

# Factors influencing grazing behaviour of small and large ruminants at high pastures in Basho valley, Northern Pakistan

Veronika Seim and Øystein Holand

Department of Animal Science, Agricultural University of Norway,  
P.O. Box 5025, N-1432 Ås, Norway  
1999

## Introduction

Feeding behaviour, habitat use and diet selection of grazing animals are affected both by environmental and animal related factors. Humans are also influencing grazing behaviour on different scales, especially in intensively herded pastoral systems where the animals are gathered every evening for milking and predator protection. The aim of this study was to single out the most critical factors influencing grazing behaviour of small and large ruminants on alpine summer ranges in Basho valley, Northern Pakistan.



Goats grazing

Photo: Veronika Seim

## Material and Methods

Twelve small (6 goats and 6 sheep) and ten large (6 cows of the local breed and 4 female crossbreeds between yak and cows, *dzomos*) ruminants were selected for the behavioural study. The animals were all milk-producing adults representing one herding system. Feeding behaviour and diet choice of the small ruminants were recorded for 10 days, whereas the cows and *dzomos* were studied by two observers for 5 days at the same summer settlement, *broq*. The animals were individually marked and observed during the entire daily grazing period; from morning when they were released and until they returned in the evening.

All the marked individuals within the herd were scanned (Martin & Bateson, 1994) every 45 min and their activity, behaviour and habitat use were recorded. Information on the diet selection was collected using the focal sampling technique (Martin & Bateson, 1994). The plant groups; *graminoids*, *herbs* and *leaves*, selected were recorded every 10 seconds until 30 observations were gathered at each focal. The observation sessions were rotated within species and between grazing individuals. In addition date, time of the day, climatic parameter, habitat type, altitude and behaviour were recorded both during scan and focal observations. Statistical analysis procedures were run using General Linear Models (GLM) (SAS, 1989).

## Results and discussion

Small ruminants were herded together and the habitat use was directed by the herder. As a consequence goats and sheep used the same habitats for the same amount of time. Altogether 8 habitat types were used and the most dominant type, moraine slopes with *Artemisia* sp. was most frequently (45 %) grazed. Sheep spent less time walking (58 %) compared to goats (70 %). While not-walking sheep preferred standing compared to

goats which more often lied down. Sheep also spent less time grazing (55 %) compared to goats (67 %). Grazing by sheep was heavily reduced when temperature raised during the middle of the day, whereas goats seemed less affected. If no shadow was available the sheep formed groups and tried to hide under each other to find protection against the sun. We conclude that diurnal and daily variation in activity and behaviour between sheep and goats was partly related to sheep's sensibility to heat-stress.

Since a new herder was responsible for the animals each day, daily grazing time did vary, ranging from 38 % to 84 % by the goats and between 29 % and 79 % by the sheep. The percentage of time spent grazing does not always correspond to forage intake. Some of the herders pushed the animals around and the main part of the animals forages were snatched while walking.

Little variation was found in activity and behaviour of large ruminants. Walking accounted for 83 % and 79% of the total activity of cows and *dzomos* respectively, whereas both species spent about 75 % of their time grazing. The large ruminants grazed heavily in the morning followed by a period of rumination in the middle of the day starting a new grazing period in early afternoon. Cows and *dzomos* grazed only in three habitat types and the most frequently grazed type was abandoned cultivated fields (cows; 62% and *dzomos*; 64%). Since all large ruminants were followed to the same pastures in the morning and left on their own during the day, no effect of herder on behaviour, habitat use and diet selection of cows and *dzomos* was found.

Maximum daily vertical movement was 1000 m for small ruminants and 300 m for large ruminants. Energy cost of moving up these slopes was estimated to about 20 % of BMR for the small ruminants and about 9 % of BMR for cattle. This extra energy cost is probably low compared to the extra energy gain grazing at higher pastures. The lower pastures offer less biomass of high quality compared to the higher pastures where the vegetation growth had just begun indicating low biomass but of high quality.

