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21st International Grassland Congress / 8th
International Rangeland Congress

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The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

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Presenter Information

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How do grazing and stochastic rainfall affect vegetation? — Insights from a simulation approach

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Key words : Simulation model ,stochastic precipitation ,interaction analysis ,understanding degradation ,grazing impact

Semi-arid and arid regions are endangered by desertification and degradation on a global scale .Most of the drylands are characterized by unpredictable and stochastic rainfall ,so the effects of overgrazing may be masked by rainfall .Due to the stochastic rainfall ,the strong dependence of vegetation on rainfall and the lack of empirical long-term studies on vegetation dynamics it is difficult to separate the effects of grazing and climate without using a modelling approach .

We therefore use a simulation model to investigate how an interaction between grazing and stochastic rainfall affects vegetation dynamics .To separate the natural and anthropogenic effects from each other we built a grid-based and individual-based simulation model which describes the dynamics of the dominant tussock grass species of a temperate semi-arid steppe , *Festuca pallescens* ,under grazing in Northwest Patagonia (Argentina) .The model operates at the scale where the grazing decisions take place and includes a biologically plausible grazing model .Further ,it describes the impact of stochastic rainfall and grazing on the essential biological processes seedling establishment ,growth and mortality .

We use a pattern-oriented approach to indirectly determine unknown model parameters and to calibrate the model to show the observed dynamics .In a second step we simulate the dynamics of the *Festuca* steppe under different stocking rates .An analysis of the simulation experiments reveals how stochastic precipitation affects demographic processes of the perennial tussock grass *F pallescens* ,how grazing triggers the demographic processes and how grazing and stochastic rainfall interact .

The separation of the natural and the anthropogenic effects on vegetation greatly advances our quantitative understanding of the grazing impact in semi-arid and arid regions and provides robust arguments for the discussion of sustainable management of rangelands .