CarboGrass (ID 53)

IMPACT OF GRASSLAND MANAGEMENT ON SOIL CARBON STORAGE

Coordinator

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Project partners

Country	Organization
Colombia	CIAT
Kenya	ILRI
United Kingdom	Rothamsted Research
Kenya	Jaramogi Oginga Odinga University of Science and Technology (JOOUST)
Argentina	National Institute of Agronomic Technologies - INTA
Spain	Universidad Politécnica de Madrid
New Zealand	AgResearch
Germany	Karlsruhe Institute of Technology
Switzerland	Agroscope

Summary

Grasslands and pastures cover about 40% of the Earth's ice-free land surface and its soils store about 20% of the global carbon (C) stocks. However, overuse of grasslands due to inadequate management and the pressure to fulfill the growing demand of food has resulted in their deterioration and even desertification. Reverting this trend offers huge opportunities for climate protection as possibly up to 150 Tg of soil C per year (CO2 eq) may be captured through improved grazing management or introduction of silvopastoral systems (SPS). Unleashing the CS potential of global grasslands will require the implementation of adequate management practices though this requires that the mechanisms underlying CS are fully understood across different environmental conditions and grassland systems. Although several restoration strategies and management practices including SPS have been tested, there is a lack of a common framework that allows to assess their impact on CS and other important services.

The objectives of this proposal are: to assess the potential of improved grassland management on soil C, nitrogen (N) cycling and soil health across the globe; to analyze how changes in environmental conditions and management affect CS in grasslands; to provide standardized, high quality datasets on grassland soil C/N cycling and management and environmental induced soil C stock changes, allowing to benchmarking ecosystem models and the tailored application of such assessment tools to various grassland systems in different regions; to develop a framework of methods (incl. models) allowing to identify the potential of different grassland management options to enhance restoration of soil C stocks while improving grassland productivity and livelihoods.

Paired grassland sites in ten tropical and temperate regions around the globe will be selected to assess a) impacts of management and environmental conditions on soil C stocks, soil CS potential, soil C/N cycling and health by applying a pairwise comparison approach (e.g. extensively or natural grasslands versus intensively managed grasslands), b) the potential of improved management (e.g. overuse versus adapted management/cover, SPS) on soil C stocks and c) the potential of restoration measures to revert grassland desertification. At all sites standardized established methods will be implemented and cross-validated by laboratory intercomparison. These protocols will be applied to soil samples collected down to a depth of 1m (where possible) to analyze soil organic C content (SOC), total N, available and total organic phosphorus, physical properties, microbiological activity and C and N isotopes and complemented with environmental and management information at each of the paired

sites. The data obtained for C (N) stocks and soil processes will be related to soil characteristics, type of ecosystem management, restoration strategy and environmental conditions. The comparison between management practices and its effects in different climatic settings will help understand the potential of these strategies for the improvement of SOC stocks and productive performance and provide linkages between SOC, soil health and nutrient cycling and ecosystem services provided by the soil. The modeling of CS with LandscapeDNDC, RothC or other models using project data will help in the design of decision tools to foster farm management practices that contribute to productivity while maintaining or even enhancing SOC stocks.

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