RESEARCH REPORT

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An Economic Analysis Of The Environmental Impacts Of Livestock Grazing In Mongolia

Erdenesaikhan Naidansuren and Onon Bayasgalan
Environment and Security Center of Mongolia, NGO Suite #123,
Government House III, Baga Toiruu, 44 SB District, Ulaanbaatar, Mongolia
Tel: + 976-9191-0331 Fax: + 976-11311938
Email: erdene@environ.mn

In the last two decades Mongolia's vast areas of pastureland have been rapidly degraded and desertified. Although the main cause of this national crisis is believed to be climate change, overgrazing and livestock over-population are also major contributing factors. Now a new EEPSEA study has assessed the degradation and the economic value of the livestock (particularly goats) that are causing much of the damage. To find a solution to the crisis, it has also evaluated a number of key policy options.

The study is the work of Erdenesaikhan Naidansuren and Onon Bayasgalan from the Environment and Security Center of Mongolia. The researchers show that goats have lower economic value due to their high environmental costs. They recommend that a communal pasture management system should be set up and that fees should be imposed on the use of pastures. This mix of policies should ensure that the use of pasture land becomes sustainable. It should also secure the long-term livelihoods of herder households.

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Comments should be sent to: Mr. Erdenesaikhan Naidansuren, Chairman, Environment and Security Center of Mongolia, NGO Suite #123, Government House III, Baga Toiruu, 44 SB District, Ulaanbaatar, Mongolia.
Tel: + 976-9191-0331 Fax: + 976-11311938

Email: erdene@environ.mn

EEPSEA was established in May 1993 to support research and training in environmental and resource economics. Its objective is to enhance local capacity to undertake the economic analysis of environmental problems and policies. It uses a networking approach, involving courses, meetings, technical support, access to literature and opportunities for comparative research. Member countries are Thailand, Malaysia, Indonesia, the Philippines, Vietnam, Cambodia, Lao PDR, China, and Papua New Guinea.

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Last but not least, we sincerely thank the editor of this report for her hard work in making it more reader-friendly.

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AN ECONOMIC ANALYSIS OF THE ENVIRONMENTAL IMPACTS OF LIVESTOCK GRAZING IN MONGOLIA

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EXECUTIVE SUMMARY

Mongolia's pastureland has seen rapid rates of degradation in the past two decades because of climate change and inappropriate grazing patterns. With such levels of pastoral degradation, the following entities in the country are being negatively affected: herders, the livestock sector, the economy, the employment sector, the nomadic cultural heritage, and biodiversity.

The foremost objective of this report was to develop policy options that would make the pastures of Mongolia sustainable in the long term, and to slow down the process of desertification, which has thus far affected 72% of Mongolia (SDC 2007). The pastureland of Mongolia is a common access resource, but herders do not always behave in environmentally sustainable ways. The net effect of over 40 million livestock owned by approximately 200,000 herding families in a vast, fenceless landscape is tremendous. Moreover, this highly complex issue involves not only herders and government institutions, but also the country's mindset in terms of animal husbandry.

This report comprises an economic analysis that focuses on the negative impacts of livestock keeping, particularly of goats which have the largest impact on pasture quality among the five livestock types in Mongolia. The absence of regulations and the inadequacy of pertinent laws and government policies have facilitated what can be considered as a national crisis. This report proposes three policy options to address this problem. Although some of the solutions are already present in the current legal framework, none have been enforced for various reasons. The three policy proposals all aim at reducing grazing efforts and introducing enterprises that will improve livestock productivity. In all three options, there is a livestock population target, and we determine how much it costs to get each policy option to reach such a target.

In order to highlight the economic significance of the impact of livestock on pasture sustainability, we determined the pure economic value of goats, sheep and horses. Calculating the pure economic value of livestock is a new concept for Mongolian agriculturalists and economists alike. Our findings showed that goats were not worth the high value that herders placed on them. In fact, they were the least economically valuable among livestock animals, all things being equal.

Mongolia has the highest per capita livestock figure in the world but does not benefit fully from this. Firstly, Mongolians primarily drink imported milk despite ample domestic supply due to the remote locations of most local milk markets. Secondly, the

country cannot achieve competitive advantage in the meat market because its slaughtering system does not meet international trade standards. Lastly, herders are not experienced or skilled enough in processing their products for value addition; they only know how to sell the raw materials. All these point to a very inefficient animal husbandry production system.

A common underlying aim of the policy options is to develop local markets for wool, milk, meat and hides so that the productivity of each livestock type is multiplied, hence reducing the need for herders to maintain or increase livestock populations. This report actually recommends that the most optimal option in achieving sustainable pastures is the implementation of a mixture of two of the three policy options: introducing a communal pasture management system and imposing pasture utilization fees on herders. This hybrid policy will combine the efforts of herders and the government. It will result in (a) the gradual reduction of livestock numbers to comply with pasture carrying capacities, (b) an increase in livestock productivity and household income with the introduction of new small and medium enterprises, (c) the establishment of inbreeding centers for highly productive local livestock species, and (d) degraded pasture restoration. This mixed policy will ensure sustainable pastures as well as secure the long-term livelihoods of herder households.

1.0 INTRODUCTION

1.1 Problem Statement

Eighty per cent of the land in Mongolia is a common access resource, and the 200,000 herder households of Mongolia use 90% of it as pastureland (Zagdarsuren and Mandah 1998). The foremost issue in Mongolia today is the severe levels of degradation of its vast pastures due to the absence of a successful, sustainable pasture management system. The main reason for this is the lack of effective coordination and regulation. Bad pastures have a direct impact on the lives and livelihoods of herders; they can strip entire families of their entire income by killing off their livestock. Degraded pastures also indirectly affect the well-being of the entire Mongolian population through undernourished livestock and the under-supply of meat and dairy products. Although the main cause of land degradation in Mongolia is believed to be climate change, overgrazing and over-population of livestock are collectively a major contributing factor in the destruction of pastures.

1.2 Research Objectives

The main objective of this study was to generate policy options to improve the quality of pastureland by reducing the negative impacts of livestock grazing in Mongolia. The specific objectives were as follows:

a) To identify the current situation of pasture degradation in the study areas with a focus on the impact of livestock.

b) To develop policy options for alleviating pasture degradation.

c) To estimate the costs of these policy options and determine their expected impacts on local herding communities and pastureland.

1.3 Research Sites

Mongolia is administratively divided into 21 provinces and the capital city of Ulaanbaatar, and has a total population of 2.7 million. Each province has an average population of 75,000 inhabitants and 14 to 27 counties (also referred to as *soums*).

Eight counties from Uvurhangai and Bayanhongor provinces were selected as the study sites. They were among the provinces with the highest goat population density. These provinces are located in between the Hangai and Eastern Altai mountain ranges, about 400–800 km to the south-west of Ulaanbaatar City. The counties are Bayanundur, Sant, Hujirt and Hairhandulaan in Uvurhangai Province; and Ulziit, Jinst, Bogd and Bayanlig in Bayanhongor Province (Figure 1). These counties are located in different natural zones of Mongolia, such being the mountain forest steppes (Ulziit, Hujirt), the dry steppes (Hairhandulaan, Bayanundur and Sant), and the Gobi Desert zones (Jinst, Bogd, Bayanlig) (Figures 2 and 3).

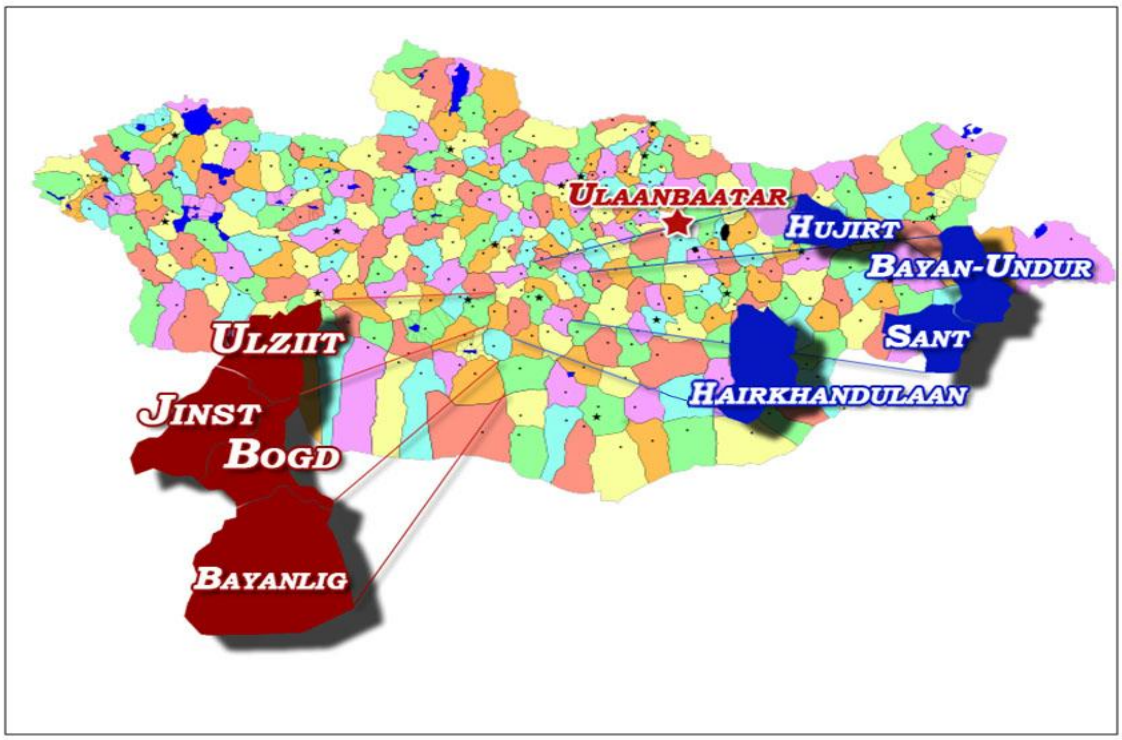

Figure 1. Study sites

Source: Batmunkh (2008)

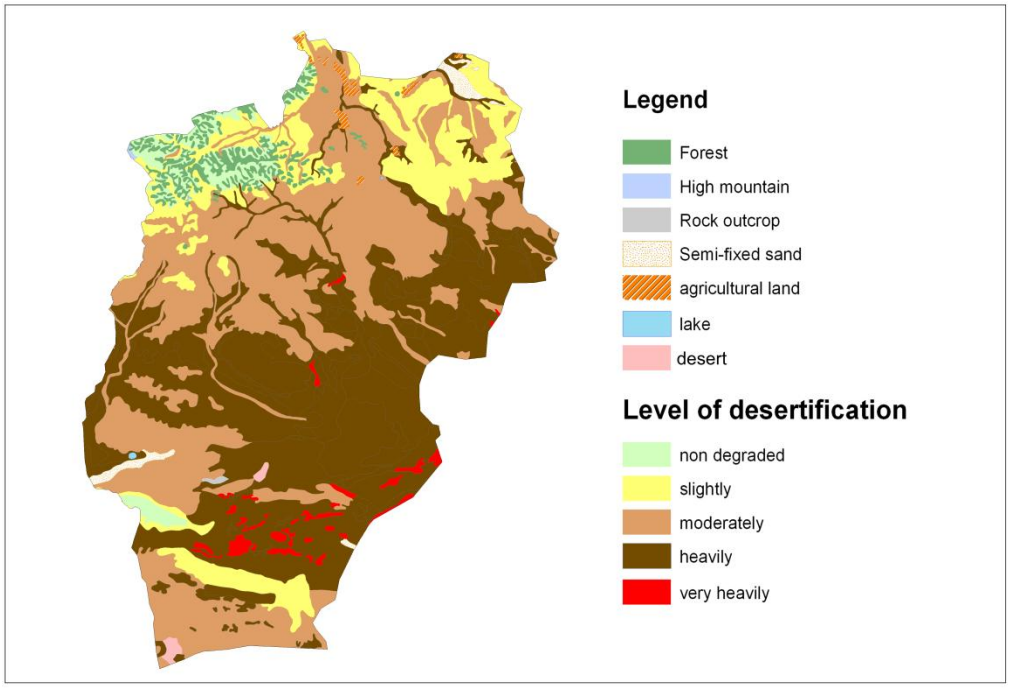

Figure 2. Uvurhangai Province

Source: Dash and Haulenbek (2006)

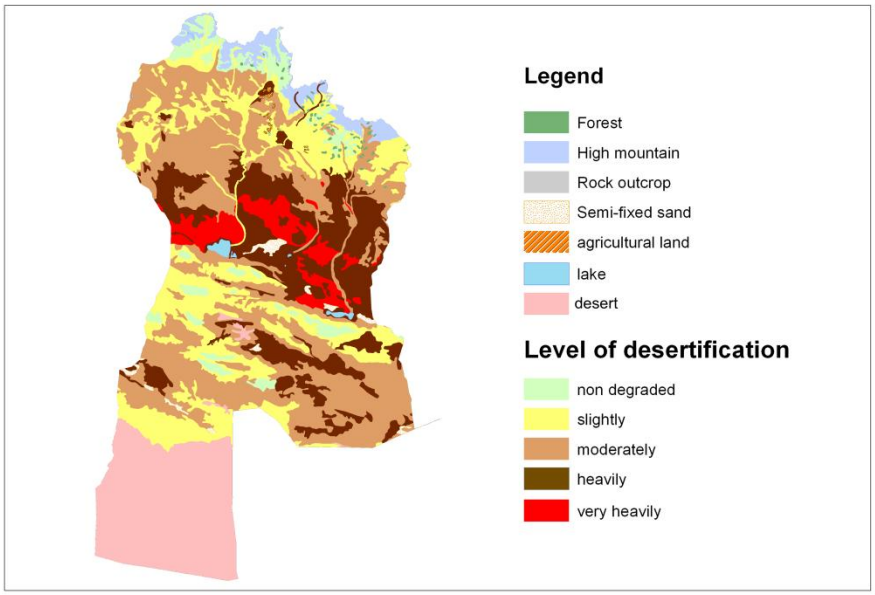

Figure 3. Bayanhongor Province

Source: Dash and Haulenbek (2006)

1.3.1 Climate and weather

The study provinces are located in the northern semi-arid zones of the Altai mountain range in Central Asia. The altitude of these provinces ranges between 1,000 and 4,000 meters above sea level. The climate is continental and displays extreme temperature fluctuations. The annual average air temperature ranges between -1 and +4 degrees Celsius. During the cold season (December – February), the temperature ranges from 18 to –30 degrees while in the summertime (May–August), it ranges from 15–30 degrees. The annual precipitation is 200–325 mm in the northern forest and mountainous regions and 50–100 mm in the Gobi desert region.

