

## **Sound management may sequester methane in grazed rangeland ecosystems**

Chengjie Wang<sup>1</sup>, Guodong Han<sup>1</sup>, Shiping Wang<sup>2</sup>, Xiajie Zhai<sup>1</sup>, Joel Brown<sup>3</sup>, Kris M. Havstad<sup>3</sup>, Xiuzhi Ma<sup>4</sup>, Andreas Wilkes<sup>5</sup>, Mengli Zhao<sup>1</sup>, Shiming Tang<sup>1</sup>, Pei Zhou<sup>1</sup>, Yuanyuan Jiang<sup>1</sup>, Tingting Lu<sup>1</sup>, Zhongwu Wang<sup>1</sup> & Zhiguo Li<sup>1</sup>

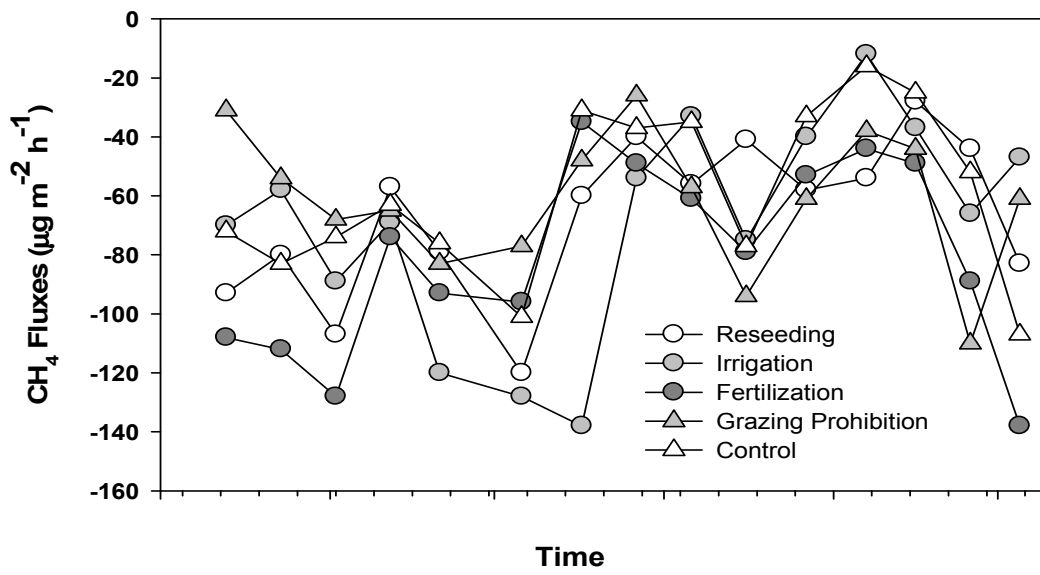
<sup>1</sup>College of Ecology and Environmental Science, Inner Mongolia Agricultural University, Huhhot 010018, China, <sup>2</sup>Laboratory of Alpine Ecology and Biodiversity, Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing 100101, China, <sup>3</sup>Jornada Experimental Range, United States Department of Agriculture, Las Cruces, 88003 NM, USA, <sup>4</sup>College of Forest Science, Inner Mongolia Agricultural University, Huhhot 010018, China, <sup>5</sup>World Agroforestry Centre, 12 Zhongguancun, Beijing 100081, China.

Correspondence and requests for materials should be addressed to G.D.H (email: [nmganguodong@163.com](mailto:nmganguodong@163.com)) or to S.P.W. (email: [wangsp@itpcas.ac.cn](mailto:wangsp@itpcas.ac.cn)).

