

Forming mechanism and classification standard of "Black-Soil-Type" degraded grassland in Yangtze and Yellow River headwater region of Qinghai-Tibetan plateau

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Introduction Alpine meadow comprises a principal part of natural ecosystems , accounting for 90% of the grassland area in Yangtze and Yellow River (YJR) . However , an unreasonable stocking rate and grazing system , and the effect of increasing population , global climate change and natural disaster on alpine meadow ecosystems , grassland has resulted in over half being degraded to different degrees . This has seriously threatened the existence of herds and hindered sustainable development of animal husbandry . This report explores the effects of rodents , overgrazing , and climate change on degraded grassland .

Materials and methods There are 16 counties and 1 township in the YJR source region (31°32'~36°16' N , 89°24'~102°15' E , 3500m~4500m) . The climate is dominated by Southeast monsoon and high pressure of Siberia . The average air temperature is 5.4°C~4.1°C . Average annual precipitation is 274.6mm~746.9 mm , above 50% of which falls in the short summer growing season from June to August . According to grassland type and approximate distributing area of "black-soil beach" degraded grassland , 120 sample areas of field investigation and 92 training sample areas of remote sensing were surveyed and inspected in 16 counties and one township . Evaluation indices and classification of degraded grassland follows (Table 1) .

Table 1 Evaluation indices and classification of degraded grassland .

Degraded ranks	Original vegetation coverage	Ration of palatable forage (%)	Degraded indication plants(%)	0~10cm Content of organic matter(%)	0~10cm Ratio of grass vs soil
I Original vegetation(OV)	>90	>75	<10	>15	<20
II Light degradation(LD)	75~90	55~75	10~30	15~10	20~35
III Moderate degradation(MD)	55~75	35~55	30~50	10~7	35~50
IV Heavy degradation(HD)	45~55	20~35	50~75	7~5	50~75
V Extremely heavy degradation (black soil beach)(ED)	<45	<20	>75	<5	>75

Results With the aggravation of degradation , the community quantitative values show a declining trend . No . of species , diversity index and evenness index reached the maximum in MD grassland , the minimum in ED grassland , and the percentage of aboveground biomass for high quality forage reduced abruptly . The similarity index was maximum between OV , LD and MD grassland , and then between LD and MD ; Overstocking has reached to 10⁷ sheep units ; *Ochotona curzoniae* pest is not a primary reason of grassland degradation . Grassland degradation can lead to changes of physics characteristics and nutrition factors of soil . With the increase of stocking rates , the average content of organic matter , organic carbon , total N , total P trend decreases , and contents of available N appear changing trend of "S" curve . The increase of average annual air temperature over fifty years was 0.16°C/10a in YJR source region , which is much larger than 0.04°C/10a in other region of China .

Conclusions The formation of the "Black-Soil-Type" degraded grassland ecosystem is a result of a range of factors including human activity . According to the different degraded ranks , relevant measures of rehabilitation should be adopted , and the lighter the degraded degree , the earlier and quicker rehabilitation occurs . Restoration of degraded grassland ecosystems has commonly two paths : one is natural restoration and the other is rehabilitation or reclamation by human factors . The lightly and moderately degraded grassland ecosystem can be reversed . Therefore , by fencing closure , weeding , fertilizing , using rodenticide , decreasing stocking rate , optimizing population structure by stocked and slaughter ages , they can be rehabilitated . As for extremely degraded grassland , they no longer can be utilized and the condition cannot be reversed . Therefore , only building artificial and semi-artificial grassland through furrow , scarification and replanting can we restore these heavily degraded systems .

Reference

Ma , Y .S . , Lang , B .N . & Wang , Q .J . (1999) . Review and prospect of the study on "Black Soil" deterioration grassland . *Prataculture Science* , 16 : 5-8 .