1.3.2 Social data

The study counties are representative of typical Mongolian rural population. Table 1 shows that most of the households (73–86%) live in remote areas and herd livestock.

Table 1. Distribution of population in the study counties

Province	County	Population			Household		
		Total	Men	Women	Total	Urban	Rural
Uvurhangai	Bayanundur	4261	2113	2148	1204	171	1033
	Sant	3525	1771	1754	1148	180	968
	Hujirt	6649	3240	3409	1903	803	1100
	Hairhan-dulaan	3510	1762	1748	1038	211	827
Bayanhongor	Ulziit	3477	1692	1785	1002	238	764
	Jinst	1958	993	965	537	133	404
	Bogd	2909	1391	1518	788	171	617
	Bayanlig	3413	1694	1719	888	239	649

1.3.3 Native plant and animal species

Bayanhongor and Uvurhangai provinces reside side by side with the former being on the west and the latter on the east. They both contain a mixture of dry and desert steppes to the south and mountainous forest steppe bordering the Hangai and Eastern Altai mountain ranges.

Bayanhongor Province contains many medical plants such as the desert cistanche, licorice, roseroot, agriophyllum pungens, snow lotus, sand rise, and sphallerocarpus. It also has marmots, foxes, corsac foxes, wolves, badgers, lynxes, leopards, ibexes, goitered gazelles, white-tailed gazelles, and antelopes. Some of the desert regions have wild horses, wild donkeys, wild camels, wild boars, and the Gobi bear, all of which are considered rare species.

Uvurhangai Province is well-known for its waterfall called Ulaan Tsutgalan, which has begun to dry up frequently during summers. It has wild sheep, ibexes, wild horses and camels, goitered and white-tailed gazelles, foxes, lynxes and leopards. In

terms of bird life, it has swans, pelicans, snow cocks, black grouse, partridge, and snow grouse.

Overgrazing of pastures and competition for water resources have affected all of the mentioned flora and fauna. Livestock herds have encroached into the habitats of wild animals and graze heavily on the medicinal plants. Livestock also compete for water with the bird species which are becoming fewer with each migrating season. Thus, the dwindling numbers of native plants and animal species in these two provinces is of particular concern. Protecting these species is critical because they preserve the biodiversity of the land, which in turn is essential to the sustainability of the pastures.

1.3.4 Economic activity

The main economic activity in the study counties is animal husbandry. The semi-arid nature of the land, sparse vegetation, and limited precipitation in this part of Central Asia is suited to pastoral livestock production. Crop and vegetable farming exists, although its contribution to the local economy is insignificant.

Since pasture is an open access resource, herders do not possess any land. Output per head of livestock is small because of the low productivity of grasslands in a semi-arid region. Consequently, herders have a high interest in increasing their livestock sizes.

1.4 Literature Review

This study referred significantly to two important publications by the Mongolian National Agricultural University. The first, "Goat Herd: The Most Pressing Ecological and Economic Issues" (Mongolian National Agricultural University 2009) is the title of a very comprehensive book of conference proceedings and reflects the general opinions of Mongolian scientists relating to livestock grazing. It contains a compilation of 11 important studies conducted by 23 livestock experts in Mongolia. Because Mongolia has a population of only 2.7 million people, these studies are very representative of the studies on this subject carried out in the country. In particular, the study by Zagdsuren and Oyunchimeg (2006) recommends taxes for different types of livestock, especially goats, based on household income level, while Dungu and Bayarsaikhan (2009) paid attention to the breeding of goats to increase their productivity, which is one way to reduce pressure on grasslands.

The second publication was "Development Trends in the Goat Industry" which covers the most important issues surrounding the goat industry and gives statistics on livestock population, growth trends, and the production and export rates of cashmere in the country. It has highly critical content on the flaws of public policies pertaining to herders and gives sound recommendations, especially for the improvement of the productivity of livestock.

The study by Tserendash, Erdenetsogt and Narantuya (2009) was useful in regard to understanding the behavioral patterns of goats in particular. The researchers' experiments illuminated the disparities in the eating habits and preferences of goats and sheep. Their study found that goats had the most harmful impact on pastureland. The researchers are strong proponents of the pasture use fee policy in addition to the strict enforcement of livestock ratios. Meanwhile, the recommendations offered by Dungu and

Bayarsaikhan (2009) in their study leaned towards the development of goat breeding practices that would produce the best quality of cashmere.

2.0 LEGISLATIVE FRAMEWORK ON PASTURE USE

There has never been any particular legislation defining the manner in which pastureland should be used in Mongolia. Establishing legally binding regulations on pastures was not deemed necessary with a sparse human population and such vast pastures. However, times have changed and the Mongolian nomads have begun to outpace nature's rate of replenishment with the sheer number of livestock they have been breeding. Although there has been a livestock census system in place in Mongolia since 1918, currently there is neither an established system of assessing the state of pasture resources nor a nationally adopted system of measuring pasture carrying capacities.

2.1 Traditional Pasture Regimes

2.1.1 The *khoshuun* system (1300s–1950s)

Traditionally, nomadic herders grazed the vast but fragile grasslands of Mongolia by rotating animals over shared pastures seasonally and in a species-segregated pattern. Herders were a part of *khoshuuns*[1] where they shared labor resources and controlled their grazing patterns according to pasture quality. They knew about the detrimental grazing habits of goats and thus kept the sheep to goat ratio at 3:1or 4:1. Ruling nobles and monks from Tibetan Buddhist temples operated the *khoshuuns*. *Khoshuuns* were better ecologically distributed than the *soums* of today because they spanned the country from north to south and incorporated different ecosystems (Mearns 1992). The *khoshuun* system was completely demolished during the fifties when socialism permeated into Mongolia's political scenario.

2.1.2 The collective system (1950s–1990)

When socialism emerged in Mongolia, the State introduced 'collectives' (also called *negdels*) which were established in every county in the early fifties. In the collective system, livestock was generally deemed as common property and herders were only allowed to keep herds of up to 75 heads for themselves. All livestock operations were centralized and the quality of the pastures was regulated by the State. This system was not popular among herders because it did not reward herders according to their level of work. It collapsed in 1990 together with the collapse of the Soviet system.

2.1.3 Current pasture regime (1990s-present)

The current pasture regime is worse than both the *khoshuun* and collective systems because regulations regarding the management of pastures are practically non-existent. The pasture use system is in chaos; there are constant disputes over who is entitled to use which pasture and it has become the norm for herders to try to use as much

[1] *Khoshuun* was the name for a small administrative division in Mongolia before 1920. It is similar to the current *soums* or counties.

pasture as they can. Few herders feel obliged to assume responsibility over managing this deteriorating resource. Since it is illegal to claim private ownership over pasture, why would herders want to invest their time and effort in protecting it?

Currently, there are a few herder groups scattered across the countryside; they were established with the aid of international development organizations. The herders in these groups manage their livestock together. Herding groups are becoming more popular among herders, who are becoming convinced that collective management is far more effective than individual management.

The Land Law stipulates that local government units are responsible for regulating pasture utilization and the distribution of pastures for use among herders in their territories. County legislative councils are to review and adopt pasture utilization plans for their respective counties which are then to be implemented by county administrative bodies. Despite this law, there is no administrative framework or staff, or sufficient funds for pasture resource management within local counties.

Within the government structure, the Ministry of Food, Agriculture and Light Industry (MFALI) and the Ministry of Environment and Tourism (MET) carry the highest responsibility to address the issue of pasture degradation in the nation. The MFALI shoulders the brunt of the responsibility over pasture management and is channeling much effort into improving pasture sustainability. However, it does not have the authority and scope of jurisdiction that the MET has over the issue. Unfortunately, the MET does very little about the problem and tends to leave matters in the hands of the MFALI. The limited cooperation between these two agencies results in inefficiency and ineffectiveness of action taken, for example, through overlapping activities.

2.2 Current Laws Pertaining to Herders

There are very few laws and policies that pertain to livestock management. They are discussed briefly below.

2.2.1 Land Law 2002

The Land Law of 2002 covers the fundamentals of land resource management. Provision 52 defines the responsibilities of county governments regarding pasture regulation in their territories. It also allows herder communities to occupy or temporarily possess certain pastures near winter shelters through contractual agreements with the respective county administrations. Provision 58 allocates a specific sum of money and specifies the government's land quality monitoring responsibilities. According to this provision, the state should monitor the conditions of land resources every five years through its implementing agency. Due to the weak functioning of local government bodies and the lack of cooperation between land and agricultural state agencies, the recommendations made by the monitoring agencies are hardly ever followed up and hence result in very few outcomes. There is no clear framework within the central and local government structure that allocates responsibility for the regulation of pasture resources.

2.2.2 Law on Land Use Fees 1997

In 1997, the government adopted the Law on Land Use Fees, which imposes fees for all types of land use, including pasture use and hay collection. This law sets the amount of fees for pasture use based on type of livestock, represented by SEUs. The annual grazing fee ranges from 55–77 MNT per SEU. Ironically, herders were exempted from this law from the very beginning by parliamentarians, fearful of losing their votes. Thus, they have never had to pay pasture use fees.

2.2.3 Individual Citizen's Income Tax Law 2006

The law on personal/individual income tax attempted to regulate livestock numbers by taxing herders based on their livestock assets. The tax rate varied by economic region (intended to encourage even utilization of pastures). For example, the annual tax rate per SEU in the central region was 100 MNT (8 cents), the tax in remote provinces was 50 MNT, and in other regions, it was 75 MNT. The herder's tax rate was ten times lower than that of other citizens, whose income tax is 10% of their annual earnings. In June 2009, Parliament exempted all herders from paying individual income tax, justifying their decision with the 2008 economic crisis.

2.2.4 Pasture Law draft 2006

The first Pasture Law draft appeared in 2006. The draft essentially focused on giving rights to herders to possess winter and spring use pastures. This was to encourage herders to make investments to improve the productivity of their own pastures. In 2009, the draft was amended with a provision to give possession rights not to individual herders as in the first draft, but to entire herder communities. If this law eventually gets passed, it is likely to regulate livestock numbers and herd compositions in accordance with the PCCs of the respective domains (see Section 3.3 for more details on PCCs). Although this can be a good policy instrument, it is still a draft after four years and there remain many weak points like how to regulate livestock numbers if PCCs are exceeded and the lack of market regulations. This draft has been hindered from moving forward due to the continuous debate over it; mainly, politicians are reluctant to pass this law because of the sensitivity of the issue, especially among their own constituencies.

2.2.5 Government pasture policies

"Best Herder Award"

After the collapse of the socialist system, the State promoted a policy to encourage livestock breeding to strengthen herders' livelihoods and promote economic growth. In 1990, the government created an award called "Herder with a Thousand Livestock". The prize was an honorable title accompanied by a certificate signed by the Minister of Agriculture. Herders who received this honorary title were very much respected. This award raised public criticism, however, in that it only encouraged higher livestock numbers which is detrimental to the environment. The government responded by making some revisions to the award, incorporating environmental concerns, which they renamed the "Best Herder Award". However, the essence of this award remains unchanged. In addition, all the 21 provinces in the country have a similar internal best herder award system. In effect, this award counteracts the environmental mission of the government.

Goat subsidy policy

In October 2008, the government decided to support goat producers because they represented one of the largest groups suffering from the economic crisis. It offered herders 5,000 MNT for each kilogram worth of cashmere that their goats represented (i.e., for every 1.5 goats). The total payments amounted to USD 21 million, which was taken from the Mongolian Development Fund, a fund designed to benefit as much of the population as possible. Many other sectors were suffering as much as the cashmere sector during that time. Such a move reveals the fact that the government still does not fully recognize the full extent of the damage that goats impose on the environment.

3.0 PASTURELAND USE

As at 2007, 72.3% of Mongolian land was reported to be undergoing desertification and pasture capacity was being exceeded by a margin of 32.5% or by 16 million sheep equivalent units (SEUs) (SDC 2007).

3.1 Causes of Overgrazing

In order to identify the main causes of pasture degradation in the study areas, we used primary and secondary sources of information. First, we conducted a survey among local herding communities asking them about their opinions and feelings concerning local environmental problems and the root causes, effects, and possible measures that could be taken to prevent further deterioration of the land. Then we reviewed agricultural and environmental government, NGO and scientific reports, and also looked at satellite images of desertification to gather information on the rate of desertification and land degradation in Mongolia.

Current pasture management systems are unsustainable for the following reasons: rapid herd population growth; weaknesses in land law, policy and regulation; and the lack of institutional and governmental support. The high global demand for cashmere is a key reason driving the growing herd population.

Mongolian land systems have been in a flux this past century and herders have had to adjust to many administrative changes. Analyzing the differences between past and present land laws will explain the legislative weaknesses that have intensified unsustainable pasture management.

The Mongolian Constitution, the Civil Code, and the Land Law govern the entire legal framework for land tenure. Although residential land was privatized in 1996, pastureland has never been considered as private property. Under the centralized socialist regime which lasted from the 1940s to 1990, the state owned all livestock, which was steadily controlled at around 25 million heads. When Mongolia transitioned into a market economy in the early nineties, the economy was hit very hard by the withdrawal of Soviet participation. Many people were left jobless with few job alternatives available. Animal husbandry became a popular option because the state began to distribute livestock as private property to willing herders in the 1990s. Livestock numbers rose steadily from 25 million in 1986 to 43.3 million in 2008 (Mongolian National University of Agriculture

2009). This transition was completely revolutionary in Mongolia and the livestock sector grew without any form of regulation whatsoever.

In 1989, the sheep to goat ratio was 4:1 but by 2008, the ratio had become 1:1. Goats move faster than sheep and have more destructive grazing habits. Therefore, if goats dominate a mixed herd of goats and sheep, the latter will not be able to match the pace of goat grazing and as result, will be underfed. Underfed sheep cannot survive the harsh winters of Mongolia. In addition, goat domination will cause pastures to degrade quickly. Therefore, herders traditionally kept the ratio of sheep to goats at 4:1 or 3:1.

Between 1989 and 2008, however, the number of goats quadrupled, camel numbers fell by half, and cattle herds reduced by 10% while the amount of cashmere produced tripled between 1990 and 2008 (Mongolian National University of Agriculture 2009). While the number of sheep increased 1.3 times, its share among the five traditional livestock animals in Mongolia reduced from 58% in 1989 to 42.4% in 2008.