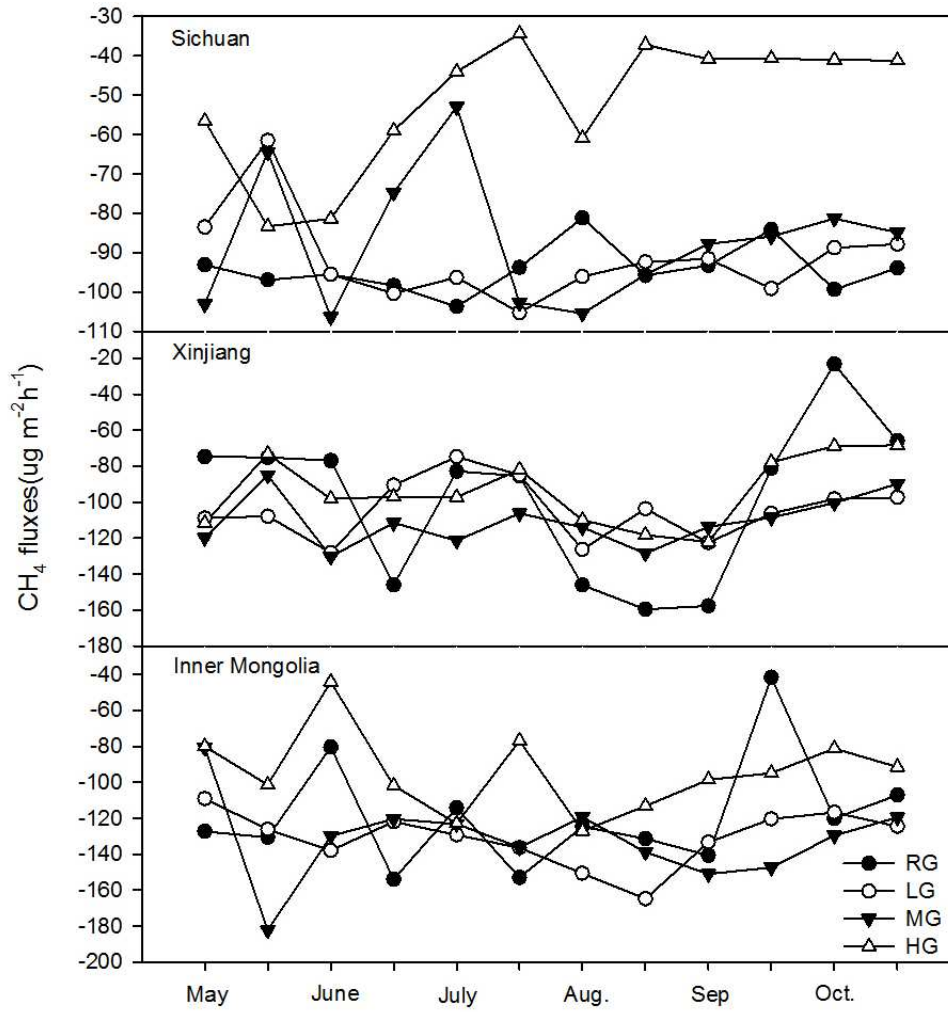
## Supplementary information

**Table S1 | Major national policies and programs related to rangeland management in China**

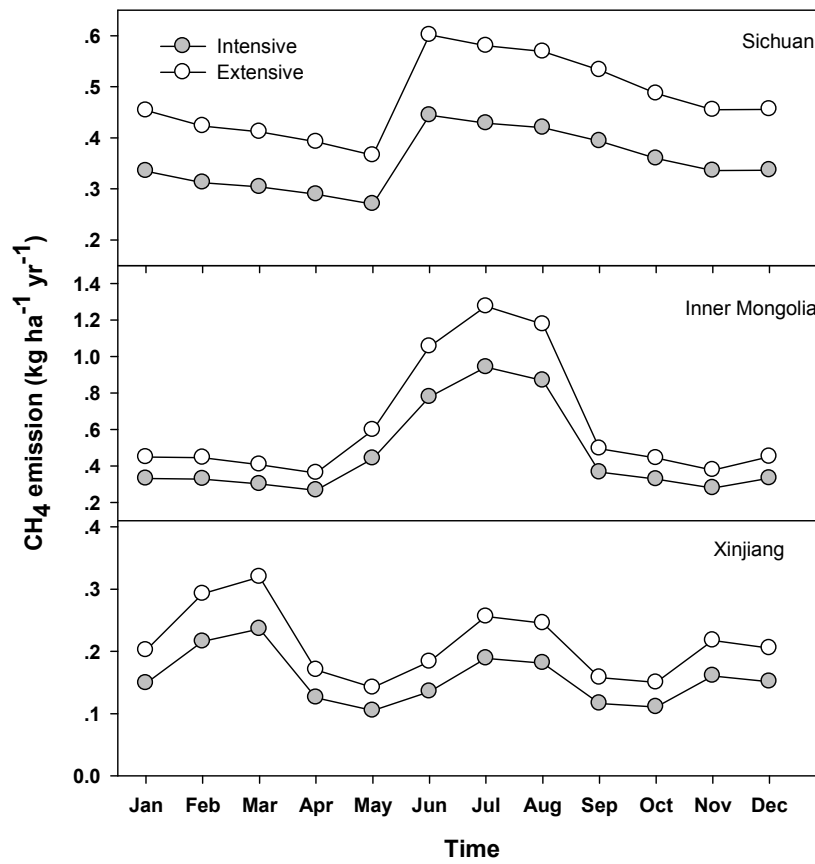
Policies	Date of Issue	Governing Policy Body
Rangeland Law	Jun 1985	Standing Committee of National People's Congress
Law of Land Contract in Rural Areas	Aug 2002	Standing Committee of National People's Congress
Program of Returning Farmland to Forestland and Rangeland	Sep 1999	State Council
Program of Returning Grazing Land to Grass	Jun 2001	State Council
Decision of the State Council on Combating Desertification	Sep 2005	State Council
National Management Measures on Rangeland and Livestock Balance	Jan 2005	Ministry of Agriculture
Improving Farmers' Income by Establishing Mechanism of Encourage and Reward of Ecological Protection in the Rangeland Region	Oct 2010	State Council



**Figure S1 | Dynamics of CH<sub>4</sub> flux during the growing season in temperate desert steppe in Ningxia autonomous region.** The grassland improvement options are reseeded, irrigation, fertilization, grazing prohibition and control area. CH<sub>4</sub> fluxes are daily mean values, representing measurements with three replicates (nine flux measurements per day).



**Figure S2 | Dynamics of CH<sub>4</sub> flux during the growing season of vegetation in three studied regions (Sichuan, Xinjiang and Inner Mongolia).** The grassland utilization options are grassland resting, light and moderate grazing, with heavy grazing as the control treatment. CH<sub>4</sub> fluxes are daily mean values, representing measurements with three replicates (nine flux measurements per day). RG: rest from grazing; LG: light grazing; MG: moderate grazing; HG: heavy grazing.



**Figure S3 | Estimated monthly CH<sub>4</sub> output from livestock in three study regions (Sichuan, Inner Mongolia and Xinjiang).** The livestock production option is intensive management, with extensive management as the control treatment.

