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Sustainability and resilience of the Mongolian indigenous rangeland

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Abstract

Mongolia's indigenous civilization relies on the rangeland system for grazing the livestock. Three main risks to traditional animal husbandry exist including pasture degradation, unnatural livestock deaths, and negative impacts of new civilization unfavourable to animal husbandry. Mongolia's traditional animal husbandry has sustained through managing these three risks, and animal husbandry production has continued to grow. The second risk has been mitigated traditionally by pastoralists through generations. Accordingly, herds of adult animals can recover quickly as environmental conditions improve. The third risk is successfully mitigated by the modern animal husbandry sector. This is evidenced by the fact that Mongolia's rangeland culture is still considered sustainable, adaptive, and resilient despite intensified agricultural, infrastructure, and mining developments, as well as urbanization during the past 100 years.

Introduction

Mongolia's traditional pastoral culture has evolved by adapting to the favorable and unfavorable conditions of nature. Mongolia's gross livestock output has continuously been on the rise since the year 2000. In this paper, we explore how Mongolia's traditional pastoral culture has adapted to and stabilized in response to the challenges and opportunities presented by modern urbanization and technological advancements. On the one hand, Mongolia's livestock behave like wildlife, independently foraging for grass and grazing selectively; on the other hand, it represents society and culture as it is an integral part of the life of pastoralists. Thus, it is entirely possible to view Mongolia's traditional pastoralist civilization as a model of harmonious coexistence between nature and society.

The sustainability of traditional animal husbandry is primarily due to its spread across more than 1.5 million square kilometers and its ability to maintain the vastness and sufficiency of its pastureland. Livestock herding follows four main procedures, each carefully adapted to the specific conditions of the four seasons. Each season involves a distinct set of activities, while preparations for the next season begin during the current one. The effectiveness of the preparations will determine how successfully the new season is managed. In this way of following a one-year cycle of four seasons, traditional animal husbandry production differs markedly from the production of other commodities and goods. The animal husbandry industry is complex and encompasses a wide range of activities, including livestock herding, herd management, pasture selection and utilization, seasonal livestock migration (plus otor), winter camp facilities management, livestock birthing and raising, feeding, and fat deposition, reserving fat, overwintering, watering, salt supplementation, hay and fodder management, sheering, milking, etc. Knowledge and expertise in these complex operations are essential to the success and sustainability of the pastoralist business.

Methods
Using livestock statistics from Mongolia (National Statistics Office, 2024), the data were processed using simple mathematical calculations, and key indicators were calculated for presentation in tables and graphs, which were subsequently interpreted to draw conclusions. Approximately, 10 tables and graphs are included in this study and will be featured in the poster presentation.

Results
The number of herder households in Mongolia fluctuates by approximately 12%, influenced by natural conditions, with an average of 170,000 households over the past 32 years. 'Herder Households-I' has grown to 188,000, while 'Herder Households-II' has declined and stabilized at 60,000. Livestock distribution varies across soums, with an average of 735 livestock-owning households per soum. Mongolian pastoralist communities maintain a strong cooperative culture, supported by modern communication. Traditional livestock management practices, including breeding control and risk management, have contributed to stable livestock survival rates, even during environmental challenges such as dzuds and droughts. Over the past 51 years, the average annual livestock mortality rate has remained below 8%, highlighting the resilience of Mongolian pastoralism.

Discussions
In the age of globalization, where the cultures of many countries are being introduced to Mongolia, it may seem that the country's traditional pastoral animal husbandry is at risk of being overshadowed and potentially destroyed due to conflicts with urbanization, crop farming, transportation, and mining development. On the contrary, the gross livestock output is constantly growing. So, where does the secret behind the stability, adaptability, and regenerative capacity lie? The results of our research several potential answers, outlined below.

