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Disembedding and Disentangling Grassland Valuation: Insights into Grassland Management Institutions and Ecological Research in China

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Abstract: After two decades of implementing top-down grassland restoration projects focused on reducing livestock numbers and pastoralist populations, the Chinese government's well-funded efforts have not significantly reversed grassland degradation. This study reviews the institutional changes in grassland management over the past forty years, highlighting the Livestock and Grassland Double Contract Household Responsibility System of the early 1980s and the Grassland Ecological Reward and Compensation Policy introduced in 2011. It demonstrates how these institutional transformations have shaped pastoralists' evolving understanding of grassland value and reveals that commodifying grassland's economic and ecological value has led to the capitalization of nature, disembedding husbandry from grassland production, and undermining the effectiveness of conservation projects. This article also showcases the development of grassland ecology research in China, noting its increasing detachment from a holistic understanding of ecosystems and the interdisciplinary needs of management practices. The disjunction between grassland ecology research and practical management has resulted in a lack of techniques aligned with local ecological and socioeconomic contexts. This article champions active engagement with and protection of pastoralist communities to reintegrate grasslands' true economic and ecological value into management practices, thereby effectively restoring degraded grasslands and achieving sustainable management.

Keywords: grassland degradation; social–ecological system; commodification; capitalization; ecological restoration

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1. Introduction

To address the issue of grassland degradation in China, which became evident in 2000, the central government has invested substantial funds and resources in a series of grassland protection projects [1,2]. These projects have been based on the simplified logic that overgrazing is the direct cause of grassland degradation [3]. Consequently, the restoration of degraded grasslands has been pursued through the enclosure of grassland and efforts to reduce livestock numbers [4]. The value of grassland has been monetized to facilitate this reduction, and pastoralists are supposed to receive ecological compensation to make up for their lost income [1,3]. However, despite the compensation provided to pastoralists, livestock numbers have not decreased as expected, and the degraded grasslands have not recovered as planned [1,5]. To understand why these well-intentioned projects have failed to restore degraded grasslands, it is essential to investigate pastoralists' views on the changing ecological value of grassland and, subsequently, their perceptions of grassland conservation measures. This understanding has the potential to bridge the gap between policy implementation and on-the-ground realities and holds promise for more effective and sustainable grassland management strategies.

1.1. Simplified Logic of the Recovery Method: Grazing Ban and the Invalid Results

Since 2000, the issue of grassland degradation has garnered significant public attention due to several widespread sandstorms originating from degraded grasslands and extending southward and eastward, even reaching Korea and Japan [6]. These events highlighted the severity of the problem at that time. According to the Third National Grassland Resource Survey, approximately 38.67 million hectares of grassland in the Inner Mongolia Autonomous Region, accounting for 56.9% of the available grassland area, are moderately or severely degraded. The productivity of natural grasslands has generally decreased by 30% to 70% [7]. Overgrazing, attributed to pastoralist activities, has been identified as the primary cause of grassland degradation [8].

In response to this pressing issue, the Chinese central government has spearheaded a series of projects aimed at restoring degraded grasslands. The flagship initiative, the Returning Grazing Land to Grassland (RGLG) project, was launched in 2003. This comprehensive project is designed to curb overgrazing through various measures, including year-round and spring grazing bans. The government has committed significant resources, including manpower, fencing materials, and financial investments, to this project. By 2018, the central government had poured a total of USD 3.84 billion into the RGLG project [9]. In addition to the RGLG project, the Beijing and Tianjin Sandstorm Source Control Project and the Public Welfare Forest Conservation Project were rolled out in 2002 and 2004, respectively. In 2011, the Grassland Ecological Reward and Compensation Policy (GERCP) was introduced, with the total investment exceeding USD 19.5 billion to compensate pastoralists for reducing their livestock through grazing bans, making it the largest Payment for Ecosystem Services (PESs) project in China [10].

However, despite the substantial efforts and investments, the situation on the ground does not seem to be improving as expected. The number of livestock has not decreased, even with the compensation allocated to alleviate grazing pressure on grasslands. In fact, in Inner Mongolia, the livestock numbers have continued to rise, from 99.3 million sheep units in 2015 to 102.3 million in 2017 and a staggering 109.3 million in 2022. This trend of 'partial improvement but overall deterioration' in terms of China's grassland degradation has not been fundamentally reversed [11]. This begs the question: despite the significant investments in terms of fiscal transfer funds and human power, why has the situation in terms of grassland degradation not been fundamentally addressed?

1.2. Grassland Ecology in China: Payment for Ecosystems as a Solution

Amplified concerns regarding escalating environmental crises have led to evolving strategies to meticulously quantify the cost of environmental degradation (value lost) and monetize the benefits (value gained) derived from nature, which are increasingly being integrated into decision-making frameworks. These approaches serve as potential tools to enhance both social and ecological sustainability through a proper valuation of the resources [12–14]. The ecosystem services model supposedly signifies a shift from traditional hierarchical, directive management to more decentralized, ostensibly voluntary decision frameworks that enable policymakers and resource managers to integrate environmental externalities into market transactions [13,15,16]. In recent decades, an intriguing phenomenon has emerged among Chinese grassland scholars, who have become increasingly captivated by the concept of payment for ecosystem services as an innovative policy remedy for the rampant degradation of grasslands. By financially incentivizing local communities and stakeholders to engage in sustainable practices, PESs schemes present a novel paradigm that supposedly harmonizes ecological stewardship with economic benefits, mitigates environmental degradation, and fosters a synergistic relationship between human activity and ecological preservation.

Conservation experts from various fields support assigning a monetary value to the environmental benefits that contribute to human well-being. This approach can be incorporated into policy decisions alongside traditional market values and thereby, lead to the creation of market-based tools, such as PES schemes. These tools provide compensation to

natural resource managers for implementing environmentally friendly management practices [15,17]. Furthermore, these schemes may include conditional agreements, payments only if a service is successfully delivered, or penalties for failure to adhere to agreed-upon service provisions [16,18–20]. Although these schemes are theoretically appealing, they often encounter practical difficulties, including high transaction costs and power imbalances between the negotiating parties, and often involve the state mediating to ensure service delivery through a mix of voluntary and regulatory mechanisms [15,16,21].

The practical implementation of PESs often significantly diverges from idealized models. A substantial body of critical literature contends that PESs schemes may perpetuate social and environmental injustices by altering traditional livelihoods and excluding Indigenous and long-tenured groups from their lands [16,22]. Moreover, these schemes have been criticized for commodifying nature, which oversimplifies the intricate ecological and social dynamics involved. This could result in policy decisions that prioritize economic efficiency at the expense of ecological health and human well-being [16]. As PESs has become a cornerstone of global environmental governance, the social and ecological implications of these models warrant careful consideration and adjustment to ensure their positive contribution to a just transition and environmental sustainability.

