

Grazing intensity and precipitation affects herbage accumulation, herbage quality, and animal performance in semiarid grassland

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Background

- Increasing grazing pressure on native grassland in Inner Mongolia, P.R. China
- Overgrazing and degradation (more than 80% of the typical steppe ecosystem in Inner Mongolia is degraded).
- Grazing not only alters the ecological functionality of the grassland but also its value for livestock farming.
- **Aim of the present study:** Analysis of grazing-induced changes in productivity and herbage quality as well as its effect on animal performance.



Fig. 1: Area of research, Inner Mongolia, P.R. China

Materials and methods

- Controlled grazing experiment (initiated in 2005)
- Experimental factors: Grazing intensity, Year (i.e. different rates of precipitation)
- Parameters:
 - a) Productivity: end-of-season herbage mass, herbage accumulation, live weight gain (LWG)
 - b) Herbage quality: e.g. crude protein, neutral detergent fibre, acid detergent fibre, in-vitro digestibility, metabolizable energy
- Near-Infrared-Spectroscopy (NIRS) technique
- Statistics: ANOVA by using the Mixed Model, simple regression analysis in SAS version 9.1.

RESULTS (2005-2008)

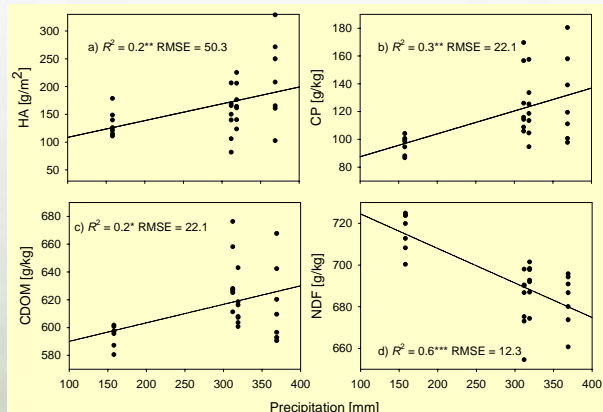


Fig. 2: Relationship between precipitation and herbage accumulation (HA), crude protein (CP), in-vitro digestibility (CDOM), and neutral detergent fibre (NDF).

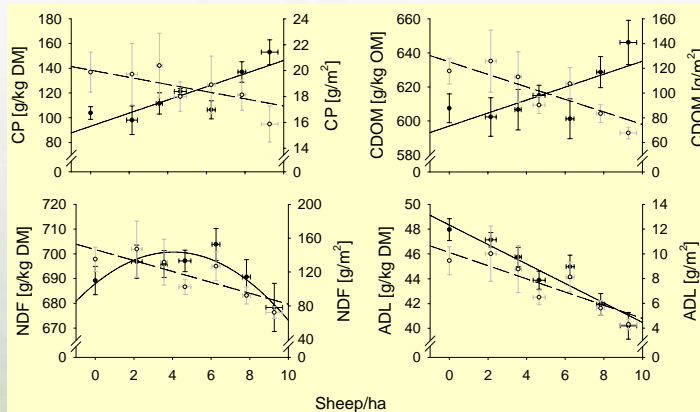


Fig. 3: Relationship between stocking rate and crude protein (CP), in-vitro digestibility (CDOM), neutral detergent fibre (NDF), and lignin (ADL).

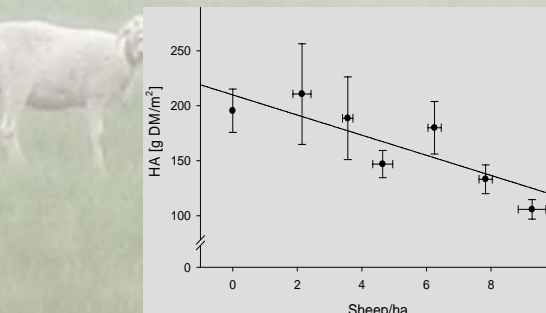


Fig. 4: Relationship between stocking rate and herbage accumulation (HA).
($HA [g DM/m^2] = -9.6 \times SR + 209.9, r^2 = 0.3^{***}$ RMSE = 43.9)

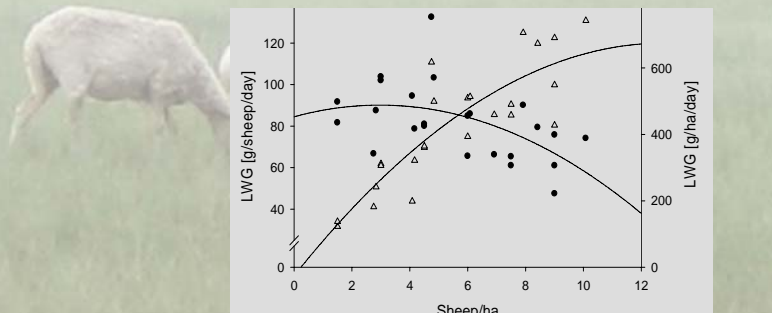


Fig. 5: Relationship between stocking rate and live-weight-gain (LWG).
LWG per sheep (g LW/d) = $-0.6369x^2 + 3.7919x + 84.5045, r^2 = 0.32^{**}$ RMSE = 14.5, peak: 3 sheep/ha
LWG per ha (g LW/d) = $-4.2805x^2 + 109.5529x - 25.8257, r^2 = 0.8^{***}$ RMSE = 86.7, peak: 13 sheep/ha

Conclusions

- Precipitation appeared to be the crucial factor determining accumulation and quality of herbage.
- Grazing intensity played the key role in determining animal performance.
- Increasing grazing intensity decreased herbage accumulation but increased herbage quality.
- Animal performance in this rangeland was primarily influenced by herbage quantity. There were no benefits of grazing-induced increases in herbage quality on live-weight-gain.

