

Grassland Resource and its Situation in Inner Mongolia, China

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Abstract

The Inner Mongolia grassland is one of the most important grazing lands in China. It is also a main section of the Europe-Asia steppe. In recent years, due to over use and insufficient management, grassland degradation has become a significant problem. There are a number of factors constrain grassland resources in Inner Mongolia. Group effort and some effective measures had to be taken for a sustainable management of Inner Mongolian grassland resources.

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The Inner Mongolia Autonomous Region, along China's northern border, is a narrow strip of land sloping from northeast to southwest. It stretches 2,400 km from west to east and 1,700 km from north to south. As the third largest among China's Provinces and Autonomous Regions, it covers an area of 1.18 million km², or 12.3% of the country's territory. It has eight Provinces and Autonomous Regions as neighbors to the south, east and west, and Mongolia and Russia in the north, with a border of 4,200 km. Inner Mongolia has large area of plateau landforms, mostly over 1,000 m above sea level, including the Inner Mongolia Plateau (the second largest among the four major plateaus in China), Ordos Plateau, etc.

Inner Mongolia has 72.2 million ha of cultivated land, or 6.11% of the region's total, and 186.7 million ha of forests, 15.8 % of the region's total. The 788.8 million ha area of grassland is the largest land form in Inner Mongolia, covering 67% of its total territory area and comprising more than 20% of China's total grassland (see Figure 1). A significant proportion of Inner Mongolia is desert or semi-desert. The Inner Mongolia grassland has significant tracts of land used for a number of purposes such as livestock grazing, wildlife habitat, recreation, as well as natural areas and watersheds. Most types of grassland in China can be found in Inner Mongolia. Approximately 35% is typical steppe, 21% desert steppe, 10% meadow steppe, 10% as the ecotone of desert to grassland, 6.8% as the transition area of grassland to desert, and 11% as lowland meadow.

Three major zonal grassland categories, i.e., meadow steppe, typical (dry) steppe and desert steppe are distributed along the northeast to the southwest in Inner Mongolia (Table 1). Other types of grassland such as shrub steppe and sandy land vegetation are among the vast land territory of the region. More than 2,000 plant species and over 600 animal species have been found in the Inner Mongolia grassland.

Inner Mongolia is the grassland research center in China as it has the earliest and best-preserved national natural grassland reserve. Grasslands are an extremely valuable resource to the agricultural industry and provide a significant percentage of forage for the 9.2 million live stockings. It also yields a wide variety of important environmental, social and economic values.

Situation and trends

Grassland is the birthplace of Mongolia ethnic minorities and their colorful cultures in China. It is also one of the most important agricultural resources in Inner Mongolia. There have been about 250 million livestock raised in the past decades, but in recent years, because of grassland degradation, we are facing extreme environmental, ecological and social changes and challenges.

(Grassland degradation and land desertification)

Nowadays, the total area of degraded grasslands in Inner Mongolia has increased to 25 million ha, covering 39.2% of the total useable grasslands. There are about 0.083 million ha of grassland deteriorated every year.

Field survey showed that from 60's to 90's, the total forage yield of the meadow steppe in Xilinhaote decreased about 54-70%; the typical steppe yield has decreased 30-40%; and the desert steppe yield has decreased 50%. In degradation areas, perennial grasses and legumes decreased dramatically, while poisonous and harmful plants increased. Vegetation coverage, forage yield, community height all decreased (Table 2).

China is a country of large physical size, larger distribution areas, and a serious danger of desertification. Land desertification reaches 18 Provinces (Autonomous Regions), with about 0.4 billion people affected by it. The

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Figure 1. Typical landscapes of grasslands in Inner Mongolia.
 (A) cattle grazing on a typical steppe, (B) sheep grazing near a riverside,
 (C) wetland in grassland area, (D) high biodiversity in grassland.

