The Current Situation of Grassland Resources in Mongolia

Ganbold JIGMED

(Received December 28, 2005)

Bull.Facul.Agric.Niigata Univ., 58(2):133-136, 2006

Key words : conservation, desertification, grassland, Mongolia, resource

Mongolia stretches across Central Asia and occupies an area of 1.6 million km^2 of mountains, steppes and deserts. The country locates between 87^{0}41' and 119^{0}56' of the eastern longitude and 41^{0}35' and 52^{0}09' of the northern latitude. Mongolia is landlocked country between Russia and China, and has no access to the sea. Mongolia extends 2,400 km from the Altai mountain range in the west to the Great Khingan Mountains in the east, and for 1,260 km from the Great Sayan Mountains in the north to Orvog Gashuun Hill in the Southern Gobi.

Although famous for its seemingly endless expanses of steppe, Mongolia is a mountainous country with almost 80% of its territory located at an elevation of 1,000 m or more above sea level. The average elevation is 1,580 m a.s.l. with the highest peak of Tavan Bogd (4,374 m) and the lowest basin of Khuh Lake Hollow (560 m). Mongolia is surrounded by the eastern and western Alpine Ranges; Great Sayan, Buteel and Khentei mountains in the north, Great Khingan Mountains in the east, Mongolian Altai and Gobi-Altai Ranges in the south-east and south, Khan Khuhii and Khangai Mountains in the west and the Gobi Desert in the south. As shown in Table 1, the territory of Mongolia is divided into six natural zones (alpine, taiga, wooded steppe, steppe, desert-steppe and desert) with markedly different terrain, climate, flora and fauna.

Grassland resources and meadows of Mongolia

Mongolia is an agricultural country. Mongolia's grassland consists of 2,823 species with 564 vegetation types and 128 families of plants (Gubanov, 1996). Totally, there are 2,823 species of vascular plants belonging to 662 genera in 128 families, 417 species of mosses belonging to 162 genera in 32 families, and 930 lichen species belonging to 133 genera and 39 families. 875 species in 136 genera and 28 families of fungi, and 971 species in 221 genera and 60 families of algae have been also found in Mongolia, so far (Table 2). While the big trees usually dominate the mountain taiga region, they lose their position in the transitional zones, and gradually disappear towards the steppe, desert steppe and desert

Table 1. Principal characteristics of the vegetation zones of Mongolia

Vegetation zones	Land area (1,000 km^2)	Land area Ratio (%)	Precipitation (mm)	Accumulated temp. above 10℃	Growing period (days)
Alpine zone	7,018	4.5	400-500	<1500	60-70
Taiga	6,094	3.9	300-400	1500-1700	65-90
Forest steppe	36,468	23.3	200-300	1700-2000	90-112
Steppe	40,510	25.9	125-200	2000-2500	112-125
Desert steppe	34,338	21.9	100-125	2500-3000	125-130
Desert	24,030	15.3	<100	>3000	>130

Table 2. Composition of vascular and lower plants

Classification	Family	Genera	Species
Vascular plants	128	662	2823
Moss	59	191	445
Lichen	53	175	930
Fungi	28	136	900
Algae	76	221	1236

Department of Plant Technology, School of Agrobiology, Mongolian State University of Agriculture, Ulaanbaatar, Mongolia
gan@msua.edu.mn

zones; shrubs and dwarf shrubs form isolated communities or mixed communities, together with other plant species common in those regions.

Mongolian flora has 845 species of plants which are used in medicine, over 1,000 species for fodder, 173 for food, 64 for industry, 489 decorative species and 195 for other purposes (Figure 1, 2). Also, there are 1,150 vitamin rich species, over 200 species which aid in fermentation, 281 species with high alkaloid content, 231 species with flavonoids, 65 species with coumarin, and 68 species with soil restoration properties. In this country, there are 547 species of honey-bearing plants (belonging to 190 genera and 53 families) including 23 woody plant species, 72 shrub-like species and 450 grass species. About 600 species can be used as forage. About 80% or 126 million ha of the total land is grassland and 2 million ha are hay land. Grasslands and meadows supply almost all of the needed forage for livestock production. The livestock get about 98% of its total feed consumption from grassland pastures. The carrying capacity of Mongolia's grassland is about 60-76 million head of sheep. Summer and autumn seasonal grasslands are sufficient; however, winter and spring grasslands are scarce. Periodic droughty in spring and summer affects several provinces of entire country, followed by harsh winters can kill millions of livestock.

