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## Grassland deterioration in the source region of Yangtze-Yellow Rivers in China and integrated control of ecological environment

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**Key words :** grassland deterioration , black barren , ecological environment , integrated control

**Introduction** Black Barren indicates seriously deteriorated alpine meadow . It is a comprehensive symbol for ecological environment deterioration in Yangtze-Yellow Rivers' source region in China , displaying serious grassland degeneration and spreading of desertification ; aggravation of soil erosion and water loss ; threatened biological diversity and increased frequency of natural disaster .

**Materials and methods** Gansu Grassland Ecological Research Institute applied remote sensing , geographic information system and ground survey ; by comparative analysis of Dari county's 1985-1997 ground survey data and remote sensing image data , established dynamic monitor model of grassland resource remote sensing .

**Results** Comparing surveys in 1985 and 1997 , reveals that Dari county's forage yield and carrying capacity decreases annually  $2.17 \times 10^4$  t fresh yield and  $1.00 \times 10^4$  SU separately (Table 1) ; black barren increases to 818.97 km<sup>2</sup> (Chen , 1998) (Table 2) . There is overgrazing in specific place , time , partial grassland ; speaking as a whole , however , entire grassland is not overgrazed (Table 3) . Change by global temperature rise should be the major cause for grassland deterioration and occurrence of vast sheets of semi arid-semi humid area's Dari county's black barren (Ding , 2001) .

**Table 1** Change of animal husbandry condition of Dari county .

Year	Total area km <sup>2</sup>	Crassland km <sup>2</sup>	Usable grassland km <sup>2</sup>	Dense brush km <sup>2</sup>	Black barren km <sup>2</sup>	Bared rock and other km <sup>2</sup>
1985	14842.47	13689.80	11172.53	326.47	145.13	680.17
1997	14842.47	13225.90	10793.66	319.62	818.97	477.98

**Table 2** Change of landuse of Dari county .

Year	Usable grassland			Theory yield 10 <sup>4</sup> t	Theoretic stocking rate 10 <sup>4</sup> SU
	4 level	5 level	6 level		
1985	1033.60	5824.43	4314.20	371.38	172.43
1997	0	5356.10	5754.30	345.45	160.39
year decreases				2.17	1.00

**Table 3** The theoretic and real stocking rate of Dari county between 1985 and 1997 .

Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Stocking rate (104 head)	52.0	54.2	46.0	40.4	38.8	40.9	44.0	45.0	45.0	47.0	47.0	49.0	50.0
Sheep unit (SU)	126	131	111	97.7	93.8	98.9	106	109	109	114	114	119	12
Theoretic Carry Capacity(SU)	172	171	170	169	168	167	166	165	164	163	162	161	160

**Discussion and recommendation** Climatic warming up is the principal cause of deteriorated alpine meadow in this region , and unreasonable grassland utilization enhances the expansion and damage of the Black Barren . Four recommendations are made around changing unreasonable grassland utilization , i . e . to combine ecological control with grazing adjustment , to carry out integrated control on base of small river valley , to apply 3S technology in accurate planning and to introduce key technologies . Fencing natural grassland , warm pen construction , establishment of perennial pastures , use of solar energy are key techniques to be introduced soon .