CSIRO PUBLISHING
The Rangeland Journal, 2014, **36**, i–ii
http://dx.doi.org/10.1071/RJv36n6_IN

Introduction to the Special issue of The Rangeland Journal on 'Social and ecological aspects of grassland use in northern China: implications for adaptation to climate change'

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The idea of this Special Issue was originally conceived by Xiangyang Hou, Director General of the Institute of Grassland Research, Chinese Academy of Agricultural Sciences (IGR, CAAS), Hohhot, China to celebrate the fiftieth anniversary of the setting up of the Grassland Research Institute in Hohhot, Inner Mongolia. The title, 'Social and ecological aspects of grassland use in northern China: implications for adaptation to climate change' was chosen to reflect the key issues of climate change and overgrazing by livestock of the grasslands of northern China and on the social and ecological impacts that they were having on grassland use. Professor Hou identified a list of topics and invited the authors of papers on these topics that reflected the issues raised in the title. The authors have acted as the Associate Editors of this Special Issue in evaluating the papers on the basis of the comments of the reviewers and using our expertise in reviewing and editing manuscripts.

The natural rangelands in northern China extend over an area of 313 m ha, accounting for 79.7% of the total area of the natural rangelands in China. These rangelands are important in maintaining national and regional ecological security, promoting regional economic development and ensuring social stability (Wu *et al.* 2009). The grasslands of these rangelands play an important role in livestock production. Climate change in the last 50 years has been characterized as a warming and drying trend in this area with an increased frequency of droughts, sandstorms and snowstorms, frequently causing damage and losses to local grazing communities (You *et al*. 2002; Bao *et al*. 2011; Zhang *et al.* 2011). The management of these rangelands was adjusted when land reform was implemented along with the implementation of a household responsibility system in the 1980s. Increases in livestock numbers and different approaches to rangeland management have led to some areas of severe overgrazing and to concerns over loss of biodiversity and ecosystem functioning.

This special issue describes the effects of increases in temperature and more variability in rainfall on plant productivity in these rangelands (Wang *et al*. 2014*a*; Wu *et al*. 2014) and then addresses the vulnerability of ecosystems and households to climate chance and the adaptive capacity of these rangelands and those who obtain their livelihoods from them (Ding *et al.* 2014; Yang *et al*. 2014). The studies show the effects on plant productivity, indicate those regions which are most vulnerable and suggest that the adaptive capacity to cope with climate change has increased, particularly in the last decade. The extent to which adaptive capacity can be increased is a function of the perceptions that herders have about climate change and its effects and this is described in the paper of Li *et al*. (2014).

There is continuing debate in China about the extent to which rangeland degradation is a function of human activities, associated with stocking rates of livestock, that are too high, and, inappropriate management, or is related to climate change. All of these are likely to be involved to different extents depending on, for example region or ecosystem type. The papers in this Special Issue dealing with this topic focus on the effects of grazing at the household and regional scales on plant community productivity and diversity (Zhang *et al*. 2014) and specifically in the papers of Hou *et al*. (2014*a*) and Wang *et al*. (2014*b*) to desert steppe. The former paper explores the effect of different grazing regimes on plant productivity, and soil carbon and respiration rates, whilst the paper of Wang *et al*. (2014*b*) reports the different responses of plant types to different durations of grazing during the plant growing season. Maintaining the grassland management theme, Baoyin *et al*. (2014) report on the interaction between climate variability and mowing regime in a long-term study. In a salutatory paper, Hou *et al.* (2014*b*) point out the importance of the attitudes of herders towards the proper management of these rangelands, particularly in the drier parts of the region.

This series of papers demonstrates that research on grasslands in Inner Mongolia is addressing the most important issues concerning the interaction between grazing management and climate change, the adaptive capacity of such systems and how these systems are perceived by herders. An integrative approach to rangeland research is vital for new knowledge to be obtained and for the outcomes of that knowledge to be relevant to its application. This Special Issue suggests that this integrative approach is being fostered in the rangelands of northern China.

