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# Challenges and opportunities for carbon sequestration in grassland systems

A technical report  
on grassland management  
and climate change mitigation



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# **Challenges and opportunities for carbon sequestration in grassland systems**

A technical report on  
grassland management and  
climate change mitigation

Prepared for the  
**Plant Production and Protection Division**  
**Food and Agriculture Organization of the United Nations (FAO)**

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## EXECUTIVE SUMMARY

Implementing grassland management practices that increase carbon uptake by increasing productivity or reducing carbon losses (e.g. through high rates of offtake) can lead to net accumulation of carbon in grassland soils – sequestering atmospheric carbon dioxide (CO<sub>2</sub>). Globally, the potential to sequester carbon by improving grassland practices or rehabilitating degraded grasslands is substantial – of the same order as that of agricultural and forestry sequestration. Because practices that sequester carbon in grasslands often enhance productivity, policies designed to encourage carbon sequestering grassland management practices could lead to near-term dividends in greater forage production and enhanced producer income.

Practices that sequester carbon in grasslands also tend to enhance resilience in the face of climate variability, and are thus likely to enhance longer-term adaptation to changing climates. Developing policies to encourage the adoption of practices that sequester carbon has several significant challenges, such as demonstrating additionality, addressing the potential for losses of sequestered carbon, and engaging smallholders and pastoralists with uncertain land tenure. In addition, the paucity of data in developing countries hampers the measurement, monitoring and verifying of carbon sequestration in response to those practices.

This report reviews the current status of opportunities and challenges for grassland carbon sequestration. Based on these observations, the report then identifies components that could foster the inclusion of grasslands in a post-2012 climate agreement, and the development of policies to improve grassland management.







## CHAPTER 1

# Introduction

The implementation of improved land management practices to build up carbon stocks in terrestrial ecosystems is a proven technology for reducing the concentration of carbon dioxide (CO<sub>2</sub>) in the atmosphere – offsetting emissions from other sources and drawing down atmospheric CO<sub>2</sub>. Developing effective policies capable of growing terrestrial carbon sinks is a serious challenge. Grassland carbon sequestration faces the same challenges as those relating to forestry and agricultural sequestration, but in some ways they are greater. Sequestration rates can be slower, the ability to measure change could be more difficult, benefits may be distributed across more landowners/land managers with less certain tenure, practices may be more varied, costs of implementation are more poorly quantified, and the scientific information to inform policy analysis is less complete.

The opportunities to benefit from grassland practices that sequester carbon can be greater too. The large populations of people who depend directly on grasslands tend to be poor and vulnerable to climate variability and climate change. Implementing practices to build – or rebuild – soil carbon stocks in grasslands could lead to considerable mitigation, adaptation and development benefits. However, the discussion of grassland carbon sequestration has lagged behind that of agriculture and forestry; forestry is an important, existing component of the Clean Development Mechanisms (CDM) of the Kyoto Protocol.

This report discusses the challenges that grassland sequestration faces and the substantial and diverse opportunities that arise with management practices that lead to carbon sequestration in grasslands. The report concludes by identifying key knowledge barriers and deriving a set of recommended activities and observations that can overcome them.



