

The Assessment of Land Resource Conservation and Utilisation in Source Regions of the Yangtze, Yellow, and Lantsang Rivers

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INTRODUCTION

This paper analyses the status of land resource use in the source regions of the Yangtze, Yellow, and Lantsang rivers in Qinghai and argues that priority should be given to protecting and enhancing the efficiency of grassland use. It examines the fact that the potential for intensive use of land resources is very small. The paper looks at the factors causing degeneration of grassland and the main land types, beginning with a general description of the study area, and it puts forward a series of recommendations for using grassland in a sustainable and rational manner.

The general situation in the study area

District coverage

The source regions of the Yangtze, Yellow, and Landsang rivers lie at 89°24' to 102°41' E and 31°39' to 6°16' N. They cover the hinterland of the Tibetan plateau, where the average elevation varies from 3,450 to 6,621m; and include 24 counties-which include Yushu(except Kekexili), Guoluo, Huangnan, Hainan (part of Gonghe county), Xunhua county and Hualong county in Haidong region and one village(i.e., Tanggula village of Ge'ermu). The area of the drainage basin in Qinghai is 31.8190×10^4 km²- 44% of the total area of Qinghai.

Natural environment

Since this region is in the interior of the Tibetan plateau, it has a plateau climate, i.e., cold, dry and windy, with strong radiation. The yearly average air temperature ranges from -6.0°C to 4.0°C ,and the annual average precipitation is about 300mm. Soil types include alpine tundra

soil, alpine meadow soil, and alpine pasture soil. Given that the soil formed over a short duration, the soil layer is thin and has poor chemical properties and strong physical variations, so it is difficult to restore the constituents of the soil once destroyed. The vegetation types in source regions from southeast to northwest are mountain forestry, alpine shrub and shrubbery, alpine meadow, alpine grassland, and alpine scree vegetation. Alpine grassland, which is the dominant vegetation type in the region, will be discussed in this paper.

Basic characteristics and main problems about soil use

Basic characteristics of land use

There are 173,100 ha of cultivated land (including garden land) in this region, accounting for 0.57% of the total area, and this land is mainly to be found in Xunhua, Hualong, Guide, and Jianza counties. Forests are mainly to be found in southeast Huangnan and Guoluo and south of Yushu, and the area they cover is 1,229,500 ha, which is 3.8% of the total area. The area covered by water is 1,372,200 ha or 3.95% of the total area. What is more, an area of 4,009,000 ha is bare as it is covered by glaciers, jokul (snow/ice-covered mountains), desert, and so on, which covers 11.04% of the total area.

In this area, the status of land use generally coincides with the characteristics of the soil. On all types of land, the area of grassland is much more than that of forestry and farmland. According to the records, in 1998, the grass land area accounted for 251,681.3 sq.km., covering 79.1% of the total area of the source region of the three rivers, 212,248 sq.km. of which is usable or 84.33% of the total grass land (Table 1). This determines the orientation of animal husbandry development in the source region. The area of swamp, glacier, and jokul accounts for above 80% of the total area of unusable lands that are difficult to exploit, so the potential available land resources are limited.

Table 1: Area of grassland in the source regions of the Yangtze, Yellow, and Lantsang rivers in 1998

Unit: km²

Land area	Grassland area	Available grassland area	Percentage of grassland (%)	Percentage of available grassland (%)
318190	251681.3	212248	79.1	84.33

Source: Qinghai Bureau of Statistics. Flare Data during 50 years. Beijing: China Statistics Press, 1999

Grassland resources and main problems

The key factors leading to grassland degeneration in source regions of the Yangtze, Yellow, and Lantsang rivers contain natural factors and human factors. The climate is dry and chilly; the growth period for grass is short, which confines vegetation growth making it lower, sparser, and even withered. Humans tend to overuse the grasslands, which accelerates the trend of grassland degradation. Overgrazing restrains the growth of root, stem, and leaf of edible grass to a significant degree. Thus, the height, cover area, and growth speed decline sharply, and the grass quality is reduced annually, which not only influences grassland productivity but also produces a large amount of noxious grasses and weeds that occupy space and provide spaces for rodents. The rampant activity of rodents results in great damage to the feeble soil structure and withering of grass. The bare surface soil is carried away by wind converting the cold meadows to deserts. It is reported that the grassland area of upwards of moderately degraded resources is 10,323,000 ha (35% of the total area), among which the black soil type covers more than 2,000,000 ha. Compared the 1950s, the yield of pasture per unit area has decreased by 30 to 70%. The construction of grass community and variety has changed and the degradation of palatable forage grasses has resulted in the loss of grazing. For example, from 1988 to 1998, while the area of grassland and the available grassland in the whole region increased by 1,961,600 ha and 105,300 ha (Table 2), the use efficiency declined by 5.7%. The basic reason is the degradation of the quality of grassland.

