Pasture Degradation and the Impact of Grazing in Qinghai (Tibet)

A contribution to sustainable Rangeland Management

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Introduction

The Chinese Province of Qinghai is one of the largest pastoral regions in China with extensive rangeland resources. In most regions livestock production is still the most important source of income for the local population.
Political changes, socio-economic transition and the adjustment of the economy to market mechanisms caused transformations in live-stock production in many parts of Tibet over the last decades. Interviews with herders in the study area (Xinghai County, Qinghai Province, see figure 2) showed that conditions for livestock production have deteriorated together with the state of pastures over the last decade (figure 1).
In the present study the occurrence of pasture degradation was examined on three common pasture types of the Tibetan Plateau on the terraces of the Yellow River .

Figure 1: The comparison between fenced and non-fenced areas shows the intensive utilization of pastures

Figure 2: The locations of Qinghai Province (China) and the area of investigation (red square)

Methods

The three pasture types examined in the area of investigation were *Achnatherum splendens*-, *Kobresia/Stellera*- and *Orinus*/ *Stipa*-dominated societies.
Vegetation transect studies were conducted in twelve fenced pasture patches (four of each society) following the Braun-Blanquet approach.
The data on the distribution of species under different levels of grazing collected in 144 vegetation surveys along transects has been analyzed with multivariate techniques. The classification was carried out using TWINSPAN (Two-Way INdicator SPecies ANalysis). For Ordination DCA (Detrended Correspondence Analysis) was applied (figure 5).
Additionally, dung and soil samples were collected along the transects in order to get information on the distribution of livestock in the fenced pastures through the frequency of dung pellets and the concentrations of nitrate and phosphate.

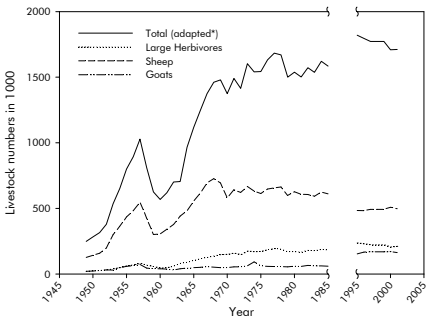

Figure 3: The development of livestock numbers show a marked increase (Xinghai County, 1949-2001, * weighted according to FAO).

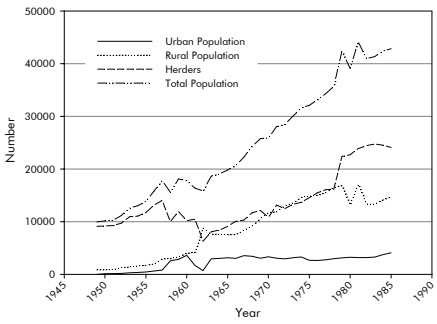

Figure 4: The development of the population in the area of investigation displays a significant increase (1949-1985, 49.900 inhabitants in 2001)

Results

Significant population growth and subsequently increasing livestock numbers have had an effect on pasture productivity during the last 50 years (figures 3 and 4). The continual decline of livestock numbers since at least 1995 possibly indicates the limit of carrying capacity on pastures in the study area.
It is still under discussion whether changing levels of temperature and precipitation have an impact on pasture productivity (figure 6).
The study showed that severe degradation on pastures in Xinghai County occurs especially on *Achnatherum splendens*-dominated pastures, were stocking rates were above the carrying capacity. As the tussocks of *Achnatherum* are less eaten by livestock, pasture productivity is much lower than on patches dominated by *Kobresia* or *Orinus*. Because of the relative grazing resistance of Cyperaceae, *Kobresia* pastures are in a fairly stable condition. *Orinus*-dominated grazing grounds reach their carrying capacity in the investigated areas.
An obvious gradient of decreasing degradation with increasing distance from the gate was identified in the more severely degraded pasture plots (figure 5).

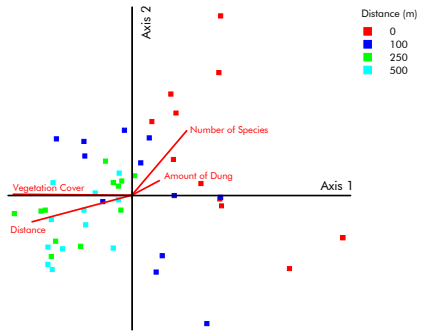

Figure 5: The DCA of 4 fenced *Orinus*/ *Stipa*- dominated pastures shows gradients mainly with distance from the gate in the number of species, plant cover and dung amount (n=48, Eigenvalue/ Post-hoc correlation Axis 1: 0,17/0,58; Axis 2: 0,08/ 0,17)

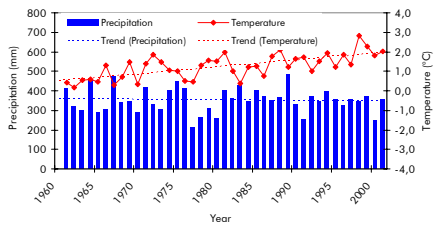

Figure 6: The development of the annual average temperature and the annual amount of precipitation in Xinghai (1961-2001, China Meteorological Survey)

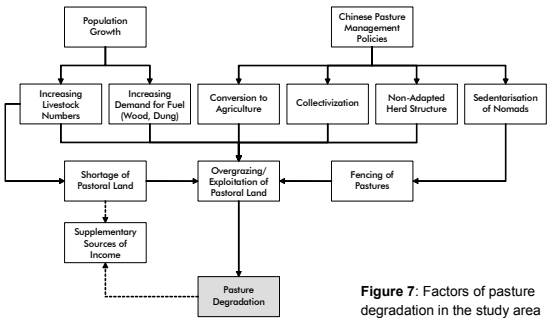

Figure 7: Factors of pasture degradation in the study area

Conclusions

Interviews with herders, vegetation surveys and evaluation of population, livestock and climate data indicate that a complex interaction of factors led to a decline in pasture productivity (figure 7). The changing political interventions as well as high stocking rates and climatic changes have had an impact on the condition of pastures today.
Reduced herd sizes would probably be the only possibility to initiate rangeland regeneration. As a result, the income of herders might decrease dramatically.
Therefore, rangeland improvement is only possible in cooperation with political decision makers.

Literature: Qinghai History Editors Committee (2000): A History of Qinghai County. Xian (in Chinese)
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