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Presenter Information

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Effect of grazing on soil structure and consequences for soil mechanical and hydraulic properties in Inner Mongolia

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Key words : grazing intensity , soil structure , hydraulic and mechanical properties

Introduction Animal trampling can strongly affect soil physical properties . Destruction of soil structure caused by animals leads to increase in soil bulk density followed by an increase in surface runoff . Grazing can cause changes in pore functions which affect the hydraulic properties of the soil . Stresses exerted by trampling can also lead to changes in soil mechanical strength . The soil physical properties can be affected much more when considering arid climate conditions . The objective of this study was to investigate how the animal trampling can affect soil physical (hydraulic and mechanical) properties in an Inner Mongolia grassland ecosystem with different grazing intensity , with different moisture conditions .

Materials and methods The effect of trampling by sheep and goats on physical (hydraulic and mechanical) properties of grassland soils on the steppe in Inner Mongolia , was investigated . The samples were collected from two different steppe ecosystems (*Leymus chinensis* steppe and *Stipa grandis* steppe) . The samples were taken from sites with different grazing intensities : ungrazed since 1979 (UG79) , ungrazed since 1999 (UG99) , winter grazed (WG) and overgrazed (OG) at the *Leymus chinensis* site and ungrazed since 1979 (SG UG79) and continuously grazed (SG CG) at the *Stipa grandis* site . The studied soils were derived from aeolian sediments above acid volcanic rocks . From each site soil samples , for measurements of soil hydraulic and mechanical properties , were taken .

Results The soil hydraulic functions and soil mechanical properties were affected by grazing . It was found especially for the top soil . The animal trampling caused a decrease in soil total porosity and an increase in soil bulk density . The saturated hydraulic conductivity was lower for the grazed sites compared to ungrazed sites . Grazing caused a reorganization of soil particles which resulted in decreased soil air permeability . Furthermore , animal trampling affected soil sensitivity and intensity of shrinkage . Grazing also affected soil mechanical properties by changing the precompression stress values which were higher for the grazed sites compared to ungrazed .

Conclusions The results show that grazing can strongly affect soil physical (hydraulic and mechanical) properties . Animal trampling causes soil structure deterioration , especially in the top layer of the soil . Changes in soil structure due to grazing affect soil functions as well as plant productivity .

References

- Chen J . , Huang D . , Shiyomi M . , Hori Y . , Yamamura Y . , Yiruhan . (2007) . Spatial heterogeneity and diversity of vegetation at the landscape level in Inner Mongolia , China , with special reference to water resources . *Landscape and Urban Planning* . 82 , 222-232 .
- Dan S . , Mengli Z . , Bing H . and Guodong H . (2006) . Examining the genetic diversity of *Stipa grandis* under various grazing pressures . *Acta Ecologica Sinica* . 26 (10) , 3175-3183 .
- Fukuo A . , Saito G . , Akiyama T . and Chen Z . (2001) . Influence of human activities and livestock of Inner Mongolia grassland . *Proceedings of the 22nd Asian Conference on Remote Sensing* . 788-791 .
- Hoffmann C . , Funk R . , Wieland R . , Li Y . and Sommer M . (2008) . Effects of grazing and topography on dust flux and deposition in the Xilingele grassland , Inner Mongolia . *Journal of Arid Environment* . In press .
- Horn R . (1986) . The influence of animal treading on soil physical properties of mountainous soils . *Mitteilgn . Dtsch . Bodenkundl . Gesellsch .* , 46 , 64-69 .