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## Goat behaviour patterns in hill country

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### ABSTRACT

The grazing behaviour of mixed age cashmere producing does was recorded on pasture dominated hill country at six physiological stages; post-weaning, pre-mating, early pregnancy, late pregnancy, early lactation and mid lactation.

Observations were conducted from sunrise to sunset on three consecutive days at each physiological stage. Activity, land slope, time and position of focal animals were recorded. Flock position over the study site was also registered.

At each physiological stage grazing was the predominant activity (34-63% of the time observed). The major grazing period occurred during the afternoon. Grazing occurred predominantly on steep and easy slopes (>70% of the time observed). Pasture height influenced the goats preference for the slope grazed. The does travelled in a regular pattern around the study site. This pattern was less distinct when the does had kids at foot.

Activities observed during late pregnancy differed considerably from activities observed at other physiological stages. Some of these differences included more time spent standing and no distinct afternoon grazing period.

Rain was the main event to interrupt grazing and initiate a change in the movement pattern of the does.

**Keywords** Goat, grazing, behaviour, hill country, activity, slope, pasture height, movement patterns.

### INTRODUCTION

Goats have been described as mixed feeding "opportunist" (Lu, 1988) with the ability to utilise a wide range of plant species in a wide range of environments.

Given this ability, an important element in determining effective management possibilities is accurate knowledge of goat feeding behaviour and preferences. Aside from farmer observations, limited information has been available to date on the behaviour of goats in New Zealand hill country.

As a basis for the design of future experiments, this study aimed to quantify the grazing and movement patterns of goats at different physiological stages, given a choice of slope, aspect and vegetation.

### METHODS AND MATERIALS

#### Site

The study was carried out between February and November 1990, at the Whatawhata Research Centre.

The site selected was a 4 ha hillside paddock of varied topography (Fig. 1). Easterly, northerly and southerly aspects were represented. The altitude of the site ranged from approximately 300 to 350 metres. A large sheep camp was situated near the highest point of the paddock and a 2-3m wide vehicle track cut through the middle of the area. A gully and water course ran from just below the sheep camp to the bottom left hand corner of the paddock.

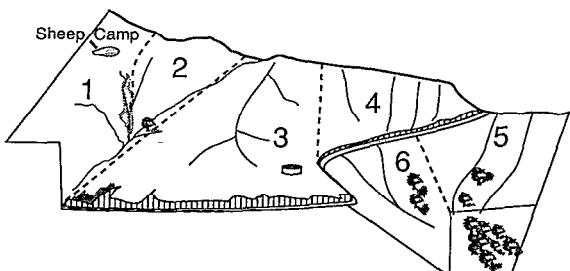


FIG 1 Observation site showing topography and zones.

Slope was categorised as follows:

*Steep* - intertrack zones and areas visually assessed to be >25°.

*Easy* - areas visually assessed to be 0-25°.

*Tracks* - well defined animal tracks.

*Track edge* - the area up to 10cm below the track.

*Road* - vehicle track.

The vegetation present on the study area consisted of browntop dominated pasture, five small scattered trees, scattered patches of rushes on the easier slopes and in the gully and a small area of sprayed gorse and bracken fern. Seasonal weed species included thistles, foxglove and flat weeds. An area of bush at the northern end of the paddock and the bottom third of the gully were fenced off to ensure goats were visible at all times.

For observation purposes the paddock was divided into six zones, delineated by natural features, the whole of which could be viewed from a fixed location. The goats observed were familiar with the site, having grazed in the area on a number of previous occasions. Over the study period 4 days received rainfall of over 10mm, 9 days received 0-1mm and there were 8 days with no rainfall.

## Procedure

Observations were made from a hide situated on an adjacent ridge, 150m from the study paddock at the closest point (zone 6) and 300m from the furthest point (top of zone 1). The hide was a hut constructed of plywood with adequate room for two people to sit at a built in bench. The viewing window was a 0.5 x 1.5m opening which could be covered by 3 removable plywood panels. Entry was by a door in the rear wall.

Seven sets of observations were conducted at six different physiological stages (Table 1). Each set of observations were conducted over 3 consecutive days. Observations were recorded from sunrise to sunset.

