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STUDY ON THE IMPACTS OF GRASSLAND ECOLOGICAL COMPENSATION POLICY IN CHINA FROM THE PERSPECTIVE OF PASTORALISTS' BEHAVIOR

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ABSTRACT

Since 2011, the Grassland Ecological Compensation Policy (GEC) had been implemented in 13 provinces (districts) across China. This policy reduced the livestock number carried by grassland, relieved grassland degradation, and restored and consolidated grassland ecosystem services by controlling livestock carrying capacity and granting subsidies to herders to improve their income. This study analyzed the behavioral choices of pastoralists under the GEC policy and the impacts on grassland ecology and pastoralists' livelihoods through a case study in northwest of China. Further, based on the individual endowment effect and reference dependence effect in behavioral economics theory, the mechanism of the GEC policy affecting pastoralists' behavior was discussed. At last, we provided some suggestions to improve the design of the GEC policy in the future.

KEYWORDS: Grassland Ecological Compensation Policy, Pastoralists' behavior, Grassland degradation.

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1. INTRODUCTION

In recent years, China had attached great importance to ecological environmental protection. 2016-2020, the Chinese national finance had arranged a total of 647.2 billion US dollars of ecological and environmental protection-related funds, with an average annual growth rate of 8.2%. Among them, 283.1 billion USD were from the central government, accounting for 43.7%. Ecological Compensation had become the main means of ecological management in forests, grasslands, watersheds, wetlands, etc., and the cumulative ecological compensation-related expenditures of the central government from 2016 to 2020 were 111.6 billion USD, of which grassland ecological compensation funds are 122.1 billion USD, accounting for about 11% of the central government's ecological compensation amount[1].

Grassland Ecological Compensation Policy included grazing ban and grassland-livestock balance, “grazing ban” referred to the implementation of grazing ban or seasonal grazing ban for severely degraded pastures, “grassland-livestock balance” referred to the control of livestock number based on the pasture area and grass yield. From 2003 to 2010, the state only granted financial compensation to herding households for grazing bans, but no subsidies for grassland-livestock balance. 2011 onwards, grassland-livestock balance was included in the scope of compensation, and was granted to herding households in the form of “rewards”. In the first round of the GEC Policy from 2011 to 2015, the compensation for grazing ban was 0.058 USD/ha, and the subsidy rate for grassland-livestock balance was 0.015USD/ha. The second round of the GEC Policy standard was increased to 0.073 USD/ha and 0.024USD/ha respectively in 2016, and the third round of the GEC Policy starting in 2021 was further increased to 0.142USD/ha and 0.047USD/ha. Together with production subsidies, herders' employment transfer projects and other financial inputs, the total amount of grassland ecological compensation funds from the central government had increased year by year, from 1.99 billion USD in 2011 to 2.95 billion yuan in 2020.

In the context of the general requirement of financial funds to improve quality and efficiency, the implementation effect of the GEC Policy had been widely concerned. Many scholars carried out research around the policy implementation effects, while the natural climatic conditions and grazing conditions among regions were very different, and the evaluation results vary greatly. Gu Y(2012) et al. concluded that after 4 years of grazing ban in grassland of Hulunbeir, the vegetation biomass of grasslands showed annual fluctuations and the overall ecological condition of grassland did not improve significantly[2]. Xu Q(2011) et al. found that grazing ban in Xilinhot, Inner Mongolia was beneficial to the improvement of net primary productivity and biomass of grassland, and the ecology of grassland with 7 years of grazing ban was effectively restored[3]. HengbatA(2021) pointed out that the GEC policy relieved grassland degradation in the Yili Valley, but did not significantly increase herders' income due to the low amount and unreasonable distribution of subsidies[4]. The overall satisfaction of herders in the Qinghai-Tibet Plateau region of Gansu Province with the GEC policy was low, and the policy implementation had limited effect on promoting the diversification of herders' livelihoods [5]. It could be seen that the GEC policy had played a role in improving grassland ecology, but there were still problems in the transformation of livestock production way and improving the livelihoods of pastoralists [6].

