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Presenter Information

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Introduction Due to its continental and dry climate, Mongolia is one of the world's large rangeland areas. Nomadic pastoralism on these rangelands is the backbone of Mongolia's agricultural sector and builds the basis of income for many herder families. However, large areas of Mongolian rangeland pastures are heavily degraded, mainly due to overgrazing. We examined whether a resting time without grazing results in self rehabilitation of degraded rangeland.

Materials and methods At five sites selected according to their level of degradation grazing exclosures with fences were installed. After four years vegetation inside (rested) and outside the fences (grazed) were compared. Standing biomass and biomass proportions of grasses, forbs and sedges were measured by cutting ten replicates of 1 m² areas. Canopy cover, basal cover, litter cover and proportion of bare soil were measured using the line point intercept method. Data were analysed with analyses of variance.

Results and discussion Degradation was characterised by a strong decrease in canopy, basal and litter cover resulting in a strong increase in open soil. The proportion of grass species dramatically decreased with increasing degradation as observed by Sasaki *et al.* (2007). In parallel the species number and the standing biomass decreased. All these strong effects (all $P < 0.0001$) indicate how much the different services rangelands provide are impaired by degradation.

Resting time of four years strongly increased canopy ($P < 0.0001$) and litter ($P < 0.01$) cover and thus reduced open soil ($P < 0.0001$). These changes may have protected soils from erosion and formation of hard soil crusts. This may, in turn, have ameliorated the conditions for the recovery of the existing vegetation. In fact, key grass species as *Agropyron cristatum* and *Stipa sibirica* strongly profited from the resting (grass proportion, $P < 0.0001$).

An important finding of the study was that the success of fencing strongly varied among the three levels of degradation for important characters as canopy cover, litter cover, bare ground, standing biomass and grass proportion (degradation level x resting; $P < 0.001$). The lacking effect of resting on species number (P : ns) and the still nearly inexistent grass proportion in the totally degraded site suggest that the capacity of a plant community for resilience may be high as long as adapted plant species are still present above a minimum threshold. Reintroduction of species that were lost during the process of degradation seems much more difficult (Ulambayar *et al.* 2008) and time consuming.

Conclusion Self rehabilitation of degraded rangeland by grazing exclosure was successful as long as the adapted plant species were still present in the plant community i.e. as long as degradation was not too severe.

Table 1 Effect of degradation level and four years of resting (grazing exclosure) on species number (SpNr), cover of canopy, plant bases, litter and bare soil, standing dry mass (DM) and dry mass proportion of plant types. (SEM: standard error of mean; n=20 for slight and heavy degradation and 10 for total degradation).

Degrad. Level	Resting	SpNr (m ⁻²)	Cover(%)				DM (g m ⁻²)	DM proportion(%)		
			Canopy	Basal	Litter	Bare		Grass	Forb	Sedge
Slight	Yes	13	64	17	28	8.3	68	37	58	4.9
	No	13	61	22	14	25	60	26	68	5.1
Heavy	Yes	11	93	5.7	5.5	1.7	99	48	33	19
	No	11	80	2.8	6.7	14	54	24	45	32
Total	Yes	5.1	74	0.0	4.7	21	53	1.6	86	12
	No	2.7	47	0.0	0.3	53	24	0.3	84	16
SEM		0.8	2.5	2.0	2.3	2.5	10.2	3.8	4.2	4.0

References

- Sasaki, T., et al., 2007. Threshold changes in vegetation along a grazing gradient in Mongolian rangelands. *Journal of Ecology* 96, 145-154.
- Ulambayar, B., et al., 2008. Restoration of degraded Mongolian rangeland by overseeding techniques? This Volume.