

# LOSS OF GRAZING BY LARGE MAMMALIAN HERBIVORES CAN DESTABILIZE THE SOIL CARBON POOL

Grazing ecosystems make up about 40% of the Earth's land surface (nearly 50 million km<sup>2</sup>), storing vast amounts of carbon (about 500 Pg) in the soil. One crucial aspect in this soil carbon storage is through grazing by large mammalian herbivores. While we increasingly understand the role of large mammalian herbivores on the size of the soil carbon pools, we know relatively little about their effects on an equally important aspect – stability.

For this, we established long-term monitoring plots by experimentally denying herbivores to graze by putting fences (see Figure for one such plot). In these grazed-and-fenced treatment-and-control plots, we estimated the soil carbon and nitrogen pools annually from 2006 to 2021.

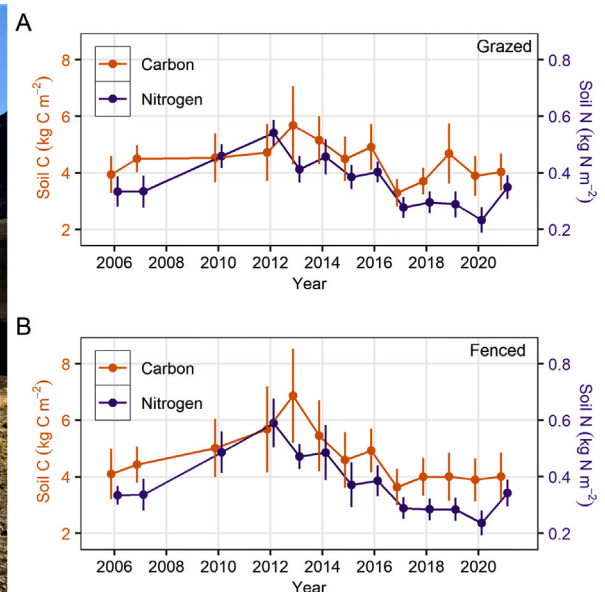
We found that soil carbon and nitrogen pools fluctuated 30-40% more in the

fenced plots where animals were absent, compared to the grazed plots. Through multiple lines of evidence – phase-space analysis and structural equation modelling, we find that soil carbon and nitrogen pools were more stable through lower fluctuations in the presence of herbivores than under fenced plots.

With continuing decline in large mammalian herbivores across the globe, their influence on soil carbon stability can have unintended negative consequences for the global carbon cycle. So, protecting the herbivores that keep the soil carbon stable should remain a key priority for mitigating climate change and carbon stewardship.

## Reference:

“Loss of grazing by large mammalian herbivores can destabilize the soil carbon pool” by Dilip G T Naidu, Shamik Roy, Sumanta Bagchi.



**Figure:** Change in soil carbon and soil Nitrogen