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Can individual land ownership reduce grassland degradation and favor socioeconomic sustainability on the Qinghai-Tibetan Plateau?

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ABSTRACT

Land degradation neutrality (LDN) was introduced to provide a policy framework to achieve Sustainable Development Goal (SDG) 15. Land use policy and management changes can alter the status of land-based natural capital, and exert an influence on ecosystem functioning and interactions with a socio-ecological system. Over the last 30 years, continued efforts to maintain the socioeconomic sustainability of the Qinghai-Tibetan Plateau (QTP) led to the implementation of a unique ownership policy of individual households that were contracted to use defined grassland properties rather than collective nomadic practices. Two distinct types of privately-owned grassland properties now exist: individual private property (IPP) and jointly managed private property (JPP).

The influence of IPP (vs. JPP) on grassland degradation has been the subject of a limited number of studies that are reviewed in this paper to help estimate some baseline indicator values for LDN on the QTP. Grasslands under IPP were more degraded according to soil and vegetation measurements, which were indicative of excessive vegetation removal and trampling due to grazing pressure. This pressure occurred because livestock mobility was limited by the imposed restrictions of fencing. A review of the associated socioeconomic status of this practice suggests that the disruption of social networks by the imposition of property lines between individual households acted to limit cultural transmission and collective benefits, such as the sharing of labour, pasture and food. Moreover, IPP seemed to lack the necessary resilience that is required to support the communities and their livestock.

Although studies in the QTP are relatively scarce, research suggests that the notion that grassland contracts would address the region's social, economic and environmental problems should be revisited because there is a significant difference in LDN indicator values for IPP and JPP, and evidence of significant degradation in the decades before the 2015 baseline when the UNCCD adopted LDN and SDGs. Evidence suggests that JPP is a more resilient system, capturing the environmental benefits of nomadism and the socioeconomic benefits of land contracts. Given that some of the grasslands are already contracted to individual households, creative JPP property arrangements should be respected. A reconsideration of whether the not-yet-contracted grasslands should be contracted individually rather than jointly, is required if LDN is to be achieved on the QTP by 2030. If the current policy is maintained, research evidence suggests that JPP should be encouraged, and policy makers should seek better ways of ensuring long-term sustainability and that LDN is achieved to maintain the natural capital and associated ecosystem services of the QTP.

1. Introduction

The concept of land degradation neutrality (LDN) (Cowie et al., 2018) was introduced to provide a framework for policies to achieve the Sustainable Development Goal (SDG) 15 ("Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss"). LDN is defined as "a state whereby the

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amount and quality of land resources necessary to support ecosystem functions and services and enhance food security remain stable or increase within specified temporal and spatial scales and ecosystems" (UNCCD, 2016). The concept is designed to maintain the world's land resources in a healthy and productive state for future generations. The Qinghai-Tibetan Plateau (QTP) is a source of many of Asia's major river systems and is a unique environment for a wide variety of alpine species that extends over an area of 2.27×10^6 km^2 (Cai et al., 2015). As the largest high-altitude grazing region in the world (Cao et al., 2017a), the QTP also constitutes an immense carbon (C) pool (Wang et al., 2002; Yang et al., 2008), with a potential to provide feedback into the global climate system (Liu et al., 2014). Grasslands on the plateau, where pastoral practices date back at least 8800 years (Miehe et al., 2009), cover around 1.33×10^6 km^2, accounting for almost 59% of the QTP and about 30% of grasslands in China. Over millennia, those who lived on the plateau played a crucial role in the formation and maintenance of its environment (Foggin, 2012). The global importance of the QTP ecosystem means it is critically important to understand the current state of its land resource and natural capital, modified by policy and social change in recent decades, relative to the historical baseline of pastoral nomadism that operated on the plateau for thousands of years.

Socio-economic developments, as seen in many other countries (Török et al., 2016), have led scientists from China working in remote sensing and policy-making to believe that overgrazing, associated with communal property rights, was the major driver of grassland degradation (Yeh et al., 2017). Accordingly, grassland de-collectivization was advocated, and from the late 1980s through the 1990s, grassland use rights were assigned to individual households through a long-term leasing system (Yeh and Gaerrang, 2011; Yu and Farrell, 2016). Many Chinese researchers (e.g., Wuyunga and Mao, 2016; Sun et al., 2014; Ma and Qiao, 2015) still believe that individual private property is a powerful source of grassland protection, which promotes good vegetation and soil management and provides significant socioeconomic benefits to residents.

