



# Adaptation of herders to droughts and privatization of rangeland-use rights in the arid Alxa Left Banner of Inner Mongolia



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## ABSTRACT

Residents of arid areas have developed their own adaptive strategies and adaptive capability to cope with an unstable environment that experiences frequent droughts. These strategies and this capability are based on traditional practices that developed from a profound understanding of their environment, but both the strategies and the capability have been affected by institutional change. Specifically, rangeland-use rights in the Alxa Left Banner were privatized in 1996, and the implementation of this policy decreased the ability of local herders to use traditional solutions. In this paper, we describe the change in their adaptive capability after implementation of this policy. Traditionally, local knowledge of the heterogeneity of resources and of key resources based on a deep understanding of the local environment, combined with tight social relationships, let herders use three traditional grazing strategies (seasonal migration, long-distance migration, and raising a diversity of livestock species) to mitigate the impacts of drought. But privatization has nearly eliminated their ability to rely on these traditional strategies and has weakened the forms of social and other capital that supported these strategies and provided a high adaptive capability. We argue that this institutional change has adversely affected traditional practices and undermined the adaptive capability of herders. Consequently, managers of the Alxa Left Banner must find ways to restore the various forms of capital to restore the herders' adaptive capability, particularly given the growing need to account for future climate change.

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## 1. Introduction

IPCC (2007) noted that residents of semi-arid and arid areas will face increasing challenges caused by climate change during the 21st century. People in developing countries will be especially seriously affected because their vulnerability to climate change will be aggravated by other stresses, such as population increases and a lack of access to basic services (IPCC, 2007). In arid areas of China, the climate is characterized by unpredictable precipitation changes and frequent meteorological disasters such as drought (Piao et al., 2010; Zhai et al., 2010; Zhang, 2011). These characteristics directly influence the condition of the rangeland resources that are essential for livestock productivity and for the livelihoods of herders. Despite the frequent environmental fluctuations, such areas have supported livestock and the herders who require these herds for their survival for more than 1000 years (Fernandez-Gimenez and Le Febre, 2006). This is because local herders have developed a

profound understanding of their grassland ecosystem and how it sustains livestock production (Li and Li, 2012). Herders have gradually developed their own adaptations and adaptive capacity to cope with recurring droughts (Wang, 2006; Xie and Li, 2008).

However, these strategies and adaptive capacity have been adversely affected by institutional change. Specifically, since 1996, the government of China has implemented a program to privatize rangeland-use rights in the northwestern arid region of China. By ensuring the rights of herders to manage and to benefit from their own rangeland, this policy had two purposes: to stimulate enthusiasm for animal husbandry among herders and to mitigate the "Tragedy of the Commons" (Hardin, 1968). However, this policy drastically changed animal husbandry practices and herder livelihoods (Li et al., 2007), and traditional adaptive strategies that had sustained local herders for many centuries became difficult or impossible to implement. Some studies have shown that adaptation and adaptive capacity can be improved or constrained by government and other social institutions (e.g., Adger and Kelly, 1999), and the privatization policy provides a concrete example. Irrational policy choices and system failures (whether economic, social, institutional, or political) can decrease adaptive capacity and leave a system vulnerable to unexpected situations (Williamson

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et al., 2012). Therefore, in research on how to sustain adaptive capacity in the context of future climate change, it is important to identify improper or outdated institutions (Adger and Kelly, 1999).

Many researchers have discussed the concept of adaptive capacity and have tried to measure this factor (e.g., Eakin and Lemos, 2006; Engle and Lemos, 2010; Williamson et al., 2012). The most common method is to measure this capacity by assessing its determinants (Smit and Pilifosova, 2001; Adger et al., 2007), such as the availability of technology and the quality of basic infrastructures. However, under the influence of changes in current institutions, each determinant of adaptive capacity also changes. Research based on primary data and that was designed to reveal the changes that affect the adaptive capacity in a context of climate change is lacking. There has also been limited research (Coleman, 2011) on specific policies related to the role of property rights in defining adaptive capacity, which is alarming given the obvious importance of these policies and their effects on adaptation under future climate change (Agrawal, 2010; Coleman, 2011). To provide some of the missing information, we undertook a case study in an arid region of northwestern China to reveal the processes responsible for changes in the adaptive capacity of local herders against droughts under the influence of the government's privatization policy.