1. Interest in livestock herding remains strong among families, and the number of herder households tends to fluctuate by approximately 12%, depending on favorable or unfavorable natural conditions. Based on data from the past 32 years, the average number of herder households is 170,000, with fluctuations occurring approximately every 7 years. Furthermore, during one-quarter of the 32 years, the number of herder households declined, while it increased during the remaining three-quarters of the same period. The number of herder households increased by up to 21,000 during three years of favorable climate conditions, while it decreased by nearly 26,000 over three years of unfavorable weather.

The number of 'Herder Households-I' (households primarily engaged in livestock farming) increased by 45,000 compared to 1992, stabilizing at 188,000. In 2001 and 2010, marked by severe drought and dzud, the number of herder households declined, followed by a subsequent resurgence. On the other hand, the number of 'Herder Households – II' (households that participate in the official livestock census and rely on a combination of livestock and non-livestock income sources) declined for approximately 10 years, from 158,000 in 1992, when livestock was privatized, to 60,000 over the past 20 years, where it has since stabilized. The number of households participating in the livestock census appears to be less affected by dzuds, likely because they raise fewer animals with adequate hay and fodder reserves or engage in more intensified farming practices. Further study is needed to explore this in more detail.

2. Households with livestock are distributed throughout Mongolia, with 200-400 households in 34 soums, 450-950 households in 224 soums, and 1,000-2,000 households in 72 soums. The average number of livestock-owning households per soum is 735. The distance between herder families varies, depending on factors such as the four-season cycle of the year, precipitation, pasture yield, and the need for cooperation and collaboration. During winter, this distance ranges from 5 to 20 km, with a family possibly moving between two to three winter camps to access pasture.

3. The moves of livestock and herder households, coupled with the communal use of pastureland, have fostered the development of a unique pastoral community culture. The pastoralist community has a concentric structure,

with herder households sharing a common pasture at its core and allies from soum and provincial centers forming the outer layers. IIn the outermost circle are relatives and friends living in the capital city of Ulaanbaatar, other provinces and soums, and even abroad. A herder family may be familiar with other families within a 100 - 200 km radius. This layered structure of pastoralist communities is rooted in a traditional culture where the brotherhood among pastoralists is strong, and there is a sincere commitment to helping one another within the shared pasture. In Ulaanbaatar and other provinces, the 'Nutag/Local Councils' are established at the intersection of nomadic and settled cultures uniting Mongolians with a pastoralist way of thinking. The modern-day layered structure of pastoralist communities enables herders to access a wide range of information, goods, and services without the limitations of space and time by using information technology.

4. Livestock breeding, or the suspension of breeding, is integral knowledge embedded in Mongolian traditional herding practices. Breeding management is carried out with consideration of summer precipitation, winter snow, and cold forecasts, the availability of labor within the herder family, and the livestock's condition, including fat reserves and strength. Traditionally, measures have been implemented to limit the number of breeding livestock, particularly during years of drought and dzud. Suspending the breeding of mother animals can be a strategic measure to reduce fat loss for the livestock during harsh winters and to lessen the workload associated with birthing and rearing in the spring. During 2019-2021 with the COVID-19 pandemic, Mongolian herders suspended livestock breeding, increasing the number of non-breeding mother animals by 6-7 times compared to the average in previous years. This measure significantly eased the burden on herders, allowing the animal husbandry sector to remain stable throughout the pandemic and even achieve overall production growth. In contrast to restrictions on production processes in some countries, where workers protested to express their desire to work, Mongolian herders continued their usual herding activities.

5. Statistics from the past 53 years show that practices related to the delivery of animal babies and newborn care have been passed down through generations and have remained consistent. Livestock rearing refers to the proportion of animals successfully raised out of every 100 born. Except for two major drought and dzud in 2001 and 2010, respectively, livestock rearing has remained stable over the past 53 years. Even during the COVID-19 pandemic (2018-2022), the rearing rate remained stable on average, without any decline, which is a testament to the effectiveness and resilience of Mongolian traditional livestock-rearing methods.