In China, researchers are increasingly attracted to PESs as a policy solution to overgrazing due to its potential to foster long-term ecological resilience and socioeconomic prosperity, while aligning with the country's highly interventionist environmental regulatory framework [23]. This model regards environmental governance and ecology as a state-led development project and is a pivotal element of the broader ecological modernization initiative [23,24]. This regulatory approach positions the state as a mediator between environmental and economic concerns, incorporating critical imperatives, such as revenue generation, poverty alleviation, environmental protection, and legitimation, into comprehensive national ecological reforms [25,26].

The state's top-down implementation model internalizes environmental issues by emphasizing the technocrats' quantification of natural resources and environmental externalities, which, although effective, may inadvertently perpetuate social inequities [27]. The advent of remote sensing technology has further reduced the costs associated with environmental monitoring and has improved the accountability of policy outcomes by providing large-scale, continuous, and repeatable observations. Remote sensing offers significant advantages, including monitoring extensive and inaccessible areas, delivering real-time data, and minimizing the necessity for extensive fieldwork [28]. The synergy between earth system sciences and grassland ecologists has bolstered the implementation of this top-down, interventionist conservation strategy [29].

However, the top-down environmental regulatory regime is not merely an arbitrary administratively managed system, but a comprehensive system that merges legal, economic, and political instruments to enhance regulatory enforcement [25,30]. This interventionist state approach, driven by the development of ecological sciences, provides an epistemological foundation for legitimizing state-led technocratic practices involving socioenvironmental engineering and naturalizing social inequalities between urban and rural populations [31]. Consequently, the perpetuation of PESs has become central to environmental governance, state formation, and the continued uneven valuation and stratification in the use of land resources in the grassland regions of China [23]. One example of how this technocratic approach may result in the uneven utilization of land resources in China is the limitation of relying solely on remote sensing technology to assess the progress of grassland restoration projects. A primary critique of remote sensing is the absence of ground truth data, which is crucial for validating and calibrating remote sensing measurements [32]. Without ground-based verification, the measurement accuracy and reliability of satellite-derived data remain questionable. Moreover, relying exclusively on remote sensing data neglects the disconnect between the stated goal of grassland protection against overgrazing and the on-the-ground techniques local officials use to assess and monitor grassland degradation [33]. While remote sensing and test plot measurements

are explicitly geared towards monitoring grass production, the carrying capacity of local grasslands cannot be accurately assessed without systematically coupling data on forage growth with data on livestock numbers.

Additionally, information gathered locally is often compiled solely to fulfill short-term policy goals, which frequently change according to the formation of different green development agendas [34,35]. This information blockage results in the viewpoints of rational planners and technicians employed by the central state taking precedence over those of local pastoralists. Consequently, the goals of conservation programs shift towards fulfilling program quotas set by the bureaucracy, rather than achieving long-term ecological sustainability and economic viability for local communities [30,35]. As such, it is important to hear the perspectives of pastoralists on the causes of grassland degradation and the value of grassland ecology, which will be explored in the following sections.

1.3. Pastoralists' Perceptions on Grassland Value: A Missing Perspective

Undoubtedly, the perceptions of pastoralists regarding grassland conservation measures are crucial to the success of these policy programs. Grassland serves as a home, production resource, or base for compensation requests for pastoralists. The differing views on the functions of grassland and the value they generate are decisive in determining whether grasslands can be truly and sustainably protected. It should be noted that the change in valuation by pastoralists for grassland conservation is not solely triggered by PESs-based policy projects. In fact, pastoralists' perceptions of the value of grassland have been gradually transforming since the implementation of the Livestock and Grassland Double Contract Household Responsibility System (LGDCHRS) in the early 1980s, which brought fundamental changes to the grassland property rights regime.

Various scholars have provided explanations from different perspectives for the failure of grassland restoration projects, which can be categorized into the following three aspects. The first and mainstream explanation, as articulated by the Deputy Director of the Grassland Supervision Center of the State Forestry and Grassland Administration in 2018, is overgrazing. Consequently, the foremost conservation measure is to eliminate overgrazing [8]. Overgrazing is seen as a characteristic of traditional nomadic animal husbandry. More than 80% of China's natural grassland has degraded due to this practice, leading to low productivity and production methods that, at the expense of ecology, have rendered the grassland an unsustainable, severely degraded, and economically depleted ecosystem [36].

The second explanation posits that these conservation projects oversimplify the complexity of the social–ecological system of grasslands. For example, the appraisal mechanisms at the national level fall short of capturing most of the value of pastoral systems because they operate with simplifications that focus on market exchanges and the formal economy [37]. These projects do not consider the variability and uncertainty of the dryland environment but tend to use impractical and generalizable solutions by simplifying the analysis of complex problems, such as imposing a unified carrying capacity standard for each pastoral household within a township [23,38].

The third explanation is the "tragedy of commodity", whereby the implementation of PESs has altered local internal conservation mechanisms [1,39]. These mechanisms include disrupting the mutual dependence between livestock and vegetation, excluding pastoralists from grassland conservation and supervision, and encouraging both pastoralists and outsiders to engage in activities harmful to grasslands, such as digging for desert stones, medicinal herbs, and catching *Mesobuthus eupeus* to sell [40]. One criticism of PESs is that it may shift people's decision-making logic from considering actions that benefit the social–ecological system to those that are most advantageous for individuals [41].

Over the past four decades, a series of institutional and policy changes have significantly altered pastoralists' perceptions of the value and significance of grasslands. However, few scholars have explored the reasons for grassland degradation and slow recovery from this perspective. This article aims to elucidate the shifts in the perceived value of grass-

lands among pastoralists and examine how these shifts influence the implementation of grassland conservation policies in China. By analyzing these changes, this study seeks to provide a deeper understanding of the complex interplay between local knowledge systems and policy frameworks. The insights gained from this analysis will offer more effective strategies for sustainable grassland management by integrating local knowledge and practices within ecological studies. The objective of this study is to emphasize the necessity of holistic and adaptive management strategies that account for the variability and complexity of grassland ecosystems. Engaging pastoralists in the decision-making process and ensuring their active participation in conservation efforts are critical factors for achieving effective outcomes.

2. Methods and Data

This study utilizes data from government documents, policy papers, and official statistics to examine the implementation of LGDCHRS since the 1980s and PESs in the Inner Mongolia Autonomous Region of China, from 2011 to 2022. The policy on grassland management has transitioned from a decentralized governance model to a more top-down administrative approach imposed by the Chinese central government. We selected and analyzed the planning and implementation guidelines of grassland management policies on the Xilingol grassland of Inner Mongolia. This analysis aids in understanding the formal approaches to ecological zoning and grassland preservation, as well as the local practices used to deliver compensation for ecosystem services and enforcement.