Despite the extreme livestock population rise, namely of goats, herders still struggle to survive. They remain vulnerable to many risks for which they receive no formal preventive support, only various forms of disaster relief. The harsh winters of 2000–2002 killed eight million livestock heads and left thousands of herders without any source of income. Again, in the winter of 2009–2010, Mongolia lost over 8.4 million livestock heads according to the National Emergency Management Agency (2010). In spite of these disasters, the government and herders have done very little to safeguard the country's livestock from being obliterated by future blizzards.

The total number of livestock in the study counties increased two-fold from 2003 to 2008 with an average growth rate of 1.19% per annum (Figure 4). However, the 2009–2010 *dzud*[2] reduced this figure to below 2004 levels. The livestock figures show that the counties had generally similar growth trends, which imply that they were affected by similar forces. Figure 5 shows the overall livestock increase in five out of the eight counties from 2004 to 2010.[3]

[2] A *dzud* is a multiple-nature natural disaster consisting of a summer drought resulting in inadequate pastures and production of hay, followed by very heavy winter snow, winds and lower-than-normal temperatures. Particularly heavy snow cover prevents livestock from accessing pasture and receiving adequate fodder.

[3] These five study counties had exceeded their 'Pasture Carrying Capacities' (PCCs). The policy options for this study focused more on these five counties as they were most at risk from serious degradation.

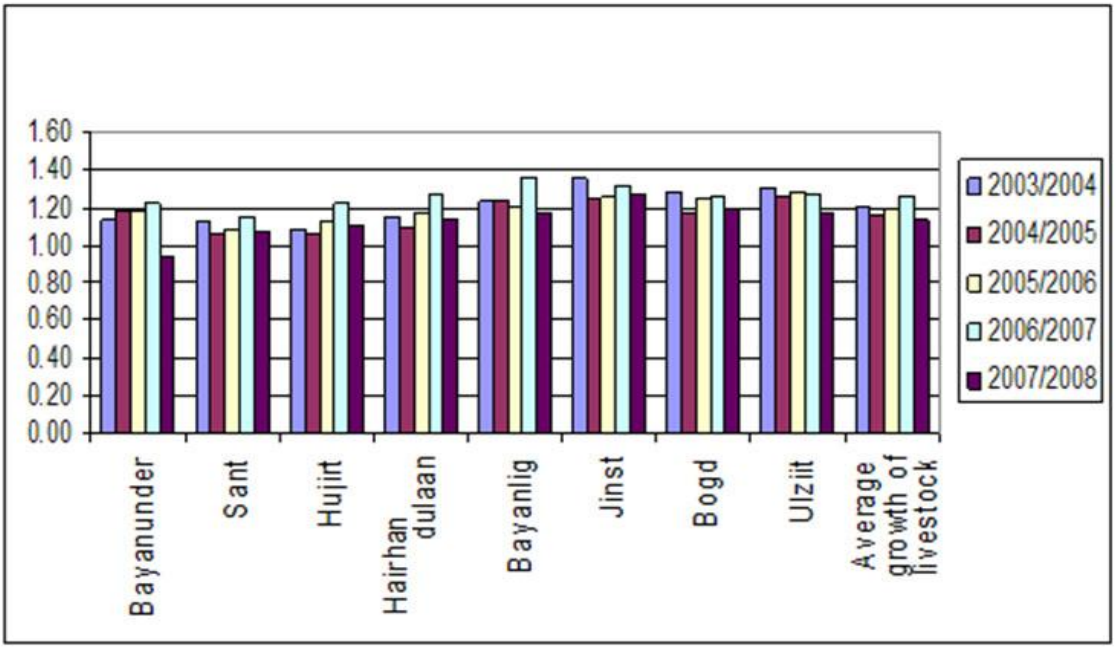

Figure 4. Average annual livestock growth rate in the study counties (2003-2008)

Sources: Statistical Bureaus of Bayanhongor and Uvurhangai Provinces (2009)

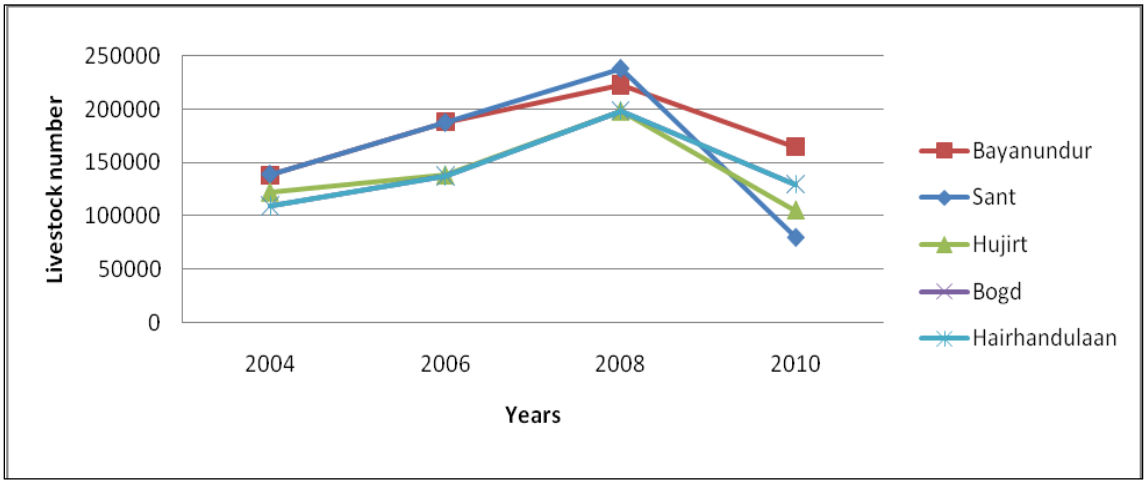

Figure 5. Livestock herd size increase in five of the study counties (2004-2010)

Sources: Statistical Bureaus of Bayanhongor and Uvurhangai Provinces (2009)

Note: There was a drop due to the 2009-2010 *dzud.*

3.2 Overview of Land Degradation

The National Land Authority (NLA) of Mongolia defines land quality based on the following characteristics (ALAGAS 2008):

- Thickness of nutrient layers
- Humus content

- Soil pollution and contamination
- Land surface changes
- Plant yield and plant cover changes
- Plant species composition and changes

Thus, good or bad pasture would be measured according to the above characteristics. According to the Land Law of Mongolia, land quality assessments should take place very five years in each county. The most recent assessment took place in 2008; however, the previous one had taken place way back in 2001. The study team worked together with land assessment researchers to finalize the latest assessment reports of the study counties in May and June of 2009.

Table 2 shows that most of the counties in the two provinces have severely degraded lands. Uvurhangai has a higher level of pasture degradation, which ranges from 45.2% to 80%. Sant County displays the worst case of degradation at 80%.

Table 2. Pasture status in the study counties

County	Total pasture ('000 ha)	Average grass productivity (kg per hectare)	Pasture degradation status (ha)				Degraded pasture (%)
			Normal or slightly degraded	Low	Medium	High	
Bayanundur	324.1	260	147.8	28.3	134.2	13.8	54.4
Sant	260.9	250	150.7	115.7	87.1	5.9	80.0
Hujirt	152.2	460	59.3	52.3	21	19.7	61.1
Hairhandulaan	410.8	150	225.1	74.5	55.3	55.9	45.2
Bayanlig	1118.7	110	856	116.2	39.1	107.4	23.5
Jinst	509	160	361.2	111.7	36.1	-	29.0
Bogd	365.8	160	304.6	0	44.8	28.3	20.0
Ulziit	374.1	400	217.8	133.9	22.4	-	41.8

Source: ALAGAS (2008)

3.3 Pasture Carrying Capacity

Pasture carrying capacity (PCC) is an important term used in the livestock sector. The carrying capacity of a pasture is the maximum number of animals that can graze a pasture throughout the grazing season without harming it. The PCC ensures adequate forage for grazing animals and leaves enough residual forage for re-growth the following year. Residual forage protects the soil from erosion and increases the forage yield the following year by improving stand vigor, soil moisture and nutrient cycling. Improving the productivity of a pasture can increase its carrying capacity.

PCC is measured in Sheep Equivalent Units (SEUs). In general, carrying capacity is largely determined by four factors: (a) annual forage production, (b) seasonal

utilization rate, (c) average daily intake, and (d) length of the grazing season. The following equation, adopted from Tserendash (2006), illustrates the relationship.

$$\text{Carrying Capacity} = \frac{\text{Annual Forage Production} \times \text{Seasonal Utilization Rate}}{\text{Average Daily Intake} \times \text{Length of Grazing Season}}$$

Table 3 shows the PCCs of the eight study counties. The information was obtained through measuring the annual forage production in each of the counties, taking into account the reduced productivity of pasture from the 2008 livestock census data.

Table 3. The pasture carrying capacities (PCCs) of the study counties

County names	Total pasture (kg/ha)	Average annual grass yield (ton)	Total available feed (ton)	Current livestock ('000 heads)	Current SEUs* ('000)	PCC ('000 SEUs)	Pasture utilization rate (%)	Exceeded SEU ('000)
Bayanundur	324.1	0.26	84.3	218.7	321.6	156.0	206.1	165.5
Sant	260.9	0.25	65.2	236.7	298.5	120.8	247.2	177.7
Hujirt	152.2	0.46	70.0	187.5	310.4	129.6	239.5	180.8
Hairhandulaan	410.8	0.15	61.6	194.5	246.9	114.1	216.4	132,8
Bayanlig	1,118.7	0.11	123.1	149.2	196.4	227.9	86.2	0
Jinst	509.0	0.16	81.4	119.3	127.3	150.8	84.4	0
Bogd	365.8	0.16	58.5	159.5	193.4	108.4	178.4	84.9
Ulziit	374.1	0.4	149.6	177.4	247.2	277.1	89.2	0

Sources: Statistical Bureaus of Bayanhongor and Uvurhangai Provinces (2009)

Notes: *SEU = sheep equivalent unit in heads. 1 camel = 5 SEUs; 1 horse = 6 SEUs; 1 cow = 6SEUs; 1 goat = 0.9 SEU

Table 3 shows that the SEUs of Bayanundur, Sant, Hujirt, Hairhandulaan, and Bogd counties exceeded their PCCs by 178–247%. The PCC of Sant County, for example, was 120,800 SEUs, yet it was supporting 298,500 SEUs and all its pastures were over-utilized at a rate of 247%. Sant County needs to decrease its SEUs by 177,700; otherwise, all its pasture would be overgrazed in a short period, and the underfed and weakened livestock will face high risk of mortality from sickness and recurrent natural disasters such as *dzuds* and droughts.

The 2009–2010 *dzud* [4] killed 135,471 heads of livestock in Sant County (equivalent to 170,790 SEUs) which is not far from the target amount of 177,700 SEUs.

[4]This *dzud* took place while this report was being finalized.

The *dzud* reflects the vulnerability of herders to natural disasters. In certain cases, *dzuds* will wipe out entire livestock populations, alleviating the pressure to reduce livestock, but worsening the pressure on herders to find alternative sources of income.

3.4 The Environmental Impact of Goats

The goat population in Mongolia has been growing consistently since 1990 and it surpassed the sheep population in 2004. In 2008, the sheep population was 18.3 million and the goat population was 19.9 million. Nationwide, an average of 600,000 goats are added each year and at this rate, the number of goats will reach 25 million by 2014–2015 (Mongolian National University of Agriculture 2009). The subsistence nature of livestock husbandry, ever increasing prices of commodities (due to inflation), easy access to buyers, and easy sale of goats have led herders to breed as many goats as they can. There is a lack of awareness-raising measures among herder communities about the dangers of overgrazing and a scarcity of alternative income sources.

Among the different types of livestock in the two study provinces, the highest rate of population growth has been that of goats. Figure 6 shows that the goat population was more or less stable from 1971 to 1991 with deviations of 300,000–600,000. It increased sharply from 1992 to 1998. However, the heavy blizzard of 2000 reduced goat numbers in the two study provinces to 1990 levels. Herd sizes, thereafter, continued to increase to an all-time peak of 1.69 million goats in Bayanhongor Province and 1.56 million goats in Uvurhangai Province in the fall of 2009. The sudden increase was initially caused by the privatization of livestock, and then further spurred by the growing worldwide popularity of cashmere. The goat population then fell by 16% from the 2008 level and by 42% from the 2004 level in Bayanhongor Province and Uvurhangai Province, respectively, after the *dzud* of 2009–2010.

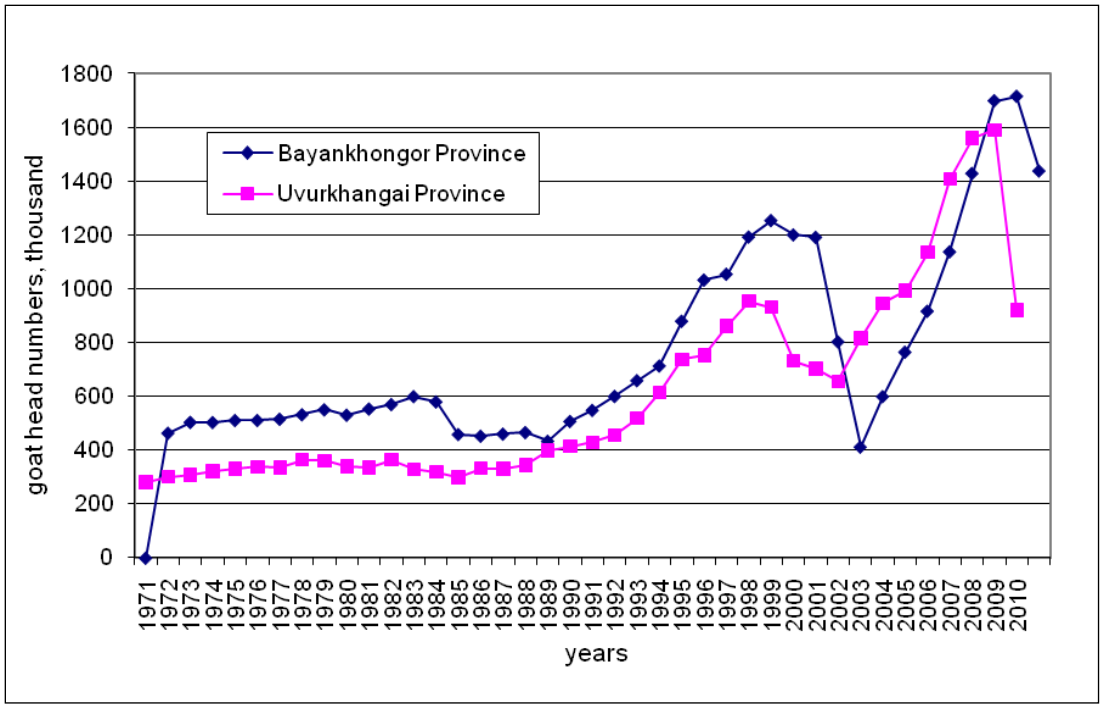

Figure 6. Goat population growth in the two study provinces (1971–2010)

From an environmental conservation and development point of view, there are several reasons to keep the goat population at a steady level:

a) Goats uproot and browse vegetation, and selectively eat seeds as well as seedlings (Tserendash et al. 2009; Zagdsuren and Oyunchimeg 2006). Very aware of this, herders traditionally kept the sheep to goat ratio at 3:1 or 4:1. This herd composition allowed the process of natural pasture regeneration to occur. However, this composition ratio has been lost for many years.

b) Goats increase soil erosion the most, compared to any other livestock animal because their sharp hooves trample and break the crypto-biotic crust that covers the soil (Mongolian National University of Agriculture 2009). There is no government regulation or policy that addresses this problem. In fact, in the fall of 2008, the government supported goat herders with a total subsidy of 30.03 billion MNT (USD 21 million).[5]

c) Goats are the most voracious of all livestock. The amount of forage they eat per day is, on average, 5.9% of their body weight whereas the proportion for other livestock is a lot lower (Tserendash et al. 2009). If allowed to, goats are capable of grazing until the complete depletion of the pasture (UNDP 2008).

d) The cashmere market is becoming increasingly competitive with neighboring China producing more quality cashmere in recent years. Mongolian herders, however, receive a very meager sum for the raw product while the retailers make

[5] MNT stands for the Mongolian national currency; Tugrig. As of April 2009, 1 USD was equal to 1,430 MNT.

a big profit (Mongolian National University of Agriculture 2009). Therefore, over-dependence on cashmere sales is something herders must avoid as it is a non-sustainable source of livelihood.

