International Journal of Research Studies on Environment, Earth, and Allied Sciences (IJRSEAS)
| *Volume-2 Issue-2* | *Apr-2025* | *ISSN: 3066-0637* | *Website:* https://eesrd.us

Manuscript ID:
IJRSEAS-2025-0202045

OPEN ACCESS

Quick Response Code:

Website: https://eesrd.us

DOI: 10.5281/zenodo.17707485

DOI Link:
https://doi.org/10.5281/zenodo.17707485

Volume: 2

Issue: 2

Pp. 199-202

Month: April

Year: 2025

E-ISSN: 3066-0637

Submitted: 15 Mar. 2025

Revised: 20 Mar. 2025

Accepted: 20 Apr. 2025

Published: 30 Apr. 2025

Address for correspondence:
Rakesh Kumar
Assistant Professor, Dept. of Geography, Murarka College, Sultanganj TMBU, Bhagalpur
Email: rkrakrak05@gmail.com

How to cite this article:
Kumar, R. (2025). Sustainable Pastoralism and Rangeland Management in Central Asia. International Journal of Research Studies on Environment, Earth, and Allied Sciences, 2(2), 199–202. https://doi.org/10.5281/zenodo.17707485

Sustainable Pastoralism and Rangeland Management in Central Asia

Rakesh Kumar
Assistant Professor, Dept. of Geography, Murarka College, Sultanganj TMBU, Bhagalpur

Abstract

The huge rangelands of Central Asia, comprising Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, are critically important to both the economy of the region and the subsistence of its inhabitants. Pastoralism, which is a historic part of the societies of the region, makes an important contribution to national Gross Domestic Product and provides jobs for about one-third of the population. Unfortunately, the economic importance of these rangelands comes at a time when serious environmental problems confront them, as deterioration has affected about 60% of the agricultural areas. The cause of this deterioration is mainly overgrazing, aggravated by new patterns of land use, the inevitable effect of climate change, and a continuing lack of implementation of policy. This paper will examine some of the difficult issues facing these regions, such as land insecurity, impediments to traditional movement, and the aggravating occurrence of violent weather phenomena. At the same time, it will examine different avenues of approach to the problems, such as community based rangeland management, and legislative changes. By means of reviewing current reports and policies for 2024 and 2025, the opportunities for achieving sustainability will be pointed out by means of co-operating regional and community effort, new technology and international co-operation. The report indicate that the problems of environmental deterioration remain, but that, as shown by the legislation for herders in Mongolia and the change in land code in Kazakhstan, there are opportunities for restoring some resilience. The leading recommendations are active support for rotated grazing schemes and use of traditional ecological knowledge to increase ecosystem service and provide subsistence in the light of worsening climate change.

Keywords*: Sustainable, Pastoralism, Rangeland management, Central Asia, Grassland*

Introduction

Encompassing an array of ecosystem types, the rangelands of Central Asia, which comprise about 65-73% of the area of Central Asia, include deserts such as the arid Karakum and Kyzyl-Kum deserts, as well as mountain systems such as the Pamirs and Tien Shan ranges. They support mobile pastoralism, a practice going on for millennia involving sheep, goats, cattle, horses and camels which constitutes a component of economic stability and a strong cultural heritage. The existence of 171 million animals indicates the economic contribution of pastoralism in terms of cashmere and meat exports and other products but it is subject to increasingly serious threats to its survival, i.e. degradation of its agricultural land, increasing climatic variation, and severe and drastic social and economic changes brought about by the collapse of the Soviet Union. On the other side of the coin, it can be argued that the economic advantages of pastoralism, including contributions to gross national product and employment, are of greater importance than the immediate effects on the environment although it is recognised that these important economic advantages are accompanied by certain effects on the environment. It can be suggested by supporters of this view that the ill effects of pastoralism from an environmental point of view may be alleviated by technical innovations in livestock management techniques and the land use planning ramifications without the necessity of making any radical changes in the existing economic system (Pandit et al., 2024).