We conducted over 200 in-depth interviews with pastoralists, village cadres, and banner husbandry officials in the Xilingol grassland (Figure 1), during multiple field trips between 2001 and 2022. These interviews, conducted with consent, were recorded for subsequent analysis. The survey questionnaire addresses several key issues: the implementation process of grassland contracting, changes in water resource utilization, impacts of climate change, costs and benefits of pastoral livestock management, strategies and costs of pastoralists in coping with natural disasters, changes in cooperative and reciprocal practices among pastoralists in terms of livestock management and disaster resilience, the impact of fencing on livestock management and grassland protection, the effects of payments for ecosystem services (PESs) on pastoral livelihoods, and the perceptions of pastoralists towards PESs. The qualitative data from these interviews reflect pastoralists' evolving perspectives on grassland conservation programs and the varying informal practices that grassroots cadres employ to enforce compliance. The qualitative longitudinal interviews comprehensively portray how grassland management policies have affected pastoralists' perceptions of grassland value and modified their herding practices. This, in turn, has shaped the evolving socioeconomic and human–nature relations in the grassland regions of Inner Mongolia.

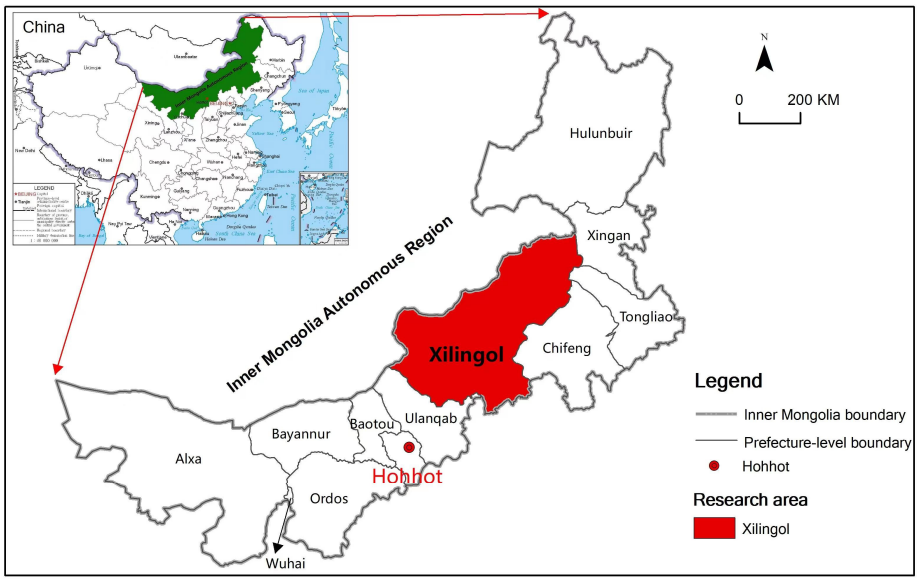

Figure 1. Research Area in Inner Mongolia, China.

To extend the robustness of our analysis, we employed a mixed methods approach. Quantitative data from official statistics published in the Animal Husbandry Yearbook (1985–2022) were triangulated with qualitative insights from policy documents (See Table 1) and interviews to ensure a comprehensive understanding of the policy impacts. We categorized different codes to identify recurring themes and patterns within the qualitative data, providing a nuanced view of the local implementation practices and the resulting socio-ecological changes. This methodology allows for a detailed examination of both the formal policy frameworks and the grassroots-level responses, offering insights into the effectiveness and challenges of grassland conservation efforts in Inner Mongolia.

Table 1. Grassland Management Policies and Guidelines in China.

Year	Policy and Guidance Documents	Issuing Agencies
1982	Summary of the National Rural Work Conference	Central Committee Document No. 1
1983	Several Issues on Current Rural Economic Policies	Central Committee Document No. 1
1996	Regulations on Further Implementing and Improving the "Double Rights and One System" of Grasslands in Inner Mongolia Autonomous Region	Inner Mongolia Autonomous Region, No. 168
2011	Guidance on the Implementation of the Grassland Ecological Protection Subsidy and Reward Mechanism Policy for 2011	Ministry of Agriculture, Ministry of Finance
2016	Notice on Issuing Opinions on Improving the Separation of Ownership Rights, Contracting Rights, and Management Rights of Rural Land	General Office of the Central Committee of the Communist Party of China, General Office of the State Council, No. 67
2016	Guidance on the Implementation of the New Round of Grassland Ecological Protection Subsidy and Reward Policy (2016–2020)	Ministry of Agriculture, Ministry of Finance
2021	Guidance on the Implementation of the Third Round of Grassland Ecological Protection Subsidy and Reward Policy	Ministry of Finance, Ministry of Agriculture and Rural Affairs, National Forestry and Grassland Administration
2021	Opinions on Deepening the Reform of the Ecological Protection Compensation System	General Office of the Central Committee of the Communist Party of China, General Office of the State Council

3. Results

3.1. An Overview of Grassland Management Institutions in Inner Mongolia

Since the establishment of the People's Republic of China in 1949, there have been two significant changes in grassland management institutions in Inner Mongolia. The first major change occurred with the implementation of LGDCHRS in 1984, which transformed the collective property rights of grassland into private use rights [38] (pp. 96–97) [42] p. 12. This shift led to the transition from traditional nomadic livestock husbandry to a sedentary system, effectively halting seasonal movement [38] (pp. 96–97). The second major change was the introduction of PESs in 2011. This program provides pastoralists with relatively high compensation, encouraging them to reduce their livestock numbers or even cease animal husbandry and relocate to urban areas [43,44]. The specific grassland management institutions during these three stages are detailed below.

3.1.1. Before the LGDCHRS

For a long history, the ownership of grassland in Inner Mongolia was held by feudal nobles, temples, or the state. Generally, pastoralists did not possess individual land ownership; however, they had certain recognized rights to use grassland for grazing their own livestock and the herds of local nobles [38] p. 93. During the collective economy period from the 1950s to the 1970s, when grassland was collectively owned, pastoralists established mutual assistance groups. Households voluntarily moved together to jointly use grassland and manage livestock based on labor division and cooperation [38] (pp. 95–96). Subsequently, some groups were combined into larger communes, each with its own allocated grassland. Livestock grazing was restricted by the boundaries of the commune's grassland, and the transhumance of animals throughout the four seasons was arranged by the commune [38] p. 96. Due to the common use of grassland, the daily grazing radius of livestock was relatively extensive, with horses, cattle, and sheep having a grazing radius of 30 km, 20 km, and 10 km, respectively [42] p. 37. In 1980, Xilinhot, located in the center of the Xilingol grassland, had established five communes, one of which comprised 503 pastoralists and 87,999 livestock. To establish this commune, each household had to sell their livestock at a discount of 20–30% of the total price to the commune, with the remaining 70–80% of the livestock value used as shares to join the commune. At the end of each year, pastoralists received 3% of the value of their livestock as a dividend [38] p. 96.

