

# The effect of livestock grazing on plant diversity and productivity of mountainous grasslands in South America - a meta-analysis

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## Abstract

Mountainous grasslands in South America represent highly diverse ecosystems that offer a broad spectrum of benefits to people. These include the regulation and purification of water, prevention of soil erosion, provision of livestock feed, and preservation of cultural heritage. Previous research has underscored the significant role of grazing in shaping the diversity and productivity of grassland ecosystems, particularly in highly productive, eutrophic systems. In such systems, grazing has been demonstrated to restore grassland plant diversity by reducing primary productivity. However, it remains unclear whether these findings are applicable to South American mountainous grasslands, where plants are adapted to different environmental conditions. To address this gap, we conducted a meta-analysis of experiments that excluded livestock grazing. The goal was to quantify the impact of grazing exclusion on plant diversity and productivity across mountainous grasslands in South America. Our findings, akin to studies conducted in temperate grasslands, revealed that herbivore exclusion led to an increase in aboveground biomass. Nevertheless, it also resulted in a reduction in species richness and Shannon diversity. Interestingly, the effects of grazing exclusion became more pronounced with longer exclusion durations, yet remained robust to various climatic conditions, including mean annual precipitation and mean annual temperature, as well as the evolutionary history of grazing. In contrast to results observed in temperate grasslands, the reduction in species richness due to herbivore exclusion was not correlated with increased aboveground biomass. This suggests that the processes regulating (sub)tropical grassland plant diversity may differ from those in temperate grasslands. Further research is imperative to better comprehend the specific factors influencing plant diversity and productivity in South American montane grasslands and to discern the ecological implications of herbivore exclusion in these unique ecosystems..

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