Although the 1985 Grassland Law established a framework for the contracting of winter grasslands to individual households, many of those households were unwilling to operate in isolation because of their history of collective nomadism, and preferred to manage the rangelands as commons (Cao et al., 2011a, 2017a). Consequently, two private land ownership practices developed: individual private property (IPP) and jointly managed private property (JPP). Both are based on individual private property ownership (Wang et al., 2015a). This situation has provided a unique opportunity to explore whether an IPP system is a sustainable form of grassland management practice on the QTP, i.e., whether it can enable LDN. Prior to the year 2000, Western (vs. Chinese) studies largely focused on effects of the changes on socioeconomic systems and the alteration of land tenure arrangements on grassland degradation (Harris, 2010). This was primarily due to a belief that at both regional and global scales, socioeconomic drivers were more important than the forces of nature (Chen et al., 2014). Many of these studies only provided descriptions and lacked empirical evidence (Cao et al., 2017a). However, after 2000, Chinese investigators began to show a greater interest in the role of land tenure policy on the degradation of grasslands and socioeconomic sustainability, particularly those on the QTP.

This work reviewed the progress made through case studies and field investigations to assess whether the IPP policy should be re-evaluated, and whether or not the IPP empowers land owners to support the various processes (biophysical and socio-economic aspects) required to deliver resilience and promote LDN with no net loss of natural capital (Cowie et al., 2018). The focus was on key 'manageable properties' of natural capital defined as a foundation for LDN (nutrient levels, pH, land cover, vegetation community structure and biodiversity; Figure 3 in Cowie et al., 2018), which could serve as indicators to determine the 2015 baseline when the UNCCD adopted LDN and SDGs were agreed.

2. Methodologies

The analysis compared the difference between qualitative assessment and quantitative LDN indicators for IPP and JPP management taken from studies on the QTP. The earliest studies (Cao et al., 2011a,b) compared social-ecological benefits of IPP and JPP on the QTP using qualitative and quantitative methods. More recent work has used different words to describe IPP and JPP in China. For example, IPP is also called individual-household management, single-household management, private property rights, grassland contract policy, and fences, while JPP is also called multi-household management, group management, collective action (management), cooperative management, joint management, community-based management, or public property rights. Papers for analysis were collected in two ways: (i) by using the 'Baidu Scholar' search engine (widely used in China) to identify papers similar to or citing Cao et al. (2011a,b); and (ii) authors were identified by attending meetings and conferences, and using their names as search criteria.

To be included in this study, papers had to have a comparison between IPP and JPP, include the QTP, or other regions (Ningxia Hui Autonomous Region, Inner Mongolia, and Gansu province), present qualitative or quantitative analysis by social survey methods or field experimentation and relate to social, cultural, economic, or ecological indicators in the context of LDN. Papers written in English were listed in the Science Citation Index, Social Sciences Citation Index, or Arts and Humanities Citation Index, while papers written in Chinese were listed in the Chinese Science Citation Database or Chinese Social Science Citation Information database (Shao and Shen, 2011). Work not from the QTP was used to assess whether results from the QTP were similar to other regions or not. Overall, 18 papers met these criteria, of which 12 were from the QTP, and the others were from other regions. The hypothesis tested was that the social-ecological system under JPP is more likely to be sustainable and permit LDN than under IPP.

3. Results

Due to including both qualitative and quantitative comparisons between JPP and IPP across the studies, the results are divided into two parts, first a qualitative comparison (Table 1) to provide context for the quantitative results that include indicators for LDN and other relevant factors. Indicators for almost all social-ecological characters of JPP and IPP were found.

Table 1
Qualitative ecological and socioeconomic indicators for individual private property (IPP) and jointly managed private property (JPP).

Indicators	JPP	IPP
Ecological		
Transhumance	Yes	No
Vegetation condition	Good	Poor
Soil nutrient status	Good	Poor
Water sources	Poor	Good
Pasture-use efficiency	High	Low
Pasture quality	High	Low
Socioeconomic		
Income	Higher	Lower
Cost	Lower	Higher
Equality	Yes	No
Livestock mortality	Lower	Higher
Milk production	No change	Decrease
Livestock limit agreement	Yes	No
Monitoring mechanism	Yes	No
Assistance from outside	Yes	No
Social relations	Good	Average
Cultural heritage	Better	Worse

Note: qualitative data mainly from Cao et al. (2011a); Chen and Zhu (2015); Gongbuzeren and Li (2016); Wang et al., (2016) and Cao et al. (2018a).