and acid detergent fibre (ADL) as internal markers for estimation of in vivo apparent digestibility and hence feed intake by pastoral/agro-pastoral cattle and goats
3. To develop and evaluate empirical equations for predicting feed intake by pastoral/agro-pastoral cattle and goats using feed quality characteristics generated
4. To develop enteric CH<sub>4</sub> emission factors for pastoral/agro-pastoral cattle and

[RUFORUM: www.ruforum.org](http://www.ruforum.org)

| (GRA; <https://globalresearchalliance.org/>)



**New Zealand Government**  
Te Kāwanatanga o Aotearoa



Government of  
the Netherlands



MAKERERE UNIVERSITY

**Principal investigator**  
Dr. Constantine Bakyusa Katongole

Department of  
Agricultural Production  
School of Agricultural  
Sciences  
P.O. Box 7062  
Makerere University,  
Kampala – Uganda

Email: [tbakyuka@caes.mak.ac.ug](mailto:tbakyuka@caes.mak.ac.ug); [constantine.katongole@gmail.com](mailto:constantine.katongole@gmail.com)  
Tel: +256 772619782;  
+256 702205953

Link to PI Profile:  
<https://bit.ly/3EprE2n>

goats using the IPCC Tier-2 CH<sub>4</sub> conversion factor default model, and compare them with the IPCC Tier-1 default emission factors suggested for African and developing countries

### General planned activities

1. Two Masters students will be recruited to conduct research on the study topics
2. Identify and select students to be trained.
3. Develop empirical equations through a modelling for predicting feed intake.
4. Develop enteric CH<sub>4</sub> emission factors for pastoral/agro-pastoral cattle and goats. Supervise and guide two MSc students.
5. Present project findings at national and international scientific conferences. Conduct feedback dissemination meetings in the study area.
6. Prepare and submit project reports to RUFORUM.

### Students activities

1. Conduct participatory meetings with key resource persons for feed availability characterization
2. Sample feeds for quality characterization
3. Set up and conduct on-farm trials for estimating feed availability, digestibility and intake
4. Process and prepare feed and faecal samples for laboratory analyses

### Expected outcomes

1. Change in the national enteric CH<sub>4</sub> estimation methodology from one that uses the IPCC Tier-1 default emission factors for Africa and other developing countries to one that uses emission factors based on gross energy intake.
2. More accurate and reliable national GHG (i.e. enteric CH<sub>4</sub>) inventory reported to the UNFCCC

RUFORUM: [www.ruforum.org](http://www.ruforum.org)

(GRA; <https://globalresearchalliance.org/>)



**New Zealand Government**  
Te Kāwanatanga o Aotearoa



Government of  
the Netherlands



MAKERERE UNIVERSITY