The post-independence era saw a significant disruption in the traditional mobility of pastoralism because of privatization which has led to localized overgrazing in the zones adjacent to settlements and reduced biomass. Climate change has compounded this matter. Increased regional temperatures of between two and three times the global normal pattern has led to droughts, cold events or dzuds, and extensive salinization of soils. It is projected that by 2025 more than 60% of agricultural lands will be severely degraded. This poses a serious threat to food security in the regions and to biodiversity. The implementation of sustainable management practices is essential to reverse the ecology, to provide for adaptive capacity to environmental changes, and for the support of local livelihoods. A counter-argument posits that the considerable economic benefits derived from pastoralism, which support levels of Gross Domestic Product and employment, are superior to any immediate ecological considerations.

The argument suggests that technological advances in livestock management and land use planning could bring about sufficient reduction in ecological degradation without radical structural alteration in the present economic framework (Pandit et al., 2024). This article will examine the present issues and responses and in particular the developments in policy expected between 2024 and 2025, to provide pathways to sustainable and resilient pastoralism.

Literature Review

Research into the rangelands of Central Asia has identified several causes or drivers of degradation, which operate multifactorially: overgrazing, fixity of mobility in domestic ruminant herds, and anthropogenic pressures like mining and oil extraction (Kerven et al., 2012). Other research, conducted by ICARDA, suggests that the mismanagement associated with private ownership which became widespread in the post-Soviet changes, such as fixity of movement of the flocks leads to a situation of excessive local grazing pressure (Khanyari et al., 2021). FAO reports also emphasize that tenure insecurity and borders encumbering transhumance led to excessive land acquisition for development (Kerven et al., 2012). At the other end of the spectrum, it has been argued that if pastoralism is commercially beneficial (notably by contributing to GDP and providing employment) its environmental effects need not be catastrophic (as they are avoidable by technological advancement in herd management and land use planning) since essentially the same economics would operate.

Community-based rangelands management emerges as a critical avenue in ensuring collective initiatives towards pasture restoration and general well-being supports. The STELARR project of ILRI supports the development of sustainable livestock product value chains where profits derived from them are reinvested to restore local environments, particularly as they relate to cashmere in this region (Xie et al., 2024). Historical studies, such as those examining Kazakh pastoralism, refer to changes which have occurred from clan based to industrial economies. Issues of current inequalities in access to subsidies are currently present (Shamsutdinov, et al. 2021). Some writers argue, however, that the the economic returns of pastoralism such as economies of scale (i.e. GDP contribution) and employment generation far outweigh immediate environmental issues and that ultimately technological initiatives (livestock management, land use planning) will secure a higher rate of growth without changing the underlying economic model.

Recent literature addresses climate adaptation, with studies on dzuds and aridity calling for rotational grazing and infrastructure improvements. Gaps include limited integration of indigenous knowledge and quantitative assessments of 2024-2025 policies, which this article seeks to bridge.

Methodology

This qualitative analysis synthesizes secondary data collected through web searches and targeted browsing (e.g., FAO, ICARDA, ILRI) of articles, reports, and policy documents. The analysis involves a thematic comparison of challenges faced, strategies employed and current developments in Central Asia. The comparisons are based on the degree of degradation, effectiveness of policies and sustainability indicators. Limitations include reliance on English language sources and potential biases in self-reported data which were countered by corroboration.

