

Guest Editorial

Grasslands and rangelands of China: systems, connectivity, environment and development

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Overview

China has extensive grasslands and rangelands, surpassed only by Australia (Liao and Jia 1996). It is 62 years since the late Professor Wang Dong presented the first lecture in rangeland management to university students in China (Ren and Hou 2004). Since then knowledge in grassland and rangeland sciences has steadily grown and now these sciences are critical for the development of China. In this Special Issue, critical reviews by some of China's premier grassland and rangeland scientists are assembled for the first combined meeting of the International Grassland and Rangeland Congresses to be held in Hohhot, Inner Mongolia from 29 June to 5 July 2008.

In this set of seven papers, four themes have emerged. The first is that China has developed integrated crop-livestock production systems over a long period that are sustainable but which are capable of development to further raise productivity, increase incomes of rural people and reduce pressure on the rangelands. The second is that the *connectivity* of the components in these systems needs to be improved and more connections made. The third is that the *environment*, in its fullest sense, is now being stressed by the rapid development and that a new approach to monitoring of the systems and their components, restoration of degraded landscapes and basic science is required. The fourth is that *development* must not jeopardise food security. China will have to use good governance and technological interventions to arrest a further decline in the environment.

Systems

Several papers in this Special Issue demonstrate the importance of systems thinking for understanding and managing the rangelands of China. Ren *et al.* (2008) describes a logical system for classifying the grassland and livestock production. This system was developed in China over a 50-year period and was influenced by the classification system for plants and animals (Linnaeus) and for the chemical elements (Mendeleev). The grassland classification system is mature in the sense that it provides a logical framework to accommodate unknown properties of climate and soil, and to guide agricultural production. The authors cogently argue why their classification system has great potential for use within and beyond China. Li *et al.* (2008) classify and describe the livestock production

systems used in China and thereby introduce the grazing systems used on the grasslands and rangelands of China. They point out that the recent rapid increase in demand for livestock products is shifting national attention from grasslands and rangelands as a source of meat and other products, to the dominant crop-livestock systems and the smaller industrialised systems close to cities. Hou *et al.* (2008) describe in more detail the crop-livestock systems in China and demonstrate by case studies, how integrated crop-pasture-rangeland-livestock systems are successfully operating in several contrasting parts of China. These spatially and temporally integrated systems are raising production efficiency and increasing farmer's profits.

Connectivity

Several papers describe the importance of connectivity between different primary production systems at local and regional scales for synergy and farmer/herder incomes in China. Connectivity in rural areas between crop and livestock producers occurs elsewhere, such as in Australia, New Zealand and the USA, but the connections differ and each is unique. Hou *et al.* (2008) usefully identify the importance of system coupling and overcoming discordance for improving exiting systems in China. They recognise that most countries are moving towards optimised and integrated structures for the different components of agricultural systems and propose that better integration and connectivity may reduce rangeland degradation. However the trend in China is for integrated systems to be replaced by specialised crop and livestock production systems and they question whether this is in the best interest of China. They call for more research and development. A similar concern is expressed by Long *et al.* (2008) with respect to the traditional livestock grazing systems on the Qinghai-Tibetan plateau. In this case, the authors propose that productivity and profitability of the unique yak grazing system can be raised by better connectivity with education, governance, grazing research and sustainable technologies using wind and solar energy.

Environment

Nearly all authors propose strategies for preventing and managing degradation of grassland and rangeland resources. Han *et al.* (2008) present two views on managing degradation;

first, that development of local high input areas for forage production could alleviate grazing pressure on adjoining rangelands and second, that there should be a shift from current thinking that grasslands and rangelands are only for livestock grazing to an appreciation that they provide many important ecosystem services that benefit the nation. This latter view is developed further by Li *et al.* (2008) who raise questions about how to share benefits from ecosystems services and how to deal with the large number of the poor who currently derive their livelihoods from grazing livestock. Hou *et al.* (2008) and Long *et al.* (2008) also support the two views of Han *et al.* (2008) and in their papers demonstrate how these would be achieved. Wang and Ba (2008) identify some key areas for basic research for designing management for arresting and reversing degradation; methodology to measure rangeland function/value and health, processes that link health with ecosystem services and the effects of climate change on rangeland biodiversity and function. How landscapes and communities absorb disturbance and maintain function is an international quest of ecologists (Walker and Salt 2006) and Wang and Ba and others in China are joining the quest. Finally, Ren *et al.* (2008) view their classification system as a tool for predicting shifts in grass species composition as climate changes in China and for thinking about circumstances that cause transitions to other states.

Development

The rapid modernisation and development underway in China is stressing many ecosystems, in particular the grasslands and rangelands (Han *et al.* 2008; Li *et al.* 2008; Hou *et al.* 2008) and imposing environmental and public health risks. China must manage these challenges through sound governance and technological interventions. The stability of food supply and agricultural production is of course a major concern of the Central Government of the world's most populous nation. China as a result of rapid development cannot afford a more polluted ecological system, nor to "sacrifice self-sufficiency in food supply for urbanisation and business growth." "An old Chinese saying goes: 'One must take a long-term view of the deficiency in the future even when the supply is more than enough, and it would be too late to regret a state of unpreparedness when one is faced with scarcity.'" (China Daily 2008).

Other countries which trade with China are also influenced by this rapid development. One such country is Australia. Here China's insatiable demand for energy and mineral resources, much of which comes from Australia's rangelands, is creating scarcity of labour for grassland and rangeland pastoral development (mining companies pay higher wages). Potential gains in grassland and rangeland management in Australia now await subsidence in the 'China boom' (Foran 2007). China continues to introduce, from Australia and other countries, genetic material for breeding plants for sown pastures (Liu *et al.* 2008) and improving domestic animals for meat and other products. It is unlikely though that China will become an exporter of meat so Australia's meat trade will not be affected. As China

increasingly manages environmental degradation, Australia, and other countries, can provide considerable expertise in general and in particular to assist with restoration of degraded grasslands and rangelands.

These papers are a valuable but incomplete review of scientific knowledge on the grasslands and rangelands of China. These landscapes include people and so papers on social science and issues of living in remote rural communities are yet to be written. The paper by Long *et al.* (2008) discusses some social aspects of herders on the Qinghai-Tibetan plateau and how they determine management of the rangeland and livestock but the social-grassland/rangeland-livestock-economic relationships deserve further scholarship. Similarly the relationships between grazed landscapes and water issues, the conservation and utilisation of biodiversity, were not addressed. Papers on these and other topics would be welcomed by the Editor of *The Rangeland Journal* in the future.

Finally, 2008 is the 60th Anniversary of the Graduation from University of Professor Ren Jizhou, the father of modern grassland science of China and Academician of the Chinese Academy of Engineering. We dedicate this Special Issue to Professor Ren, and wish him good health and long life, so he can continue inspiring grassland scientists within and outside China for many years to come.

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