Further analyzing the reasons for the poor implementation of the policy, many studies examined the policy formulation logic, implementation process and policy impact from the perspective of the policy design, and pointed out that the GEC policy had low compensation standards, overly simplistic policies, lack of dynamic adjustment mechanisms, and little supervision of violations[7-9]. The GEC Policy lacked legal and property rights basis and the game mechanism between compensation subjects[10]. When the government formulated GEC policy, it paid more attention to the grassland restoration, but did not promote herders' initiative to adapt to external changes and market development and promote livelihood transformation in the implementation process, so the policy sustainability was weak [11]. Thus, it appeared necessary to analyze the GEC policies from the perspective of the users (pastoralists) affected by the policies. Studies had been conducted mainly on herders' descriptions of policy implementation in field studies [12-13], but there were few studies that further analyze herders' specific behaviors under the influence of the policy,

especially the reasons behind herders' behaviors under the influence of the policy as "limited rational" economic man. This paper aimed to fill the gap in the literature in this area. Based on the "limited rational" economic man hypothesis of behavioral economics, we analyzed the behavioral choices of pastoralists under the GEC policy and the impact on grassland ecology and herders' livelihoods through a case study in northwest of China. The mechanism of GEC policy influencing herders' behavior was further discussed and some suggestions were raised for improving the design of GEC policy in the future.

2. ANALYZING FRAMEWORK OF THE IMPACTS OF GEC POLICY FROM BEHAVIORAL PERSPECTIVE

2.1 Prospect Theory of Behavioral Economics

Different from the rational economic man hypothesis of traditional economics, behavioral economics believed that people in real society had limited rationality, incomplete information and other characteristics. Prospect Theory proposed that people were irrational in the face of uncertainty, and individual behavioral choices had characteristics that exhibit individual endowment effect and reference dependence effect. The individual endowment effect referred to the fact that once an individual owns an item, his evaluation of the value of the item was much higher than before. The existence of the endowment effect would lead to deviations in the psychological prices of buyers and sellers, thus affecting market efficiency. Reference dependence referred to the fact that people's judgment of gains and losses was often decided according to reference points, and people generally evaluate the decision results by calculating the change of that result relative to a reference point, by focusing on the difference between the final result and the reference point. Irrational feelings of gain and loss could have an impact on decision making, and people favor the more equitable distribution scheme. If the gap between the two sides was too large and violated social justice, people might even choose to give up their own interests to punish those who commit unfair acts.

2.2 Research Ideas

As individuals in the real society, pastoralists' behavioral choices inevitably follow the laws of prospect theory. The GEC policy, which granted herders subsidies based on their household pasture area, co modified the value of pasture resources and tried to buy pasture ecosystem services with subsidies. Under the influence of the policy, different behavioral choices emerged among herder groups depending on individual feelings of gains and losses, which ultimately determined the effects of policy implementation. Based on the analysis of pastoralists' behavioral choices and livelihood and ecological outcomes, this study attempted to further analyze the process of GEC policy's influence on individual pastoralists' behavior and explained the mechanism behind pastoralists' behaviors.

2.3 Research Framework

Under the influence of the GEC policies, herders' attitudes and perceptions of grassland resources had changed and adopted specific behavioral choices. This study combined the individual endowment effect and reference dependence effect in prospect theory to explain the whole process of the GEC policies affecting pastoralists' behavior, changing the interaction within herders' groups and with the government, and ultimately influencing grassland ecology and pastoralists' livelihoods.