3.1.2. The Implementation of LGDCHRS

Following the implementation of the household contract responsibility system in agricultural areas, LGDCHRS was introduced in the 1980s in pastoral areas of Inner Mongolia. This system distributed livestock and grassland to individual pastoral households. LGDCHRS aimed to address the "*Daguofan*", a term describing the tragedy of the commons, where every livestock grazes on communal grassland. Grassland management was reorganized into smaller, contracted areas for each pastoral household. The most direct result was the cessation of seasonal movement, leading to a significant reduction in the daily grazing radius of livestock, for example, 3–3.5 km for horses, 2 km for cattle, and 1.5–2 km for sheep, in eastern Inner Mongolia [42] p. 37.

These changes have been recognized as progress in the discourse, which claims that backward nomadism, characterized by "following water and grass to breed livestock", should be replaced by intensified livestock breeding dependent on infrastructure, including sheds, wells, artificial grassland, high-yield feed fields, and storage facilities. Consequently, the grassland landscape was gradually fragmented by fences. The risk of grass availability, previously mitigated by mobility, has increased sharply due to the cessation of seasonal movement. Grazing impacts caused by the same number of livestock on grassland during droughts exemplify and exacerbate overgrazing and grassland degradation. Moreover, the labor division and cooperation among pastoralists diminished, requiring pastoralists to become "versatile" in managing their own livestock and building infrastructure [45]. The roles of village leaders and experienced pastoralists in arranging grassland utilization

and livestock breeding at the village scale have been abandoned. This includes managing seasonal movements, improving livestock breeds, and responding to natural disasters. Consequently, one of the key principles of adaptive governance of grasslands, action on the ecological scale, has been lost [46].

3.1.3. The Implementation of PESs

In 2011, the Grassland Ecological Reward and Compensation Policy (GERCP) was initiated across the entire pastoral area of China, encompassing 13 provinces. This policy operates on a five-year cycle and aims to encourage pastoralists to reduce their livestock numbers and protect grasslands by providing compensation for grazing bans and rewards for maintaining livestock numbers within the grassland carrying capacity [3]. The GERCP project recognizes pastoralists' efforts to provide grassland ecosystem services and offers compensation as payment for these services. The policy measures include: (1) for grasslands with very harsh living environments, severe degradation, and unsuitable conditions for grazing, a grazing ban and enclosure were implemented, with the central government subsidizing pastoralists at the rate of USD 11.7/ha/year; (2) for usable grasslands outside the grazing ban area, based on the approved reasonable livestock carrying capacity, the central government provided rewards for maintaining a balance between grass and livestock to pastoralists who did not exceed the carrying capacity, at a rate of USD 2.9/ha/year [47]. This mechanism attempts to compensate pastoralists who contribute to grassland conservation through government subsidies. During the first round of policy implementation from 2011 to 2015, satisfactory results were achieved, such as poverty elimination and a reduction in grassland exploitation [10]. However, the livestock numbers did not decrease as expected. For instance, in Inner Mongolia, during the first three years of PESs, the number of livestock decreased from 96.94 million sheep units in 2010 to 93.4 million sheep units, a decrease of 4%. However, by 2014, the number of livestock had increased to 97.7 million sheep units, surpassing the 2010 levels before the implementation of PESs.

3.2. Changes in the Pastoralists' Perceptions of Grassland Value

Based on the above analysis, the implementation of LGDCHRS and PESs has significantly changed grassland management in Inner Mongolia [1]. It is crucial to recognize that these policies and projects have also profoundly influenced pastoralists' attitudes towards grassland, affecting the effectiveness of these initiatives [23,39]. This section will explore the changes in pastoralists' perceptions of grassland value from three perspectives: the nature of grassland, the ownership of grassland, and the purpose of grassland conservation. Although there may be an element of romanticism in describing the collective period, the statements in regard to these three aspects are fundamentally accurate.

3.2.1. What Is Grassland for Pastoralists?

Before the implementation of LGDCHRS, the grassland was both the homeland and the most important asset for pastoralists. Mongolian singer Tengger encapsulates this sentiment in his song "Heaven," where he describes the grassland as "home" with its blue sky, clear lake, and green expanses. From an external perspective, pastoralists rely on grassland because they are dispersed in remote areas, isolated from political and economic centers, and have no other industries to depend on. However, from the pastoralists' perspective, the grassland resembles a mother, a metaphor frequently found in Mongolian songs and proverbs [48]. A Mongolian proverb states, "The first-class rich have friends, the second-class rich have knowledge and wisdom, and the third-class rich have cattle and sheep, but the greatest wealth is still the grassland" [45]. This comparison implies that wealth is not merely economic but is foundational to the pastoralists' way of life.

After grassland was contracted to individual households, it transformed into a means of production. Once pastoralists left livestock husbandry, the grassland became an asset that could be rented out for income. This transformation did not occur overnight. Initially, during the implementation of LGDCHRS, pastoralists found it difficult to accept the

construction of fences on grassland. As an elderly Mongolian woman remarked, "If the grassland was divided like a spider web, then there must be a problem with the grassland". However, driven by the market economy, such as the sharp rise in cashmere prices in the 1980s, pastoralists were motivated to increase their goat herds, believing "it meant losing money if we did not increase goats" [49] (pp. 153–157). Consequently, grassland became a means of production that facilitated income generation. In the collective economy, pastoralists had to consider grassland and livestock use value. Post-LGDCHRS, the value of grassland and livestock became intertwined with market transactions. In essence, exchange value became the core concern for pastoralists after the implementation of LGDCHRS.

Following the implementation of PESs in 2011, the grassland became a voucher for some pastoralists to receive compensation [1,23]. On the one hand, the high compensation prompted some pastoralists to completely abandon the grassland and move to towns; on the other hand, it attracted a few pastoralists who had left grassland and livestock breeding for years, to return and reclaim their abandoned grassland. These individuals primarily sought a paper certificate, which they could use to apply for compensation, regardless of the location or health of the grassland [39]. The previously mentioned exchange value required pastoralists to actively work on their grassland. Under the concept of exchange value, pastoralists had to manage their livestock well, while protecting the use value of the grassland. Even when renting the grassland to others, they needed to consider its health. However, under PESs, pastoralists can receive compensation merely for having a nominal contracted area of grassland and a contract certificate [1,35]. Thus, aside from exchanging compensation for PESs, the exchange value of grassland has diminished further in the eyes of some pastoralists.