Table 2: Changes in grassland in the source regions of the Yangtze, Yellow and Lantsang rivers in 1988-1998

Unit: 10⁴ hm²

Year	Grassland area	Available grassland area	Availability ratio
1998	2516.81	2122.48	84.3%
1988	2320.65	2111.95	91%

Black soil type degraded grassland

The degradation of grassland in this area, especially the formation of the black soil type is due to both natural and biological factors. The natural factors include wind and water erosion, frequent freezing and melting of grassland, and a warmer and drier climate, amongst others. The biological factors consist of seasonal overgrazing over prolonged periods, damage due to rodents, excessive reclamation, and aging of fields, amongst others. Overgrazing is the main reason for the grassland's ecological unbalance and the degradation and the formation of black

soil types over vast areas. There are 3,333,000 ha of black soil type degraded grassland in Qinghai, and this is mainly distributed in the source regions of the Yangtze, Yellow, and Lantsang rivers, namely, in Yushu and Guoluo as well as in Zeku county. There are 33,000 ha of black soil type grassland in Zeku county, among which the moderately degraded accounts for 48.02%. Guoluo has 1,234,000 ha of black soil type grassland, accounting for 37% of the whole black soil type (Table 3). In Guoluo, this type mainly occurs in Maduo and Dari counties, accounting for 51.39 and 32.97% of the whole degraded grassland. In Maduo and Dari counties, where grassland degradation is very serious, damage caused by rodents is very severe, accounting for 52.02 and 20.25% of the entire area damaged by rodents.

Table 3: Status of degraded grassland in Guoluo Canton

Unit: 10⁴ ha

County	Black sandy degraded grassland area	Area damaged by rodents and insects					
		Total	Rodent damaged area	Rodent appearance area	Insect pest area	Insect appearance area	Intermix area of rodents and insects
Maduo	63.41	128.81	121.29	4.75	/	/	2.27
Maqin	7.25	28.38	22.61	0.43	0.57	/	4.77
Gande	8.05	22.27	19.48	0.16	/	/	2.63
Dari	40.69	50.13	44.24	1.65	/	/	4.24
Jiuzhi	1.76	11.11	6.4	0.46	/	0.04	4.21
Banma	2.24	6.9	5.9	1.0	/	/	/
Total	123.40	247.60	219.92	8.45	0.57	0.04	18.62

Desertified grassland

Desertified grassland in the source regions of the Yangtze Yellow, and Lantsang rivers is mainly distributed in farming and pastoral areas, and the condition in Gonghe County is the most serious and typical (Table 4). The total area of desertified grassland in Gonghe and Guinan is 1,267,000 ha, accounting for about 29% of Hainan. The main types of degradation are *Achnatherum splendens*, *Orinus thoroldii*, *Stipa purpurascens*, and *Iris lactea var.chinensis*. The area of degraded grassland in Gonghe is 506,000 ha or about 39.3% of the county's grassland, among which lightly degraded grassland covers 63,800 ha, accounting for 12.61%; moderately degraded grassland covers 412,200 ha, accounting for 81.47%; and heavily degraded grassland covers 30,000 ha accounting for 5.92%. The degradation of grassland results in the decline of productivity (Table 5). The production of *Achnatherum splendens* has decreased by 45.8%, and the overgrazing is serious.

Table 4 : Status of degraded grassland in the main regions in Hainan Canton

Unit: 10⁴ ha, 10⁴kg, 10⁴head

County	Grassland area	Degraded grassland area								Percentage of Degenerative grassland %	Pasture loss	Livestock capacity decline (goat)
		Total	Lightly degraded		Moderately degraded		Heavily degraded					
		Area 10 ⁴ hm ²	Area 10 ⁴ hm ²	%	Area 10 ⁴ hm ²	%	Area 10 ⁴ hm ²	%				
Tongde	47.5	21.8	18.1	82.89	0.6	2.68	3.2	14.43	45.95	36839.90	25.23	
Xinghai	106.2	39.1	20.9	53.42	8	20.56	10.2	26.02	36.82	57048.30	39.07	
Guinan	57.4	28.6	15.8	55.33	10.8	37.69	2	6.98	49.82	43008.52	29.46	
Gonghe	128.8	50.6	6.4	12.61	41.2	81.47	3	5.92	39.28	87590.84	59.99	

