



## Monitoring Cattle Utilization and Behavior in a Mediterranean Oak Woodland

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**Presenter Information**

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**Key words :** grazing, spatial distribution, GPS, heart rate, energy expenditure

**Introduction** The sustainable utilization of woodlands by cattle is a serious challenge world-wide. The domination by woody vegetation of poor nutritional quality and the low yield of herbaceous vegetation limit cattle performance (Perevolotsky 1994). Shortages of alternative grazing areas in Israel necessitate finding an optimal grazing management for the woodlands that, on the one hand, will improve cattle performance and, on the other hand, will create an open, parkland landscape and decrease fire hazards (Perevolotsky and Seligman 1998; Henkin et al. 2005). Recent methodological developments have greatly improved our ability to study animal performance and rangeland utilization. This research integrates these approaches to study the behavior and physiology of cattle in woodland habitats.

**Materials and methods** The experiment was conducted in the Western Galilee, Israel (long. 35°15', lat. 33°01', alt. 200-500 m a.s.l.). The vegetation is dominated by scrub-oak woodland (*Quercus calliprinos* Webb), interspersed with batha vegetation and patches of herbaceous vegetation which is green 4-5 months a year. The area was classified into six vegetation types using aerial photography and ERDAS imaging, which were verified at the landscape level and then represented as a digital GIS map. The nutritional value of herbaceous and woody species was determined for the winter (December), spring (March) and summer (July) seasons. In each of these seasons Lotek GPS collars with activity sensors and Polar heart rate sensors were fitted on six cows in order to monitor their spatial distribution, activity and heart rate. The activity sensors were calibrated and activity was classified as graze, walk, or rest (Ungar et al. 2005). Energy expenditure was calculated using the heart rate and oxygen pulse method (Brosh et al. 2007).

**Results** Cattle spatial distribution was related to the different types of vegetation. During the winter and spring growing seasons cattle grazed in the open brush area which was rich in herbaceous species. In the summer, when the herbaceous species were dry, cattle spent more time in the tree vegetation type. No seasonal differences were found in the overall time devoted to each activity; animals spent 46.0±1.2, 52.5±1.5, and 1.5±0.5 percent of the day resting, grazing and walking, respectively. However, there were seasonal variations in the diurnal pattern of activity. Changes in activity over the course of the day were reflected clearly in the heart rate pattern. Daily energy expenditure varied according to reproductive state and the availability and quality of the forage, being 686, 594, and 525 kJ per kilogram metabolic body weight per day in March, December, and July, respectively.

**Conclusions** The applied methodologies provided a reliable tool for monitoring changes in cattle behavior and physiology even in a dense woodland formation. Vegetation structure and seasonal conditions determined the behavioral dynamics of free-ranging cattle in the Mediterranean oak woodland. Although cattle are naturally grazers, they browsed the woody vegetation in the summer when the quality of the herbaceous vegetation was low. Cow performance on the woodland range was comparable to that of cows grazing herbaceous rangeland in the study region. Therefore it appears that in this system cattle grazing may constitute a sustainable management tool for conservation, and is worthy of longer-term monitoring.

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