3.2.2. Who Does the Grassland Belong to?

As stated above, the grassland is often compared to "Mother Earth". Before the implementation of LGDCHRS, pastoralists believed that the grassland was jointly owned by all pastoralists. This common ownership was guaranteed by a series of institutional arrangements. There were many beliefs and rules emphasizing conservation in the use of grassland [45]. For example, Prof. Liu Shurun's research in the Hulunbuir grassland in Inner Mongolia revealed the role of a "*nutugchin*", a coordinator of grassland management and livestock breeding, who played a crucial role in conserving grassland and local knowledge. "Nutug" means "hometown" in Mongolian, and "chin" means "the person of. . .". Thus, it can be literally translated as "the person who guards the grassland hometown". Before the implementation of LGDCHRS, "nutugchins" were nominated at all administrative levels of leagues, banners, and *sumus* (counties). In some areas, they were referred to as *galin ah*, especially where camel breeding was prevalent. "*Nutugchins*" were primarily responsible for arranging grassland use and livestock movement [45]. Importantly, during this period, leaders at all administrative levels and pastoralists respected and obeyed the commands of "*nutugchins*". As the Mongolian proverb says: "The horse who eats *artemisiae herba* will brim with energy and vitality, and the person who listens to the old man will have wisdom growth". With these experienced individuals guarding the grassland, the "grassland mother" could be protected, while nourishing the material and spiritual lives of pastoralists [45] (pp. 126–131).

At the beginning of LGDCHRS implementation in the 1980s, even though the use rights of grassland were distributed to individual households, most pastoralists did not immediately change their mindset. This is also the reason why Inner Mongolia implemented the second round of grassland contracting in 1995. For herders, using grasslands on a household basis presents many difficulties. It was difficult for them to imagine how to graze livestock within a fixed, fenced, and much smaller grassland area [38] p. 101. However, under various influences, they gradually adopted the "my grassland" concept and put up fences around their contracted areas to protect their use rights. A primary factor was the increase in livestock, which led pastoralists to realize the necessity of using fences to "protect their own grassland from others' livestock" [45] (pp. 126–131). From 1984 to

1999, favorable weather conditions and market prices, particularly the rapid increase in cashmere prices, led to a significant increase in livestock numbers in Inner Mongolia, with sheep numbers increasing by 56% from 23.77 million in 1984 to 37.03 million in 1999 [50]. The widespread growth in livestock numbers made pastoralists understand the need to build fences to keep neighbors' cattle and sheep out, or else they would suffer ecological and economic losses. Different regions in Inner Mongolia experienced varying modification processes. For instance, Zhang [49] (pp. 127–132) noted in her research on the Ordos grassland in western Inner Mongolia that local pastoralists began building fences around 1990, gradually shifting the meaning of grassland from "collective" and "public" to "private". However, Li and Zhang [38] p. 101 found that most fences in central Inner Mongolia's Xilingol grassland were constructed after 2000. With the entry of state-owned or private capital for activities such as mining, road construction, agricultural planting, and later wind and solar power development, which occupied grassland, pastoralists needed fences to assert their use rights and receive compensation. Consequently, under internal and external pressures, pastoralists established and exercised their grassland use rights by constructing fences. However, in response to external pressures, pastoralists often used fences merely to obtain compensation rather than to genuinely protect their use rights.

Although the use rights of grassland still belong to pastoralists, the implementation of PESs has generally increased the perceived instability of these rights. The top-down policy enables every pastoralist to participate in the project, with the price of receiving compensation being the imposition of certain restrictions, such as a seasonal or year-round grazing ban. PESs further promotes the diversification of pastoralists, who can be roughly divided into four categories. The first category comprises households with no livestock or a few livestock, who leave the grassland and move to towns, relying on the compensation to make a living [1]. Under relatively loose supervision, some of them rent out their grassland to earn additional income. The second category includes outsiders who take this opportunity to use the grassland to raise livestock [1,39]. The third category consists of moderately wealthy and wealthy households, who continue to engage in animal husbandry with increasing costs, loans, and risks [51]. The fourth category includes a small number of pastoralists, who have left the grassland for years but return to claim their share of the grassland due to the compensation benefits.

The question of who owns the grassland has become more ambiguous. Pastoralists who leave the grassland with compensation or reclaim their share of grassland solely to obtain compensation do not care about the grassland beyond their contract certificate, which allows them to earn compensation. They do not consider the health status or even the specific location of their grassland. Outsiders who rent grassland are primarily interested in the immediate benefits of animal husbandry, often leading to overuse of the contracted grassland. If this grassland becomes unusable, they simply rent another piece. Only the local pastoralists who continue to engage in animal husbandry care about the health of their grassland. However, under the pressures of climate change, grassland degradation, and loan burdens, they also tend to raise more livestock than their grassland's sustainable carrying capacity [1,23].

3.2.3. For Whom Is Grassland Conservation?

Before the implementation of LGDCHRS, pastoralists primarily relied on grassland animal husbandry for their livelihood and believed that sustainable grassland use was essential for their own well-being. The pastoral areas were remote from agricultural zones and even more distant from industrial centers. At that time, life was simple; there was little need for cash, and local income came almost entirely from animal husbandry, with the grassland serving as its foundation [52] p. 7. The transhumance system, which involved the seasonal migration of livestock, operated like a complex mechanism, with numerous interlocking components. Each pastoralist household or group functioned as a small gear, contributing to the overall operation of the system. This complete dependence on grassland resources compelled every pastoralist to engage in grassland conservation.

After the grassland was contracted to individual households, pastoralists initially had a strong desire to protect it. However, various restrictions rendered them increasingly powerless [52] p. 23. Firstly, since different households were allocated specific grassland parcels, moving livestock to other pastures became difficult unless arrangements and payments for rent were made. Secondly, prior to settlements, when pastoralists lived in yurts, there were few paths, and both people and livestock could move freely without the constraints of fences. After settlements, multiple roads emerged in front of each house, and numerous routes between fences became severely degraded due to over-trampling. Thirdly, compared to the cooperative and straightforward tasks arranged during the collective era, pastoralists had to become versatile after LGDCHRS [52] p. 23. Their adaptive governance, which respected natural grassland laws, was replaced by unreasonable practices that ignored the grassland ecosystem's characteristics. Traditional grazing knowledge became obsolete, necessitating the acquisition of new skills, such as driving, feeding livestock with forage, and using the Internet [52] p. 33. Additionally, the cost of purchasing fodder and forage has increased, forcing pastoralists to increase their livestock numbers to repay bank loans. Some even resort to usurious loans, creating a vicious cycle. Despite knowing that the degraded grassland cannot support so many livestock, pastoralists must maintain high livestock numbers to meet their financial obligations. Without sufficient funds to buy fodder and forage, both livestock and livelihoods are jeopardized [45] (pp. 126–131).