Source: Statistical data of Hainan canton

Table 5: Change in productivity of grassland in Gonghe

Unit: kg/ha

Site	Grassland types	Average in 1974	Average in 1982	Percentage of decline in production (%)
Gonghe	<i>Achnatherum splendens</i> Pasture on bottomland	3060.0	1657.5	—45.8
	<i>Orinus thoroldii</i> Pasture on bottomland	1782.0	1210.5	—32.1
	<i>Kobresia capillifolia</i> Pasture	2955.0	1893.0	—35.9
	<i>Kobresia pygmaea</i> Pasture	2655.0	1834.5	—30.9
	<i>Iris lactea var. chinensis</i> Pasture	5985.0	4348.5	—27.3

Source: Shi and Wang 1994

Poisonous and weedy grassland

This pattern of degradation happens to all kinds of grasslands and in all kinds of climate conditions. The degradation process from the grassland from good quality to poisonous and weedy, mainly, *Achnatherum inebrians*, *Oxytropis glabra*, and *Ligularia virgaurea*, decreases the ratio of availability of grassland and does great harm to livestock. Other factors include the over-exploitation by humans and the rampant activity of rodents.

Improving use and sustainability of grasslands

Management of grazing capacity

Grassland degradation is accelerated by overgrazing, especially in the regions where there is desertification. It is necessary to control the numbers of livestock according to the grass available in different seasons so that the grazing capacity of grassland is not exceeded.

Grassland restoration

Productivity and quality of grasslands can be improved through reseedling with grass species that are suitable for the natural environment and require little or no soil disturbance. This should be aimed at conserving local species, increasing grass varieties, improving grass quality and productivity, and preventing the grassland from desertification.

The most efficient measure for recovering and improving degraded natural grassland is by enclosing and closing pastures in the degraded areas. Enclosing facilities can benefit forage growth, allow seeds to mature and reseed, and improve vegetation varieties and the productivity and quality of grassland. Examples can be cited of the biomass of *Kobresia* meadow in a semi-enclosed situation for three years increasing by 44.41%, the edible grass increased to 78%, the non-edible grass decreased to 22%.

Rotational grazing

Rotational grazing can increase grazing capacity by 10~20%, because the intake rate of livestock is much higher, the vegetable composition of forage is raised, the productivity and quality enhanced, the management improved, labour saved and labour intensity lowered, and reseedling and fertilization is enabled and weeds cleared in the rotational grazing areas at the same time. One of the measures for reasonable use of grasslands is to choose livestock according to the different kinds of pasture and promote rotational grazing according to the season.

Enhancing grassland management

The black soil type degradation trend can be managed through timely control. At the same time, the spread of rodent damage can be prevented through carrying out biotic control methods. Biological control and biological synthetic products, for example, type C which is environmentally friendly as well as non-toxic to livestock and human beings. What is more, it produces less contaminants in the ecological system. The method has been used widely in Qinghai province and in the other northern provinces of China, and it has resulted in the average fatal rate of type C reaching more than 90%. In the source regions of the Yangtze, Yellow, and Lantsang rivers, type C should be chosen to kill rodents efficiently and safely.

Context-specific models

In the source regions of the three rivers, different areas must choose different uses and protection patterns for grasslands according to their

different natural, social, and economic conditions. Dividing the source region into farming areas and pastures and better protection patterns could be put into practice in these three areas.

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Chapter 15

Experiences of Aid Agencies in the TAR Shared at the Round Table Meeting

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INTRODUCTION

The Round Table Meeting (RTM) was held so that various development and aid agencies working in Tibet could share their experiences. It was moderated by Dr. Nyima Tashi, Vice-President of TAAAS, and attended by representatives from the Bridge Foundation, Canadian International Development Assistance (CIDA), EU (European Union), The Mountain Institute(TMI), The Swiss Red Cross, the Tibet Poverty Alleviation Fund, and World Concern. The organisations were involved in a wide range of socioeconomic development programmes in Tibet, including rural development, education, and health services. The participants were asked to share their experiences and the major challenges they faced in implementing their activities in the field. The RTM was conducted in an open session which provided the representatives with an opportunity to respond to questions from the other participants at the Conference.

Development planning, approach, and strategy

The participants stated that the examples of agricultural development, from Himachal Pradesh, India, and of integrated rural development from Pakistan are relevant for TAR. They emphasised that community mobilisation and institution building were fundamental prerequisites for sustainable development and lauded the approach of the Aga Khan Rural Support Programme (AKRSP), Pakistan, in addressing gender issues by including education for women. There was general agreement that educating women must be given high priority since "an educated mother will educate the whole family."

The participants at the RTM also acknowledged that cultural dimensions needed to be considered from the inception of development programmes