

## **Summary of Key Research Findings Leading up to MOR2 Project**

### **Ecological Findings from 1994-1995 Fieldwork in Bayankhongor Aimag**

- Mongolian desert-steppe systems display non-equilibrium dynamics. Inter-annual variation in precipitation explains more of the variation in vegetation cover, species composition and biomass than grazing intensity.
- Mountain/forest steppe systems are equilibrium systems in which grazing intensity significantly influences plant cover, biomass and species composition.
- Steppe systems have characteristics of both equilibrium and non-equilibrium systems.
- It is important to measure multiple vegetation attributes (e.g. cover, biomass, species richness) in order to understand system dynamics.
- In the mountain/forest steppe and steppe, increasing distance from water points is associated with an increase in palatable grasses and a decrease in weedy forbs associated with disturbance.
- In all ecological zones, soil nutrient concentrations (nitrogen, phosphorus and potassium) were strongly associated with differences in species composition. Soil texture was also important in the desert-steppe.
- In the mountain/forest steppe and steppe P (phosphorus) and K (potassium) concentrations were negatively associated with distance from water, suggesting that livestock may harvest nutrients from the broader landscape and concentrate them near water sources. Thus livestock may affect plant species composition both through direct effects of grazing and trampling and indirect effects of nutrient re-distribution (of P and K).

### **Herders' Ecological Knowledge and Environmental Observations**

1993 & 2000

- Herders possess rich knowledge of their environment and ecological relationships, which is expressed in their management practices and institutions.
- Much of herders' knowledge coincides with scientific understanding of ecological relationships.
- Herders perceive declines in pasture productivity and species diversity, but attributed these to changes in climate or see them as temporary and reversible responses to overgrazing or other disturbances.
- Herders' knowledge can serve as the basis for future management institutions and provide potential monitoring indicators, and suggests that herders should be involved in designing rangeland tenure policies and monitoring approaches.
- However, herders' lack of experience with severe and irreversible rangeland degradation could prevent them from foreseeing the potentially negative consequences of their own actions.

2010

- Herders' perceptions of changes in temperature, rainfall and streamflow largely correspond to changes measured over time at meteorological stations and streamflow gauges, although in some instances they perceive declines in streamflow where the measured changes were not statistically significant.
- Most herders also perceived a decline in the amount of snow, but were divided in their perceptions of the timing of snowmelt. Slightly more herders in both the desert steppe and forest steppe perceived that snowmelt was coming later now.

### **Climate Change, Dzud and Their Impacts and Policy Implications**

2010

- In 2010 we conducted case studies in 4 soums affected by the 2009-2010 dzud. Two soums were in the forest steppe and two in the desert steppe. In each zone, one of the soums had active CBRM groups and the other case study site did not.
- Households that did fall otor (in the forest steppe), stored more hay (desert steppe) and reserved spring pastures (desert steppe) had fewer livestock losses than those in the same region who did not do these practices. In soums where surface water has declined herders were unable to use pastures, and their animals did not gain enough weight to withstand the dzud conditions.
- CBRM organizations were effective in organizing herders to prepare well for winter by managing their pastures and storing hay, helped them to respond during the dzud (desert-steppe), and brought herders together after the dzud to learn from their experiences.
- In two of the soums incoming otor herders during the dzud created a "hoofed dzud" that led to greater losses for local herders.
- Key regional and national-level policy lessons from this study included:
  1. Dzud preparation and response at all levels depends critically on clear policies to guide and capacity to implement pastureland governance across multiple scales. As national policies for pastureland tenure and management are revised and strengthened it is especially important to consider provisions for designation of dzud (otor) reserves at the local, aimag and national levels, and mechanisms to coordinate and regulate otor movements between different soums and aimags.
  2. In order to improve coordination and communication among multiple agencies (National Emergency Management Agency (NEMA) and others) and relief organizations and different levels of government, it is important to identify the distinct roles of local, regional and national government, donor and aid organizations and community organizations and develop effective communication and coordination mechanisms between them.
  3. Due to the different ecological and management characteristics of different geographical regions in Mongolia, regionally-specific recommendations for dzud preparation and response may be required.