3.5 Pasture Management Problems: Causes and Solutions

It is important to stress that the intention of this study and of the government is not merely to decrease grazing efforts or to reduce goat populations, but to do so in a manner that makes grazing activities sustainable. Thus, the starting point of our policy investigation was to determine the pasture carrying capacity (PCC) status of the target counties as this was the most important indicator of pasture sustainability. Getting herding communities to maintain PCC limits should serve as the main objective or threshold value of any policy recommendation. We identified the PCCs and Pasture Utilization Rates (PURs) for each of the study counties. Table 4 shows the baseline figures for 2008 and Table 5 shows the figures after the *dzud* of 2009-2010.

Table 4. PCCs and PURs for the study counties (2008 baseline)

County	Current SEUs ('000)	Current PCCs ('000 SEUs)	PURs (%)	Excess SEUs ('000)
Bayanundur	321.6	156.0	206.1	165.5
Sant	298.5	120.8	247.2	177.7
Hujirt	310.4	129.6	239.5	180.8
Hairhandulaan	246.9	114.1	216.4	132,8
Bayanlig	196.4	227.9	86.2	0
Jinst	127.3	150.8	84.4	0
Bogd	193.4	108.4	178.4	84.9
Ulziit	247.2	277.1	89.2	0

Sources: Statistical Bureaus of Bayanhongor and Uvurhangai Provinces (2009)

The counties and PURs highlighted in bold in the table represent the five counties where the PCCs were exceeded in 2008. The last column reflects the number of SEUs that they had to reduce. However, the *dzud* of 2009-2010 killed 8.4 million heads.

After the *dzud*, pasture utilization became normal (Table 5) in Hujirt County (PUR 92.7%) due to a reduction of 61.3% in SEUs. The situation in Sant County was close to normal with a PUR of 107.5%. However, SEUS still exceeded PCCs significantly in three counties (Bayanundur, Hairhandulaan, and Bogd), but not as severely as in the pre-*dzud* period.

Table 5. Post-*dzud* data for the study counties

County	SEUs lost ('000 heads)	Reduction in SEUs (%)	Post-*dzud* SEU>PCC ('000)	Post-*dzud* PURs (%)
Bayanundur	91.8	28.5	73.8	147.3
Sant	168.7	56.5	9	107.5
Hujirt	190.3	61.3	(-9.5)	92.7
Hairhandulaan	80	32.4	52.8	146.3
Bayanlig	44.3	22.6	(-75.8)	66.7
Jinst	41.1	32.3	(-64.6)	57.2
Bogd	34.8	18	50.2	146.3
Ulziit	38.5	15.6	(-68.4)	75.3

Source: National Statistical Office of Mongolia (2010)

Note: The counties in bold are those where the SEUs still exceeded the PCCs significantly, even after the 2009-2010 dzud

Among the *soums* that were worst hit by the *dzud* were four of the five counties (except Bogd) which had exceeded their PCCs before the *dzud*. Despite the decline in livestock numbers in these five *soums*, they were still considered by this study as target areas for remedial action because the herders are likely to raise their livestock numbers yet again. Thus, for our policy recommendations, we focused only on the five counties in question. This is not to say that the other three counties were ignored. We also considered reduced PCCs for them along with the five to ensure the sustainability of the pastures in the future.

We first identified the root causes of the unsuccessful attempts by the government and other parties to tackle the grazing management problem and then crafted solutions. Table 6 shows the causes and possible solutions identified. Four policy options were borne out of this exercise.

Table 6. Policy problems and solutions related to pasture management in Mongolia

PROBLEMS	SOLUTIONS
Lack of pasture regulations	Regulate pastures such that carrying capacity is not exceeded or Establish a communal pasture management system for herding groups
Exclusion of herders from income tax	Tax herders based on their income
Exclusion of herders from land use (pasture) fees	Charge herders for pasture use
Lack of investment in strengthening the capacity of local governments	Hold more training workshops to strengthen the capacity of provincial and county governments
Lack of incentives to promote business in the countryside	Provide incentives to encourage herders to set up small and medium-sized enterprises
Promotion of goat population growth	Promote goat productivity instead of goat population growth
Inappropriate rewards that promote livestock population growth	Change the reward system to one that solely promotes environmentally-friendly herding practices

4.0 POLICY OPTIONS

4.1 The Policy Options

We initially developed four possible policy options as listed below. We also considered the option of not doing anything.

1) Introducing a communal pasture management system
2) Imposing pasture utilization fees on herders
3) Reinstituting income tax for herders
4) Setting pasture grazing quotas

4.1.1 Option 1: Introducing a community pasture management system

This policy option will establish herder groups of approximately fifteen herding families each. Each group will share a designated pasture area which the members will use exclusively. The members' main responsibilities will be to coordinate their livestock movements, monitor pasture quality, and ensure the quality of the pasture by defining

livestock size limits that suit their land. They will also pool funds to invest in pasture restoration and protection. Trespassing by non-member herders will be legally forbidden through a contract made with the local government.

The involvement of central and local governments will be crucial during the initial establishment of the herder groups. The government's role in this policy option will be to oversee the successful management of the herding groups, strengthen their capacity to maintain strong and environmentally-effective practices and loan money to herders to invest in small and medium-sized enterprises (SMEs) for dairy production, hide and meat processing, and wool and cashmere thread production to maximize livestock potential and improve herder livelihoods. Members would need to be aware of how their herding styles fit into the general PCC scenario and know the legal borders of their specific areas (since these will not be fenced). During the initial years, the government will assist in settling pasture delineation disputes and monitoring pasture quality to ensure that each group's livestock is grazing within permissible limits.

4.1.2 Option 2: Imposing pasture utilization fees on herders

This policy option is based on removing the exemption of herders from having to pay pasture use fees under the Law on Land Use Fees 1997. Herders will become obligated to pay fees based on their pasture use, subject to an impact-based index for each livestock species. The predicted outcome of the policy is a significant reduction in livestock numbers (especially goats) over twenty years. This policy will take into account the pasture use inequalities that exist between different herders and will have features that provide more income options for herders by supporting the establishment of SMEs.

In the Law on Land Use Fees, the fee rate ranged from 55-77 MNT depending on the type of natural zone (for example, fees were lower for drier zones). The present (2010) value of 77 MNT in 1997 is 20 MNT, which is 1.4 US cents per year for each SEU. If we consider that one sheep eats 1.6 kg of forage per day, this amounts to 584 kg annually. The local market price of a 25-kg bundle of hay is 2,500 MNT (USD 1.80). This means that each sheep consumes USD 42 worth of feed annually. In comparison to this value of forage, the pasture fee for each SEU is far too small (0.13%).

In setting effective fee rates, we used five variables to target the animals according to their respective level of environmental impact. The following formula, which is an updated version of the traditional pasture fee formula, was used to calculate the fees:

$$R = 77*Y*X*C*D*T$$

where

R = Fee to be paid

77 = Base pasture fee per head of livestock in MNT

Y = Pasture quality (bad - 2, good - 1)

X = Livestock type (3 - goat, 2 - horse, 1 - sheep, 0 - camel and cow)

C = Pasture proximity (distant, not utilized - 0.5, heavily utilized - 1.5)

D = Pasture carrying capacity (exceeded - 2, not exceeded- 1)

T = Herd ratio of sheep to goats (doesn't comply - 2, irrelevant/complies - 1)

Camels and cows are not chargeable for pasture fees because they are not considered a major risk to pastures and their numbers are small compared to goats and sheep. The under-estimation of the impact of goats on pasture quality has been the leading cause of the downfall of the agricultural sector. The national SEU value of goats is set at 0.9. This value seriously under-values the negative impact of goats on pastures. In this policy option, the SEU for goats is set at 3. Using the above equation, it was found that that the pasture fee rate for all livestock should range between 77 and 1,848 MNT per SEU per year. The pasture fee for each goat will be 1,848 MNT in heavily degraded pastures.

Instead of the traditional focus on livestock numbers, this policy prioritizes pasture quality. We expect this policy to lead to the following outcomes:

- Higher pasture fees, especially for goats and horses, will discourage herders from raising these livestock types.
- Goat herders will not think of increasing numbers but how to raise good quality cashmere goats and increase productivity per head. Herders will pay more attention to not only the quality and color of the cashmere from their goats, but also fully utilizing goat milk during the milking period. They will also refrain from keeping old goats which produce coarse cashmere.
- Herders will be forced to think about pasture carrying capacity, seek unutilized pastures, and maintain optimal ratios of sheep and goats within their herds. This will ensure balanced utilization of pasture resources.
- Herders will eventually compete for good quality pasture and thus, the policy may be detrimental to poor herders while wealthy herders will get better quality pastures unless the government intervenes with regulations to ensure fair and equal distribution of pasture resources among all herders.
- This policy will result in better pasture quality and the government will obtain funds for pasture management from pasture fee collection.

4.1.3 Option 3: Reinstitution of income tax for herders

The Mongolian tax law stipulates that every citizen should be taxed 10% of their annual net income. However, herders were exempted from this tax law in 2009 because they allegedly represented the most vulnerable sector of society. This policy option proposes the lifting of this exemption, with some slight amendments. We calculated that just applying the regular tax system on herders would not be effective in getting them to change their herding behavior as the amount of the tax would be too small.

This option would impose a tax on herders based on the number of livestock that they possess. An index system, which would incorporate the economic value of livestock, would categorize camels as 2 SEUs, horses and cows as 5 SEUs, and goats as 1.5 SEUs. Goats are valued here at 1.5 SEUs instead of 0.9 SEUs because of their cashmere production potential.

To make the tax rate effective enough to make herders reduce their herd sizes, this policy will use the following equation, which makes the tax rate substantially higher than if calculated using the current formula for individual income tax.

$$T = 75 * T * Z * K$$

where

T = Tax to be paid

75 = Base tax in MNT (as stipulated in the General Tax Law of 2003)

T = Profitability of livestock (goat - 5, horse - 3, sheep - 1, camel & cow - 0)

Z = Coefficient for goat age (Z=2 for male goats above three years of age, Z=1 for others)

K = Coefficient for productivity (high productivity breed - 0.5; otherwise - 2)

The first factor is based on the economic returns of goat breeding. On average, a goat produces 300 grams of cashmere per year, which yields about 9,000 MNT (USD 6.3). The second factor is the age of the goat. In order to optimize their yearly profits, herders are interested in keeping their goats alive for as long as possible. Although the quality is markedly poorer, five-year old male goats yield almost twice the rate of one-year old goats. The third factor considers the productivity of each livestock type. Higher taxes are imposed on those species that offer lower economic returns.

The tax level will range from 37.5 MNT to 2,250 MNT per year per SEU for goats, horses and sheep. Cows and camels are excluded from the proposed tax because of their small numbers and their contribution to the livelihood of herder households in the project counties.

4.1.4 Option 4: Setting grazing quotas for herders

Quotas are generally considered an effective tool for managing open access resources throughout the world. This is especially so in fisheries. Although pastures are also an open access resource, the case of Mongolia is unique. Quotas are only useful if the open access resource can be easily defined either by man-made enclosures or by the limited nature of the resource. Mongolian pastures simply cannot be fenced. Quota management was tested for ten years from 1980 to 1990 in Inner Mongolia (Williams 1996); herders were given limited pasture areas and herd quotas with the aim of changing the nomadic herding lifestyle into a settled one. However, this quota-based grazing system proved unsuitable for Mongolia. Mongolian herders are not nomadic of their own accord, but have become so because the pastures are extremely vulnerable to climatic conditions and limited plots of pasture do not guarantee consistency in forage quality and quantity. Thus, after consideration, we concluded that this policy option was not viable to pursue.

4.1.5 Taking no action

We felt it was important to also consider the option of the government taking no policy action to rectify the pastureland crisis in the country. In such a scenario, a large

number of herders with already low herd sizes will lose their herds to *dzuds* and starvation and find themselves without a means of livelihood. This will dramatically increase rural to urban migration, which will further exacerbate the poverty and unemployment problems that already exist in Ulaanbaatar and other cities.

5.0 SURVEY METHOD AND FINDINGS

Data collection and analysis were done from March 2009 to January 2010. All calculations were made to reduce livestock numbers gradually over a 20-year period. As we were completing the calculations to meet the project deadline, the 2009–2010 *dzud* took place. Livestock mortality levels peaked in March/April 2010. At the time and for several months after, there was a lack of data on livestock mortality at county and national levels. We included whatever data we could find to reflect *dzud*-induced changes into our final report to reflect the actual situation. However, it was not possible to re-do the whole survey and analysis to reflect the post-*dzud* scenario. Therefore, this report still focuses on the pre-*dzud* scenario as per the original plan. Its findings and recommendations for planned and gradual reduction of livestock numbers are still valid. The *dzud* did not change the reality of destructive pasture practices or their resultant negative impacts.