Traditional use of grassland

Livestock rearing, using transhumant production system, is the main land use, and principal source of livelihood in vast areas of the semi-arid and arid zones of Asia; indeed, it is probably the only way of exploiting these seasonal pastures the nomadic people occupy. A major constraint for improving livestock production and family incomes is lack of feed during winter and early spring period, which is of extremely low temperatures, and during when breeding stock are pregnant and most vulnerable.

The grazing cycle is the most montaged one, depending on the four main seasonal pastoral zones in Mongolia (Table 3). ***A zone of alpine snow and rock***, which locates above the summer pastures, is of little use for grazing; the snow line is at about 3,500 meters. These pasturelands are usually found in the north and western regions of Mongolia. ***Summer grazing lands***, locating above 1,300 m provide rich grazing for about three months per year. These are the fattening pastures and about 50% of the total pastureland of Mongolia, and are probably capable of carrying more stock. ***Spring and autumn pastures*** are the transition routes, which are heavily grazed twice a year, largely owing to a lack of winter-feed. These transitory grazing areas in spring and autumn are also subjected to very high stocking pressures, as herds are forced to leave their winter grazing areas early, and remain as long as possible in the autumn. ***Winter pastures*** consist of desert plains, low meadows and marshlands, which are totally inadequate for the number of stock carried. Desert pastures is only utilized when there is snow for drinking needs.

Different part of the country has different grazing cycle in order to manage grassland effectively. To avoid grassland degradation, overgrazing, and exceeding the capacity, we

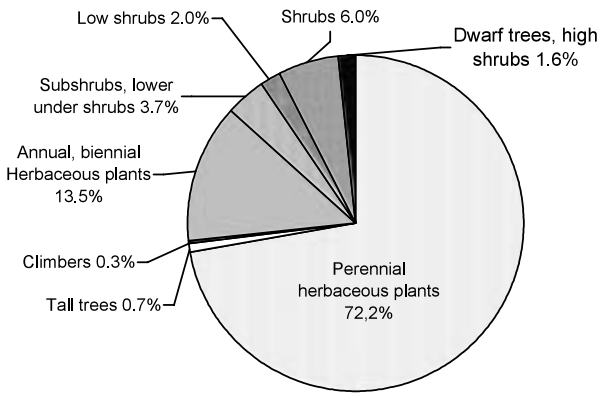

Figure 1. Life forms of plants in Mongolia

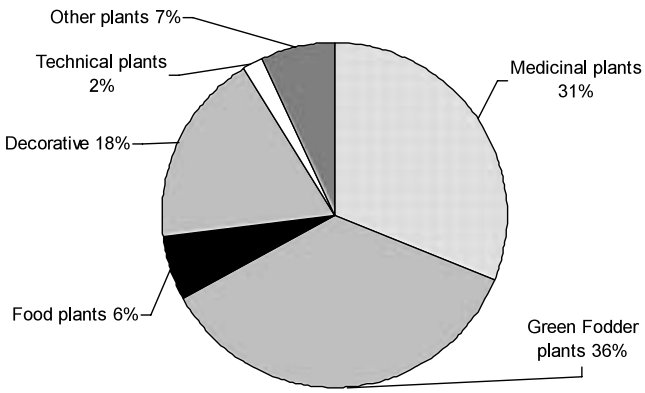

Figure 2. Plant resources in Mongolia

Table 3. Grassland resources in Mongolia

Vegetation zones	Grassland area (1,000 ha)	Grazing capacity ha/ sheep head	Feeding capacity
High mountain	5.7	1.4	—
Forest steppe	28.8	1.6	5-7
Steppe	35.2	2.2	2-4
Desert steppe	35.6	4.0	1-2
Desert	20.4	1.6	2-3

Table 4. Degraded grassland (1000ha)

Area of degraded grassland	Percentage in total grassland (%)	Area in different degradation level	
		heavy	moderate
8595	7.3	3501	5094

have to have good management, land classification and land use policy. In case of Mongolia, rangeland management remains one of the most controversial issues facing livestock. Before 1994, the output of annual forage production sector was 500-700 thousand tones. But, in 2004 only 5.1 thousand ha out of 201 thousand ha of cropping area were sown for fodder crops and harvested 9.6 thousand tones fodder. Due to the disintegration of centralized forage system during the last 12 years of transition period to a free market economy, the country lost 11.2 million head of livestock during the winter-spring of 2000-2001 and 2001-2002.