According to IPCC (2007) and Adger and Vincent (2005), adaptive capacity represents the sum of the resources and assets that are available to an actor to support their adaptation to some form of change. Based on the characteristics of our study area and the goal of our research, we have defined "adaptive capability" as the available resources that are actually used to adapt to a change, and have defined this term in the context of the resources, knowledge, skills, and assets available to herders and that are used to reduce losses of animals or of their production. Because we focus on the processes that have determined changes in their adaptation, we tried to answer two questions: (1) What were the traditional strategies and adaptive capability of herders before the privatization policy? (2) How did the privatization policy affect their strategies and adaptive capability? Our goals in answering these questions were to identify the underlying factors responsible for the observed changes and use them to help community managers develop an improved adaptive capability in the future.

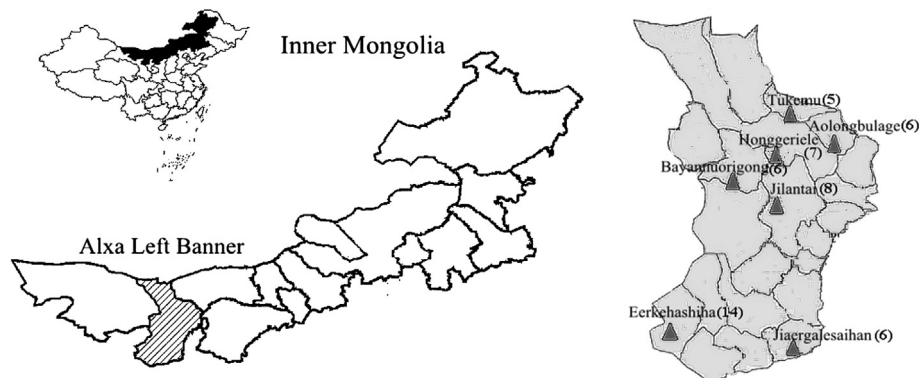
## 2. Study area

The Alxa Left Banner of northwestern China covers an area of 80,412 km<sup>2</sup> in the Alxa League of Inner Mongolia (Fig. 1). This region is very dry, with only 100 mm of annual precipitation and 3000 mm of annual evaporation; the average annual temperature is 7 °C, but

mean monthly temperatures range from a minimum of –13 °C in January to a maximum of 27 °C in July (China Meteorology Administration's National Climate Centre, unpublished data). The arid area includes the Tengger Desert and the Ulan Buh Desert, which cover 42.3% of the area (Alxa League Statistics Bureau, 2008). The eastern edge of the Alxa Left Banner includes the lower slopes of the Helan Mountains, which have higher precipitation and therefore provide important summer pastures. Because of the low precipitation, the main vegetation type is desert grassland composed of drought-tolerant vegetation such as *Reaumuria soongorica*, *Sal-sola passerina*, and *Haloxylon ammodendron* (Alxa League Chronicles Compilation Committee, 2000), as well as various species in the Chenopodiaceae. Traditionally, local herders were called "the people who live on the backs of camels", but most of them no longer raise camels and instead herd goats and sheep. Only a few herders who live nearest to the deserts still raise a small number of camels. In 2007, 14,727 herders still engaged in animal husbandry in the Alxa Left Banner (Alxa League Statistics Bureau, 2008).

Unpredictable precipitation changes and frequent drought are the most obvious characteristics of the local climate. Climate statistics obtained from the China Meteorology Administration's National Climate Centre from 1960 to 2010 (Fig. 2) show high interannual fluctuation in precipitation in the Alxa Left Banner. The maximum annual precipitation was 198.4 mm, and the minimum was only 37.5 mm. The coefficient of variation equaled 39.2%. Drought, which occurs when precipitation decreases below 80 mm, is common, occurring every 4 or 5 years. Overall, precipitation in the eastern part of the banner is greater than that in the western part, and rainfall in the southern part is greater than that in the northern part. In addition, some small wet areas have developed due to a combination of local precipitation and the terrain; the precipitation in these areas is relatively abundant even in a drought year (Liu, 1991).

Before privatization, most herders followed a traditional nomadic lifestyle, in which they moved from lowland areas during the winter to higher-elevation pastures during the summer. All of the land was owned by the government and shared among herders, and there was generally a high degree of cooperation in sharing pastures, both during years with sufficient rainfall and during years with severe drought. In a year with significant drought, herders were often required to travel considerable distances to reach areas of pasture that were capable of sustaining their herds. The privatization of rangeland-use rights in the Alxa Left Banner was carried out in 1996. Under this program, usage rights were distributed at the *sumu* level ("township" in the Mongolian Language) and the *gacha* level ("village"). The local government used the total area and total population of each *gacha* to calculate the per capita area of



**Fig. 1.** Location of the Alxa Left Banner in northern China. The Banner covers an area of 80,412 km<sup>2</sup>. Triangles represent the locations of the seven areas where we surveyed 52 households. The sample size at each location is presented in brackets. We conducted two or three detailed interviews at each location.

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