The implementation of PESs further transformed pastoralists' moral sentiment towards grassland conservation. For some, the grassland's meaning shifted from being a homeland to a voucher for obtaining compensation [1]. The ecological service function of "grassland as an ecological barrier in northern China" gained prominence, and various conservation projects were implemented, primarily through grazing bans [2]. However, the role of "grasslands as a homeland for pastoralists" was neglected. Firstly, PESs directly compensated pastoralists, fostering dependency and increasing the number of individuals who relied on compensation and grassland rents rather than engaging in livestock rearing [52]. This attracted outsiders seeking short-term benefits, exacerbating overgrazing issues. Secondly, PESs schemes distributed compensation to individuals rather than collectives, undermining the collective action needed for effective grassland ecological function maintenance. This led to the fragmentation of local social systems and the abandonment of community cooperative rules for rational grassland use [39]. Lastly, compensation encouraged irrational consumption and disrupted family unity. For instance, a village leader in eastern Inner Mongolia noted that over twenty SUVs appeared within a month of compensation distribution. Many pastoralists lacked plans for reasonable use of the compensation. The implementation of PESs also led to the division of large families into smaller units, further fragmenting the ecosystem and creating more social problems [23,39]. Overall, while LGDCHRS and PESs schemes aimed to improve grassland management and pastoralist livelihoods, they introduced new challenges and complexities that require careful consideration and adaptation to ensure long-term sustainability and social cohesion in pastoral communities.

3.3. Characteristics of Grassland Ecological Research in China

As mentioned above, the commodification of both ecosystem services and economic value has profoundly altered the social–ecological system in pastoral areas, including relationships among pastoralists and between humans and nature. Despite continued state investment, the resulting social disorganization and grassland degradation persist [35,44]. However, reflection on this issue should not end here; it must extend into the field of grassland ecology as an academic discipline. Grassland ecology in China, developed since the 1950s, has played a crucial role in grassland management. Reflecting on this field can provide a foundation for the future management of pastoral areas. As Beck emphasized in his "Risk Society" [53] p. 79, while the misapplication of scientific rationality has caused numerous problems, it should still be used to correct errors. Therefore, this section further analyzes the dilemma faced by grassland management and pastoral areas, by exploring

the development of grassland ecology in China over the past four decades, focusing on potential solutions.

Research on grassland ecology in China began in the 1950s and has gained increased attention since the late 1970s. According to interviews with pioneers in livestock and grassland science, including Zhang Zutong, Fu Xiangqian, Chen Shan, and Liu Shurun (July 2008), early grassland ecological research in China was closely linked to livestock and animal husbandry studies. The first grassland major in China, established in 1958, was established by the Department of Animal Husbandry and Veterinary Medicine at Inner Mongolia University. Later, influenced by Prof. Wang Dong and Prof. Ren Jizhou, a grassland major was established at Gansu Agricultural University, maintaining a strong connection with animal husbandry [38] p. 40. The Department of Ecology at Inner Mongolia University was established in 1957, led by Prof. Li Jidong, one of the founders of modern Chinese ecology, who relocated the ecology and geobotany team from Peking University to Inner Mongolia University. In 1977, Inner Mongolia University established China's first undergraduate major in ecology. Field research has been a significant focus in the development of grassland ecology. An ecological research station was established in Xilingol grassland in 1979, concentrating on monitoring, research, and demonstration. It had natural advantages in terms of conducting grassland research, because it was the closest research station to grassland and pastoralists at that time. Based on an analysis of the annual meeting records from 1981 to 1998 at the research station, as well as 11 collected paper publications during this period [54], early grassland ecological research exhibited two main characteristics. These early efforts laid the groundwork for understanding and addressing the complex challenges in grassland management, providing essential insights that remain relevant in developing effective strategies for sustainable pastoralism and ecological conservation in China's grassland regions.

3.3.1. Losing the Understanding of the Complexity and Integrity of Grassland Ecosystems

Early research from the ecological research station reveals a shift in research direction, with a decreased focus on the overall grassland ecosystem and an increased focus on detailed studies, such as plant succession, plant physiology, and photosynthesis. This trend aligns with Lin and Fyles' findings, which highlight the limitations of an overemphasis on technical knowledge [55]. While this approach has facilitated a deep understanding of the technical aspects of plants and land, it falls short of comprehending the holistic complexity of the ecosystem. When research began at the station in 1980, 28 topics were identified and categorized into seven areas: plants, animals, soil, water, material cycles, grassland utilization, and database construction. For instance, the fifth edition of "Research on Grassland Ecosystem," published in 1997, included detailed studies on the effects of grazing on soil physical properties, soil nutrients, soil microorganisms, and the locust community response. However, notably, it lacked articles addressing the overall impact of grazing on vegetation [56].

3.3.2. Taking an Engineering Approach to Grassland

These studies also reflect an increasingly distant approach from nature and a focus on artificial interventions. Since 1981, the annual meetings have proposed establishing and studying artificial grassland. Based on the author's analysis of the summaries from the working meetings of the positioning station from 1981 to 1998, by 1984, various experiments on artificial grassland began to appear in the collection of papers. These experiments included studies on the biological characteristics of **Leymus chinensis** under cultivation, the establishment of **Leymus chinensis** artificial grassland, winter-snow-layer fertilization of **Artemisia frigida** communities, background investigations on cutting grass succession test areas in **Leymus chinensis** grassland, and cutting grass succession tests on artificial **Leymus chinensis** grassland. Since then, studies on natural grassland have significantly diminished. The few studies that focus on natural grassland often emphasized its backwardness and lack of artificial modification, critiquing the unreasonable utilization of natural grassland

(1985) [57] and its management practices (1981) [58]. These studies continued to advocate for an eco-developmental logic underpinning systems science approaches to environmental management as not just techniques of managing natural resources, but as the very foundation of the progress of China's grassland region, a notion of utmost importance to development and legitimacy [23]. Emphasizing human control of nature through technical management, these studies advocate for the technoscientific control of socio-natural systems and portray ecology as both malleable and that it can be altered through human intervention and the correct calculation of its ecological functionality [23,30,59]. This logic posits that ecological engineering through environmental modeling and functional land zoning will transform a herding society into an ecologically modern society and pave the way for a "healthier" grassland region and community [26,59].