Since small ruminants normally use the pastures at higher altitudes cattle will follow and graze pastures earlier grazed by small ruminants when they are moving to the higher *broqs*. This multi-species grazing system might increased animal output per unit area since small ruminants depend on high quality forage whereas large ruminants are better adapted utilising bulk forages of lower quality.

The sheep selected more graminoids (79 %) compared to the goats (62 %). No difference was found in goats and sheep selection of herbs, 25% and 21% respectively. In addition, goats selected 13 % leaves. This is in accordance with the classification of sheep as a selective grazer and goat as an opportunistic feeder.

Habitat type influenced diet selection of both species. In addition, date affected diet selection of graminoids and herbs in both species, but did not affect selection of leaves. This might be explained by the fact that the habitat type offering leaves was passed on the way to the pastures every day, while the frequency of visiting typical graminoid or herb dominated habitats varied daily dependent on herder.

No differences between cows and *dzomos* were found in diet selection, their diet consisted of approximately 35 % herbs and 65 % graminoids and indicate potential interspecific competition for forages.

Totally 18 different species of herbs were recorded eaten by both small and large ruminants and as expected diet overlap on plant species level was low compared to on plant group (i.e. graminoids, herbs and leaves) level. While 63 % of the large ruminants diet of herbs consisted of *Thymus sp.*, small ruminants selected this species occasionally. *Artemisia sp.* composed 11 % of the small ruminants diet, but was rarely selected by the large ruminants. *Bistorta sp.* was selected by all animal species, but was twice as common in the diet of small ruminants, probably because *Bistorta sp.* is more common at higher altitude where small ruminants grazed more frequently.

Animal species with large overlap may compete for food, especially at high grazing pressure. Ricardi and Shimada (1991) concluded that variation in diet selection reflects variation in availability or scarcity of other feed options. Selection is found to diminish at high grazing pressure and uniformity of the sward (Black and Kenny, 1984). Based on our findings that sheep, goats, cattle and *dzomos* all selected a quite similar diet, we conclude that the available quantity of forage limits animal production and that the animals have to graze whatever plant material available. Low quantity of available forages results in that a typical opportunistic feeder (goats) select less herbs than expected and grazers (cattle) eat more herbs. Based on chemical analysis of some of the most important forage plant species we agree with Huston and Pinchak (1991) that arid rangelands usually are dominated by forages that are relatively high in quality during early vegetative stages but quickly declines in quality as the forages mature.

## Conclusion

The high percentage of time spent grazing and large interspecific overlap of plants selected indicate low biomass of available forages. Since quality of the summer forages is relatively high, quantity may limit animal production. Optimal habitat use, both in space and time, is essential and is highly dependent on the decisions of the herder. Weather might effect small ruminants, especially the sheep's activity, behaviour and diet choice. Unless there is large overlap, multiple-species grazing system will increase the output from pasturing. The dynamic seasonal grazing system as well as the daily vertical movements are adaptations to the low availability of palatable forages in Basho.

## References

- Black, J.L. & P.A. Kenney. 1984. Factors affecting diet selection by sheep. II. Height and density of pasture. *Aust. J. Agric. Res.* 35:565-578.
- Huston, J. E & W.E.Pinchak. 1991. Range Animals Nutrition. In: Heitschmidt, R.K and J. W. Stuth.(eds.). *Grazing Management an ecological perspective*, pp. 27-64. Timber Press, INC. Portland, Oregon. ISBN 0-88129-190-4
- Martin, P. & P. Bateson. 1994. *Measuring behaviour, and introductory guide*, 2nd edition. Cambridge University Press, Cambridge, 6: 84-87.
- Ricardi, C. & A. Shimada. 1992. A note on diet selection by goats on a semi-arid temperate rangeland throughout the year. *Applied Animal Behaviour Science* 33:239-247.
- SAS Institute Inc. (1987). *SAS/STAT™ Guide for Personal computer*, Version 6 Edition. SAS Institute Inc Cary, NC. ISBN 1-55544-064-9.