Effects of livestock grazing on soil moisture and rangeland vegetation cover in upland grasslands of Iran

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Introduction Soil moisture holding capacity plays an important role on vegetation establishment and growth in rangelands . Rangeland plants are grazed by livestock and in the mean time soil surface gets compacted which adversely affect soil infiltration . In the most of cases the present range condition is the result of the previous management applied (Ferrero , 1991) . Thurow et al . (1986) indicated that the biomass of the available vegetation plays an important role in soil infiltration rate of rangeland . The short and long term grazing period impacts on infiltration rate of the soil in rangelands was investigated by Weitz and Wood (1986) .

Materials and methods The experiment was conducted in Hanna Station rangeland located in northeastern part of Isfahan , Iran The experiment was carried out for two years (2004 and 2005) . Soil moisture holding capacity and vegetation cover dynamics were measured in three rangeland sites of heavily grazed (critical area) , moderately grazed (key area) and not grazed (reference area) . Soil moisture was measured (standard method) on monthly basis (early May to early September) and Vegetation cover as well as infiltration rate (double ring methods) were measured at the start (early May) and the end of the grazing season (early September) . All the measurements were repeated for two years (2004 and 2005) . Treatments were arranged in split plots in time and location and the data were analyzed using Completely Randomized Block Design with four replications .

Results and discussion The infiltration rate followed a decreasing trend from early grazing to season (early May) to the end of the grazing season (early September) (Table 1) . The average vegetation cover in reference area was 67 .2% in early May which more than half of it (37 . 6%) belonged to cool season grasses and the rest was occupied by forbs (Table 1) . By the end of the grazing period the grass component of the vegetation in all sites significantly decreased . The percent of bare ground in key and critical area in early May was 24 .8% and 77 .5% , which increased to 60 .3 and 92 .6% , respectively . The higher organic matter in reference (3 .9%) and key (3%) areas compared to critical area (1 .7%) well explains the better ability of soil in these sites to store more moisture during grazing season . The adverse impact of early and high intensity grazing on organic matter content of the soil was indicated by Naeth et al . (1991) . There is a significant relation between increased livestock trampling and decreased soil infiltration as well as increased soil compaction (although is not linear) . The trend of soil moisture decrease through grazing season was slower (0 .7% / month) in top soil (0-15 cm) compared to lower layer of 15-30 cm (1 .2%) . The higher organic matter content in upper layer of the soil profile well defines its better moisture holding capacity (Figure 1) .

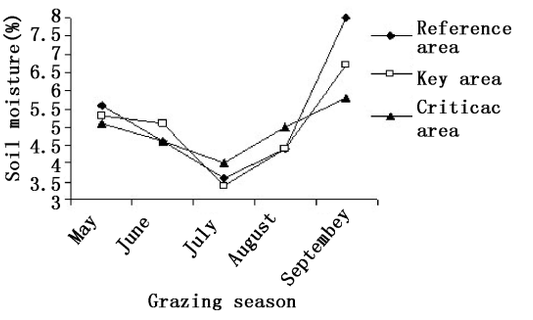

Figure 1 *Meansoil moisture varlation during grazing season in different range sites in 2004 and 2005 .*

Table 1 *Mean vegetation composition (percentage) and infiltration rate (mm/minute) of rangeland under different long term grazing intensities .*

Rarge site	Grazing period																	
	May									Septenmber								
	Vegetation composition				Measuring time						Vegetation composition				Measuxing time					
					1	5	10	30	60	90					1	5	10	30	60	90
	Grass %	Forbs %	Litler %	Bare ground%	infiltration ratel (mm/minute)						Grass %	Forbs %	Litler %	Bare ground%	infiltration ratel (mm/minute)					
Reference area	37 .6	29 .6	25 .1	7 .7	19	7	4	3 .5	3	2 .5	9 .5	9 .6	73 .6	7 .3	11	6	4	3 .5	2 .5	2
Key area	16 .5	38 .8	19 .9	24 .8	12	3 .5	2 .5	2	2	2	10	28 .2	10 .5	60 .3	9 .5	5 .8	3 .5	2 .5	2	2
Critical area	1 .0	16 .3	7	77 .7	11	35	3	15	1	0 .5	1 .0	3 .6	3 .3	92 .6	9 .5	4	2 .9	2	1 .8	1 .5