Before each observation period pasture height measurements were taken along seventeen 20m transects (20 points/transect). The day prior to each set of observations the study area was stocked with 100 mixed age cashmere producing does. Thirty of the does were chosen randomly for detailed observation. Coloured

plastic collars assisted in quick and accurate identification of these does. Observations were made with a 20 x 50mm telescope and 7 x 50mm binoculars.

## Doe Activities

The following activities were recorded:

*Grazing* - eating pasture and movement associated with this activity, head at ground level.

*Browsing* - eating vegetation other than pasture and movement associated with this activity, head above ground level.

*Walking* - walking or running, with head up, did not include steps taken while grazing or browsing.

*Standing* - including standing while feeding kids and ruminating.

*Sitting* - resting, sleeping or ruminating, legs tucked under body, head up or bent back around onto back.

*Lying* - resting or sleeping with head on ground and legs usually extended rather than tucked under body.

*Scratching ground or vegetation* - rubbing body against banks, rubbing head on vegetation etc.

*Drinking* - from trough or water course.

*Urinating*

*Defecating*

One doe was observed each hour. Within the hour, the doe was observed continuously for three 10 minute periods with intervening 10 minute breaks.

Doe identity, activity, slope, zone and time were recorded during each 10 minute period of continuous observation. One person observed the goat and called out its behaviour while a second person entered the information directly into a portable computer, programmed specifically for the trial. Time was automatically recorded when an activity or slope class changed enabling calculation of the time engaged in each activity and on each slope class.

Activities were recorded as if mutually exclusive. In practice, a doe would occasionally continue to graze while urinating or sitting. In these cases the latter two events were recorded.

**TABLE 1** Percentage of total time observed performing each activity at each observation period.

Physiological Stage	Feb Post Weaning	Mar Pre Mating	May Pregnant	Aug 1 wk prior to kidding	Oct Early lactation (kids 3-5 weeks)	Nov <sup>1</sup> Mid lactation (kids 10-12 weeks)	Nov <sup>2</sup> Mid lactation (kids 11-13 weeks)
Mean Pasture height (cm)	5	*<3	*<3	5	2	9	4
Grazing	37	51	50	34	63	45	50
Sitting	24	20	21	27	21	27	23
Walking	15	11	14	10	7	8	11
Standing	12	9	10	24	8	11	11
Browsing	5	7	2	0	0	5	2
Other	7	2	3	5	1	4	3

<sup>1</sup>19-21 November<sup>2</sup>27-29 November

\*Visually estimated

### Flock Movement Patterns

During the 10 minute breaks between continuous observations a scan of the paddock was made recording the number of does in each zone and the time. The daily movement patterns around the paddock were determined from these recordings.

### Statistical Analysis

The daily activity pattern for each month of observation was analysed statistically. Activity was considered as two classes, grazing or not grazing. A logit analysis was used to test the effect of hours of the day on activity. The procedure gave the log-odds of finding the goats grazing or not grazing at any hour of the day.

## RESULTS AND DISCUSSION

### Doe Activities

For each month of observation grazing was the predominant activity (Table 1). The physiological stage of the doe, with the exception of late pregnancy, had little effect on the ranking of activities observed. The ranking, from greatest to least time, was: grazing

> sitting > walking > standing > other.

During late pregnancy (August) the time spent standing was greater than the time spent walking. The does were due to kid the week following the observation days and were showing signs of discomfort. This may have contributed to the greater amount of time standing during this period.

The availability of browse was low in all months, particularly August and October. Thistles and foxglove were the main species browsed in February and November while rushes, gorse and bracken were browsed in March.

Rain was the main event to interrupt grazing, as was noted by Kilgour and Ross (1980). The does usual response to rain was to stop grazing and move to an area of shelter. The amount of rain required to initiate this response varied for individual does.

### Daily Activity Patterns

All classes of activity occurred during the morning whereas grazing was the predominant activity during the afternoon. A logit analysis showed that the odds of observing a goat grazing during the afternoon were twice ( $P<0.05$ ) that of observing a goat grazing during the morning (Table 2). Kilgour and Ross (1980) also

noted a major feeding period during the afternoon.

If the major grazing period is in fact the major intake period then timing of management practices, such as shearing, may best be arranged to ensure minimal disturbance of goats during the afternoon. This activity pattern may also have implications from an experimental point of view, for example, the timing of sampling of goats when determining diet selection.

