

Αναφορά

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Rangeland health assessment in silvopastoral systems of northern Greece

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SUMMARY

Silvopastoral areas in Greece, dominated by deciduous oaks, are mainly utilized by domestic animals but grazing is practiced irrationally resulting in their degradation. The aim of this study was to identify which are the most important indicators for assessing their rangeland health. The study was conducted in Lagadas county, northern Greece. There were selected 17 representative plots of 0.1 ha each, where 19 indicators related with soil stability, hydrologic function and biotic integrity were measured. The collected data were analyzed statistically with the Principal Component Analyses (PCA). It was found that 16 out of the 19 indicators measured accounted for 89.6% of the total variance. It is suggested that these indicators are the most important to be used in assessment of rangeland health.

KEY WORDS: rangeland health, silvopastoral classification, multivariate techniques

INTRODUCTION

Rangeland health is an important concept for assessing rangeland ecosystems. It indicates “the degree of integrity of the soil and ecological processes that are most important in sustaining the capacity of rangelands to satisfy values and produce commodities” (National Research Council 1994). Its assessment is based on a wide range of biotic and abiotic indicators related to soil stability, hydrologic function and integrity of rangelands (Pellant *et al.* 2000).

In the Mediterranean region, silvopastoral systems are widespread grazing resources, invaluable in providing feed to the animals, especially in the long and dry summer period. In addition, they are complex systems with many more products and services than forage production, while their management requires an integrated approach (Papanastasis 1996). In this paper, an attempt is made to identify the most suitable indicators for assessing rangeland health in Mediterranean silvopastoral system of Greece.

MATERIAL AND METHODS

The study was conducted in Lagadas county (ca 40°47' N, 23°12' E) in central Macedonia, northern Greece, during the spring of 2003. The dominant vegetation was consisted of deciduous oaks (e.g. *Quercus pubescens*, *Q. petraea*). Seventeen silvopastoral sites were chosen, each with an area of 0.1 ha. In each site, 16 quadrats (50x50 cm each) along two diagonals, were placed. In each quadrat, a set of 19 indicators was assessed (Table 1). More specifically, the cover indicators were estimated ocularly by two independent observers, the plant height was measured and the quantitative indicators were rated on a scale from 1-6. Finally the relative palatability factor (RPF) of the dominant species for sheep (s) and goats (g) was estimated. In each quadrat, the three dominant species, according to their cover, were determined. For each of these species, a value of their palatability for sheep and goats was assigned. After multiplying this value with the cover of each dominant species, their RPF was calculated.

For selecting the most important indicators, the PCA in a varimax rotated space was applied and the 19 indicators were classified into factors. PCA analysis was based on the statistical package SPSS/PC (version 11.0).

Table 1. List of indicators assessment (E: estimated, M: measured, C: calculated).

Physical Term	Mode	Units	Biotic Term	Mode	Units
Cover of litter	E	(%)	Height of trees	M	cm
Cover of bare ground	E	(%)	Height of shrubs	M	cm
Cover of rock, gravel	E	(%)	Height of herbs	M	cm
Cover of cryptogams	E	(%)	Plant vigor	E	1-6
Cover of annuals	E	(%)	Number of seedheads	E	1-6
Cover of perennials	E	(%)	Age-class distribution	E	1-6
Cover of shrubs	E	(%)	Presence of legumes	E	1-6
Cover of trees	E	(%)	RPF (s)	C	(%)
Erosion	E	1-6	RPF (g)	C	(%)
Animal trail	E	1-6			

RESULTS AND DISCUSSION

Table 2 shows the first 7 factors with eigenvalues higher than 1. These factors accounted for 89.6% of the total variance and included 16 of the 19 indicators used in the analysis.

Table 2. Factors' extraction from PCA analysis.

Component	Eigenvalue	% of Variance	Cumulative %
1	2.69	14.2	14.2
2	2.67	14.1	28.2
3	2.65	14.0	42.2
4	2.59	13.7	55.9
5	2.57	13.6	69.5
6	2.15	11.3	80.8
7	1.67	8.8	89.6
8	0.68	3.6	93.2

The positive or negative correlation of each indicator with each of the seven factors is presented in table 3. Indicator loadings less than 0.600 (i.e. loadings that related with low strength correlations) were excluded. Such loadings were given by the cover of rock and gravel, the cover of cryptogams and the height of shrubs. These three indicators seem not to be important for assessing the rangeland health in the silvopastoral systems studied.

Table 3. Rotated component matrix.

	Component						
	1	2	3	4	5	6	7
Cover of annuals	0.843						
RPF (g)	-0.784						
Cover of perennials	-0.653						
Cover of litter		0.879					
Cover of trees		0.872					
Cover of shrubs			0.869				
Animal trail			0.855				
Erosion			0.605				
Height of herbs				0.858			
Bare ground cover				-0.837			
Plant vigor					0.867		
Age-class distribution					0.818		
Number of seedheads					0.705		
Height of trees						0.899	
RPF (s)						0.639	
Presence of legumes							0.863

CONCLUSION

Indicators related with cover of the various vegetation components and the erosional status of the soil seem to be important for assessing rangeland health in Mediterranean silvopastoral systems dominated by deciduous oaks.

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