4. Discussion

4.1. The Capitalization of Nature and the Two Disembedding Processes in Regards to Grassland Value

As we examine the evolving significance of grassland for pastoralists, it becomes apparent that nature is increasingly "cut" and "extracted" from the social life of local people within the developed market mechanism. Implementing the LGDCHRS and PESs has precipitated two disembedding processes within the grassland social–ecological system. The first process involves the commodification of the grassland's economic value, a direct consequence of the LGDCHRS. This commodification leads to the economic value being disembedded from the grassland's ecological, social, and cultural dimensions. The second process, stemming from the implementation of PESs, concerns the commodification of the grasslands' ecological value, where only a portion of this value is harnessed to provide ecological barrier services in central China. This selective commodification alters the moral inclinations of pastoralists towards grassland protection.

4.1.1. Disembedding Process of Grassland Economic Value

In her research conducted in western Inner Mongolia, Zhang ([49] p. 191) introduces the concept of "Disembedding 'Nature'" to elucidate the transformation in the relationship between nature and humans following the implementation of the LGDCHRS. This paradigm shift is marked by the transition from a relationship characterized by integration and symbiosis to one of division and opposition, with nature increasingly objectified by human actions. This transformation is primarily evident in the subdivision of grasslands into smaller, tradable plots, a change that many pastoralists find difficult to accept. This resistance stems from alterations to their longstanding grazing practices and, more significantly, from a profound conflict of beliefs. As pastoralists articulate, "The grassland is our mother earth and cannot be dismembered and divided by her children" [45] (pp. 126–131).

Despite the challenges, grassland contracting has been implemented across Inner Mongolia, facilitated by the region's relatively flat terrain and the absence of insurmountable natural barriers. Typically, grasslands are divided based on family size and livestock numbers according to specific standards, whether applied to pastoralist groups or individual households. In 1996, Inner Mongolia launched a second round of LGDCHRS implementation, during which grassland previously contracted to pastoralist groups was further distributed among individual households [38] p. 71. While some areas retain common grassland, the more prevalent arrangement now involves fragmented grassland utilized by individual households. Consequently, the relationship between pastoralists and the grassland has evolved from adaptation to active construction and transformation [38] p. 71. The increasing prevalence of fences, motor-pumped wells, forage planting, silage pits, warm sheds, and various mechanical facilities, underscores this shift. Pastoralists are compelled to become multifaceted workers to cope with these changes in livestock management post-LGDCHRS [45] (pp. 126–131).

Meanwhile, the relationships among pastoralists have also changed accordingly. First, contradictions have emerged within families and between neighbors. These include dis-

putes over the fairness of grassland division, livestock encroaching on neighbors' grassland, and fences blocking access routes. Secondly, income from renting grassland, especially to outsiders, weakens the moral incentive for pastoralists to abide by social norms and promote common interests [60]. Thirdly, the original reciprocal support among pastoralists in the face of disasters has been replaced by economic transactions. Renting other people's grassland at high prices and even paying for livestock's drinking water from wells during droughts has made pastoralists more calculating. Finally, in the era of the collective economy, pastoralists could rely on the leadership of *nutugchins* and village leaders for winter and disaster relief. Now, pastoralists must rely on themselves. Facing increased uncertainty, they feel confused and uncertain about their future, making them more focused on short-term benefits rather than long-term sustainability. All these changes have led to the gradual physical and emotional division of pastoralists by fences, which creates physical distance, contradictions, and mutual distrust. This has given rise to a "fencing society" that physically and emotionally divides pastoralists [61].

The emergence of a "fencing society" has significantly altered the relationship between people and grassland. As previously mentioned, nature is increasingly objectified by human actions. As a result of the increasingly developed market mechanism, nature is "cut" and "extracted" from the social life of local people, endowed with a standardized market value, becoming a profitable economic production factor, while losing its vibrant vitality and original rich connotation. This process is the capitalization of nature. In Mongolian society, this represents a profound shift in the cultural significance of nature, accompanied by environmental consequences [49] p. 153. For pastoralists, the grassland is now seen primarily as a productive resource. Elvin noted that failing to exploit this resource economically results in lost potential wealth. The term "the cash-in imperative" encapsulates this notion [62] p. 2. This perspective also sheds light on why pastoralists, despite knowing that outsiders might overexploit the grassland, still choose to rent out their contracted land. Furthermore, the cashmere price surge in the 1980s led pastoralists to increase their goat herds, operating under the belief that reduced grazing equates to financial loss.

4.1.2. Disembedding Process of Grassland Ecosystem Service Value

Based on our research in a township in the south-central Xilingol grassland in Inner Mongolia, it is demonstrated how the implementation of PESs in the 2010s led to the collapse of the local co-management mechanism that had protected grazing lands for 30 years [1]. This collapse precipitated a tragedy of the commons, characterized by outsiders bringing in their livestock and local pastoralists indefinitely increasing their herds. Prior to the implementation of PESs, even households with no or a few livestock depended on livestock breeding and pastoral communities for their livelihood. The future of pastoralists hinged on the sustainable use of grassland, reinforced by local regulations that prohibited renting grassland to outsiders. During this time, community support mechanisms were also in place, such as earning income through shepherding or protecting grassland for mowing. However, post-PES implementation, households with minimal or no livestock received compensation based on their grassland contracting certificates, despite often being unaware of the specific locations of their grazing lands, since these were commonly used. After completing market transactions for ecosystem services, these households relocated to towns, severing ties with the community's mutual support systems. Under lax supervision, they began renting their grazing lands to outsiders, without regard for the consequences, exacerbating the livestock influx. This situation led other households to abandon the norms on controlling livestock numbers and protecting grassland, instead using compensation funds to secure loans for increasing their livestock numbers.

Therefore, the commodification of ecosystem services fails to reflect the broader value of the ecosystem as it strips away the social and ecological dimensions embedded in these services, which are crucial at varying scales [63] (pp. 172–174). In this case, the original grazing land co-management and livestock quantity control mechanisms were the most

directly and significantly affected elements. PESs may shift people's decision-making rationale from considering what practices fit the community social-ecological system to considering what is most beneficial for individuals [1]. The process of commodification has led to the disorder of social metabolism, resulting in unsustainable social and ecological outcomes, thus leading to the tragedy of commodification [63] (pp. 172–174).

4.2. Research on Grassland Ecology and Its Detachment from Grassland Management

The studies on grassland ecology often focus on technological and technocratic solutions, while overlooking traditional grassland management practices. The research can be divided in regard to the following two aspects.

