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Energy balance of goats grazing in a mountainous forest rangeland of Northern Morocco

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Grazing in mountainous forest rangeland imposes additional physical activities compared those of confined animals. These grazing activities generate additional energy costs due to increased muscular efforts, which could limit the use of the energy available for maintenance and production. The aim of this work is to study the seasonal changes of energy requirements (metabolizable energy (ME) for maintenance, locomotion, lactation, and pregnancy) and energy balance of local goats grazing a mountainous forest rangeland of Northern Morocco (Beni Arouss). During each studied season, eight local female goats (30 ± 2.6 kg live-weight and 36 ± 6 months of age) were fitted with GPS collars and accelerometer to monitor their grazing activities. A total of 72 goats were measured during the three grazing seasons. Feeding behavior data were estimated by direct observation. The studied parameters were diet composition, bite weight, biting rate, and intake rate. The seasonal energy requirements and energy balance of the experimental goats were significantly affected by season ($P < 0.01$). The highest ME intake was recorded during spring (9100 kJ/day), in contrast to summer and autumn (<6000 kJ/day). The energy expenditure for horizontal locomotion was higher and similar during summer and autumn (about 750 kJ/day) than in spring (570 kJ/day). The low energy expenditure for vertical locomotion was observed in the green season (about 360 kJ/day). The pregnancy ME requirements were estimated to be 4100 kJ/day in autumn. The additional requirement energy for lactation during spring was estimated at 2600 kJ/day (Figure 1). Consequently, a low surplus of energy was recorded during spring (<2%), conversely to the summer and autumn seasons, which recorded a high energy balance deficit (>25%). Overall, these findings provide useful and target information for herders to improve the diet of goats to guarantee the sustainability of their farming systems.