Relationship between small ruminants behaviour and landscape features in Northeast of Portugal

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Introduction

In Northeast Portugal, most small ruminant production is an extensive activity based on grazing itineraries. The shepherds direct their flocks on daily grazing itineraries across different patches of landuse.

The study of livestock activities permits understanding the animal's perception of landscape. Animal activities (grazing, resting and walking) were also affected by landscape attributes.

The aim of the study was to examine the relationships between livestock behavior and landuse types, and to check how they change throughout the year and the time of day (temperature and vegetation moisture effect).

Having an understanding of animal landscape use could help to develop strategies to better management the landscapes and its temporal changes.

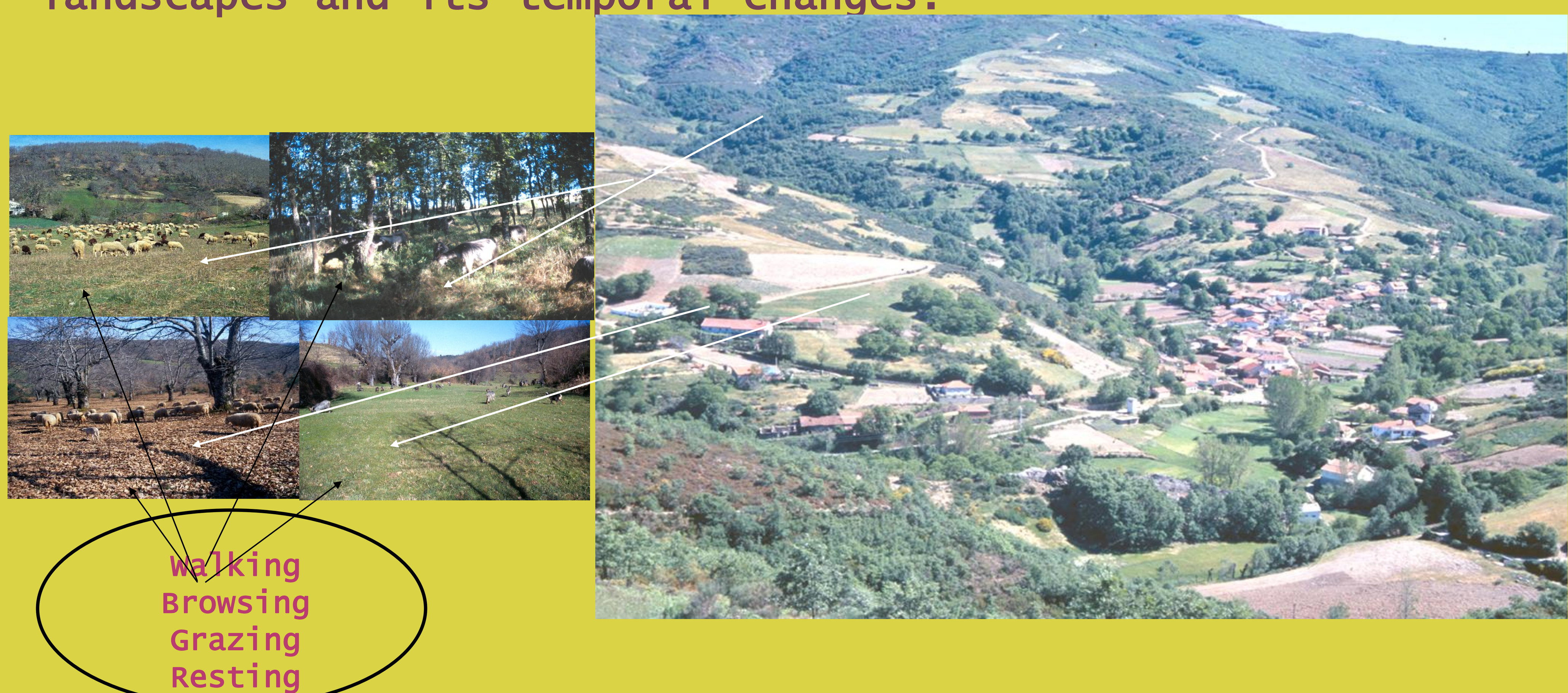

Fig 1:Relationship between landscape, landuse types and activities.

