



Tropentag, September 17-19, 2013, Stuttgart-Hohenheim
“Agricultural development within the rural-urban continuum”

Evaluation of Methods to Identify Grazing Activity in Free-Ranging Ruminants Fitted with GPS Collars

ESTANISLAO DÍAZ FALÚ¹, L. LIN², ANDREAS SUSENBETH², UTA DICKHOEFER³

¹University of Hohenheim, Institute of Plant Production and Agroecology in the Tropics and Subtropics, Germany

²Christian-Albrechts-Universität zu Kiel, Institute of Animal Nutrition and Physiology, Germany

³University of Hohenheim, Institute of Animal Production in the Tropics and Subtropics, Germany

Abstract

Activities performed by grazing herbivores influence the energy available for their growth and production. Although the activity pattern can be identified by fitting GPS collars to free-grazing ruminants, conclusions derived from these data may differ depending on the method used to classify the animals' behaviour. Hence, we compared two methods to estimate the time animals spent grazing, walking, and resting from GPS data.

From July to September 2008, six ewes grazing six different 2 ha-plots in the Inner Mongolian steppe, China, were fitted with GPS collars for 24 h recording their locations every 30 seconds. Behaviours (*i.e.* grazing, walking, resting) of animals at different locations were derived from GPS data using the speed threshold (SP) and residence time (RT) method. Simultaneously, the actual behaviours performed by the animals were determined every 3 min by direct observation. SP was implemented by analysing the speed time-series at increasing lag intervals, discriminating periods of low but sustained movements (observable at increasing lags) from static periods (low speed is kept at increasing lags). RT uses the time an animal stays within a circle of a certain radius. Radiuses ranging from 5 to 20 m were tested to identify the circle size that delivers the clearest separation between segments. When animals spent < 3 min, 3–30 min, or > 30 min within the defined circle they were considered to walk, graze or rest, respectively. Statistical differences between values obtained by the two methods were analysed by ANOVA using R software.

Both methods resulted in higher grazing (8.7 vs. 7.6 h d⁻¹; $p = 0.02$) and lower resting times (7.5 vs. 8.7 h d⁻¹; $p = 0.002$) than the observed activity pattern. In terms of walking time, SP resulted in higher values than both RT and observed (0.5 vs. 0.1 h d⁻¹; $p = 0.008$). For both methods, the main source of error was the misclassification of resting locations as grazing ones (15% of the resting locations).

No method was advantageous over the other. However, their utilisation could lead to significant overestimation of grazing time and hence energy requirements, particularly when grazing speed is low.

Keywords: Free-ranging ruminants, GPS collars, grazing activity, residence time method, speed thresholds