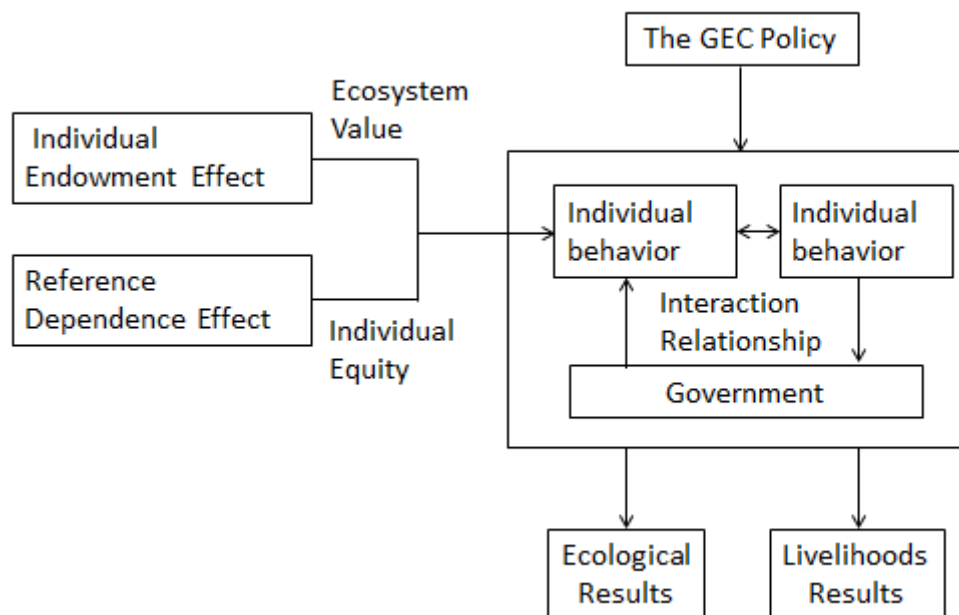


Fig. 1 Analyzing Framework of the Impacts of GEC Policy from Behavioral Perspective

3. PASTORALISTS' BEHAVIOR AND OUTCOMES UNDER THE GEC POLICY

3.1 Study area

The case site A Village located in N County, northwest of China. Pastures were distributed to households after 1984, but jointly used by 8 households in one group. The local livestock carrying capacity took into account of both population and pasture area, which about 40 sheep units for one household. Grassland ecological compensation subsidies had been distributed to pastoralists in A Village since 2011.

This study analyzed the behavioral choices of herder groups after the implementation of the GEC policy, reflecting the changes in grassland ecology and herders' production and life after the subsidy was distributed to households. Data for quantitative analysis was from the county government statistics, and data for qualitative analysis was from the field work at the household level. The fieldwork was completed in 2018-2019, mainly using semi-structured interviews to conduct 143 herder households' surveys in A Village. The interviews focused on household farming and herding production and livelihoods, pasture use, herders' perceptions of changes in pasture ecology and livelihoods, and their evaluation of the GEC policy.

3.2 Pastoralists' behavior under the GEC Policy

3.2.1 Pastoralists still rely on animal husbandry as their main source of livelihood

In terms of income structure, the livestock-related income of herders in a village accounted for 80%, 66% of which was from selling livestock. Other sources of livestock-related income included renting pasture, grazing trade, selling livestock products such as dairy products and wool. 15% of the total income was from government subsidies, and only 12% was from other labor working (Fig.2). Major expenditures were also mostly related to livestock. The most important source of income for herder households was still livestock grazing. The GEC policy provided herders

subsidies based on pasture area, required them to control the number of livestock and seek other alternative livelihoods, however, herders in the interviews believed that the amount of ecological subsidies was too small. They still highly depended on pasture resources to maintain livestock husbandry, which basically did not lead to livelihood transformation, and the number of livestock in N County showed a trend of increasing year by year (Fig.3).

Among the interviewed households, the total number of labor force in A village was 136, and the percentage of non-pastoralist laborers was 19%. It was also found in the fieldwork that the main way of living for households was still animal husbandry, and the labor force engaged in non-agricultural and pastoral activities was low. More than 80% of the families who choose non-pastoral work were young herding families divided from big families. They have no pasture for animal husbandry, therefore had to choose other ways to maintain their living. Some households had transformed their livelihoods by contracting farmland to grow cash crops, renting out farm machinery and selling forage, but most herding households still relied on animal husbandry. Ecological compensation only provides herders with a certain amount of cash subsidies, and the amount was insufficient to support herders' household living expenses. Due to the overall low level of economic development in western China, it was difficult for local herders to engage in higher-skilled jobs due to the limitations of minority languages and cultures, education levels, and working ability. Pastoralists lacked the ability to find alternative livelihoods, so the livelihood transition had not been successful.