Challenges in Sustainable Pastoralism and Rangeland Management

Central Asia's rangelands face extreme degradation with 23%-60% of the land severely affected by overgrazing, climate change, and human interaction (Dear et al., 2013). Overgrazing occurs due to the inability to move small herd animals' post-privatization of rangelands, leading to increased grazing near villages and consequent soil erosion, which means, loss of biodiversity (Kolluru et al., 2023). In Kazakhstan it has shown that 1.9 million km² of rangelands there is evidence of overgrazing around villages and smallholders unable to access distant pastures. Kyrgyzstan indicates that pastures have now become over used therefore degrading the quality of agroecosystems, whilst Uzbekistan and Turkmenistan are encountering salinisation of soils due to poor irrigation systems (Lemenkova, 2014). However, some suggest that the economic benefits that derive from pastoralism, such as its direct contribution to GDP and employment, far outweigh the environmental degradation effects that are noticeable now therefore suggesting that modern technological improvement in the areas of livestock management and production and land use planning will minimise the extent of degradation that is expected to occur whilst keeping essentially the same form of economic model intact. This would include precision grazing technologies, optimised forage product management, targeted genetic improvements in livestock (such as those that would give an improved immunity to livestock disease in general and the consequential need for agricultural medicines), which would allow for the gradual reduction of the ecological footprints while maintaining economic output (Pandit et al., 2024).

Climate change exacerbates the vulnerability of pastoralists, which include increased temperatures causing reduced precipitation, droughts, and the retreat of glaciers affecting water for 30% less availability by 2025. Dzuds can cause drastic livestock loss as evidenced in the 23.1% of severely degraded rangelands in Mongolia. Tenure insecurity and land being acquired for mining disrupt access to migration routes, effectively marginalizing pastoralists. (Khanyari et al., 2021). Others argue that the economic benefits of pastoralism, including contributions to GDP and employment outweigh the negative immediate impacts on the environment, suggesting that with proper technological advancements, livestock management and land use planning productivity can be slowed alleviating degradation but without significantly changing the present economic model.

Inequality from a socio-economic perspective is evident where subsidies that favour large owners exist and lack of labour forces in certain cases are not advancing mobility. For instance, in Tajikistan population growth puts pressure on the valleys whilst in Turkmenistan lack of transparency exists with their government. However, the

benefits economically from pastoralism such as being contributions of GDP or job availability outweighs the environmental concerns at present and it is maintained that advancements in technology within livestock management or land use planning will allow for mitigation of any form of degradation without changing the existing economic model. Such advances would include the likes of precision grazing systems, improved feed management and improvements genetically selected for livestock in order for smaller ecological footprints and economic output.

Strategies and Recent Developments

Sustainable approaches emphasize CBRM and advocation of collective practices for rotational grazing and pooling of resources. Investment in pasture management in Kyrgyzstan is designed to stimulate greater incomes for smallholders, through regenerative practices. In Kazakhstan, the extensive grazing mosaics are designed to be conducive to biodiversity, with World Bank projects supporting a transition from subsidies to sustainability (Lemenkova, 2014). Some opinion holds that the financial benefits of pastoralism, in terms of GDP and employment, outweigh any immediate environmental considerations and that advancements in livestock management techniques, and the economics of land planning can avoid degradation, without fundamental change to the prevailing economic paradigm.

Innovations in technology such as satellite monitoring and AI advisory systems improve efficiency in the use of water and fertilizers, reducing wastage of resources. The STELARR project of the ILRI aims to develop a range of certifications for value chains which will lead to the reinvestment of the money should in the restoration of the environment, for example cashmere production in Mongolia (Bestelmeyer et al., 2023). The policy initiatives of 2024-2025 can be seen as suggestive of some advances. Mongolia has passed the Law on Herders, which regulates rights to the herders who uses the resources of an ecosystem and determines those rights based on the carrying capacity of a region. Cooperatives offer loans to herders for implementing sustainable practices. Kazakhstan passed amendments to its Land Code prohibiting the changes of use of grazing lands. Only the use of the lands can be enforced. Uzbekistan has, under its Decree No. 126 encourages the rotation and restoration of pastures and Kyrgyzstan, with its new Land Code centralizes the management of grasslands, though there is a risk of exclusion of local pastors, except cooperatives. The International Year of Rangelands and Pastoralists initiated dialogue in the region (Brandt,2016). Some state that the economic benefit that would be gone from pastoralism, in the form GDP production and jobs etc, outweighs the immediate environmental concerns and that the technological advance in livestock management and land use planning will be able to mitigate the threats due to pastoralism without changing the economic model.