The main purpose of the survey was to determine the opinions of herder families with regard to the quality of their surrounding ecosystem services, the severity of pasture degradation, the causes of pasture deterioration, the relative impact of livestock on pasture, the level of government and herder involvement required in pasture management, and pasture management policy options. Policy-makers and government environmental and agricultural officers were also interviewed for their views on potential policy options.

5.1 Demographics of the Study Counties

The survey was conducted between June 20 and July 20 of 2009. Twenty herder families from each county participated in the survey, which means that a total of 160 herders and their family members were surveyed. Most of the respondents were family heads, of which 77% were men and 23% were women. We intended to question ten herders that had goats and ten herders without any goats in each of the counties. However, we were unable to find such samples. Twenty-five officials including county governors, deputy governors, local parliament speakers, agricultural officers, and environmental inspectors were also interviewed and asked to fill in a specific questionnaire.

Table 7 illustrates the livestock ownership statistics of the 160 herding families which participated in the survey. Generally speaking, 200 heads of livestock is the minimum poverty threshold number, and herders with 600 or more heads are considered wealthy. About 42% of the respondents had livestock within the 0-200 range, 36.9% had 201-600 heads and 11.9% had livestock within the 601-1,000 range. About 9.4% owned over 1,000 heads. In terms of goat ownership, 58.1% of the respondents were within the 0-200 range, 19.6% owned 201-400 heads, 12.6% had 401-600, and 8.11% were within the 600-1000 range with the rest owing more than 1,000 heads (Table 8). Thus, two

sections of the respondents were extremely poor, one was well-off, and the remaining three were in the middle-income range.

Table 7. Total livestock owned by the respondent herding families

Number of livestock (heads)	Hujirt	Sant	Hairhan-dulaan	Bayan-undur	Jinst	Bogd	Bayanlig	Ulziit	Total
Below 100	7	2	3	4	5	0	6	6	33
100-200	7	2	4	2	4	6	3	6	34
201-400	3	4	10	5	3	6	3	3	36
401-600	0	5	2	4	4	2	3	4	23
601-1,000	0	6	1	2	2	2	3	4	19
Above 1,000	3	1	0	3	2	2	2	3	15
Total	20	20	20	22	20	18	20	20	160

Sources: Statistical Bureaus of Bayanhongor and Uvurhangai Provinces 2009 (2008 census data)

Table 8. Goats owned by the respondent herding families

Number of goats	Hujirt	Sant	Hairhan-dulaan	Bayan-Undur	Jinst	Bogd	Bayanlig	Ulziit	Total
Below 100	15	4	8	3	5	0	6	6	47
100-200	4	5	7	2	4	9	3	5	39
201-400	0	9	2	5	5	3	2	3	29
401-600	1	1	3	4	3	0	2	4	18
601-1,000	0	1	0	2	3	2	2	2	12
Above 1,000	0	0	0	1	0	0	2	0	3
Total	20	20	20	17	20	14	17	20	148

Sources: Statistical Bureaus of Bayanhongor and Uvurhangai Provinces 2009 (2008 census data)

5.2 Survey Method

We used the stratified random sampling method in our survey in which the herders were grouped by the number of livestock they possessed (Tables 4 and 5). Data on livestock types and their quantities were taken from the 2008 county level livestock census by local agricultural/statistical departments in the two study provinces rather than from households as the latter were very sensitive about declaring their livestock numbers.

The survey questionnaire had six sections. The first section contained 18 questions relating to the environmental problems of the local area, pasture and resource degradation, causes of environmental deterioration, and the degradation impact of livestock. The second, third, and fourth sections had questions relating to the costs of implementation of the three proposed policy options. These sections had 4-14 specific questions related to the implementation of each policy option. These three options were: (a) introducing a community pasture management system, (b) the application of pasture utilization fees; and (c) the application of herder income tax.

The survey was done in two steps. The first was a pre-test carried out in April 2009 in Sant County, Uvurhangai Province. During the pre-testing period, we found some problems with the survey design:

- It was not possible to find equal numbers of respondents who owned goats and who did not own goats. We found that almost everyone sought to own goats to access the cashmere market. Thus finding ten respondents in each county who did not own goats was impossible.
- The survey touched on the sensitive issue of the number of livestock each respondent owned. Because the respondents were reluctant to expose details of their personal income and assets, this part of the survey was made optional. However, we obtained official livestock census data from government officials to ensure data accuracy.

The second step was the actual full-scale survey which was carried out from June 15 to July 15, 2009. Twenty households from each of the eight study counties (totaling 160 households in all) participated in the survey.

5.3 Survey Findings

The summary of responses to the first section of the questionnaire regarding the herders' opinions about environmental conditions and problems and the main causes of deterioration is given below.

The majority of the herders blamed decreased precipitation and climate change for pasture deterioration (65.5%), and the remainder put the blame on increased livestock pressure (34.5%). Believing that the main cause of pasture degradation was climate change gave rise to inaction and hopelessness on the part of the herders. This is a dangerous perception because it leads herders to believe that they are not responsible in any way for pasture degradation, which is not true, and that they do not need to take an active role in alleviating pasture problems for instance, by working together to adjust herd sizes.

Regarding the livestock species that impacted pasture quality the most, the majority said that goats were to blame (76%) while 16% said horses were to blame. The rest did not answer this question. There was a consensus that goats represented the fastest growing livestock type and that there was a relationship between livestock/goat population growth and pasture degradation.

Most herders (74%) felt insecure about their customary pasture area because they were not legally entitled to the land, and a minority (7%) responded that they hired people to ensure that their pasture was safe from free-riders. A critical question regarding whether herders cared about pasture quality in an open access pasture was answered in the negative by most of the herders (61%) and in the affirmative by 32% while the remaining 7% did not give any answer.

The majority of the herders were aware of their surrounding environmental problems and the main causes of pasture degradation, and 86% of the respondents expressed the need for government involvement and strict regulations to ensure proper

pasture management including the equitable distribution of pasture resources among herders. Figure 7 illustrates the responses to the question on what sorts of measures should be taken to utilize pastures more responsibly.

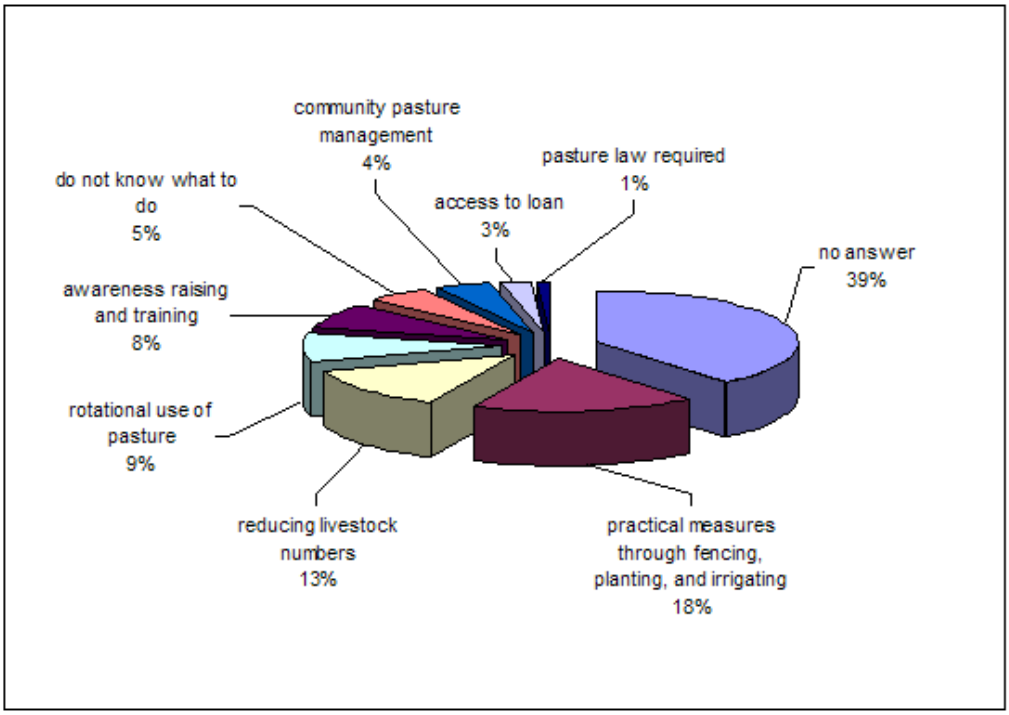

Figure 7. Respondents' suggestions for sustainable pasture management

6.0 COST ANALYSIS

6.1 Method of Analysis

There were about 997,000 heads of livestock and over 5,400 herding families in the five counties which had exceeded their PCCs in 2008. At the time of the study in 2008/2009 (before the 2009-2010 *dzud*), we estimated that to reach a livestock count that did not exceed the PCC of the pastures in the five study counties, the total number would have to be reduced to approximately 290,000 heads or by 3.4 times. Considering the fact that livestock is the only source of livelihood for the herder families and that the majority of them have less than 200 heads of livestock (which means they live below or close to the poverty line), we acknowledged that it would be impossible to reduce the livestock population to the desired level in a short period of time.

Our approach to reaching the desired level was by way of a gradual reduction system that would be carried out over 20 years. Twenty years is a flexible timeline, which may be shortened if conditions prove more favorable than anticipated and pasture quality improves more rapidly than expected. This would happen simultaneously with investments in pasture restoration, the establishment of schemes to increase livestock productivity, and the promotion of SMEs for livestock raw material and dairy processing.

Table 9. Herder households and livestock numbers in the five study counties exceeding their PCCs in 2008

County	No. of herder households	Livestock in 2008 (heads)
Bayanundur	1,168	218,736
Sant	1,067	236,784
Hujirt	1,517	187,569
Hairhandulaan	922	194,563
Bogd	776	159,500
Total	5,450	997,152

Sources: Statistical Bureaus of Bayanhongor and Uvurhangai Provinces (2009)

We calculated the costs for sheep, goats, and horses because sheep and goats made up 85–90.5% of the total livestock in the five counties, and horses came second after goats in their level of environmental impact. To estimate the impact of the policies, we first calculated the 'flock circulation' figures[6] and then we used this data in the herder expenses component of the cost-effectiveness equation.

We discounted the costs of the policies at 6%. The general interest rate of the Mongolian Central Bank at the time was around 10%. Although 20 years may seem like too long a period for the policies to be fully implemented, this length of time is necessary to guarantee the successful establishment of alternative sources of income and improved technologies, which would make herd reduction an easier process for herders.

Table 10 illustrates the total reduction percentage rates of sheep, goats, and horses that will be neccessary to effectively improve pasture conditions and make the pastures more sustainable. These livestock population reduction rates are subject to change if the prices at which the products of the animals change relative to each animal. These changes would have to be made throughout the implementation of the policy. For example, if the price of wool rises with improved processing and marketing, herders may become more compelled to increase the sheep to goat ratio to higher than 3:1 or 4:1 such that the amount of grazing pressure is still maintained while the flock composition is slightly changed. However, it is fair to say that these population target ratios are decently sound representations of the economic worth and environmental impact of the different livestock.

[6] The flock circulation figure represents the real economic value of each animal (in this case, goats, sheep and horses) in the most holistic sense. It reflects the normative value i.e. the total monetary value of the animals that herders are capable of receiving if they successfully sell all of their livestock products at prevailing market prices.

Table 10. Required livestock reduction rates for the five targeted counties

Live-stock	Target population (heads)	2008 population (heads)	Required annual reduction rate (based on 2008)	2010 population	Required annual reduction rate (after the 2009-2010 *dzud*)
Goats	~ 86,000-87,000	485,417	39%	189,124	34.5%
Sheep	~180,000	426,504	37.5%	244,725	34.8%
Horses	~21,000	48,721	20.4%	31,254	18%

Figures 8 and 9 show the projected livestock reduction rate plans before and after the 2009-2010 *dzud*. A comparison of these two graphs indicates the drastic impact of the *dzud* on livestock numbers. Again, the first figure is given more emphasis in this report, and the second figure is shown just to shed light on possible deviations.

Our population target level was based on the 4:1 sheep to goat ratio which was deemed most suitable for the environment. The horse population target was set to be halved. The total population of sheep, goats and horses spanning 20 years was calculated taking into account livestock birth rate, natural death rate, and the desired herd reduction rate.

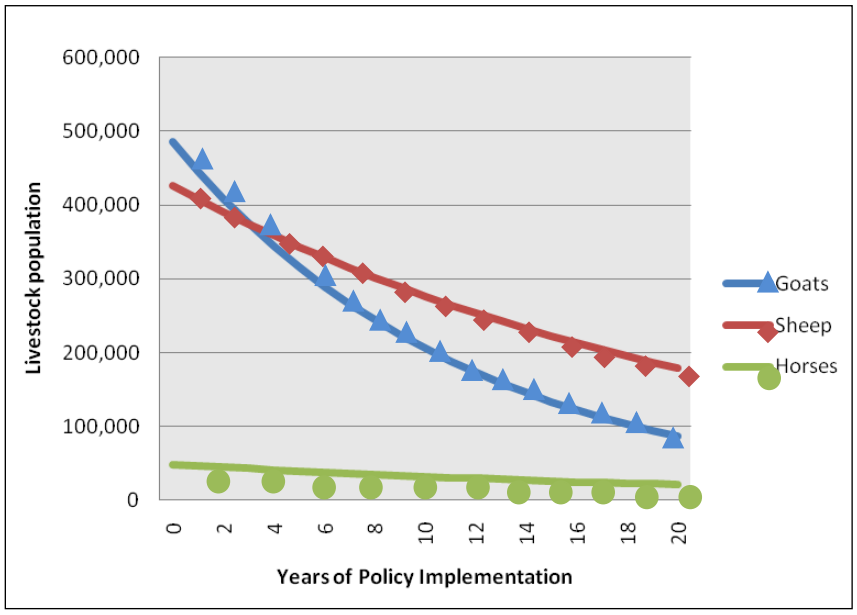

Figure 8. Projected livestock reduction rates (pre-*dzud*)

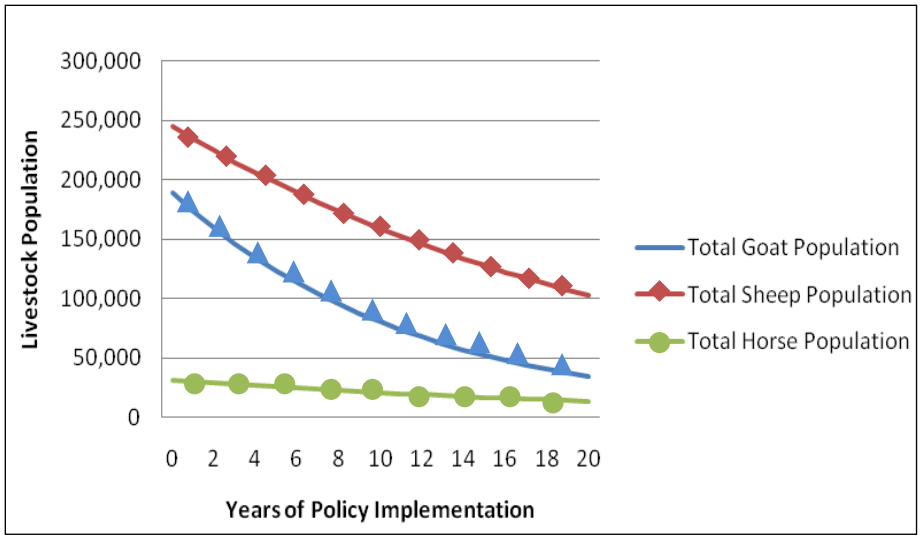

Figure 9. Projected livestock reduction rates (post-2009-2010 *dzud)*

6.2 Flock Circulation

Flock circulation numbers represent the real economic value of each livestock animal in terms of their normative value. Our flock circulation calculations appointed values to the milk, hides, and wool of all sheep, goats and horses in the five study counties because of the potential profit they can reap in the future if a large enough market is established. There is certainly a big demand for milk, hides, and wool, especially in Ulaanbaatar, but there is yet no established market system to bring the products to the customers. Table 11 shows the flock circulation calculation scheme for goats. The same scheme was used for horses and sheep, but with different coefficients.