During late pregnancy the activity pattern differed from other months with a mix of all activities occurring at all times throughout the day.

**TABLE 2** The odds of observing a goat grazing at different times of the day.

Month	Morning	Afternoon	
February	1	:	3 (P<0.01)
March	1	:	2 (P<0.025)
May	1	:	2 (P<0.01)
October	1	:	2 (P<0.05)
November <sup>1</sup>	1	:	2 (P<0.025)
November <sup>2</sup>	1	:	1.6 (P<0.1)

<sup>1</sup>19-21 November

<sup>2</sup>27-29 November

### Slope Preferences

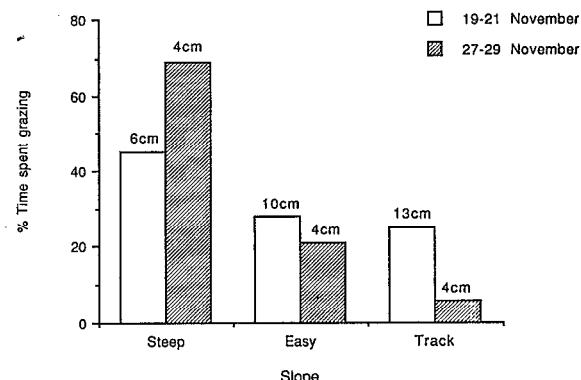
The goats spent greater than 70% of the time grazing steep and easy slopes in all months of observation (Table 3).

Between the mid and late November observations mean pasture height was reduced by sheep and cattle from 9cm to 4cm. Although this did not greatly effect

the amount of time spent grazing it did influence the slope on which grazing occurred.

At the higher pasture height there was little difference in the time spent grazing steep and easy slopes and tracks. Other studies (Lambert *et al.*, 1981) have shown that sheep prefer to graze easy slopes and tracks. This may result in competition for grazing between goats and sheep at these higher pasture heights.

At the lower pasture height, observations indicated that more time was spent grazing steep slopes and less time grazing tracks, though no objective test was made (Fig.2). The reduction in time grazing tracks may have been due to pasture spoilage on these areas during preconditioning by other stock classes.



**FIG 2** Percentage time grazing different slope classes at varying pasture heights.

Although the mean pasture height on the steep and easy slopes was the same during the late November

**TABLE 3** Percentage time spent grazing on each slope class.

	Feb	Mar	May	Aug	Oct	Nov <sup>1</sup>	Nov <sup>2</sup>
Steep	48	44	62	18	26	45	69
Easy	37	41	27	59	61	28	21
Track	14	9	9	21	11	25	6
Track edge	1	1	0	2	1	1	4
Vehicle track (flat)	0	5	2	0	1	1	0

<sup>1</sup>19-21 November

<sup>2</sup>27-29 November

observations (4cm), the variability of pasture height on the steep slopes was high (2-15cm). The patches of long pasture present may have been sufficient to result in a preference for grazing steep slopes during this period of observation. Further investigations are required to clarify the relationship between pasture height and slope grazed.

Although much time was spent grazing steep slopes there was no evidence of greater nutrient return in these areas. During daylight hours, defecation and urination occurred randomly over all slope classes.

### Flock Movement Patterns

Prior to kidding the does travelled as a mob in a regular pattern around the observation site. They started the day below the sheep camp in zone 1, then travelled across zones 2, 3 and 4 and occasionally into zones 5 and 6, then moving back to zone 1 as sunset approached. In preference to the almost flat sheep camp the goats chose steep well tracked terrain for their night area. With kids at foot the pattern became less distinct and the does spread out more over the paddock.

Uneven pasture utilisation may result from this type of movement pattern where some areas of a paddock are rarely grazed.

During all observation periods rain was the main event to alter the movement pattern of the goats. A few trees in zone 5 and 6 and the bank above the vehicle track in zone 3 provided some shelter from rain. With kids at foot, the does were more inclined to move to shelter than when the does were alone. When rain had

fallen overnight, the does and kids were in zones 5 and 6 when observations began at sunrise.

These observations indicate the importance of shelter for goats during adverse weather conditions. Does, and particularly kids, willingly seek shelter from rain, implying a possible increase in stress levels if shelter is not available.

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