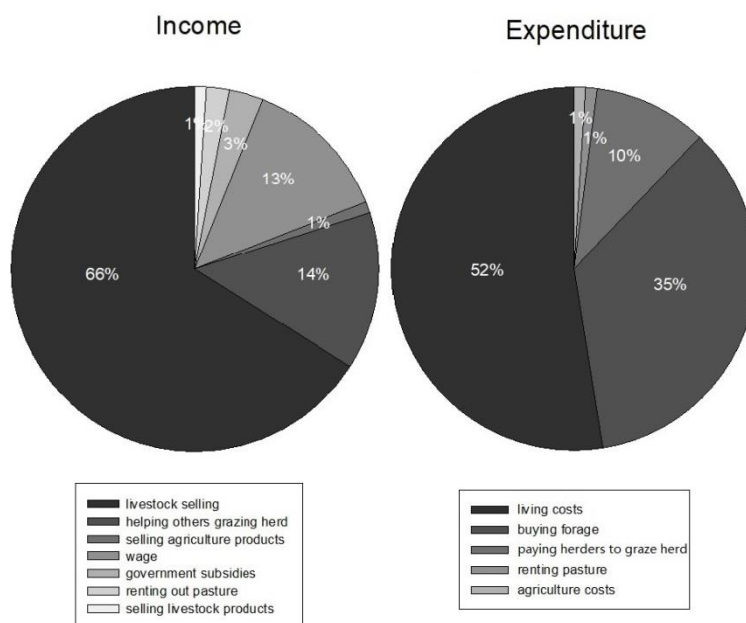


Fig.2 Income and Expenditure of Pastoralists in A village

3.2.2 Collective action of grazing disappeared and grazing trade was common

In this study, the act of herders grazing others (often farmers' livestock) livestock outside the group for a fee was called grazing trade, which was a market behavior. While the act of herders grazing livestock in group to transfer other herders livestock together at no cost or below the price of grazing trade was called collective grazing, which belonged to herders' collective action. In A

village, 15% of the herding households asked the group leader to bring their livestock to the winter pasture for grazing, and went to the summer pasture by themselves in summer, while 21% of the herding households asked the leader to bring their livestock for grazing in both winter and summer. As a result, the percentage of herding households in the village that maintain the practice of collective grazing was 36%. However, 43% of households with few livestock cannot afford to pay the high cost of livestock transfer and grazing in spring and autumn pastures and summer pastures all year round. Group leaders also charged a fee for helping other households in the group to graze their livestock, but it was generally less than the price of grazing trade.

On the other hand, grazing trade between herders and farmers outside their community was more common in A Village. Of the 21 groups interviewed in A Village, 18 groups (86%) admitted that grazing trade occurred. Households with grazing trade practices accounted for 55% of the total number of households interviewed. The village leader also pointed out that 45% of herding households in A Village grazed livestock from neighboring farming areas. In one household, the average number of grazing trade livestock was 220, and the average number of their own livestock was 102, which mean that the number of livestock outside the community was more than double of the family's livestock. The villagers reflected that the grazing trade households in the village usually grazed more than 200 sheep in order to gain profit. In 2018, grazing trade price was 2.19USD/month/sheep, 14.61USD/month/large livestock such as cattle and horses, and the average annual income from grazing trade was 1926USD, accounting for 24% of their total income.

The reasons for the emergence of grazing trade were as follow: on the one hand, from the perspective of the demand-side farmers, it was very common for farmers to raise livestock because the cash income from raising livestock was much higher than farming. At the same time, farmers did not have their own pastures, the demand for grazing trade raised. Farmers first began to accumulate livestock in the late 1980s, when herders usually gave farmers 1-2 animals in return for obtaining wheat straw from farming areas for winter forage. After 2000, with higher sheep prices, farmers' livestock numbers began to increase significantly. After the implementation of GEC policy in 2011, the government gave farmers forage seeds to encouraging them to grow forage grass on their farmland to provide winter forage for herders' livestock. Farmers gradually abandoned wheat cultivation for forage from 2010, but most of the forage farmers planted was used to meet the requirements of their own livestock, and more and more of the farmers' livestock entered the pasture through grazing transactions in summer.

