

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/06

Project duration:
24 months

Start date
16th November 2020

Funding
RUFORUM

Total budget:
US\$70,040.00

Project partners:
Climate Change Department
(CCD) in the Ministry of
Water and Environment,
MAAIF

Cattle Farmers and Agro-
forestry Farmers in
Mubende District

Project title

Machine learning for estimating sources and sinks: Developing cloud computing-based, artificially intelligent algorithms to quantify livestock and biomass for management of GHG emissions

Summary

Accurate quantification of the GHGs Inventory is becoming more important given public interest in the potential outcomes of climate change and the keen interest to invest in developing potential mitigation measures. Machine learning (ML) and Artificial Intelligence (AI) are powerful tools for technological progress. Despite the growing expertise to apply ML and AI to solve problems of societal and global good, they have not been widely applied to tackle climate change. We propose to develop a novel methodology that optimizes application of remote sensing, and AI to quantify GHGs Inventory for a particular area. We will develop a cloud based-computing platform that quantifies the GHG Inventory by integrating and running the developed AI-based algorithms for quantifying the number of animals, above ground biomass and indexed animal management systems. The research products will contribute to better management of the impacts of climate extremes.

Objectives

Overall: To develop a novel methodology for quantifying GHGs Inventory for Mubende District by optimizing application of remote sensing and artificial intelligence to quantify cattle as sources, above ground biomass and ground as sinks and incorporate cattle management systems.

The specific objectives are to develop:

1. an algorithm that optimizes machine learning and artificial intelligence to quantify ranging animals from remotely sensed imagery.
2. an algorithm that optimizes machine learning and artificial intelligence to index animal management systems, from remotely sensed imagery.
3. an algorithm that optimizes machine learning and artificial intelligence to quantify above ground biomass and ground, from remotely sensed imagery.
4. a novel artificially intelligent algorithm for quantifying GHGs Inventory for a particular area by integrating number of animals as sources, above ground biomass and ground as sinks and animal management system indexes quantified from remotely sensed imagery.

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General planned activities

Developing AI algorithms that quantify GHG Sources and Sinks and for Indexing different types of Animal Management Systems from satellite and high resolution imagery. Develop an Algorithm to quantify the GHG Inventory. Project activities management and monitoring.

Students activities

Two Masters students will undertake their research under the project. The students shall conceptualise the algorithms' structures, conduct the ground truthing and data collection activities, interface with project partners, manage project field activities and prepare scientific papers. The students will be in charge of collating all the required field data to build intelligence of the algorithm, develop the algorithms and integrate the components for each algorithm to quantify the GHG Inventory.

Expected outcomes

1. Improved reporting of GHGs Inventory of livestock throughout Uganda by Climate Change Department (CCD).
2. Strengthened capacity and improved relations between CCD and Farmers
3. Contribution to body of knowledge about application of AI/ML in estimating GHG inventories
4. Project as springboard for new proposals and better research design

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