- In another study completed in 2010, we analyzed changes in climate at two meteorological stations in Arkhangai and two in Bayankhongor Aimags, and changes in streamflow for the Khoit Tamir, Hanui and Tuin Rivers.
- Annual average temperature, and annual minimum temperature increased significantly at all sites, and annual maximum temperature increased significantly at all sites but Horiult in Bayankhongor.
- The number of rainy days increased significantly in Horiult, and average annual precipitation decreased significantly in both Arkhangai stations (Erndenemandal and Tsetserleg).
- Annual average stream discharge decreased significantly in both the Khoit Tamir and Hanui Rivers in Ikhtamir, Arkhangai, as did the annual maximum discharge. The annual average discharge of the Tuin River also decreased significantly, but the decline was much smaller than for the rivers in Arkhangai.
- These findings support other national-scale assessments of increasing temperatures, and also confirm herders' observations of warming. This research also documents the significant decline in streamflow in the rivers we evaluated. This observation also coincides with herders' perceptions.

### **Pastureland Tenure and Policy**

1999

- A historical analysis of changing tenures and land-use patterns in Mongolia suggests that in prerevolutionary Mongolia wealth and poverty determined herders' mobility and access to pasture resources, a pattern that continues to the present time.
- Historical data also reveal dual formal (e.g. monasteries) informal (herder communities) regulatory institutions in the past that coordinated patterns of seasonal movement. This amounted to an unofficial tenure system and has contributed to Mongolia's legacy of ecologically and socially sustainable pastoralism.

2002 (based on fieldwork in 1994-1995)

- Mobile pastoralists have potentially conflicting needs for secure rights (tenure) in pasture and socially and spatially flexible patterns of resource use. For example, Mongolian herders need to be sure their reserved winter and spring pastures will not be grazed by others, so they are available during the harsh seasons. However, they also need the flexibility to move to different areas when weather or pasture conditions are poor, and to camp with different households in different seasons or years. This paradox of pastoral land tenure poses problems for the management of pastoral commons.

- The vagueness, permeability, and overlap of boundaries around pastoral resources and user groups make it challenging to implement formal tenure regimes that aim to allocate rights to specific areas of land to well-defined groups of users.
- Three solutions to the paradox are evaluated: formal tenure (e.g. pasture leases), rangeland co-management, and regulation of herders' seasonal movements.
- An approach that develops and tests institutions to coordinate pastoral movements is recommended over formal tenure for pasturelands, which should be approached with caution in Mongolia.

#### 2004 (based on fieldwork in 1999)

- In 1994, Mongolia's parliament passed the Land Law, which authorized land possession contracts (leases) over pastoral resources such as campsites. Implementation of leasing provisions began in 1998.
- This study examined the status of implementation in 1999, resurveying households in Bayankhongor that were studied in 1994-1995.
- Poorer herders were largely overlooked in the allocation of campsite leases, meaning they lacked secure rights to campsites.
- The wealthy had become more sedentary and the poor more mobile, perhaps because the latter lacked strong rights.
- There was a sharp decline in trespassing following lease implementation, but that many herders and officials expected pasture leasing to lead to increased conflict over pastures.
- The Land Law provides broad regulatory latitude and flexibility to local authorities, but the Law's lack of clarity and poor understanding of its provisions by herders and local officials limit its utility.
- In general, the implied goal of land registration and titling is an all-embracing land market and the advancement of private property rights. This goal is in conflict with Mongolia's existing legal framework for pastureland tenure as well as local attitudes, which strongly oppose privatization of pasture.

#### 2007

- 3rd re-survey, in 2006, of communities in Bayankhongor studied in 1994-1995 and 1999.
- Climate remains a driver of herders' land use patterns and mobility is still a key strategy for dealing with climate variability. Many measures of mobility, such as the average distance moved, had increased since 1999.
- Global markets play an increasing role in land use through their effects on cashmere prices and resulting increase in goats, on one hand, and unregulated mining, on the other.
- Herder opposition to pastureland privatization continues but there is growing evidence of the need to regulate inter-soum and inter-aimag movements and provide more secure rights to pasture.

#### 2008

- In a study to assess the implementation of the pastureland provisions of the Land Law, in 2007 we conducted key informant interviews and household surveys in 5 soums in 4 aimags (Selenge, Uvurkhangai, Tuv and Arkhangai) and compared the behavior of herders that were members of organized herders groups or pasture user groups to those that were not.
- We found members of organized herder groups (CBRM organizations) were more mobile than non-members, moving farther, more often, and using more different campsites. CBRM group herders also were more likely to make otor moves.
- CBRM group herders also had greater structural social capital as measured by their participation in national and local organizations, interactions with government officials, and support received from local organizations.
- CBRM group herders also scored higher than non-group herders on a scale that measured trust and reciprocity (cognitive social capital) among community members.
- Case studies of formally organized herder groups revealed that some groups were successful in organizing members to coordinate movements and reserve seasonal pastures but cross-boundary movements of herders from other soums often undermined these efforts.

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