On the other hand, from the perspective of the supply side herders, The livestock was divided into households after 1984. Due to the difference in grazing experience of different herders, coupled with the fact that some herding families need to sell all their livestock for medical treatment or marriage, few and no livestock households gradually appeared in the pasture. These herders lost their ability to use the pasture through livestock grazing and need to find a way to benefit from the pasture again. In terms of economic income, few and no livestock households carrying on grazing trade with farmers in summertime were a more economical way to make a living, because they would have to bear the burden of winter forage if they raised their own animals. In terms of equitable use of resources, under the group grazing model of shared pasture in A village, large livestock households invariably took up the pasture of small households without compensation. As a result,

few and no livestock households chose to gain equitable access to collective pasture through grazing trade.

3.3 Outcomes under the GEC Policy

3.3.1 The number of livestock increased, and the gap between rich and the poor increased

With the development of economy, the income level of pastoralists in N County had increased year by year, but there was still a gap compared with the national growth rate of farmers' net income in China. The total number of livestock was increasing, while the number of few and no livestock households was also increasing. From 1984-2010, the livestock number of herders in the county increased from 450,000 sheep units to 1.8 million sheep units. And after the implementation of the GEC policy in 2011, the number of livestock still increased from 1.8 million sheep units to 2 million sheep units from 2011-2015. Households interviews also showed that households with few and no livestock (less than 50 sheep units) increased in recent years, and the gap between rich households with large livestock had gradually widened. Animal husbandry income accounted for more than 90% of the total income, and the proportion of non-agricultural and pastoral labor was only 18% (Table 1, Fig.3). It could be seen that the cash income and livestock wealth of herders had increased significantly in recent years, the number of households with few and no livestock also increased, and the stability of livestock production was insufficient. The transformation of herders' livelihoods was not successful.

Table 1 Indexes of Income and Livestock Wealth of Pastoralists

Indexes	Mean value	Maximum value	Minimum value	Standard deviation
1.Per capita net income of pastoralists in N County(dollar) ^a	193.31	1204.96	8.68	297.55
2.Growth rate of per capita net income of pastoralists in N County (%) ^a	9.04	41.71	-18.6	12.24
3.Per capita net income of farmers nationwide(dollar) ^b	231.66	1512.46	2.42	373.58
4. Growth rate of per capita net income of farmers nationwide(%) ^b	13.2	122.38	-8.57	19.24
5.Livestock number in N County(sheep units) ^a	108.62	203.93	35	45.69
6.Proportion of animal husbandry income in total income(%) ^c	90.5	93	88	3.64
7.Proportion of non-agro-pastoral labor force(%) ^c	17.25	18	16.5	1.06

The data sources and description in the table were as follow: A. 'N County Statistical Yearbook 1984-2015'; B. 'China Rural Statistical Yearbook 1984-2015'; C. Field interview data.

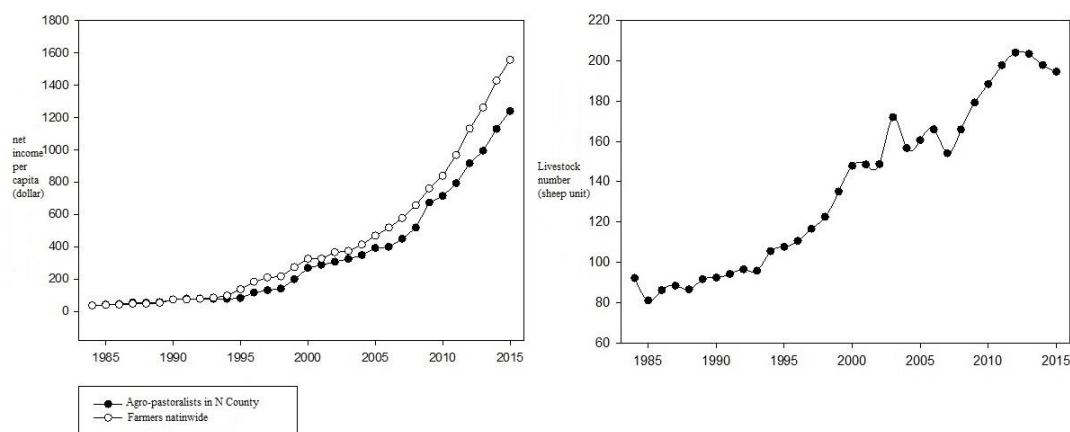


Fig.3 Net Income Changes of Pastoralists in N County and Farmers in China, Changes in Livestock Number in N County

