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Model-Based Assessment of Grazing Impact on Soil Carbon Stocks and Dynamics of a Kenyan Rangeland

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Abstract

Significant increases in atmospheric carbon concentrations is a major driver of global warming and climate change. As the largest terrestrial ecosystem carbon sink, soils store approximately 2500 Pg. C in the upper 2 m depth. Rangelands make up more than 40 % of the global land surface and contain about 30 % of global terrestrial soil organic carbon (SOC). Under proper grazing management conditions, rangelands have the potential to sequester significant amounts of additional carbon, and hence offset anthropogenic carbon emissions and contribute to mitigating climate change. Due to the heterogeneity of rangelands worldwide and notable scarcity of data in particular in Africa, attempts to estimate the impact of grazing effects on carbon in these ecosystems are a challenge. Hence, recommendations for management across different regions cannot be made. In this work, we used the DAYCENT ecosystem model to study SOC stock dynamics for a rangeland in Eastern Kenya. Operated as a livestock ranch with wildlife grazing as background noise, vegetation in this area is a mix of C4 grasses and a few stands of Acacia trees and shrubs. The effects of two soil types - sandy and clayey - and varying levels of grazing management - high, moderate and light long-term grazing intensities based on percentage removal of standing biomass - on SOC dynamics and sequestration potentials over a period of 15 to 20 years were estimated. The presentation will summarise major results of this study and will provide recommendations on grazing regime strategies for rangeland policy planning in the East-African region.

Keywords: Carbon sequestration, DAYCENT, grazing management, rangelands, soil organic carbon

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