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 the Free States, South Africa

Project ID: RU/2020/ GRG/01

Project duration:
24 months

Start date
16th November 2020

Funding
RUFORUM

Total budget:
US$70,040.00

Project partners:
Department of Animal, Wildlife and Grassland Sciences, University of the Free State

Department of Environment, Forestry and Fisheries (DEFF), South Africa

Standard Bank, South Africa

Project title
Can pastoral grazing systems contribute to climate change mitigation? Gathering evidence and exploring future scenarios in the Grassland Biome of South Africa

Summary
Grasslands represent an important biome in South Africa, mostly used for (semi) extensive grazing by livestock. Farmers in this biome are adopting new, high density grazing systems, offering the promise of increasing livestock numbers and productivity, while improving grassland health and soil carbon (C) sequestration. However, scientifically sound information on how new grazing management strategies affect grassland performance is lacking. Moreover, a better understanding is needed on the long-term soil C dynamics in grassland systems to respond to questions around the potential of grassland to mitigate climate change and the actual C footprint of livestock production. Therefore this project proposes (1) to study the on-farm performance of different grazing management systems with special reference to the spatial and temporal dynamics of soil C, (2) to model the long-term soil C dynamics of grassland integrating the available information from long-term trials and exploring the impact of management scenarios, and (3) to assess the C footprint of different livestock production systems in the grasslands. These three complementary research activities, each carried by an M.Sc. candidate, will provide a holistic assessment of C dynamics in grasslands. Research results will be used to develop a course on sustainable grassland management for farmers and extension workers.

Objectives
Overall: To improve our understanding of the temporal and spatial dynamics of C cycles and the C footprint of pastoral grazing systems in the grassland biome of South Africa as affected by management strategies, and how the C cycle affects the sustainability and climate impacts of livestock production systems.

The specific objectives to:
1. quantify the impact of different grazing systems (selective grazing and high density grazing) on the dynamics of different soil C fractions, soil C sequestration and aboveground C in vegetation in the grassland biome of South Africa
2. assess the spatial heterogeneity of C sequestration and soil degradation as

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impacted by different grazing systems
3. parameterise, verify and apply a soil C model that assists in exploring the impact of different management scenarios on the long-term soil C dynamics in grasslands
4. develop an integral assessment of the C footprint of livestock production systems in (semi-) extensive grazing systems under different management scenarios

General planned activities
Activity 1. Measuring C cycles in grassland systems under different management strategies
Activity 2. Exploring the impact of different grazing management scenarios on the long-term soil C dynamics using a soil C model
Activity 3. C footprinting of different livestock production systems in the grassland biome of South Africa

Masters Students activities
Each research activity is led by one of the three students who are receiving support through this RUFORUM grant. The student activities are closely aligned to the general planned activities.

Expected outcomes
Three M.Sc. candidates trained and graduated in this field. The proposed project will generate objective and scientifically sound knowledge on the performance of different grazing systems in the Grassland Biome of South Africa. This knowledge will be of practical use to livestock farmers in this and similar biomes, providing an understanding of why, how and under which conditions the adoption of high-density grazing is beneficial.

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