Impact of Climate-Smart Practices on Greenhouse Gas Emissions in South Carolina Livestock Operations

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Introduction

In the Southeastern United States, livestock production systems are significant contributors to greenhouse gas (GHG) emissions. Climate-smart practices offer the potential to reduce these emissions while supporting forage production and quality (Figure 1).

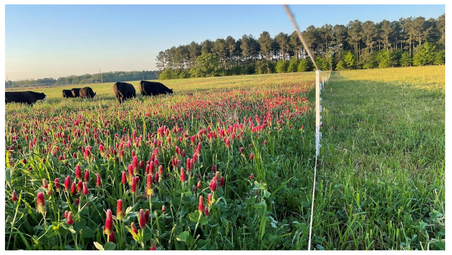

Figure 1. Perennial forage field under grazing.

Objectives

To evaluate the impact of climate-smart practices implementation on nitrous oxide (N2O), methane (CH4), and carbon dioxide (CO2) soil emissions in two grazing systems in South Carolina.

Materials and Methods

In South Carolina (Clemson University-SC State), two on-farm sites were evaluated in 2024 for forage mass and GHGs (CH_4, N_2O, CO_2) under two climate-smart practices (control and climate-smart) and two different scenarios. Climate-smart practices included poultry litter, clovers, and rotational grazing. Emissions were measured March–November using LICOR automated chambers. The scenarios were:

-Scenario 1: Areas with bermudagrass during summer and oat and clover during winter.

-Scenario 2: Areas with fescue, clover, and hairy vetch during winter, while fescue remains available for grazing during summer.

Figure 2. Chamber installation (left), soil temperature sensor installation (middle), and setup of deployment on-farm (right).

Results and discussion

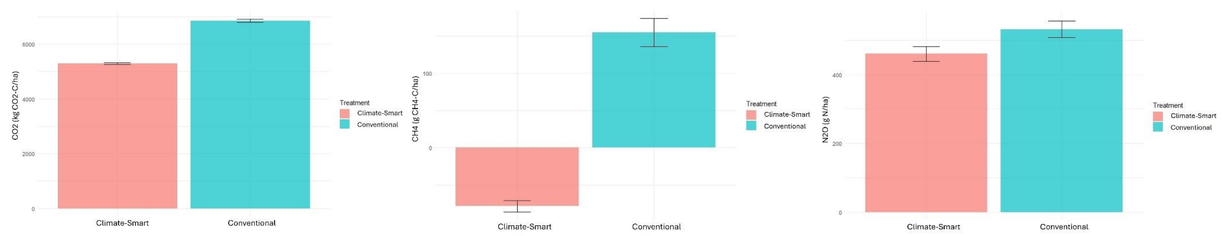

Figure 3. Greenhouse gas emissions from a bermudagrass pasture scenario managed under climate-smart practices during the cool season.

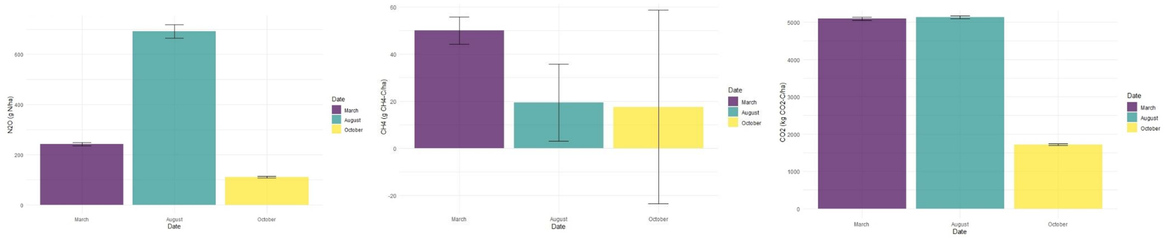

Figure 4. Greenhouse gas emissions from a bermudagrass pasture scenario managed under climate-smart practices during the over three periods.

- Climate-Smart practices significantly reduced N_2O, CH_4 and CO_2 emissions in both scenarios ($p < 0.01$).

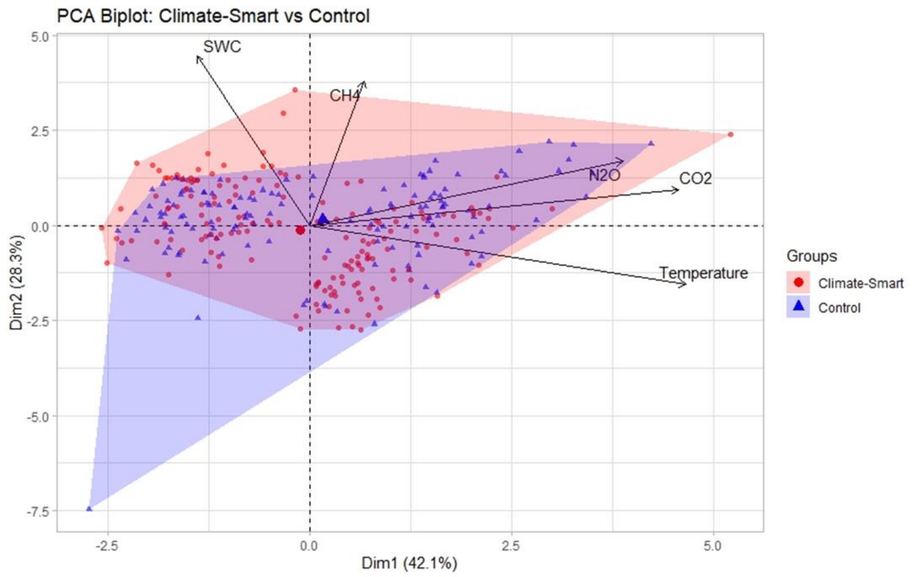

Figure 5. Principal Component Analysis of Climate-Smart Management Effects on GHG Emissions and Environmental Conditions.

- A principal component analysis indicated partial treatment separation, associating CS systems with CH4 uptake and greater soil moisture.

Conclusions

These partial results demonstrate that integrating CS practices into southeastern livestock systems can effectively reduce GHG emissions while supporting agronomic production and soil properties.

Acknowledgment

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