Table 11. Flock circulation calculation scheme for goats

Items		Details	National norms and normative coefficients	Measurement unit
Population converted into SEU		SEU Conversion Coefficient	0.9	head
Total Goat Population		Death from natural causes for mature livestock /in percentage, average from the past 5 years/	0.0204	head
Of the total goat population	Females	Percentage from the total population /average of the past 5 years of the national goat population	0.404	head
	Offspring	Number of offspring from every 100 births /average of the past 5 years of the national goat population	0.812	head
Income Items	Hides	The percentage of livestock that will have their hides sold in the market	0.39	piece
	Meat	The average amount from each goat	18.5	kg
	Milk	The amount of milk that will be produced in one month of the summer season. (Opportunity costs included)	15	l
	Cashmere	The average is taken from the Mongolian Breed goat.(Opportunity costs included)	0.28	kg
	Income Sub-total			
Expenditure Items	Salary for herding labor	The annual salary for herding each goat.	6,000	MNT
	Feed	The amount of hay that will be used for one month of winter. Each goat will consume 1.4 kg per day.	42	kg
	Veterinary costs borne by herders	The annual veterinary expenses for each goat.	350	MNT
	Depreciation costs of springs and wells	The annual cost of depreciation of water sources due to usage by goats.	400	MNT

The figures in Table 12 serve to give an idea of the relative values of each of the livestock types. These values of sheep, goats, and horses are always changing because of price fluctuations, especially in the meat market. These estimates show the present and the normative values of each animal in the five *soums* when 37.5%, 39%, and 20.4% annual reductions are made in the numbers of sheep, goats, and horses, respectively. This report stresses the normative values of the livestock because these show the potential

value of the livestock when their productivity is increased, and on the flip side, their negative environmental costs. The present values do not reflect the environmental costs, but they do show the actual current value of the animals within the present limitations of the markets to brand the products and offer them to potential customers.

Table 12. Comparison of the present and normative values of livestock

Livestock	Present value (the value today)	Normative value (theoretical value)
Sheep	5,070 MNT	6,720 MNT
Goats	6,010 MNT	4,530 MNT
Horses	450 MNT	23,820 MNT

Apparently, sheep produce five kilograms more meat and nine liters more milk than goats. Thus, sheep are theoretically more valuable than goats. The cashmere market in Mongolia is far more advanced and larger because of its international popularity than the meat, milk, or wool markets. If the latter markets also become well established, the value of sheep will grow closer to their normative value.

The flock circulation calculations valued horses at 23,820 MNT, a high price compared to sheep and goats, because of the sheer size of horses. Horses are said to offer 120 kilograms of meat and 100 liters of milk per animal. Female horses are much more valuable than male horses because they produce milk. Among the female horses, the white ones are more valued for their milk. Horse meat is not too popular in Mongolia, and horses are generally used much less than other traditional livestock animals except as a means of transportation. If the demand for horse meat were to rise, then perhaps the lofty horse value will be realized.

The lower normative value of goats can be explained by the fact that when you factor in their environmental impact capacity (which is usually ignored), then their value decreases from 6,010 MNT to 4,530 MNT. For the other animals, the normative values do not decrease because the potential value of their meat and other products outweigh their environmental impact capacity.

When calculating the total income derived from wool, cashmere and milk, we subtracted/excluded incomes derived from livestock that were deliberately slaughtered to reduce herd sizes. By doing so, we incorporated the opportunity costs of not being able to further reap wool, cashmere and milk profits from these slaughtered animals.

6.3 Measuring the Costs

The values shown in Figure 8 and Table 10 were derived from the 2008 livestock census data. These numbers would be different if we were to incorporate the fallen livestock numbers resulting from the 2009-2010 *dzud*. We used the 2008 data to calculate the costs of the different policy options relative to each other because they represented a

more realistic and accurate picture of the situation of the pastures in Mongolia. The 2009-2010 *dzud* was an external event that altered the real situation on the ground and using post-*dzud* figures would not produce accurate results for the purposes of this study. Thus the integrity of the data is intact.

It was not possible to carry out a stringent cost-benefit analysis of the different policy options simply because they were structured differently: some of them involved investing more in pasture rehabilitation, and others more in herder institutions. However, we did attempt to do a simple estimation of the costs and benefits of each option.

Herders generally keep too many livestock because they act as a form of insurance against natural disasters. However, the 2009-2010 *dzud* proved that large herd sizes do not guarantee a safety net. There were many cases where entire herds were obliterated by *dzuds*. Table 13 shows the different costs/revenue items for Policy Option 1 for Year 1. These were projected over a 20-year period. Some of the investments were designed to last five to ten years, which is why it was important that the costs for each year were calculated. The herders receive a net positive value from all of the policies.

Table 13. Costs and Revenue of Policy Option 1 (Year 1)

	Type of Costs	**Value per animal/year or per *soum*/year (MNT)**	**Initial livestock numbers in the five *soums***	**Year 1**
Total Goat Population			485,417	445,442
Total Sheep Population			426,504	408,386
Total Horse Population			48,721	46,748
Herder Household Revenue/Expenditure	Value from goats	5,000		946, 563, 150 (Note 1)
	Value from sheep	7,000		1,119,573,000 (Note 1)
	Value from horses	24,000		238,538,016 (Note 1)
	Investment to improve productivity of livestock (Inbreeding support center)	194,080,000		(194,080,000) (Note 2)
	Investment in pasture restoration	199,104,000 each year for 5 years		(199,104,000)
	Investment in livestock raw material processing (value addition)	33,500,000 for a 10-year loan payback		(33,500,000)
	Total Herder Revenue (in MNT)			1,877,990,166

Government Revenue/Expenditure	Support for herder groups		25,000,000 x 5 *soums* each year for 3 years		(125,000,000)
	Pasture boundary delineation of herder groups		80,000,000 x 5 *soums* each year for 3 years		(400,000,000)
	Detailed determination of pasture carrying capacity (very costly and time consuming work)		70 mil. MNT x 5 *soums* in Year 1, then 10 mil. MNT x 5 *soums* per year		(350,000,000)
	Costs for three technical staff for each county administration unit (community support, SME development, communal pasture management, dispute resolution, monitoring and evaluation.	Salary	9,000,000 x 5 *soums*		(45,000,000)
		Equipment and Technology	1,800,000 x 5 *soums*		(9,000,000)
		Public awareness and advocacy costs	3,000,000 x 5 *soums*		(15,000,000)
	Investment in livestock raw material processing (value addition)		335,000,000		(335,000,000)
	Loan payment from herders		33,500,000 for 10 years		33,500,000
	Total Government Expenses (-)				(1,245,500,000)
Net Policy Benefits					632,490,166 (Note 3)
Present Value of Total Policy Revenue (at 6% discount rate)					632,490,166

Source: Authors' own calculations based on existing information such as the national average salary scale for the agriculture sector and required investments for dairy operations, hide and meat processing; etc.

Notes:

1) 5,000 x 485,417 x 0.39. We multiplied by 0.39 because 39% of the goat population would be slaughtered. For sheep, we used 37.4% and for horses we used 20.4%. These percentages were derived by looking at the pasture carrying capacity and finding out by how much the livestock populations should be reduced in order to reach the desired levels by Year 20.
2) See Table A1 in Appendix 1.
3) 1,877,990,166 - 1,245,500,000 = 632,490,166
4) This table only shows Year 1 as an example. The authors did annual calculations for up to the 20th year.

6.4 Analysis of the Policy Options

The three proposed policies have similarities and differences (Table 14). Option 1, for example, has the most number of components whereas Option 3 is much simpler.

Table 14. Analysis of the components of the three policy options

Common herder cost components	**Common government expenditure components**	**Components unique to Policy Option 1**	**Components unique to Policy Option 2**	**Components unique to Policy Option 3**
Value of goats, sheep and horses that are to be slaughtered	Detailed determination of pasture carrying capacity	Inbreeding support center for improved productivity of livestock (H) (Appendix 1)	Pasture fees (H)	Tax payments (H)
Loan received from government in order to invest in a livestock raw material processing center	Salary for technical staff	Investment in pasture restoration (H) (Appendix 2)	Pasture restoration expenses from 50% of pasture fees (G)	Tax revenue (G)
	Equipment and technology costs	Expenses for support of herder groups (G)	Revenue from 50% of pasture fees (G)	Salary for tax collectors (G).
		Pasture boundary delineation costs (G)	Salary for fee collectors (G)	
	Public awareness and advocacy costs			
	Large investment in raw material processing centers/SMEs (Appendix 3)			

Notes: H = costs incurred by herders, G = costs incurred or revenue earned by the government

From the common government expenditure column, one can see that all the policy options will have an emphasis on establishing processing centers, which will be a means to improve livestock productivity and create alternative sources of income for herders. This will mean that not all rural inhabitants will have to rely strictly on herding, which will in turn reduce the need for every family to own livestock.

6.5 Policy Costs

The government receives very little money from herders in Option 1, but the herders get the highest net gains because they receive the least amount of burden in terms of fees or charges. Option 1 gives an annual average net profit of 1.11 billion MNT, which is second after Option 3. In Option 2, the government collects an ample sum of money in the form of pasture fees, but it has to spend half of this on pasture restoration. This policy distributes the expenses between the herders and the government more equally than the other two. Although Option 3 seems to be profitable for both the government and herders, it does the minimum to restore pastures and support herder groups. Table 15 shows the net gain and loss scenario for each policy option (including a No Policy alternative) and gives the benefit-cost ratios as well. Figure 10 illustrates the projected costs over 20 years.

Table 15. Average annual gains/losses of the three policy options over 20 years

	Option 1	**Option 2**	**Option 3**	**No Policy**
Total Herder Balance	+1.32 billion MNT (profits from livestock product sales, with very little expenses by the herders)	+827 million MNT (profits from livestock product sales minus pasture fees)	+778 million MNT (profits from livestock product sales minus income tax)	At the current rate of degradation, most herders will be left without pastures within the next few years.
Total Govern-ment Balance	-212 million MNT (the government does not receive any form of revenue from the herders and bears the brunt of restoration costs)	-93.1 million MNT (the government will spend half of the fee revenue on pasture restoration)	+511 million MNT (the government will retain all of the tax revenue)	The government will have to subsidize the failing livestock sector, face negative economic growth, and deal with high rates of unemployment.
Net Balance	+1.11 billion MNT (consists mainly of herder revenue)	+734 million MNT (consists mainly of herder revenue)	+1.29 billion MNT (consists of herder and government revenue)	The net effect will be negative to both the government and society. The poverty level of herders will rise drastically.
Benefit to Cost Ratio	1:0.22	1:0.42	1:0.36	There will be no benefits, only costs.

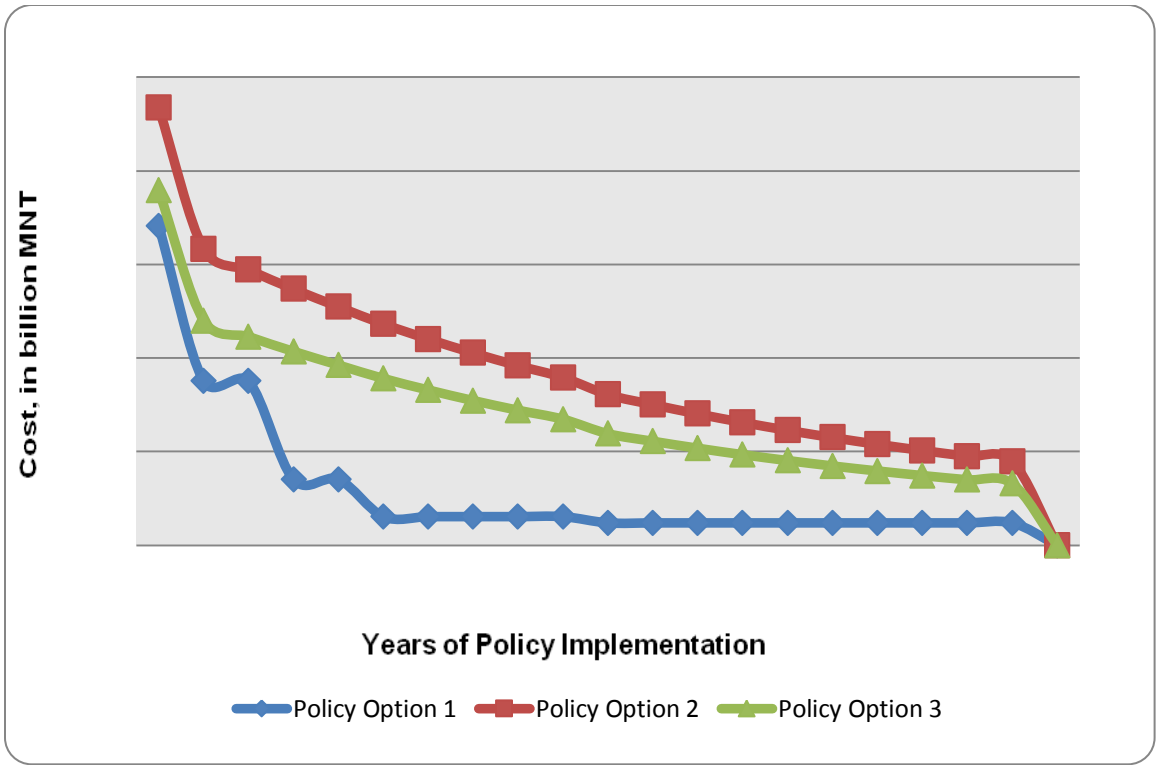

Figure 10. Costs of the three policy options over 20 years

6.6 Selection Criteria for the Policy Options

The economic performance of the options was only one of the factors in determining which policy was ideal for Mongolia. Certain policies may be great in theory but not practical in the real setting, thus a practicality criterion was also factored in. A policy will not work if there is no political will on the part of the government to pass laws supporting it, thus the government's attitude was the third criterion. The fourth criterion was support from the main stakeholders; the herders. Herders should ideally agree with a proposed policy and be willing to cooperate with the government in fulfilling their responsibilities as required by such policy. Mutual agreement should exist before a policy is passed. Each of the criteria was measured on a scale of 1 – 5 or 1 – 4, with higher scores indicating greater likelihood in terms of policy implementation. The scores were set based on sound judgment. If, for example, the likelihood of herders accepting a certain policy appeared to be very slim, then we allotted 1 or 2 points. The selection criteria are summarized in Table 16.