Methodology

Four flocks (two of goat and two of sheep) were monitored every month, for a year, in Bragança region. Data collected consists of geographical position, type of landuse crossed, and animal behaviour.

Behavioural activities (grazing, browsing, resting and walking) and the grazed species were noted every 15 minutes by direct observation.

The proportion of animals involved in each activity was calculated and animal-environmental interactions were analysed by comparing the expected and observed frequencies.

Outputs allows to identify the level of the relationship between variables: the association is positive or preferred when the quotient is higher than to 1.24; indifferent, when there is a value between 0.75 and 1.24, and negative or not preferred, when the corrected frequency value is lower than 0.75).

Results and Discussion

The relationship between activity preference and time of the day, landuse type, and their seasonal variation suggest a complex pattern of use of landscape by the flocks.

During daily itineraries, the flocks use different landuse types for different purposes.

Table 1: Preference index values of activities in different landuses and stable and path

Activities	Annual	Perennial Crops	Meadows	Shrubs	Forest	Stable	Path
Sheep							
Grazing	1.63	1.03	1.94	0.12	0.10	0.07	0.00
Resting	0.22	0.45	0.20	1.97	2.54	2.82	0.08
Walking	0.63	1.46	0.25	0.14	0.07	0.05	7.24
Browsing	1.35	2.61	0.13	3.66	0.82	0.00	0.37
Goats							
grazing	3.21	0.62	2.36	0.73	0.13	0.00	0.16
resting	0.37	1.23	0.62	0.26	1.69	4.11	0.21
walking	0.48	0.49	0.40	0.88	0.34	0.22	4.05
browsing	0.78	1.25	0.99	1.57	1.24	0.00	0.34

Table 2: Preference index values of landuses (also stable and path) in different periods of the year

Landuses	Sheep				Goats			
	cool	warm	winter	summer	cool	warm	winter	summer
Annual crops	1.56	1.46	0.62	0.63	1.63	0.88	0.95	0.77
Perennial crops	1.50	1.44	2.04	0.40	0.23	1.48	3.39	0.36
meadows	1.24	0.83	2.03	0.84	1.08	0.47	1.54	1.20
shrubs	1.00	0.26	0.00	1.63	1.50	1.35	1.11	0.45
forest	0.07	0.20	0.11	1.92	0.13	1.00	0.47	1.60
path	0.97	1.04	1.87	0.83	0.98	0.64	1.49	1.14
stable	0.04	0.96	0.00	1.50	0.04	0.91	0.00	1.85

Table 3: Seasonal variation of preference index activity values in different periods of day

	Sheep			Goats		
warm days						
Activities	morning	mid-day	afternoon	morning	mid-day	afternoon
grazing	1.06	0.76	1.32	0.51	0.78	1.52
resting	0.07	1.80	0.43	0.44	1.61	0.46
walking	1.42	0.82	0.99	1.29	0.75	1.20
browsing	3.20	0.57	0.21	1.23	0.92	1.00
summer						
grazing	1.17	0.00	1.76	0.90	0.53	1.62
resting	0.63	1.92	0.52	0.09	2.29	0.35
walking	1.91	0.00	0.99	1.20	0.21	1.24
browsing	1.99	0.00	0.91	1.35	0.12	1.02
cool days						
grazing	0.59	0.73	1.25	0.34	0.91	1.55
resting	0.64	2.09	0.33	0.00	1.90	0.60
walking	1.72	0.86	0.97	1.35	0.60	1.24
browsing	3.36	1.68	0.14	1.48	1.00	0.67
winter						
grazing	0.33	1.02	1.17	0.37	1.03	1.33
resting	0.00	1.87	0.66	0.81*	0.75*	1.44*
walking	1.81	0.70	0.99	1.34	0.54	1.39
browsing	2.13	0.99	0.70	1.41	1.36	0.30

Flocks move over the landscape with a special perception of benefits and requirements. The displacement is guided by a complex interpretation of landuses type profits (fodder, shade or transit between habitats), environmental constraints such as temperature of mid-day, moisture of pasture in the morning, and landuse types occurring near villages.

The complexity of landscape utilisation by flocks shows the importance of each landuse type for a particular animal activity.

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