6. The risk management techniques of Mongolians have a centuries-old tradition, as key risks to animal husbandry, such as droughts and dzuds, have long shadowed pastoralists since the earliest days of herding. This can be likened to the experience of countries with cultures of resilience in overcoming natural disasters, such as hurricanes, earthquakes, and tsunamis. Drought risk management involves a broad range of activities, including weather forecasting, livestock migration (otor), pasture management and scheduling, hay and fodder preparation, setting breeding caps, culling animals, and preparing infrastructure such as fencing and water points, as well as salt supplies. Orkhon, Selenge, and Darkhan-Uul provinces are key areas for hay and crop production, with numerous entities and cooperatives operating in fodder preparation, sale, and transportation. The degree of dzud disaster varies for the Gobi and Khangai regions. There have been occasional instances in the Khangai region where summer conditions were relatively favorable, and severe winter and spring conditions, including sudden snowfall and dzud, have led to significant livestock losses. In contrast to the Khangai provinces, the Gobi region experiences lower livestock loss, suggesting that summer conditions in the Gobi may enable better winter predictions, allowing drought-affected herders to prepare more effectively. The National Emergency Management Agency of Mongolia has experience taking swift action during droughts and dzuds to minimize livestock losses and support herders.

7. The primary goal of livestock grazing and herding in Mongolia is to ensure the survival of livestock through all four seasons without losses/mortality. Overwintering involves two key priorities: ensuring that animals gain sufficient fat and strength and minimizing animal mortality. Grazing is a fundamental aspect of Mongolian livestock management, as animals rely on pastureland to acquire the necessary nutrients for growth, fattening, and other outputs. As a result, herders pay significant attention to pasture selection and effective herding practices. Livestock that have access to high-quality pastures and receive proper herding care are more likely

to survive the winter and yield higher-quality products, such as wool, cashmere, and milk. A grazing animal roams freely in a pleasant natural environment, with access to fresh air, clean water, and new grass. This daily activity promotes the animal's health and supports its overall well-being. Among the many plant varieties that thrive in dry conditions, the best are consumed by livestock. The vast pastures are also home to numerous medicinal plants. Meat, milk, and dairy products from livestock fed with nutritious plants, and not stressed are true natural Mongolian products—high in quality, though produced in limited quantities. Improved animal well-being and higher outputs bring happiness to the herder.

Converting mobile pasture-based livestock to a settled farming system presents several challenges. Above all, pasture livestock have a very different temperament than the farmed animals. With an introduction to fenced pastures, they may experience physical changes and emotional stress due to their limited mobility.

The main goal of Mongolia’s traditional animal husbandry is to maintain or increase the livestock population. Accordingly, herders often focus more on the high survival rate of their livestock during the winter than on quantifying meat sales. Over the past 51 years, statistical data show that the average annual livestock mortality rate is less than 8%. Although herd sizes decrease during dzuds and droughts, they recover and grow again in cycles of favorable weather. This ability to reproduce and restore is inherent in traditional pasture livestock. It provides herders who have faced losses from droughts and dzuds with confidence in the future and the motivation to rebuild their herds.

Conclusion

Mongolia's traditional pastoral livestock system has demonstrated remarkable resilience, adaptability, and regenerative capacity despite pressures from urbanization, mining, and crop farming. The stability of the herding population, strong communal ties, and effective risk management strategies have allowed pastoralism to persist as a vital economic and cultural practice. Time-tested breeding management, disaster preparedness, and sustainable pasture use contribute to stable livestock production, even in the face of environmental challenges such as dzuds and droughts. These factors underscore the enduring viability of Mongolian pastoralism in the modern era.

Implications

The resilience of Mongolia’s pastoral system suggests that policies should continue to support traditional herding practices while integrating modern technology and sustainable resource management. Strengthening local herder networks, improving access to weather forecasting and fodder reserves, and preserving communal pasture use can further enhance adaptation to climate variability. Additionally, recognizing the economic and cultural value of pastoralism may encourage efforts to balance development with the preservation of Mongolia’s unique herding heritage. Further research is needed to explore how intensified farming practices and alternative income sources can complement traditional pastoral livelihoods.

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