Transboundary initiatives like the Central Asia Pastoral Alliance are critical in promoting inclusive policies. These collaborations aim to find common approaches to rangeland management, develop solutions for common environmental challenges, and implement sustainable pastoral livelihoods across national borders (AMRAOUI et al., 2024). Nevertheless, the effective implementation of policies for sustainable grazing across Central Asian countries is still hampered by insufficient political will, which results in a continued reliance on individualistic management methods, which ignore often the long-term ecological consequences of certain practices (Brandt, 2016) (Peter et al. 2024).

Discussion

While these tools appear promising in theory, implementation will involve numerous obstacles to their execution, such as the risk of community governance erosion due to ongoing Kyrgyzstan centralization activities, as well as the potential of smallholder pastoralists of Kazakhstan being made worse off. The combination of traditional knowledge with new technologies is suggested as the principal tool to reconcile these discrepancies and increase system resilience. Economic incentives, especially involving certification schemes, can provide crucial economic incentives, but it is essential that this be done in an equitable manner to keep the vulnerable populations at the centre of development plans. Implementation of effective climate adaptation strategies will need strong transboundary water management issues to be set up, particularly given the effects of glacial retreat on transboundary river basins. The thrust of current policies is therefore, positive in aim and effects, but their successful application will depend largely on continuous monitoring and inclusive engagement with the stakeholder community. However, others argue that the economic value of pastoralism which can be quantified in terms of GDP and jobs in the economy outweighs the immediate incidence of environmental concerns, arguing for a future game of improved livestock management and land use planning which will counteract this degradation but still not fundamentally change the existing models of economy.

Conclusion

For sustainable pastoralism to champion opportunity in Central Asia, a comprehensive approach is required that includes addressing ecological degradation through Community-Based Rangeland Management, significant policy reform, and strategic new intervention. The relevant legislative measures so far (2024-2025) taken as significant beginning platforms, and the success of these measures depends upon the successful empowerment of smallholder pastoralists and the strengthening of trans-boundary cooperation. Future measures must also focus on rebuilding traditional movement patterns, providing systemic introduction of climate smart agriculture, and effectively using global platforms such as the International Year of Rangelands and Pastoralists, to ensure protection of economic well-being and critical ecological systems. However, it is also contended that the tremendous economic contributions e.g. GDP, job creation etc. of pastoralism may outweigh immediate environmental concerns,

in which case technology in livestock husbandry and land-use planning may be deployed to deal with the economic impacts of degradation without necessarily having to undertake a change to the existing economic paradigm.

Acknowledgment
I, Rakesh Kumar, Asst. Prof, Dept. of Geography, Murarka College, Sultanganj, TMBU, Bhagalpur do hereby confirm that there has been no financial support extended to me by any institution to carry out these works and also that there has been no Conflict of Interest to carry out these works and get published.

Financial support and sponsorship
Nil.

Conflicts of interest
The authors declare that there are no conflicts of interest regarding the publication of this paper.