4.2.1. Disentangling Research on the Natural Grassland Ecosystem

This research typically assumes that traditional animal husbandry, which relies entirely on natural grassland, is backward and lacks stable, high-quality, and high-yielding grazing land. For example, a 1988 study argued that traditional livestock herds grazed year-round lack a comprehensive scientific breeding and management system, impeding increased production in animal husbandry. Ironically, the "movement" of herds allows pastoralists to maintain stable, high-quality, and high-yielding grazing land, requiring "no supplemental feeding" [64] p. 47. While "no supplemental feeding" was assessed as a lack of scientific management systems, it indicates the full and rational use of natural grassland, reducing costs. Therefore, supplemental feeding does not represent advanced methods, but rather signifies grassland degradation and increased costs. The belief that supplemental feeding creates "improved livestock" overlooks the fact that livestock raised on supplemental feeding may be unfit for natural conditions, weak, and sickly, thus requiring supplemental feeding. Pursuing more meat, milk, and cashmere production based on "improved" livestock often ignores other significant drawbacks. Based on these misconceptions, it was proposed that "if China's animal husbandry wants to significantly improve production efficiency, it must combine artificial grassland with natural grassland and transition to semi-domesticated grazing on the basis of planting artificial pasture and concentrated feed" [65]. However, decades of practice have shown that abandoning natural advantages and transforming landscapes into artificial spaces for animal production creates numerous problems [38] p. 110; [66] (pp. 47–54).

4.2.2. Disentangling Research on the Pastoralists' Knowledge and Practice

Grassland contracting, in essence, is a "mandated marketization" reform based on two erroneous assumptions: the tragedy of the commons and the backwardness of nomadism [38] (pp. 62–69). From the perspective of the tragedy of the commons, traditional grassland management and animal husbandry were misunderstood as a situation of "no owner of the grassland, no boundary for grazing, no rules for management, no responsibility for construction, and no guilt for destruction" [38] p. 68. This view contributed to the belief that it caused grassland degradation and desertification. Those who assert the backwardness of nomadism claim that traditional animal husbandry relied mainly on "raising livestock by relying on nature" and "extensive management methods", which depend solely on natural conditions and focus only on livestock quantity, rather than quality [49] (pp. 214–216). Researchers from outside often fail to understand why herds are constantly relocated and why pastoralists do not plant forage grass. If there had been better communication with local pastoralists, these misunderstandings could have been resolved, revealing that pastoralists manage their animals within their ecosystems more holistically.

Both scholars and policymakers have underestimated the knowledge and experience of traditional pastoralists, valuing technical interventions instead. While data are valuable, we should also seek insights from modern Leopold foresters, farmers, and indigenous elders, who have spent their lives observing the land, and ask them what they see [55]. As previously discussed, pastoralists have always been practitioners of land ethics, respecting, relying on, and protecting the grassland. They learn from livestock, understanding whether

forage is toxic, or delicious, and nutritious, and mastering livestock management skills on grassland [45] (pp. 126–131). Ecology provides a model for a more vibrant and harmonious human community, and ecological theory must be holistic rather than simplified, neglecting the system's complexity [67] (pp. 493–499). This article emphasizes that local people, who have long been involved in the operation of this system, cannot be ignored.

This article illustrates the changing perceptions of pastoralists regarding the social, economic, and ecological value of grassland, by presenting the implementation of grassland contracting, which has led to the dominance of anthropocentrism in grassland management and replaced the original ecological ethics of pastoralists. This view is entirely based on considerations of technical production improvements, ignoring the diversity and complexity of ecosystems and the traditional knowledge on those systems. Faced with widespread grassland degradation, scientific rationality has once again prevailed, asserting that degraded grassland can be restored if livestock grazing is reduced. To this end, various conservation projects and the largest PESs project have been implemented. The overall trend in ecological development has been to abandon a holistic viewpoint and an interdisciplinary approach. The narrative in this article is just one example of humanity's advocacy for scientific rationality and its immersion in conquering and transforming nature. This article emphasizes the importance of the pastoralists' perspective by highlighting how their views on grassland's social, economic, and ecological value have evolved. Only through actively understanding, learning from, and protecting the grassland can we re-embed and realize the true economic and ecological value of the grassland.

5. Conclusions

Our findings underscore the critical importance of integrating local knowledge into policy frameworks for grassland conservation. Institutional transformations in China's grassland management policies have significantly shaped pastoralists' evolving understanding of grassland value. The commodification of grassland's economic and ecological value has led to the capitalization of nature, disembedding husbandry from grassland production and undermining conservation efforts. This article chronicles the trajectory of grassland ecology research over the past four decades, highlighting its increasing detachment from a holistic understanding of ecosystems and the interdisciplinary needs of management practices. This study reveals that the disjunction between grassland ecology research and practical management has resulted in a lack of techniques aligned with local ecological and socioeconomic contexts. Consequently, this research advocates a collaborative approach involving all stakeholders to develop and implement effective and sustainable solutions to grassland degradation in China.

This research is unique in two significant ways. First, it offers a continuous historical perspective, comprehensively reviewing policy changes over the years, rather than focusing on a single period. Second, it highlights pastoralists' perspectives, particularly their attitudes and actions regarding recent ecological compensation policies, which are often overlooked. This study examines the transformation of pastoralists' perceptions on ecological compensation within the context of successive conservation programs. Due to data constraints, this study focuses on one region in Inner Mongolia as a case study. However, the diverse pastoral regions of China may experience varying effects, and generalizing the insights and suggestions requires caution. This research emphasizes an evidence-based approach rather than starting from theoretical assumptions, contributing significantly to understanding pastoral areas, pastoralists, and pastoralism.

Our findings demonstrate that the concept of "my grassland" among pastoralists did not form immediately after grassland contracting but developed gradually due to the need to prevent others' livestock from encroaching on their grassland. Analyzing the changing value of grasslands from the pastoralist's perspective is crucial, especially given their lack of voice in policy formulation. This article suggests that policies should be formed that create space for local pastoralists to make informed decisions about the rational use of grasslands, emphasizing confidence in their cultural knowledge, rather than relying solely

on externally imposed technology. Policymakers should understand how pastoralists form ecological value instead of relying on technocrats' abstract reification. This study suggests that policymakers consider how subsidies are distributed and utilized, giving local stakeholders a voice to address regional needs and improve fund utilization efficiency. PESs schemes require complementary measures, such as restricting the entry of outsiders and providing compensation for ecological services generated by community-level collective actions. It is crucial to align ecological protection with pastoralists' livelihoods rather than view them as opposing forces.

This article is an exploratory study to provide a localized understanding of how pastoralists in Inner Mongolia perceive ecological value. However, there is much to consider regarding how capital and social networks shape specific implementation methods. Addressing these issues is fundamental, especially under conditions of climate change and socioeconomic development, which increase the complexity and uncertainty. Further research is needed to explore situations in other regions of China. In conclusion, actively engaging with and learning from pastoralists is vital to realizing the true economic and ecological value of grasslands. This article suggests more nuanced and effective strategies for sustainable grassland management, through comprehensive and collaborative efforts.

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