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Section Animal Nutrition and

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Grazing behavior and movement patterns of Nellore beef cattle in three different pastoral systems in western Paraná, Brazil

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by Maximilian Berger

supervised by Jun.-Prof. Dr. Uta Dickhöfer

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Summary

The differences between foraging behavior and movement patterns of Nellore beef cattle in three different grazing systems in Parana State, Brazil were examined. The grazing systems investigated were an integrated crop-livestock system (ICLS) with soybean (*Glycine max*) as summer crop and signal grass (*Brachiaria brizantha*) as winter pasture, an open monopasture system (MPS) with signal grass and a silvopastoral system (SPS) with guinea grass (*Panicum maximum*) as forage and *Eucalyptus* as tree species. Per grazing system, five animals (bulls with an average body weight of 433 kg (± 64.5 kg) for the ICLS and cows with an average body weight of 405 kg (± 37.3 kg) for MPS and SPS were equipped with RumiWatch (RW) halters, a recently released, sensor-based device to monitor jaw movements and chewing activities of cattle. Additionally, all animals were equipped with global positioning systems (GPS) to determine daily locomotion activity. Animals were observed for 8 hours on three consecutive days per system to validate the accuracy of the RW algorithm under field conditions. Prior to paddock entry, mass of forage as well as forage crude nutrient contents, organic matter digestibility and metabolizable energy concentrations were determined. The ambient temperature and humidity were recorded throughout all experimental phase to calculate the temperature-humidity index (THI). The experimental phases lasted 10 days per grazing system with adaptation periods of four days. Preliminary RW automatic recordings of time and bites allocated to major ingestive activities were validated via comparison to manually counted jaw movements and time recordings. For this, two Nellore bulls with an average weight of 495 kg (± 13.x kg) were equipped with RW halters and visually observed for 8 x 30 minutes on six consecutive days. Results from validating RW logarithm showed high correlations between automatic recordings and visual observations for time ruminated and grazed (R^2=0.96 and R^2=0.94) and moderate correlation for other activity time (R^2=0.62). Similarly, counted rumination and grazing bites were highly correlated between recording methods (R^2=0.97 and R^2=0.88) with a weak correlation for other activity bites (R^2=0.12). Results from the comparison of grazing systems showed no significant differences in time ruminated (p=0.09). However, a significantly longer daily period was spent on activities other than grazing and ruminating in the ICLS, when compared to MPS and SPS (p=0.01). Daily time spent grazing was significantly longer in the MPS compared to SPS and ICLS (p=0.03). Locomotion activity was significantly lower in ICLS when compared to SPS and MPS (p=0.03). Forage analysis results showed significantly higher crude protein contents in ICLS and SPS when compared to MPS (p<0.0001). Furthermore, MPS exhibited the highest neutral detergent fiber content followed by the SPS and ICLS (p<0.0001). Metabolizable energy and organic matter digestibility were highest in ICLS with no significant differences between SPS and MPS (p<0.0001). Values for THI were higher in the MPS (67.5) and ICLS (65.5) and lowest in SPS (55.8), but did not reach the level of climatic stress in any system.