Evaluation and determination of the appropriate method for assessing optimum utilisation rate of *Eurotia ceratoides* in upland grasslands of Iran

F. Amiri and M.R. Chaichi
Department of Rangeland Sciences, Science and Research Branch, The Islamic Azad University, Poonak, Tehran, Iran, Email: fazel16760@yahoo.com, rchaichi@ut.ac.ir

Keywords: measurement methods, percent utilisation, Analytical Hierarchy Process

Introduction Determination of optimum utilisation rate for different range species is an important factor in assessing range grazing capacity. The vast rangelands in Iran with diverse vegetation types require an accurate, economic and quick method to determine the optimum utilisation rate for different range species. This experiment was conducted to determine the most appropriate method to determine the optimum utilisation rate for *Eurotia ceratoides*, which is one of the important grass species in upland grasslands in Iran.

Materials and methods The measurement methods were classified in three categories according to sampling size and then for each method the number of samples was determined using the appropriate statistical procedures (Bonham, 1989). The time spent in field and laboratory as well as all costs (equipment and labour) were measured for each sample and each method. To determine the accuracy of the applied methods, the statistical method of Estimating Sampling Sizes was employed (Cook *et al*, 1986). The collected data were analyzed by the AHP statistical method using "Expert Choice" software.

Results Stem counting was the quickest and most economic method, while the paired caging (control) method appeared to be the most expensive and time consuming method (Table 1). There was a significant difference ($P<0.05$) in the mean measured utilisation rate of *Eurotia ceratoides* between paired caging (control) and other methods, except for height-weight before and after grazing and ocular (double sample) estimation methods. The accuracy test showed that height-weight before and after grazing, ocular (double sample) estimation and paired caging (control) methods with 4.5, 8.3 and 8.6 % estimation faults (k) respectively were the most reliable methods. These results in respect of high costs and time requirement for the paired caging (control) method agree with results reported by Klingman *et al*. (1943). The stem counting method appeared to be economic and quick, but it was not accurate and reliable, supporting the results reported by Pechanec *et al*. (1937).

Table 1 Mean values for utilisation rate of *Eurotia ceratoides* assessed by different measurement methods

Methods	Percentage utilisation	Time minutes	Costs Rials	% estimation faults (k)	AHP
Paired cage (control)	56.33a	1866	170075	-------	0.0866b
Before and after grazing	55.40a	1546	155215	8.3	0.007b
Ocular estimate (double sample)	60.00a	150	39643	8.6	0.128b
Height-weight	61.93a	374	35073	4.5	0.134b
Stem count	43.68b	136	13631	16	0.233a
Reference units	40.43bc	359	37515	10.5	0.1162c
Production index	33.64dc	429	43900	18.5	0.0981dc
Plant count	30.44d	273	27988	23.4	0.0481d
Twig length	25.35d	666	67194	25	0.0684d

Means with the same letter are not significantly different at 5% level

Conclusion The results obtained by Analytical Hierarchy Process in this experiment showed that the appropriate method (quickest, most economic and most accurate) to measure the optimum utilisation rate of *Eurotia ceratoides* in upland grasslands of Iran is the height-weight method.

References
Bonham, C. D. (1989). Measurements for Terrestrial Vegetation. John Wiley and Sons. Inc., New York.
Cook, C. W. & W. Stubbendieek (1986). Range Research: Basic Problems and Techniques. Society of Range Management. USA.
Pechanec, J.F. & G.D. Pickford (1937). A comparison of some methods used in determining percentage utilization of range grasses. *Journal of Agricultural Research*, 54, 753-765.
Klingman, D., S.R. Miles & G.O. Mott. (1943). The cage method for determining consumption and yield of pasture herbage. *Journal of the American Society of Agronomy*, 35, 739-746.