Problems and challenges

The grassland degradation and desertification has increased, and the same time the vegetation yield and species composition in pasture have continuously reduced in the different zones and different pasture types in Mongolia. The natural or mainly climatic and anthropogenic factors such as global warming and increased impact of humans and livestock are affecting these phenomena (Figure 3). Intensified desertification during past 58 years in Mongolia is characterized by vegetation cover degradation, movement of wild life, sand shift, yellow sand frequency, soil erosion and many combined other factors. The grassland degradation caused by climatic factors is intensifying in the central and western part of eastern regions and the Govi desert of Mongolia.

The meteorological dynamics in air temperature and precipitation show that winter season has been getting warmer and summer has been getting drier during the last 60 years in Mongolia. The tendency will be kept further in the future according to the assessment. As scientists consider, the air temperature of Mongolia has increased by 0.7 ℃ because of the global warming. Apart from this, droughts covering 25% of the national territory happens once in 2-3 years, and more severe droughts that encompass over 50% of the national territory happen every 4-5 years. Compared to 1960s, the number of windy days in vast steppes and Gobi regions has increased by almost 4 times. As a consequence of the climatic changes, the degradation process has intensively taken place resulting in dried up lakes and rivers, significant degradation of pastureland vegetation, intensified sand movement and so on.

There are mainly multilateral activities carried out by human beings, for instance, overuse of pasturelands, enormous consumption of bushes, trees, and plants for fuels, creating off-roads, loosening soils by mining, etc., causing soil erosion in agricultural lands. Livestock husbandry predominates in the agricultural sector of Mongolia and domestic animals are valuable resources consumed by most people throughout the year. Today, due to lack of rotational use of grasslands, the country encounters overgrazing problems (about 30% of the national territory are overgrazed) and the herbage production of pastures has decreased by 19-24% (per ha). Nearly 50% (561,400 ha) of the

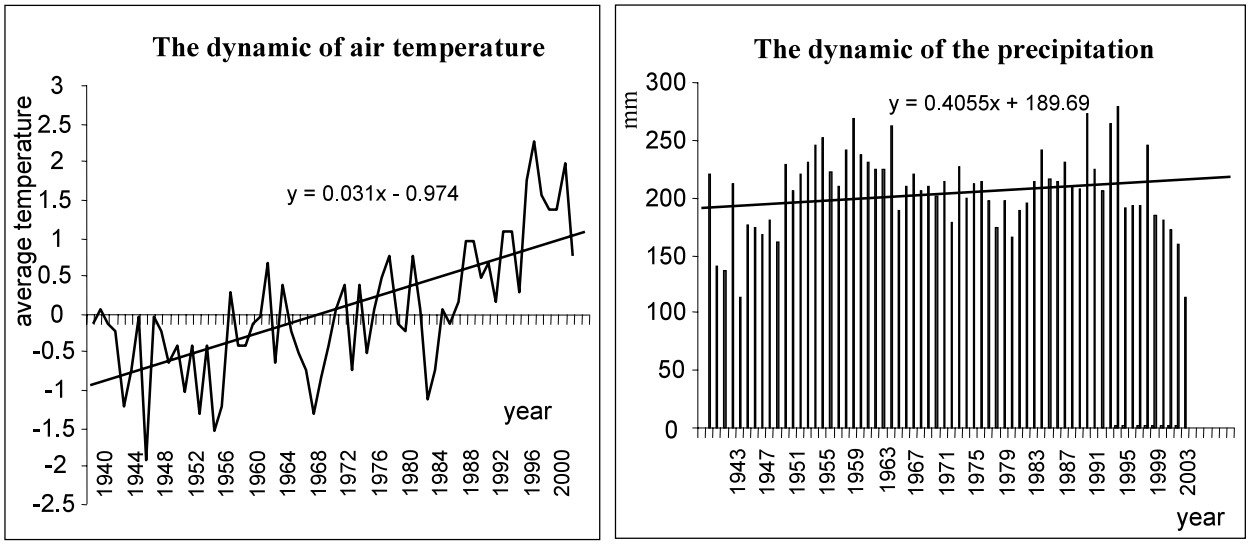

Figure 3. The dynamics of annual air temperature and precipitation in Mongolia (1940-2003)

total arable land is undergoing deterioration and soil erosion, ca. 13% of which is already heavily damaged. During the past 40 years, the size of sand-covered area of Mongolia has been extended further with another 38,000 ha (88% in Gobi region and 12% in the northern part of the country).

