

Loss of plant biodiversity can reduce soil carbon sequestration in grasslands

One third of the global terrestrial carbon stock is stored in grasslands. A new global study implies that this stock may decrease as plant biodiversity is reduced, especially in warm and arid areas. The study was led by Marie Spohn from the Swedish University of Agricultural Sciences.

Based on data from 84 grasslands spread over a total of six continents, Marie Spohn and 29 other researchers from all over the world, have significantly increased the understanding of how carbon storage in grasslands functions and relates to biodiversity and climate. Steppes in North America, the savannah in Serengeti, tundra grasslands in Northern Norway and natural pastures in the Alps are examples of ecosystems that are included in the study.

The results, published in the scientific journal *Nature Communications*, show that the soil carbon content increases with plant diversity in global grasslands, and that this relationship is particularly strong in warm and arid climates. The researchers found the most likely mechanism behind this positive relationship to be linked to the soil carbon-to-nitrogen ratio, which also increases with plant diversity. A higher soil carbon-to-nitrogen ratio is an indicator of slower decomposition rates, meaning more carbon will remain in the soil.

Previously, it was believed that soil carbon storage is mostly related to the quantity of plant biomass inputs to soil, but this study shows that the quality of the soil organic matter, the carbon-to-nitrogen ratio, is also important.

“The study has far-reaching implications as it suggests that ecosystem management that restores plant diversity likely enhances soil carbon sequestration, particularly in warm and arid climates”, says Marie Spohn.

FACTS BOX

Grassland ecosystems store approximately one third of the global terrestrial carbon stock and harbor a large proportion of all plant species. Little was known so far about the effect of climate on the relationship between plant diversity and soil carbon and the mechanisms involved. Yet, this knowledge is of crucial importance in times of climate change and biodiversity loss.

This study is unique in that it uses data from grasslands with different plant diversity on six continents to elucidate the relationship between plant diversity and soil carbon storage. The data was collected by a collaborative network of scientists from all continents using a standardized sampling design.

The article

Marie Spohn et.al. 2023. The positive effect of plant diversity on soil carbon depends on climate. *Nature Communications* **14**, 6624. <https://doi.org/10.1038/s41467-023-42340-0>

Contact person

Kari Anne Bråthen
Department of Arctic and Marine Biology, BFE
UiT – Arctic University of Norway