

Effect of grazing intensity on behavior and liveweight gain of sheep in the Inner Mongolia steppe, China

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The present dissertation was conducted within the frame of the Sino-German research project MAGIM (**M**atter fluxes of **G**rasslands in Inner **M**ongolia as influenced by stocking rate) funded by the German Research Foundation (DFG), which analyzed the effects of different grazing management parameters on the grassland vegetation as well as the feed intake and performance of sheep in the Inner Mongolian steppe of China.. For this, a grazing experiment was carried out in the grazing periods (June - September) of 2005 – 2009, which included six different grazing intensity treatments (GI: 2, 3, 4, 6, 8, and 11 sheep ha⁻¹) and two different grazing systems, an alternating system, where grazing and hay-making alternated annually between two plots, and a continuous grazing system, where the same plots were used either for hay-making or for grazing every year. The main objectives of this thesis were to investigate the effects of different grazing systems and GI's on the behavior and the liveweight gain (LWG) of sheep in the Inner Mongolian steppe.

Understanding livestock behavior in response to varying environmental conditions and forage dynamics is important in evaluating management strategies for pastoral livestock production. Hence, during the grazing period of 2008, behavior of two sheep per GI plot was monitored by visual observation during daylight on two days per month. Simultaneously, sheep's walking distance was measured by global positioning system recorders. With increasing GI animals spent more time grazing, whereas resting time during daylight decreased. GI had no effect on the animals' ruminating time and walking distance. Similarly, sheep tended to decrease their resting time in order to maintain their grazing time when daylight became shorter with advancing vegetation period. Therefore, it can be concluded that the strategy taken by sheep to avoid negative effects of an increasing GI or shorter daylight on their daily feed intake was to increase or at least maintain their grazing time at the expense of their resting time. However, this may increase their energy expenditures for physical activity and thus reduce the amount of energy available for growth or production.

Hence, using weight data collected during the 5-year grazing experiment, the effects of grazing system and GI on LWG of sheep grazing the Inner Mongolian steppe were analyzed. Results indicated that grazing system had no or only minor effects on sheep's LWG; however, significant effects of GI on LWG per sheep and LWG per ha were found. With increasing stocking rate, LWG per sheep linearly decreased while LWG per ha increased but stagnated or even decreased at highest stocking rates despite a larger number of animals per plot. Hence, results stress that it is of essential importance to define an optimum GI that considers both, the conservation of the steppe ecosystem and farmers' economical interests, and that accounts for inter- as well as intra-annual variations in herbage growth and quality.