3.3.2 Overgrazing and Grassland Degradation

In the interviews, all herders believed that the pasture was degrading year by year. 60% of the herders believed that the pasture began to degrade from 2000-2010, which coincided with the time period when livestock numbers in agricultural areas increased and grazing trade began to develop. The top three reasons for pasture degradation according to the herders were grazing trade, drought, and too much livestock, accounting for 42%, 30%, and 28% respectively. The implementation of the GEC policy in 2011 did not alleviate the trend of pasture degradation either.

The collective grazing designed in A village (the group leader took the members' livestock together to winter and summer pasture) was very weak in itself, and the most important flaw was the lack of a well-defined regulation, monitoring and punishment mechanism. Once the collective grazing action broke down, it faced the problem of compensation for herders lacked of the ability to use the pasture. And because the government could not organize effective negotiations between herders, the two sides cannot reach a consensus on the amount of compensation, who was eligible for compensation, and who paid for compensation. Therefore, once compensation as a way of cooperation cannot be reached, the strategy of households with few or no livestock was to obtain the access of grassland through grazing trade. The government had no effective monitoring and sanctioning mechanism for violators of the law, such as overgrazing. Therefore, it was inevitable that pasture disputes arise in this process.

At the village level, there was no pasture management department to monitor villagers' daily pasture use behavior and arbitrate disputes between villagers. Herders who wanted to deal with disputes need to go to the Grassland Department in county level to invite grassland law enforcement officers to the village. This was very costly, and the supervisory capacity of county grassland management department was limited and could not deal with their conflicts in time.

According to the interview with the grassland management department, we learned that the rights of the grassland management rights was limited to pastoral areas, and there was no enforcement rights for agricultural areas, so it could not stop grazing trade between farmers and herders. The measures

taken by grassland management departments to deal with overgrazing of herders included:(1) Prohibiting the renting of pasture to people from other counties; (2) Stopping their ecological subsidies, including the ecological subsidy and the transfer subsidy. However, the grassland management department did not prohibit grazing trade within the county, as long as the livestock carrying capacity was not exceeded. If overgrazing were found during inspection, the herders would be fined, and if exceed 100 animals, the livestock would be confiscated. In April and June, the grassland management department set up inspection station on the way to the spring and autumn pastures and summer pastures to check overgrazing and proof of vaccination. However, the number of herders was too large, and the manpower and fund of grassland management department were limited, led to the problem of insufficient supervision capacity.

From the above results, it could be seen that after the implementation of GEC policy, the number of livestock and cash income of herders increased, but they still relied on livestock grazing for their livelihoods. It was difficult for herders to achieve livelihood transformation, and the collective action of herders gradually disappeared. The emergence of grazing trade led to overgrazing and pastures degradation.

4. MECHANISM OF THE GEC POLICY AFFECTING PASTORALISTS' BEHAVIOR

4.1 Pasture commercialization to motivate pastoralists to increase livestock numbers

The GEC policy co modified the grassland ecosystem services, attempting to purchase ecological services directly with subsidies. This measure simplified the original symbiotic relationship between herders and grassland to one in which herders were only concerned with the area of grassland they own on paper and no longer with the quality of the grassland. The GEC policy changed the logic of herders' actions, linking pasture area to cash value, and the endowment effect made herders feel that pasture resources became private property, changing from considering what to do to adapt to the ecosystem to considering what was in their best interest. Policy design based on economic incentives undermines the starting point of ecological conservation. In a competitive market environment, where GEC policy supported the expansion of capital's influence on nature, the co modification of ecosystem services value could not reflect the value of ecosystem in a broader sense, but instead ignored other social and ecological components embedded in these services, which provided ecosystem services to people at precisely different scales.