References

1. AMRAOUI, M., BOUABIDI, L., Amrani, M., Ouakhir, H., DUDIC, B., Lukić, T., & SPALEVIC, V. (2024). LAND USE DYNAMICS AND SOIL CONSERVATION STRATEGIES IN THE EL KSSIBA REGION, ATLAS MOUNTAINS OF MOROCCO. *The Journal Agriculture and Forestry*, *70*(3). https://doi.org/10.17707/agricultforest.70.3.01
2. Bestelmeyer, B. T., Utsumi, S. A., McCord, S. E., Browning, D. M., Burkett, L. M., Elias, E., Estell, R. E., Herrick, J. E., James, D. K., Spiegal, S., Webb, N. P., & Williamson, J. C. (2023). Managing an arid ranch in the 21st century: New technologies for novel ecosystems. *Rangelands*, *45*(4), 60. https://doi.org/10.1016/j.rala.2023.05.002
3. Brandt, J. (2016). 1000 years of sustainable grazing in Nordic conditions? : what can be learned. *Research Portal Denmark*. https://local.forskningsportal.dk/local/dki-cgi/ws/cris-link?src=ruc&id=ruc-63549cbc-3024-4615-b4a4-fbbba4b2f8d9&ti=1000%20years%20of%20sustainable%20grazing%20in%20Nordic%20conditions%3F%20%3A%20what%20can%20be%20learned
4. Dear, C., Shigaeva, J., & Wolfgramm, B. (2013). Assessing the State of Sustainable Land Management Research in Kyrgyzstan and Tajikistan. *Mountain Research and Development*, *33*(4), 443. https://doi.org/10.1659/mrd-journal-d-13-00050.1
5. Kerven, C., Steimann, B., Dear, C., & Ashley, L. (2012). Researching the Future of Pastoralism in Central Asia's Mountains: Examining Development Orthodoxies. *Mountain Research and Development*, *32*(3), 368. https://doi.org/10.1659/mrd-journal-d-12-00035.1
6. Khanyari, M., Robinson, S., Morgan, E. R., Salemgareyev, A., & Milner-Gulland, E. J. (2021). Identifying relationships between multi-scale social–ecological factors to explore ungulate health in a Western Kazakhstan rangeland. *People and Nature*, *4*(2), 382. https://doi.org/10.1002/pan3.10289
7. Kolluru, V., John, R., Saraf, S., Chen, J., Hankerson, B., Robinson, S., Kussainova, M., & Jain, K. (2023). Gridded livestock density database and spatial trends for Kazakhstan. *Scientific Data*, *10*(1). https://doi.org/10.1038/s41597-023-02736-5
8. Lemenkova, P. (2014). Rural Sustainability and Management of Natural Resources in Tian Shan Region, Central Asia. *HAL (Le Centre Pour La Communication Scientifique Directe)*. https://doi.org/10.13140/rg.2.2.28841.34402
9. Pandit, A., Mir, M. S., Mir, M., Wani, Y., Bisati, I. A., Nisa, S. U., Khan, H. M., & Shah, R. A. (2024). Pastoralism in Changthang, Ladakh: Adaptations, Challenges, and Pathways for Sustainability. *Mountain Research and Development*, *44*(1). https://doi.org/10.1659/mrd.2023.00028
10. Peter, S., Niess, S., Batjav, B., Dejid, N., Drees, L., Jäschke, Y., Kasymov, U., Damdindorj, S., Dorjoo, K., Gonchigsumlaa, G., Matias, D. M., Müller, T., & Mehring, M. (2024). The role of traditional ecological knowledge, given the transformation of pastoralism in Central and Eastern Mongolia. *AMBIO*, *53*(12), 1813. https://doi.org/10.1007/s13280-024-02057-w
11. Shamsutdinov, N. Z., Sanzeev, V. V., & Шамсутдинов, З. Ш. (2021). Ecological restoration of fodder productivity of degraded pastures in the foothill desert zone of Central Asia. *IOP Conference Series Earth and Environmental Science*, *901*(1), 12033. https://doi.org/10.1088/1755-1315/901/1/012033
12. Xie, Z., Game, E. T., Phinn, S., Adams, M., Bayarjargal, Y., Pannell, D. J., Purevbaatar, G., Baldangombo, B., Hobbs, R. J., Yao, J., & McDonald-Madden, E. (2024). A scalable big data approach for remotely tracking rangeland conditions. *Communications Earth & Environment*, *5*(1). https://doi.org/10.1038/s43247-024-01516-2