The impact of different herdsmen's size on grassland ecosystem of Eastern Transect in Tibetan Plateau: A case study from Maqu

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Keywords: Maqu grassland, herdsmen's size, management, single-household, joint-household.

Introduction

In order to address grassland degradation, an individual contracting system, or namely, single-household rangeland management, based on Garrett Hardin theory of "tragedy of the commons", had been conducted in Maqu since 1980s. Despite the support of local government, such a well-intentioned system saw little fruits on managing degradation, encountering extensive frustration due to its poor practical outcomes. Meanwhile, joint-household rangeland management, as an inheritance of locality-based management, has been vigorously pursued and has played an important role on Maqu's grassland management system. In order to better illustrate the impact of size on managing the grassland ecosystem, an experiment was set up in which different herdsmen's scales (single household, small-scale, medium-scale, large-scale, oversized-scale) existing in Maqu grassland was conducted.

This study was an attempt to provide a groundbreaking management model, thus inspiring the policy-makers to achieve better solutions.

Materials and Methods

Study Site

This study was conducted in the southwest part of Gansu Province, namely, Maqu, which is one of the last few grassland-remaining regions in Gansu. With a total area of natural grassland of approximately 910600 ha, Maqu grassland receives a reputation as Asia's best natural pasture. All experiments were conducted in Oulaxiuma, Awangcang, Qihama, Cairima and Manrima, which are scattered across the whole of Maqu Prefecture.

Experimental Design

Twenty 50 cm x 50 cm quadrats were randomly selected across differently managed Maqu grasslands based on size of the management units. With the purpose of avoiding edge effects, only the central area of each plot was investigated. Researchers collected the coverage of sedge, grass, legume and noxious and miscellaneous species and then calculated the total coverage of these plots. Data on height of sedge, grass and legume were also collected. Twenty 10 m x 10 m plots were randomly selected in the same Maqu grasslands to estimate the total of grassland rat holes. Based on these data, the quality level of Maqu grasslands under different management style was assessed.

Data analysis

According to the data analysis, the small-scale ($1<n\leq10$) has the comparative advantage in coverage of grassland (the 2nd, 3rd, 4th, 5th, 6th column of Table 1) on the basis of game theory. The medium-scale ($10<n\leq20$) show the comparative advantage in grass height (the 7th 8th, 9th column of Table 1). The average number of rat hole of grassland managed by medium-scale joint-household is smaller than the number in grassland managed by other sized management systems (10th column of Table 1).

The analysis suggests that joint-household rangeland management has a comparative advantage over single-household rangeland management. A possible reason for the difference is that the area of grassland managed by single-household is usually too small to implement strategic management such as rotational grazing know to reduce rat number because higher and more dense pasture reduces their ability to detect the presence of predators.

Table1. The results of data processing about coverage, grass height, and number of rat hole (means ± standard deviation).

Herdsmen's size	C_0 [a] (%)	C_1 [b] (%)	C_2 [c] (%)	C_3 [d] (%)	C_4 [e] (%)	H_1 [f] (cm)	H_2 [g] (cm)	H_3 [h] (cm)	T [i] (pc)
single household	87±3	42±8	17±12	8±3	22±8	17.6±10.6	36±9.45	23±11.14	19±23
small-scale	88±8	43±15	18±3	10±9	17±8	25.0±10.44	43±14.43	13.33±4.16	7±7
medium-scale	89±10	37±14	18±8	10±7	25±12	30.6±7.09	54±19.28	18.33±5.99	4±6
large-scale	89±12	25±12	27±20	9±8	28±13	25.4±6.5	49±12.52	16±11.11	6±5
oversized-scale	88±4	33±4	15±7	20±14	20±7	20.5±2.12	39±7.78	11±0	14±8

[a] C_0 is the average total plot's coverage; [b] C_1 is the plot's average coverage of sedge; [c] C_2 is the plot's average coverage of grass; [d] C_3 is the plot's average coverage of legume; [e] C_4 is the plot's average coverage of noxious and miscellaneous grass; [f] H_1 is the plot's average height of sedge; [g] H_2 is the plot's average height of grass; [h] H_3 is the plot's average height of legume; [i] T is the number of rat hole.

Conclusions

First, factor of property ownership be out of consideration, areas adopting joint-household management outperformed those with single-household management. Second, managements with flexibility and adaptability in accordance with various scales of joint-household have showed their own advantages. Top priority should be given to the consideration of pasture difference when judging a reasonable scale of joint-household.

Acknowledgements

Song Bo, our classmate, provided several linguistic suggestions which substantially inspired us in the respect of English expression. Great tribute should be paid to him.

References

Zhang KR (1998) Sustainable Land Use and Management. *China Land* **9**, 23-25.

Cao JJ *et al* (2009) SWOT Analysis on Group-household Grassland Management in Maqu and Strategies for Future Development. *Pratacultural Science* **10**, 146-149.

Li YK, Li L (2010) The Main Forage Succession and Ground Surface Characteristic During Degradation and Restoration of Alpine Kobresia Meadow. *Pratacultural Science* **10**, 179-185.