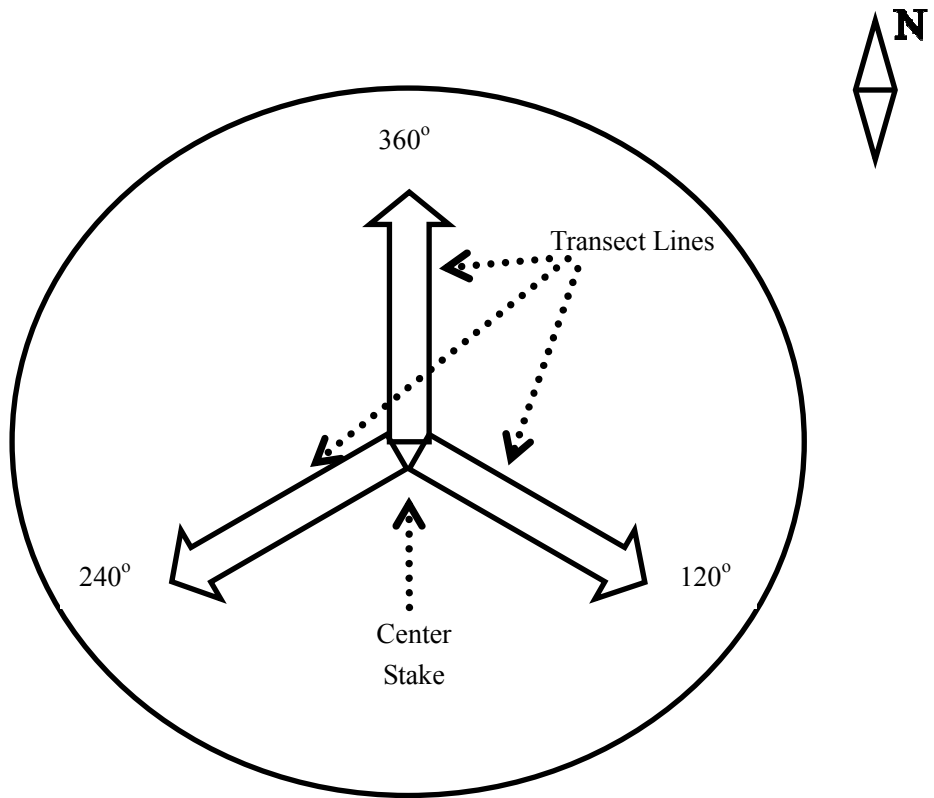
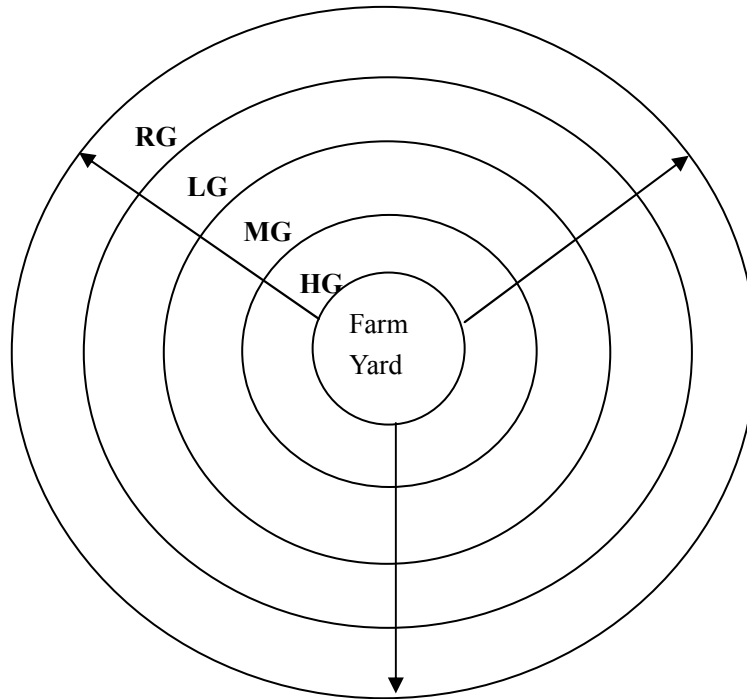


Figure S4 | Transect of sampling site in the study area.



**Figure S5 | Schematic diagram of the grazing system. Grazing gradients were divided into heavy grazing (HG), moderate grazing (MG), light grazing (LG) and rest from grazing (RG). Stocking rate decreases along the direction of the arrow.** The zones and their boundaries were defined by sampling species composition and vegetation coverage along the transects at 50 m intervals, using a single 20 cm × 50 cm quadrat, and grouping the plots into one of the three grazing intensity zones using cluster analysis. Grazing densities were quantified based on the percentage of forage utilization. The percentage of forage utilization in HG, MG, LG and RG was 65-70%, 40-44%, 24-30% and 24-30%, respectively.