In last 10 years between 1990-2000, the dried area in Mongolian territory has been increased by 3.4%, severely deserted area increased by 5.4 times, and very severely deserted area increased by 1.8 times. Almost half of Mongolia's grassland is getting less utilized because of the lack of water. Mongolians are moving from remote areas (especially in the west: Uvs, Khovdo, Gobi-Altai and Zavkhan Provinces) to urban areas. The tendency has increased overgrazing and threatens the grassland carrying capacity and ecological equilibrium. According to the statistics, more than 70% of soil cover of all land has been more or less on the process of erosion, and at least 8.6 million ha has suffered from overgrazing.

This situation will have serious consequence, and lead to increased desertification of the more highly populated areas. Therefore, there is a critical need for grassland pasture recovery and regeneration. Some research result shows that 79% of the pastureland soil is eroded. This includes 14% of erosion by water, 59% by water-wind, and 5% by wind. Besides, sandy loams just contain 22% of silt in the depth of 0-10cm and 23% in the 10-20 cm depth, whereas 25% in the depth of 20-30 cm. These numbers show that the decreased quantity of silt in the ground surface soil and the most grassland soils are sensitive to wind erosion.

In addition, with the reduction of plant species number in pasture, there are also changes of species composition from useful plants to livestock to less useful ones. In severely grazed needle grass-forbs pasture, the species composition has reduced 2-4 times, and average height reduced 10 times and composition of not-preferable plants have increased by 3 times compared to ungrazed pasture of the same type.

The recent activities on grassland improvement

It is indispensable to elaborate and implement the extensive strategy being oriented both towards eliminating natural and human impacts and preventing scarcity of natural resources with the purpose of limiting the degradation process. Orientations and policies on combating against grassland degradation should aim first of all for reducing the degradation of Mongolian ecosystems, eliminating its causes, and consequently avoiding the danger of natural desertification and reducing its adverse impacts.

There are number of researches and development programs for conservation, and improvement of grassland resources have been implemented covering different aspects of this area in Mongolia. As a part of grassland improvement program, the Mongolian State University of Agriculture (MSUA) and its affiliated research institutes conduct a number of research activities on grassland exploration, management and improvement jointly with international agencies and colleagues from other countries. During 1994, 1996 and 1998, a total of 1,473 seed collections of grassland plant species were made from 4 geographic districts throughout Mongolia through the joint collection mission between USDA-FAS and MSUA. These collections were evaluated under both natural rain fed and irrigated conditions at three sites in Mongolia. The results from these evaluations play significant role in grassland vegetation recovery in Mongolia.

In 2003-2004, under the TACIS program of European Union, the perennial fodder plant species belonging to 9 species from various European countries and Canada were studied. As a result, the *Elymus sibiricus*, *Medicago Falcata* from Russia and *Elymus dahuricus* from Inner Mongolia showed high drought resistance and over wintering capacity. In 2004, we started a new program on over seeding and recovering perennial grassland under the technical cooperation program "Green gold" of the Government of Switzerland. In 2005, the seed multiplication plot in 10 ha was established at MSUA experimental farm in Bornuur. At present, over 10 perennial forage grasses and legume species are planted and studied at this plot.

REFERENCES

Dash, D. 2000. Some Problems of Landscape and Ecology of Mongolia. UB.

David and Charles, 1974. Recreational Geography. London.

Tsegmid, Sh. 1969. Physical Geography of Mongolia. UB.

Compendium of Environment Statistics of Mongolia. 2004. UB.

Ecosystems of Mongolia and Frontier Areas of Adjacent Countries: Natural resources, biodiversity and ecological prospects. Proceedings of International Conference on Resources. Ulaanbaatar. 2005.

Geo-ecological issues in Mongolia. #4. UB, 2004.

Papers in meteorology and hydrology, Institute of Meteorology and Hydrology, Ulaanbaatar. 2003.

Proceedings of the First International Symposium on Terrestrial and Climate Change in Mongolia. UB. 2005.

The Proceedings of Sixth International Workshop on Climate Change in Arid and Semi-arid Regions of Asia. National Agency for Meteorology, Hydrology and Environment Monitoring of Mongolia, Ulaanbaatar. 2004.