Table 1. Ecological differences among three steppe regions in Inner Mongolia

	Meadow Steppe	Typical Steppe	Desert Steppe
Annual Precipitation (mm)	350 - 500	280 - 400	250 - 310
Humidity Coefficient*	0.6 - 1.0	0.3 - 0.6	0.13 - 0.3
Zonal Soils	black chestnut	chestnut	brown chestnut
Organic Matter	(3.5 - 6%)	(1.5 - 4.5%)	(1.0 - 1.8%)
Forage Yield (kg/ha)	1500 - 2500	800 - 1000	200

* Ratio of precipitation to potential evaporation

Table 2. Comparison of plant community characteristics in a degraded typical steppe

Plant community characteristics	Normal	Light Degraded	Moderate Degraded	Heavy Degraded
Total no. of perennial plants (bunch/m ²)	19	15	16	8
Total no. of annual plants (bunch/m ²)	1	4	5	7
Total coverage (%)	35	30	26	12
Mean community height (cm)	18	13	11	5
Total forage yield (kg/ha)	901	627	430	88

annual economic loss is around 54.1 billion RMB. Inner Mongolia is one of the most seriously desertified Provinces (Autonomous Regions). Located in an arid inland region, Inner Mongolia is one of the areas most seriously affected by desertification. Total desertification areas cover about 6.5 million km², which is 25.2% of the country's desertified areas

and 56.9% of its total land area. Among the desertified land, about 106.6 million ha developed in the last 30 years, with an extended rate of 33.4 million ha every year. Within a total of 88 counties (banners), 67 of them have a land desertification problem. For example, the total degraded and desertified land in Ordos Plateau is estimated to be 74.3 million ha, covering

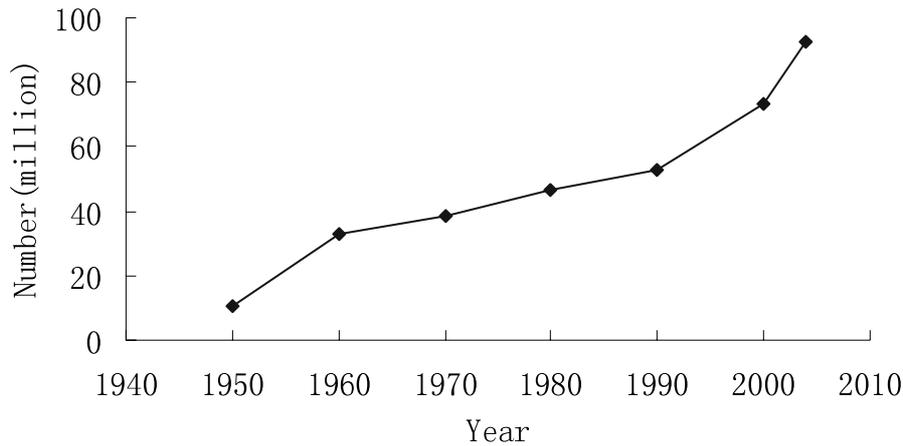


Figure 2. Changing of live stocking number during the past 50 years.

86% of its total land area.

The area of desert and latent desert, estimated to be 21.8 million ha, covers 18.5% of the total Inner Mongolia's land. Accelerated desertification was noted to occur within the last 30 years, thus enlarging the desert area by 0.33 ha annually and causing more sandstorms. Generally speaking, grassland degradation results from the cumulative effects of many factors. The main cause of grassland degradation is firmly recognized to be overgrazing (animal number in Inner Mongolia is doubled during the past 50 years, see Figure 2) and man-made destruction of vegetation (broken up grassland under cultivation, harvesting of medical plants, road construction, etc.).

(Soil erosion)

Most of Inner Mongolia is arid, with a thin soil layer, low amount of soil fertilizer and low precipitation, leading to a serious soil erosion problem. Statistics show that about 60% of its land is threatened by wind erosion, grassland degradation and soil erosion. The erosion area encompasses 2.7 million ha, covering 23.0% of its total area and 21.5% of its grassland area. The main erosion areas are Chifeng City, Xing'an League, Hohhot City, Baotou City, Ordos City, etc., with erosion accounting for more than 70% of their total area. Soil erosion leads to soil organic matter loss and decreasing soil fertilizer levels. For instance, in Zhunge'er Banner, Ordos City, the organic matter lost amounts to 1,500 tons every year, and the organic matter content is lower than 1% in most of those lands.

