Response of CO_2 Emissions to the Grazing and Enclosure in Temperate Grassland Ecosystem

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Key words : CO_2 flux , grazing , enclosure , Loess plateau , slopeland

Introduction The rangeland on the slopeland of Loess Plateau plays an important role in livestock and ecological protection . The process and main influencing factors of carbon cycle in grassland ecosystem are important in the global change . Many studies mainly focused on the flat regions . The objective of this study was to explore the influence of different management styles on soil CO_2 emission .

Materials and methods The site is on a slope grassland near Huan County , Gansu Province , China (37 .1°N , 106 .8°E) . The plots were enclosed (in 2001) free grazing grassland , and six terrains : flat , 15° shady and sunny , 30° shady and sunny , 45° shady and sunny slope . The measurement was conducted in August 2006 and August 2007 . CO_2 flux was measured with LI-COR 6400 .

Results There were different impacts of enclosure on the emissions of CO_2 in different years . In 2006 , total CO_2 flux increased due to the increase in the emissions of shady slopes . However , there were little effects on sunny slopes and flat (Figure 1) . This because enclosure increased the belowground biomass , and the major part of soil respiration is root respiration . In 2007 , there was little impact of enclosure on the emissions of CO_2 , but the CO_2 emission in different slopes were different (Figure 2) . Generally , CO_2 flux of steep plots (45°) increased and decreased in gentle plots (15°) . This probably because the soil moisture condition was poor , and the soil temperature was the main influencing factor , and the steep plots were accessible to photosynthetic active solar radiation (PAR) .

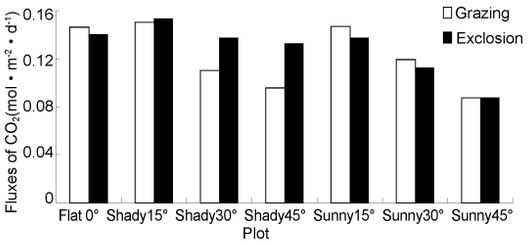

Figure 1 *The emissions of CO_2 under different management styles and terrains (2006) .*

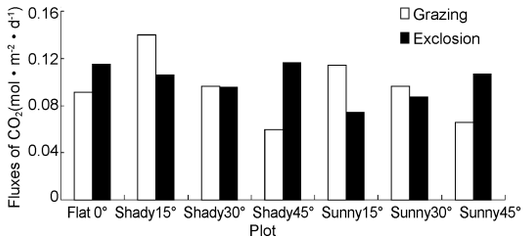

Figure 2 *The emissions of CO_2 under different management styles and terrains (2007) .*

Conclusions Current literature suggests no clear general relationships between grazing management and carbon sequestration (Reeder *et al* ., 2002) . Overall , grazing reduced the total emissions of CO_2 , because grazing removed some biomass of aboveground and litters , also changed the belowground biomass . As the impact of grazing on the grassland is complex . In addition , the breathing gas and eructation of livestock are an important source of greenhouse emissions .

Reference

Reeder , J . D . , Schuman , G . E . , 2002 . Influence of livestock grazing on C sequestration in semi-arid mixed-grass and short-grass rangelands . *Environmental Pollution* 116 , 457-463 .