RUFORUM Graduate Research Grants (GRGs)

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
University of Eldoret, Kenya

Project ID: RU/2020/GRG/03

Project duration:
24 months

Start date
16th November 2020

Funding
RUFORUM

Total budget:
US$70,040.00

Project partners:
International Livestock Research Institute (ILRI), Nairobi

IHE-Delft Institute for Water Education, Delft, the Netherlands

Project title

Greenhouse Gas Emissions, Soil Carbon Stocks and Livestock Watering Points in Agropastoral Rangelands of Taita Taveta Hills, Kenya (GRESOL)

Summary

Livestock movement within agro-pastoral landscapes is related to spatial and temporal dynamics of soil carbon stocks and nutrients, which are precursors of GHG emissions from terrestrial and aquatic ecosystems. In aquatic ecosystems, livestock loading of organic matter (dung) and urine during watering enhance biogeochemical processes leading to increased GHG emissions. However, data are limited on GHG fluxes from livestock watering points in sub Sahara Africa (SSA). This project seeks to contribute to the much-needed data on GHG emissions from ruminant production in SSA by focusing on watering points that are neglected in literature. The overarching objective of this study is to understand "how livestock populations and production systems influence water quality, spatial and temporal patterns of soil (riparian) and sediment (in watering points) carbon stocks and GHG emissions from watering points used by livestock, and how farmers/ communities perceive the influence of different livestock production systems on water quality and climate change as a result of GHG emissions?". The major outputs of this project will be refined estimates of GHG emissions from aquatic ecosystems under the influence of different livestock production systems (LPS). This will contribute to understating of the linkage between LPS, stocking density, water quality and GHG emissions, which are necessary to inform best practices that can be adopted for mitigation and strengthening resilience of LPS in SSA against climate change.

Objectives

Overall: To determine the effect of livestock movement within agro-pastoral systems on spatial and temporal dynamics of water quality and GHG emissions from livestock watering points (water pans/ ponds and streams) in Taita Taveta County, south-eastern Kenya.

The specific objectives are to:

1. determine water quality and physical characteristics of watering points (sizes of stream, age and size of pond/ pans, etc) that are precursors to GHGs emissions in different livestock production systems,
2. determine the spatial and temporal dynamics of GHGs emissions and soil

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carbon stocks in riparian areas and sediments in watering points in different livestock production systems,
3. determine soil carbon stocks in riparian zones and sediments of watering points for livestock in different livestock production systems
4. empower livestock farmers through citizen science to identify and adopt livestock management practices for improved water quality and reduced GHG emissions

General planned activities

1. Reconnaissance survey to understand the study area and identify various livestock production systems, location of the watering points and selection of the study sites
2. Water samples analysis of physicochemical parameters and microbial contamination, and sediment and soil samples for carbon content measurements
3. Measurement of GHG (CH_4, CO_2 and N_2O) over water and over soil at selected livestock watering points
4. Focused group discussions to share with livestock farmers and community representatives on water quality, GHG emissions in relation to various livestock production systems and how to minimize GHG emissions for sustainability

Students activities

Student 1: determine water quality and physical characteristics of watering points (sizes of stream, age and size of pond/ pans, etc) that are precursors to GHGs emissions in different livestock production systems

Student 2: determine the spatial and temporal dynamics of GHGs emissions and soil carbon stocks in riparian areas and sediments in watering points in different livestock production systems

Student 3: determine soil carbon stocks in riparian zones and sediments of watering points for livestock in different livestock production systems

Student 4: assess participation of livestock farmers in adoption of livestock management practices for improved water quality and reduced GHG emissions

Expected outcomes

1. Enhanced capacity of livestock farmers and stakeholders on the influence of livestock production sytems on water quality and GHG emissions
2. Different types of livestock production systems and their GHG emission factors mapped and profiled
3. Estimates of fluxes/ rates of GHG (CO_2, CH_4 and N_2O) from various livestock production systems established
4. Livestock loading rates of organic matter and nutrients into watering points/ aquatic systems determined
5. Physico-chemical parameters of water at various livestock watering point measured
6. Sediment and soil carbon stocks in watering points and riparian areas established
7. Four MSc students graduated
8. At least four articles published in refereed journals
9. At least three policy briefs published
10. Dissemination and information sharing on project outputs with scientist, relevant national and county government agencies and communities