(Climate change)

The climate of Inner Mongolia is getting drier and windier. Studies showed that from 1951 to 1987, there was 2.5 times severe drought, 4.5 times drought and 1.5 times snow disaster within 10 years. The extreme drought during 1999 to 2001 almost ruined the native grassland. The average annual precipitation of Etoke Banner, which is located in western Inner Mongolia, was lower than that of the average (266.41

mm) within the 5 years between 1997-2001. The distribution pattern of rain also changed, declining in the spring. During the past decades, the average amount of precipitation has decreased, while the average temperature has increased (e.g. the Haila'er and Xilinhaote areas increased 1.4°C, Dongsheng increased 1.1°C).

(Grassland eco-environment degradation, rat and insect damage increasing)

The grassland is a relatively fragile ecosystem, and due to long term over-use, the eco-environment is getting worse. It is apparently shown not only in land degradation, desertification, and sand storm increases, but also in the fact that many rivers and lakes dry out, and some inland rivers get shorter.

Due to grassland deterioration, desertification, and eco-environment degradation, many wildlife species had to immigrate to other area or become extinct. In the 1950's, there are about 50 million wild goats living in the grassland areas, but only 0.3 million are left now. Other wildlife like the leopard and camel are extinct in the area. The numbers of swans, eagles, geese, and owls are decreasing sharply. Based on investigations in the 1950's, there was one eagle, or owl in 5-7 km², which kept the rats at a reasonable number, but no eagles and owls could be found in 100 km² in the 1980's. Because the number of native predators has decreased, rodents have become a big problem in some of the grassland areas, which results in an accelerated deterioration of the eco-environment. At the same time, pest, especially grasshoppers occurs more often than before. From 1980 to 1996, the total grassland area damaged by rodents increased to 50 million ha, and pest damaged area rose to 16 million ha.

Constraints to Grassland Resources

Census shows the total grassland area in Inner Mongolia is 749.1 million ha at 2003, which is about 38.8million ha narrower than that in 1980's, and 100 ha narrower than that

of 1960's. A number of factors constrain grassland resources in Inner Mongolia as shown below.

- a) General grassland resource management for livestock grazing remains a key issue. Drought conditions of the last decade, and man-made drought, which comes with overgrazing, has brought home to the need for better grassland management of province-wide.
- b) Traditional grazing management (monadic grazing) frequently brings severe degradation to certain areas (water sites, around villages).
- c) In both of national and provincial levels, we lack an overall system of monitoring and reporting grassland conditions.
- d) There are limited agency resources to gather reliable information to manage the grassland objectively.
- e) Existing grazing policies (forbidden grazing, deferred grazing in the spring, etc.) may not reflect the complexity of demands now present on the grassland.
- f) The style of traditional animal husbandry often leads to seasonal overgrazing, and there is a lack of incentives for adopting grazing strategies, which promote multiple-use benefits.

Conclusion

Inner Mongolian Grassland is a comprehend system involving nature, society, economy, culture, *etc.* All these components depend on each other and condition each other. Nowadays, there is an imbalance of relations among components in the system that results in contradiction between animal husbandry and environment protection in Inner Mongolia. Sustained development of animal husbandry in grassland depends on forage source and good ecological environment, depends on coordination between production and ecological function, and depends on social ability of macro-control and macro-regulation, and so on. Hence, the sustainable development of Inner Mongolian grassland resources will require the commitment and involvement of all stakeholders, governmental organizations at all levels,

producers, related associations and organizations, the academic and scientific communities, and so on. In order to promote grassland production and environmentally sustainable development in Inner Mongolia Autonomous Region, we must begin by doing a good job on the basics, especially in improving our knowledge and application of the fundamental principles and practices of grassland management. Next, some strategies such as publication of basic ecological knowledge, stipulating appropriate stocking rate, and reclamation of degraded rangelands, etc. must be taken as soon as possible.

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