For few and no livestock households who have no livestock of their own, the value of pasture becomes the area of pasture they own on paper. It was irrelevant to them whether the pasture was good or bad. However, since the grassland had been used jointly, in order to make full use of the value of the grassland, they adopt the behavior of grazing trade, which causes the overuse of grassland resources. The wealthy and medium-sized households not only had no way to prevent the entry of livestock outside the community, but also competed to increase their own livestock in order to occupied the grassland, falling into the scenario described in the tragedy of the commons and unable to extricate themselves from it.

4.2 The Lack of Supervision and Punishment Mechanism caused overgrazing

Under the independent production model based on the households, the tradition of collective grazing among herding households disappeared, and the gap in the average number of livestock per

household gradually widened. The pasture sharing way made the pasture of few and no livestock households occupied by medium and rich households without compensation. According to the reference dependency effect, few and no livestock households were more concerned about the gap between themselves and other herding households, and they believed that it was unfair to share pasture between 8 households in 1 group. The gap between themselves and rich households was large, which was against social justice. Few and no livestock households generally chose to trade with farmers, and overgrazing causes pasture loss, so as to punish rich households who occupied their pasture without compensation.

The ecological compensation policy lacked an effective monitoring and punishment mechanism. On the one hand, the government cannot constrain rich households to provide corresponding compensation measures to the no livestock households who suffered losses due to unfair use of pastures. As a result, no livestock households commonly chose to engage in grazing transactions with farmers in order to maintain their livelihoods and compete for the right to use pasture resources. The grazing trade took livestock outside the community into the pasture, and the pasture carries too many livestock, leading to pasture degradation. On the other hand, the government lacked effective supervision and punishment to grazing trade and overgrazing households. The community norms that maintained the rational use of pasture resources were no longer effective; the grassland management departments at the county level and village collectives were not capable of monitoring villagers' daily pasture use, punishing overgrazing violations, and resolving disputes between villagers.

5. SUGGESTIONS

Based on the above analysis, it was difficult to protect grassland by simply relying on the government to grant subsidies to herders. Grassland was a typical common pool resource, the GEC policy need to rebuild effective collective action and common social norms to supervise and manage herders' livestock production behavior. This can be divided into the following three aspects: Firstly, guide herders to rebuild the production model of pasture sharing and grazing cooperation broke the vicious circle of herders competing to increase livestock and seize pasture resources under household production. Using the herders' individual endowment effect, herders were encouraged to put their pasture resources in the form of shares, established cooperative organizations for grazing production, and rebuilt collective-scale livestock production. Led by the village collective, the herders in the village united on the basis of voluntary mutual benefit, risk-sharing and benefit-sharing, in order to meet the needs of production development and to protect their economic rights and interests. Cooperative organizations should have the following characteristics: First, voluntary and mutually beneficial, herders had the freedom to join and withdraw from cooperative organizations; Second, collective and autonomous management, each member had the right to participate and make decisions; Third, resources into shares, the distribution method based on pasture share; Fourth, the establishment of public funds, accumulated public funds for resource protection and risk management. Through the form of cooperative organizations, the scattered pasture resources were integrated, the problem of inequitable utilization of pasture resources was solved, and the mutually beneficial community cooperative relationship was restored.

Secondly, clear rules, supervision and punishment measures to ensure fairness among herding households. Establishing community participation rules in farmers' and herders' grazing transactions, organized resources trade with farmers in herders' group level. The community needs to play a role in organizing herders to jointly negotiate the rules of resource trading in their village, including setting grazing trade prices, determining compensation schemes and supervising herders' grazing behavior. When grazing trade concluded, the village community must sign a formal contract on behalf of the herders and regulate and punish the herders' overgrazing behavior. The number of livestock carried by the pasture was controlled, and the appropriate use of the pasture was ensured after the grazing trade deal was reached.

Thirdly, enhanced the value of human capital of herders and promoted livelihood transformation. Through popularizing basic education and organizing technical training, comprehensively improve the quality and employability of the labor force in remote areas. Encourage herders to change their traditional herding production livelihoods and engage in other industries related to animal husbandry, while providing diversified work opportunities for young herders with stronger abilities. Change the industrial structure that was mainly based on animal husbandry.

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