Table 16. Selection criteria for the three policy options

Criteria	Importance	Description	Scale	Method of evaluation
Relative cost	**	The cost to revenue ratio shows the relative cost of the policy. This must not be mistaken with cost-effectiveness.	1-4: lowest to highest ratio	Cost and revenue calculations
Practicality	**	How feasible success of the policy is considering existing conditions.	1-5: impractical , slightly practical, very practical	Past pasture systems and regulations and their success rates.
Government's attitude	*	The willingness of policy-makers and legislators to pass laws and support the policy.	1-5: unwilling, somewhat willing, very willing	Past records of laws and policies to examine the government's tendencies
Herders' acceptance level	****	The willingness of herders to cooperate with policy requirements.	1-5: unwilling to cooperate, somewhat willing to cooperate, very willing to cooperate	Herder survey
Impacts	***	The impacts of the policy, whether they be positive or negative.	1-4: lowest to highest positive impact	Expert judgment

Note: We also estimated the relative importance of each criterion (column 2) although this was not factored into the calculations. The more * indicate more importance.

6.6.1 Option I. Community Pasture Management System

This option's overall score was 20 out of 23 points.

Relative cost (3 out of 4 points)

This policy imposes the highest cost on the government but provides the highest profits to herders. The average relative cost of 0.22 (Table 15) is lowest among the three options because the level of government aid falls dramatically as the years pass. This policy has, however, the most unequal distribution of costs among the involved parties.

Practicality (4 out of 5 points)

Through a communal pasture management system, herders can benefit from division of labor, *dzud* disaster relief (through collective funds), guaranteed pastureland access, and improved pasture quality. This policy is deemed fully practical because it gives herder groups exclusive property rights to their pasture. This, in turn, gives herders

the incentive to invest more of their time and efforts into ensuring that their land will be able to sustain them indefinitely. Under this communal property regime, herders will also benefit from reduced stress in dealing with rival herders coming in from regions that are not faring well with regard to forage. This policy poses a double-edged sword in that herders will also not have the option to migrate to other pasturelands that are managed by other herding groups. There are two immediate challenges to this policy option which will need to be addressed accordingly by policy-makers; certain groups of herders will be unwilling to join herding groups because of the inevitable reductions they will have to make to their herd size, and secondly, herders within the same group will undoubtedly have disputes regarding the division of responsibilities, the allocation of winter and spring shelters, and the exact numbers of animals that they will have to reduce in order to achieve enhanced pasture quality. An action plan must be produced, which will define the steps and procedures to be taken should there be a split in a herding group. The first alternative would be to reconcile the members of a group, but if that fails, the remaining herders should be strongly encouraged to become members of other herding groups in the surrounding area.

This policy option has to be designed so that every herder, be they wealthy or poor, has an incentive to become a member of a herding group. The government must be careful that this option does not begin to resemble the collective system of the socialist period in Mongolia. Wealthy herders do not want to have their livestock seized and redistributed simply because they have larger herds. Their hard work and strong herding skills will not be recognized or rewarded if the system allows seizure of their livestock. This policy can work without straying from the emphasis on reducing livestock numbers. If herders find that they must reduce their livestock numbers under this communal regime, they will have to liquidate their excess livestock. Thus, despite losing the actual animals, they will not be losing their economic value. This policy must incorporate punitive measures for those herders who refuse to cooperate with their herding group.

Existing herding groups successfully practicing this system are testament to the practicality of this policy option. The survey findings showed that herders were mentally ready to accept a change in the pasture management regime and to join herder groups (almost half of the questionnaire was about the benefits of being in a herder group and 60% of the replies were positive, with 20% against and 20% non-replies due to lack of sufficient information). One point was lost from this criterion because of the immense challenge that handling disputes and uncooperative herders presents.

Government's attitude (4 out of 5 points)

This option requires the most active participation of the government, which has to be responsible for many different activities. In this respect, it demands the most time, energy, and money from the government compared to the other options. It will require substantial involvement by the government especially during the initial five years. The main question is how much time and effort is the government willing to expend to successfully carry out this policy? Approving and launching this policy is relatively easy compared to actually delivering on it. If the government does not provide the appropriate amount of resources and guidance, there is a risk that this policy may worsen the pasture situation by complicating matters with the herders.

The government will need to do an inventory of existing pasture resources, implement fair division of pastures to herder groups, establish pasture boundaries, and set up a clear legal framework that allows everything to operate as smoothly as possible. Upon completing such measures within the first five years, the government's involvement will, thereafter, be limited to monitoring contract implementation by the various herder institutions and periodic assessments of pasture quality. Oversight of the implementation of the pasture agreements is the government's main function in this option. Out of all the policy options, this policy option offers the most diplomatic form of dealing with the pasture problem because it does not impose direct financial obligations on the herders. It is politically easier for the government to implement, but it requires the most grueling work. The government is unlikely to be excited about taking up such a high level of added responsibility because its current level of expertise may not be sufficient to deliver successful results. This is the main reason why this criterion loses one point.

Herders' support (5 out of 5 points)

Although a communal pasture management system will cost the herders a lot in terms of the reductions they will have to make in their herd sizes, they are not directly asked to pay anything upfront in cash. They will instead be asked to give their time and commitment towards maintaining the strength of their respective herding groups. There is a certain level of uncertainty, however, with regard to which is more difficult; paying cash or investing time and effort and reducing livestock. Herders will be offered a leading role in this new form of management. This policy offers the most support services to herders (Table 15), substantially improving their access to group services and aiding them through the transition to smaller herd sizes. The services include pasture restoration, and establishing an inbreeding support center and a herder support mechanism. The herder support mechanism is the most important element of this policy in winning the support of herders. Herders would like to enjoy an insurance system whereby they will receive support during *dzuds*, especially if they have had to downsize their herd sizes in order to meet PCCs. This policy provides the most benefits and positive externalities to herders because a collective effort to reduce herd sizes to match PCCs is the most time and resource-effective strategy.

A little over half of the 160 survey respondents had had some experience with formal and informal herder groups, and 30 were actual members of herder groups. During the surveys, these 30 herders pointed out the importance of all herders joining a similar regime. The survey results also showed that 85% of the respondents emphasized the need for the government to regulate pasture use. Approximately 40% said that the government should give herders the right to possess pasture resources, and 17% said that pasture possession rights should be given to informal and formal herder groups. The respondents had diverging opinions in the case of individual pasture ownership although 48% of the respondents were in favor of a communal pasture regime. Once the case of wealthy herders and uncooperative herders is addressed through various legal procedures, there will no longer be any substantive argument for a herder to object to being part of a herder group. Thus, this criterion received full points.

Impacts (4 out of 4 points)

This policy will cause the pastures of the five *soums* to become fragmented into many pieces. However, direct physical barriers, such as wooden fences, will not separate these fragments. If this policy is implemented successfully, it will have the most positive environmental impact because not only will it mean planning set targets to reduce livestock numbers but also managing livestock grazing in more effective ways. This policy option represents an active solution to improving pasture quality and keeping the balance between pasture grazing and ecosystem resilience.

During the initial stages of policy implementation, herders are expected to experience a reduction in their household income because of the reduction in their livestock numbers. However, other measures proposed in this policy option, such as inbreeding, livestock raw material processing through small and medium enterprise development, increased dairy production, and community development, will eventually compensate for this negative impact and yield positive results. The success of this policy option is dependent on how much of a paradigm shift the herders are willing to make regarding what they perceive to be an asset. Herders exceeding the set quotas for herd size and herders who need to adjust their herd ratios will have to make changes. Their livestock loss will be compensated through the liquidation of such livestock (or trading of livestock across and within herding groups). Once the numbers of livestock have been successfully reduced to sustainable pastureland levels, this policy will have a significant impact in retaining excellent pasture quality.

6.6.2 Option 2. Pasture Utilization Fees

This option's overall score was 9 out of 23 points.

Relative cost (1 out of 4 points)

Based on our herd population projections, this policy option is expected to yield 827 million MNT in net profits for herders (Table 15). The government is expected to spend half the revenue it receives from pasture fees on pasture restoration. This criterion receives 1 point since it does not yield a particularly high benefit in relation to costs.

Practicality (2 out of 5 points)

Herders are not used to paying any form of fees to the government in order to carry out their daily herding operations. A pasture fee system exists in law, but herders are currently exempted from it; thus, it is mainly a matter of removing such exemption. This option is more practical than Option 3, but is less enticing than Option 1. The pasture fee for goats is lower than the goat tax in Option 3, however, the sheep and horse fees are slightly more. It is unlikely that herders will agree to pay pasture fees when they have never had to pay them before and when they already have enough financial constraints. Herders are in fact accustomed to receiving all the aid they can get from the government. The government should, however, provide assistance in a constructive manner which does not breed dependency. There is a high likelihood that most herders will default on their pasture fee payments. This pasture fee system should be scaled so that herders in different wealth tiers will pay different pasture fees. One weakness in this policy is that there is no current established system or framework for fee collection. Thus, this criterion received a low score because of its high probability of failure.

Government's attitude (2 out of 5 points)

The government will receive some revenue from the pasture fees, though their net balance will still be negative. In 2008, the government supported the expansion of the goat population. Thus, this policy will be very inconsistent with the government's track record regarding livestock sector management. Most government officials will therefore be quite reluctant to support a pasture fee system. The key legislators (parliament members) will have to answer to their constituencies, which mainly comprise livestock herders. Because their chances for future re-election are at stake, they will naturally be reluctant to pass a pasture fee law.

Herders' support (2 out of 5 points)

The herder mentality is that the government is not doing enough to support their arduous occupation and that it should do more to help herders. It is most probably true that the government is not doing enough to improve the welfare of Mongolia's herding population. However, the government's role is not to be a charity organization, but to institute sound policies and systems that will make the lives of their citizens better. Herders will most likely not be in favor of the pasture fee system despite the fact that half of their payments will be spent on pasture restoration. They may favor present gains over future welfare and not see the significance of the benefits that will accrue from reducing pasture pressure and investing in pasture restoration.

Impacts (2 out of 4 points)

Half of the revenues collected from the pasture fees will be allocated to pasture restoration. In the first year, the pasture fee revenue will be 529 million MNT, which when divided among the five *soums*, will be approximately 106 million MNT per *soum*. This amount is enough to make a perceptible difference to the quality of pastures in each *soum*. Compared to the first policy option, this option has fewer regulatory features for pasture use. In terms of environmental impact, this policy is the most favorable as it proposes direct pasture restoration activities from pasture restoration funds right from the first year of implementation. Its impact in reducing the household budget is as significant as Option 1.

6.6.3 Option 3. Herders' Income Tax

This option's overall score was 10 out of 23 points.

Relative cost (2 out of 4 points)

This policy option is beneficial to the government, which receives a net profit (more than in the other two options) because all of the taxes received are considered as revenue. Unlike Option 2, the government has no obligation to guarantee that a certain percentage of the collected revenues will be spent on pasture restoration since the tax collected under this policy will be treated like any other income tax. Any plans for the government to implement pasture restoration will be performed separately and independently from this particular policy. The relative cost ranks second among the three policies and gets 2 out of 4 points.

Practicality (3 out of 5 points)

The tax rate is higher than the pasture fees. However, it is easier for herders to accept that they have to pay taxes like other citizens, which although higher than before, is still below the 10% rate that other citizens have to pay. Herders are also more familiar with tax payments because they had to pay taxes from 2006 to 2009, whereas they have never had to pay pasture fees before. The tax collection system is also more advanced than the pasture fee collection system. This is an important element because an existing framework will make the process of tax collection more efficient that setting up an entirely new system.

Government's attitude (2 out of 5 points)

This policy will bring in a substantial amount of revenue for the government. However, due to the 2009-2010 *dzud* that killed over 8.4 million livestock, this policy would appear to target the most vulnerable and impoverished sector in society; the herders. Thus, the government, which is protective of its reputation among the herders, will be especially wary of passing such a law. The government will instead face more pressure from the herders to increase its support without imposing any burdens on the latter in the process. Similar to Option 2, legislators will be opposed to the idea of imposing income taxes on herders. It would be a sure path to not getting re-elected in the following term.

Herders' support (2 out of 5 points)

This policy imposes the highest charges on herders. There is also no guarantee that the total tax amount will return to the herders and directly benefit their lives. This policy offers very few promises to herders and is the harshest of the three options on them. It has, therefore, very little appeal for herders, and although familiar with the principle of taxes, herders are expected to be extremely vocal about their objections to it. Herders are unlikely to see any potential benefits arising from this policy. Although there may be a marginally higher level of acceptance of a tax imposition than a pasture fee, both options are similar enough in this respect to accrue the same points for this criterion.

