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Grazing itineraries and feed intake of goats on communal pastures of the Jabal al Akhdar mountain range, Northern Oman

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Introduction Overstocking of the high-altitude Jabal al Akhdar pastures with goats is well known since the 1970s, but quantitative data on the impact of sedentary goat husbandry on the herbaceous and ligneous vegetation in this area that receives at maximum 300 mm a⁻¹ of winter rains are still lacking. Therefore, we investigated the spatial extent of goats' daily grazing itineraries along with species selection and feed intake at pasture across a 1000 m altitude gradient.

Materials and methods At Masayrat (M; 1030 m), Qasha (Q; 1640 m) and Sharayjah (S; 1900 m) goats' grazing itineraries were recorded by lightweight GPS collars fitted to representative animals during 4 consecutive days per village, once in spring and once in autumn 2005. In parallel, diet selection was observed every 3 min, and the number of goats feeding on herbaceous and ligneous vegetation was recorded. Overall plant species abundance and dominance along with biomass yield of the herbaceous layer was quantified on a heavily grazed and an ungrazed plateau area. Intake of 8 male goats per village was quantified during 7 d per period by weighing the amount of feeds offered and refused at the homestead. Total feed intake was calculated from the quantity of faeces excreted and overall diet digestibility. These parameters were estimated from the faecal concentration of titanium dioxide applied continuously during 11 d at 3 g d⁻¹ and from faecal nitrogen concentration. Samples of selected plants and of forages offered were analyzed for nutrient concentrations following standard procedures.

Results and discussion The length of the daily grazing itineraries ranged from 12 to 20 km d⁻¹ across the three villages ($P > 0.05$) and was slightly shorter in autumn than in spring ($P > 0.05$). The areas of high grazing pressure accounted for 46% (M), 53% (Q) and 59% (S) of the overall pasture area of 97 ha (M), 298 ha (Q) and 297 ha (S). While the stocking rates (goats ha⁻¹) deduced from herd sizes and GPS-determined pasture areas amounted to 1.0 (M), 0.23 (Q) and 0.5 (S), real stocking rates were much higher due to straying goats from adjacent villages and > 2000 feral donkeys also present in the area. As a result of the year-round grazing of village pastures, the number of plant species averaged 10.3 ± 1.91 (area: 100 m²; n=8) on the grazed plateau in contrast to 21.8 ± 6.83 species on the ungrazed plateau (area: 64 m²; n=5). The weighted average dry mass yield of the herbaceous layer was 640 kg ha⁻¹ on the ungrazed as opposed to 14 kg ha⁻¹ on the grazed plateau, demonstrating the productivity loss that results from continuously high grazing pressure. After the winter rains goats in Q and S predominantly grazed herbaceous plants (74.3% and 57.0% of observed grazing time), while ligneous vegetation dominated the diet in autumn (Q: 47.4%; S: 74.1%). Due to a different botanical composition of the pastures at lower altitudes goats in M concentrated on ligneous species in spring (71.4% of observed grazing time) and on the ground layer in autumn (61.2%). In spring feed organic matter intake per kg metabolic mass (kg^{0.75}) from the natural vegetation averaged 32.5 ± 7.82 (M), 75.5 ± 17.29 (Q) and 42.7 ± 19.61 (S) and increased to $49.5 \pm 18.0M$, 76.2 ± 24.21 (Q) and 44.3 ± 13.89 (S) in autumn. However, due to a low nutrient concentration in the range vegetation, only 21%-67% of daily crude protein intake and 33%-64% of daily metabolizable energy intake was supplied by this diet component, while the remainder originated from cultivated forages, wheat bran, dates and dried sardines offered to goats at the homestead (Figure 1).

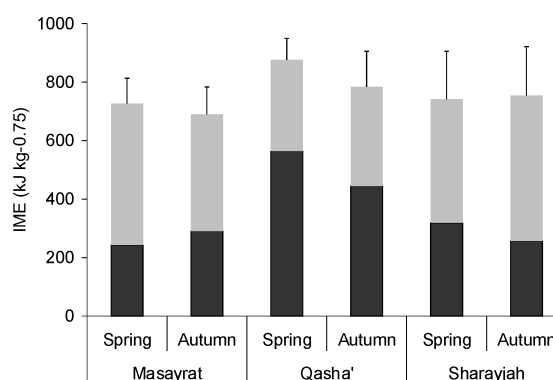


Figure 1 Goats' daily intake of metabolizable energy (IME) from natural pastures (black) and feeds at the homestead (grey) in three villages of the Jabal al Akhdar mountains, Oman (2005).

Conclusions Despite seemingly moderate values, the present stocking rates of goats on mountainous Jabal al Akhdar pastures strongly reduce the overall productivity and species diversity of the pastures. In spite of substantial supplementation of the animals' diet with cultivated green fodder and purchased supplement feeds, more than 50% of the daily feed intake originates from these pastures. If feeding and herding management of goats is not substantially changed, the already observed encroachment with poisonous ligneous species may further increase and negatively affect the biodiversity and productivity of these fragile high-altitude pastures.