# Appropriate stocking rate of yak on alpine pastures in the Three Rivers headwater region of the Qinghai-Tibetan Plateau

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**Key words :** stocking rate ,yak production ,maximum carrying capacity ,overgrazing ,Three River headwaters region ,Qinghai-Tibetan Plateau

**Introduction** Maximizing sustained livestock production is the major concern of most livestock production systems (Charudutt et al ,2001) .Overgrazing ,a worldwide problem ,has been a issue of much deliberation .According to empirical data and statistics from the government ,the rangelands of in headwater regions of Qinghai-Tibetan Plateau ,China have been overstocked .Yet , conclusive evidence about its occurrence in this headwaters region is remarkably difficult to find .Therefore ,we quantitatively examined : (1) how stocking rates relate to animal production and (2) how actual carrying capacities relate to theoretical carrying capacities .By using simple models ,we quantitatively address the relationship between domestic yak productions and stocking rates in this paper to guide yak production on two-season rotational pastures of the alpine meadow in the Three Rivers headwaters region .

**Materials and methods** The study site is located in Wosai Township of Dari County(99°30′21″～99°54′38″N ,33°34′21″～33°49′19″E ,4000m) ,Guoluo Tibetan Autonomous Prefecture of Qinghai Province .We conducted our research on *Kobresia parva* alpine meadow with alpine meadow coarse-loam soil .During the trial ,four yaks were rotationally grazed in four grazing plots of the warm-season pasture (from June 1 until the October 31) ,and in the cool-season pasture( November 1 to May 30 of the following year) from the year of 1998 to the year of 2000 .Stocking rates ,expressed as animal units (AUs) per section or animal unit months per hectare are shown in Table 1 .AUMs were used in this study by multiplying the number of animal units with the number of months that the yaks were grazed on the rangeland .

**Table 1** *Design of grazing trial*[*] .

| Treatments | No .of yak (head) | Entry weight(kg) | | AUE | | Plot of area(ha) | | Stocking rate(ha/AUM) | |
|---|---|---|---|---|---|---|---|---|---|
| | | WS | CS | WS | CS | WS | CS | WS | CS |
| Light grazing | 4 | 140 .3 | 142 .4 | 0 .7 | 0 .7 | 4 .5 | 5 .2 | 0 .32 | 0 .26 |
| Moderate grazing | 4 | 141 .1 | 141 .4 | 0 .7 | 0 .7 | 2 .8 | 3 .1 | 0 .20 | 0 .16 |
| Heavy grazing | 4 | 142 .9 | 143 .3 | 0 .7 | 0 .7 | 1 .9 | 2 .2 | 0 .14 | 0 .11 |
| Native grazing | 2-3 | 143 .2 | 140 .6 | 0 .7 | 0 .7 | 1 .0 | 1 .0 | 0 .11 | 0 .09 |
| Control | 0 | | | | | 1 .0 | 1 .0 | | |

[*] WS represents warm-season pasture ; CS indicates cool-season pasture .

**Results** The relationship between live-weight gains per yak and stocking rates was linear : $Lg = a - b \times Sr (b > 0)$ (1) ,where Lg represents the live-weight gain of individual yak (kg gain/head) ,Sr means the stocking rate .The intercept (a) of the y-axis is often thought to denote nutrition level ,while the slope (b) is thought to denote spatial stability and recovery potential of pasture under different stocking rates .It was found that intercept $a_1$ (71. 863) of the Y-axis and slope $b_1$ (20. 326) in the warm season are greater than $a_2$ (24. 53) and $b_2$ (16. 93) in the cool-season ,but there was no significant difference ($P > 0 .05$) .To gain the inflection optimum stocking rate ($Sr_{op}$) ,the equation (1) was multiplied by Sr to give the relationship between yak live-weight gain per hectare of rangeland and Sr .This resulted in Equation (2) ,which indicated the relationship between yak live-weight gain per hectare and stocking rates as follows : $Lg_{ph} = a \times Sr - b \times Sr^2$ ($b > 0$) (2) ,where $Lg_{ph}$ represents yak live-weight gains per hectare of rangeland (kg gain/ha) .From this equation ,it can be estimated that the maximum carrying capacity for warm-and cool-season and the whole-year was 0 .34 ha/AUM ,0 .24 head/ha ,0 .30 ha/AUM ,respectively .The $Sr_{op}$ with the maximum $Lg_{ph}$ was 0 .17 ha/AUM on warm-season pasture ,0. 12 ha/AUM on cool-season pasture ,and 0 .15 ha/AUM on the pastures of alpine meadow for the whole-year round grazing in the Three Rivers headwaters region .The maximum carrying capacity for warm-and cool-season and the whole-year was 0 .34 ha/AUM ,0 .24 head/ha ,0 .30 ha/AUM ,respectively .

**Conclusions** The carrying capacity of the warm-season pasture was much higher than that of the cool-season pasture during grazing .However ,the ratio for the maximum carrying capacity of warm-season/cool-season (2 .3 :1) is much lower in this region than that calculated for alpine shrub on the Qinghai-Tibetan plateau (ratio 9 :1) (Zhou et al ,1995) .

**References**

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