Impacts (1 out of 4 points)

This option will have the least positive impact on the environment and the highest negative impact on the livelihood of herders. The reduction in grazing pressure on pastureland is expected to be similar to Option 1. However, unlike the other two options, this policy does not provide for any active steps to mitigate pasture degradation nor does it offer the various services and benefits that herder groups will provide for their members. Therefore, this policy option had the lowest impact ranking.

A summary of the scores of each option is given in Table 17.

Table 17. Criteria scores of the three policy options

Criteria	Score range	Option 1	Option 2	Option 3
Relative cost	1 - 4	3	1	2
Practicality	1 - 5	4	2	3
Government's attitude	1 - 5	4	2	2
Herders' acceptance level	1 - 5	5	2	2
Impacts	1 - 4	4	2	1
Total Score	Maximum 23	20	9	10

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

This study evaluated three policy options to address the problem of pasture degradation in Mongolia.

- Option 1: Introducing a communal pasture management system
- Option 2: Imposing pasture utilization fees on herders
- Option 3: Reinstituting income tax for herders

7.1.1 The three policy options

Each of the three policy options has unique strengths and weaknesses. Recognizing these is the first step in acknowledging the complexity of Mongolia's pasture management. All of the policies challenge the deeply imbedded beliefs and lifestyles of Mongolian herders. None of them represent an easy solution to the nation-wide pasture management dilemma. They all require input and cooperation from legislators, government officers, herders, and rural entrepreneurs.

Policy Option 1 is the least contentious policy for legislators. As mentioned earlier, politicians will resist the pasture fee policy (Option 2) and increased tax policy (Option 3) in proportion to the level of resistance from their constituencies. Except for the nine districts in Ulaanbaatar, every other voting district predominantly comprises herders. However, this is not to say that Option 1 does not require substantial input from politicians, especially in terms of the political will required to push forward the passing of a law that provides a strong legal framework for herder groups. The costs incurred on the government will be highest in Option 1while the costs incurred in Options 2 and 3 will be offset by the fees and taxes collected, respectively.

The importance of the role that the government will play in each of the policy options cannot be over-emphasized. Option 1 demands a high level of expertise and familiarity from government officers with regard to property right systems, pasture

carrying capacity, and other such concepts relevant to herding while the main challenge for Options 2 and 3 relates to the implementation and enforcement of fee and tax collection regulations, respectively. Defaults on payments are expected and the government will have to create mechanisms to monitor and deal with these.

Herders are expected to be most willing to support Option 1. However, their input and level of cooperation plays a critical role in the success of this policy. As mentioned earlier, the government will need to create legally binding instruments that will make cooperation mandatory, with a special focus on the reduction of herd sizes. One of the strengths of Option 2 is that it forces herders to acknowledge that land is not a free asset and that different livestock types impose different impacts on pastures. There is no doubt that herders are aware of the pressures that are inflicted on the land by their animals, but having the government reiterate this fact will play an important role in shifting their views about their role in pasture degradation. One advantage of Option 3 is that herders are more familiar with income taxes. They will resist the policy, but due to its acceptance in society, the resistance level will be milder as compared to paying pasture utilization fees.

Virtually every rural settlement in Mongolia is weak in terms of economic activity. Each of the three policies strongly advocates small and medium-sized enterprises (SMEs) that will increase the productivity and economic value of livestock. Unemployment is rampant in the province capitals particularly among households that do not employ animal husbandry. The SME aspect of each of the policies will target the many unemployed youth in urban as well as rural locations. Any person that aspires to partake in business activities and are willing to work for newly established SMEs will help these policies succeed. This will be challenging, taking into account the low level of education of rural youth, which is why workshops and training programs need to be carried out rigorously for all three policies.

7.1.2 Hybrid policy option

Time is a very important factor in the success of any policy option. Recognizing the grave state of land degradation in Mongolia, it is certain that if pasture degradation is not addressed in a timely manner, there will be permanent degradation of the country's grassland ecosystem which will adversely affect future generations. Every winter, several thousand herders migrate to Ulaanbaatar (and occasionally, to Darkhan and Erdenet cities) mainly because they have lost most or all of their livestock due to *dzuds* or poor pastures. While in the cities, they contribute to crime, alcoholism, and pollution; increase the unemployment rate; and add to over-population and congestion.

Option 1 offers the speediest policy solution because it is the easiest to be accepted by the different stakeholders while Option 2's legal pasture fee system would strengthen herding groups and impose a smaller burden on the government. The pasture fee would be imposed only on herders with more than 200 SEUs (the minimum SEU limit for subsistence). Based on our analysis of the strengths and weaknesses of the three policy options, a hybrid policy comprising Options 1 and 2 was found to be best for Mongolia.

Option 2 should be incorporated into Option 1 approximately five years after the herding groups have been formed. Five years is ample time for herding groups to be able

to establish themselves properly. By this time, herders will also have accepted that they are responsible for pasture quality and will have adapted to the new system. A pasture fee system guarantees that herding groups have sustainable operating units. The government will not be able to assist herding groups indefinitely; they need to become independent institutions that can function without government support. A constant stream of income for herding groups will be important in order to pay group leaders, maintain and restore pastures, and organize capacity-building workshops. During the first five years, substantial emphasis will be placed on achieving optimal herd numbers and herd ratios. Pasture fees will address the probability of herders becoming complacent and breaching sustainable livestock numbers by sliding back into their previous herd ratios and numbers.

It was not within the scope of this study to measure the direct costs and expenses of incorporating Option 2 into Option 1. This would require more intensive surveys of herders and an actual case study of an operational herding group. Introducing Option 2 will be very successful provided that Option 1 runs smoothly within the first five years of implementation.

The expected outcome of the hybrid policy will be to make a marked difference in the quality of the pastures and to ensure that they are able to sustain the expected number of livestock in the long run. For this to happen, much emphasis must be laid in improving the productivity of each livestock type through the establishment of SMEs and the improvement of livestock breeds. By doing so, herders will begin to look away from trying to maximize their herd sizes and instead try to optimize the quality and productivity of their individual herds.

7.2 Recommendations

The main recommendation is to introduce the hybrid policy described above. Arising from this, the recommendations given below are targeted at the government of Mongolia. The central government is responsible for coordinating the functions of all local governments in a manner that should be significantly more efficient than is the case presently. The government should pursue these recommendations with a sense of urgency that reflects the critical importance of the pasture degradation problem in Mongolia.

- *Restructuring Mongolia's development policy*

  The government should incorporate into its development policy a clear recognition of the importance of the Mongolian livestock sector in the nation's overall development. It is critical that the mining industry does not receive all the attention with regard to its potential to raise Mongolia's GDP. Mongolia is vulnerable to facing the adverse effects of a situation where too much of the economy is dependent upon one sector. Thus, keeping the livestock sector competitive and thriving is a means of safeguarding the economy from the fluctuations of the minerals market. Thus, the country's development policy should incorporate features that favor livestock productivity while minimizing the environmental impacts of livestock through reduced grazing pressure.

- *Setting limits on goat populations*

Goats should be the priority species for livestock population reduction. A communal pasture system (Option 1), although not perfect, is the best mechanism to encourage herders to decrease their livestock numbers. Although there is a command and control element in this regime in which herders have to adhere to specific rules about herd size, this system will allow herders to have a strong voice in the sustainable management of their own pastures. The eventual incorporation of Option 2 will provide market-based financial incentives for herders to reduce their livestock sizes.

- *Creating alternative livelihood options for rural populations*

The pressure on pastureland would be greatly reduced with the establishment of SMEs to process raw materials and dairy products in rural areas. This would move people away from depending purely on herding for livelihood. Unfortunately, unemployment is prevalent in rural settlements throughout Mongolia. Idle young men are commonly found in settlements where the people do not subsist on animal husbandry. The government should seize this opportunity to motivate unemployed youth to develop their business skills and take on bigger roles in SME development in their localities.

- *Enhancing the livestock productivity per head*

This should be done through measures such as offering better inbreeding services, creating value addition opportunities as described above via SMEs as well as skills development, and promoting the utilization of animal parts that are usually unused and are deemed to have no economic value. Mongolians are extremely good at using virtually every single part of an animal without leaving any waste. The only limitation is that this is generally done only at the household level, but there is potential for such knowledge to be used in enterprise.

- *Adopting a new pasture law*

A new pasture law should be introduced which lays emphasis on ecological sustainability, the establishment of communal pasture management systems, and the gradual introduction of pasture fees as described in Section 7.1.2. The draft pasture law is notorious in Mongolia for not being passed by parliament since it was developed in 2006; the complexity of the issue has made it extremely difficult to reach a consensus. It is very likely that the delayed pasture law enactment has been a contributing factor to the worsening of pasture quality and herder welfare. Thus, a new pasture law incorporating the features recommended by this study should be drafted and passed with urgency.

- *Improving coordination between the different ministries dealing with pastureland issues*

The Ministry of Environment and Tourism and the Ministry of Food, Agriculture and Light Industry are the leading ministries responsible for addressing pastureland management issues. Unfortunately, these two ministries do not cooperate enough. Many of their initiatives overlap while others would be more effective if implemented jointly. There are also instances where other ministries should be involved, for

example, the Ministry of Health for environmental health policies/activities. The government should establish a framework which fosters regular dialogue, cooperation, and collaboration among the different ministries on the matter of pasturelands.

- *Investing more in public awareness campaigns and training programs*

Although the different ministries invest a lot of money in public awareness campaigns on environmental issues, the government can do a lot more and a lot better in terms of building awareness about the destructive nature of current land-use practices and the urgent need for corrective action. One weakness evident in current campaigns is that they oversimplify the issue, which can have a negative impact when people adopt radical approaches which do not take into account important complexities and sensitivities. Thus, awareness campaigns should be carefully thought out beforehand and their impacts monitored during and after implementation.

The above recommendations recognize and appreciate that the nomadic herding lifestyle in Mongolia is unique in the world. It is a cultural heritage that Mongolians are inherently proud of and wish to preserve for generations to come. In order to ensure that this living heritage is sustained and sustainable, the urgent steps proposed in this study have to be taken involving all stakeholders. Lastly, once the government has committed to a specific policy, further research needs to be conducted to ensure that cost and benefit predictions are as accurate as possible.

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APPENDICES

Appendix 1. Expenses in Establishing a Livestock Inbreeding Support Center

The first two policy options both offer an activity to increase livestock productivity through establishing a livestock inbreeding support center. Table A1 below was adapted from a government inbreeding program, which the government plans to establish in every province. In this study, it is proposed to establish an inbreeding center for the five study counties (which exceeded their PCCs) to support herders in improving their livestock productivity.

Table A1. Expenses in establishing a livestock inbreeding support center

Expense item	Measuring unit	Amount	Price (thousand MNT)	
			Unit	Total
Setting up a livestock productivity database	Piece	1	15	15,000
Tool to measure wool length	Piece	1	40	40,000
Employing a livestock reproduction specialist	Person	3	4,500,000	13,500,000
Motorcycle for each specialist	Piece	3	1,200,000	3,600,000
Males for inbreeding	Head	2,500	70,000	175,000,000
Identification registration for each animal (earring)	Piece	10,000	150	1,500,000
Earring metal*	Piece	1	250,000	250,000
Normal weighing scale to weigh livestock	Piece	1	25,000	25,000
Very sensitive weighing scale for wool/cashmere	Piece	1	150,000	150,000
Total (thousand MNT)				194,080,000

Note: *Earring metal is used to make ID earrings for highly productive animals to notify staff to exercise special care over them and protect them from being stolen.

Appendix 2. Degraded Pasture Restoration Costs

Options 1 and 2 include an investment for the restoration of highly overgrazed areas in the five study *soums* which exceeded their PCCs. In total, there are 123.58 hectares of highly degraded pastures in these *soums* (Table A2). Herder households whose livestock exceeds the carrying capacity of the pastures they use should make mandatory payments towards pasture restoration. It is calculated that 995.52 million MNT is required for the restoration of 123.58 hectares of highly overgrazed pastures (Table A2). Based on identified investment costs required for restoring highly degraded pasture, each *soum* government will determine annually the number of areas for restoration and the investment costs for each of the first five years. Then, the local government will divide this required investment amount among those households or herder groups whose livestock numbers exceed the respective PCCs of their areas. In this way, we expect there to be faster compliance by herders under Option I (communal pasture management system).

Table A2. Estimated investment budget for the restoration of highly over-grazed pastures in the five targeted counties

	Soums	**Degraded pastures to be restored (in hectares)**	**Soil type**	**Dominant pasture plants**	**Natural zones of study sites**	**Cost of restoration of a hectare of pasture (million MNT)**	**Total costs of restoration of highly degraded pastures (million MNT)**
1	Bayanundur	13.8	Chernozem	Dry steppe needle grass (stipa)	Steppe	7.8	108.8
2	Hujirt	19.7	Chernozem	Dry steppe needle grass (stipa)	Forest steppe	7.6	150.2
3	Sant	5.88	Chernozem gravelly	Dry steppe wild onion (allium mongolicum)	Steppe	7.8	46.2
4	Hairhandulaan	55.9			Steppe	7.8	436.02
5	Bogd	28.3	Desert grey brown		Semi-desert	8.9	254.3
Total		123.58				39.9	995.52

Appendix 3. Required Investments for Livestock Raw Material Processing SMEs

Options 1 and 2 both considered small and medium enterprise (SME) creation to support alternative income generation and additional job opportunities for herders to alleviate the potential impacts caused by livestock reduction. The funding source for herders to set up SMEs will be the SME Department of the Ministry of Food, Agriculture and Light Industry, which will give out ten-year soft loans to herders. The government adopted the Law on SMEs in 2007 and has started funding various business projects. Based on the livestock raw materials available in the five targeted study *soums*, we propose setting up the SMEs listed in Table A3 in these counties.

Table A3. Required investments to establish livestock raw material processing SMEs

Type of SME	Investment per SME (MNT)	Required SME (unit)	Total (MNT)
Milk processing	38,000,000	5	190,000,000
Wool processing	10,000,000	2	20,000,000
Food processing	5,000,000	5	25,000,000
Cashmere processing	50,000,000	1	50,000,000
Meat production	50,000,000	1	50,000,000
Total			335,000,000

This measure will stimulate local production through raw material processing centers: one milk and one food processing unit in each *soum*; and two wool processing centers, one cashmere processing center, and one meat processing center for the five *soums* to share. Herder groups can benefit from these SMEs as employees and/or suppliers of raw materials. The SMEs will create alternative jobs for newly unemployed herders. This will diversify income generation and encourage herders to pay more attention to increasing the productivity of their livestock as opposed to traditional herding management.

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