References

Bao, Y., Li, X. B., Huang, L. M., Zhang, Y. X., and Wang, H. (2011). Spatial-temporal distribution characteristics of precipitation in Inner Mongolia from 1961–2007. *Arid Land Geography* **34**, 52–61. [In Chinese]

Baoyin, T., Li, F. Y., Bao, Q., Minggagud, H., and Zhong, Y. (2014). Effects of mowing regimes and climate variability on hay production of *Leymus chinensis* (Trin.) Tzvelev grassland in northern China. *The Rangeland Journal* **36**, 593–600.

Ding, W., Ren, W., Li, P., Hou, X., Sun, X., Li, X., Xie, J., and Ding, Y. (2014). Evaluation of the livelihood vulnerability of pastoral households in Northern China to natural disasters and climate change. *The Rangeland Journal* **36**, 535–543.

Hou, X., Wang, Z., Schellenberg, M. P., Ji, L., and Yun, X. (2014*a*). The response of grassland productivity, soil carbon content and soil respiration rates to different grazing regimes in a desert steppe in northern China. *The Rangeland Journal* **36**, 573–582.

Hou, X., Yin, Y., Michalk, D., Yun, X., Ding, Y., Li, X., and Ren, J. (2014*b*). Herders' opinions about desirable stocking rates and overstocking in the rangelands of northern China. *The Rangeland Journal* **36**, 601–610.

Li, X., Wang, Z., Hou, X., Liu, Z., Sarula, Yin, Y., Ding, Y., and Hu, J. (2014). Herders' perception of climate change does not always fit with actual climate change. *The Rangeland Journal* **36**, 557–564.

Wang, Z., Zhang, Q., Xin, X., Ding, Y., Hou, X., Sarula, Li, X., Chen, H., Yin, Y., Hu, J. and Liu, Z. (2014*a*). Response of the annual biomass production of a typical steppe plant community to precipitation fluctuations. *The Rangeland Journal* **36**, 527–534.

Wang, Z., Hou, X., Schellenberg, M. P., Qin, Y., Yun, X., Wei, Z., Jiang, C., and Wang, Y. (2014*b*). Different responses of plant species to deferment of sheep grazing in a desert steppe of Inner Mongolia, China. *The Rangeland Journal* **36**, 583–592.

Wu, M. X., Qian, S., and Hou, Y.Y. (2009). Estimation of forage yield in Northern China based on NDVI data. *Transactions of the CSAE* **25**, 149–155. [In Chinese]

Wu, X., Li, P., Jiang, C., Liu, P., He, J. and Hou, X. (2014). Climate changes during the past 31 years and their contribution to the changes in the productivity of rangeland vegetation in the Inner Mongolian typical steppe. *The Rangeland Journal* **36**, 519–526.

Yang, T., Li, P., Wu, X., Hou, X., Lui, P., and Yao, G. (2014). Assessment of vulnerability to climate change in the Inner Mongolian steppe at a county scale from 1980 to 2009. *The Rangeland Journal* **36**, 545–555.

You, L., Shen, J. G., and Pei, H. (2002). Climate change in Inner Mongolia in the last 50 years and the trend in the next 10~20 years. *Meteorology Journal of Inner Mongolia* **4**, 14–18. [In Chinese]

Zhang, G., Kang, Y., Han, G., and Sakurai, K. (2011). Effect of climate change over the past half century on the distribution, extent and NPP of ecosystems of Inner Mongolia. *Global Change Biology* **17**, 377–389.

Zhang, Q., Ding, Y., Ma, W., Kang, S., Li, X., Niu, J., Hou, X., Li, X., and Sarula (2014). Grazing primarily drives the relative abundance change of C4 plants in the typical steppe grasslands across households at a regional scale. *The Rangeland Journal* **36**, 565–572.