

GPS-based indicators to support grazing management in dairy sheep

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Framework

This study is part of a broader project evaluating smart technologies for sheep farming in marginal areas.



Dairy sheep livestock system in Sardinia mainly relies on **pasture-based systems**. Sheep are typically milked twice a day and, between milking sessions, they are taken to graze.



Therefore, it is essential to develop tools that support the management of grazing areas.

**Aim:**

To investigate the spatial and temporal patterns of pasture use across different seasons in a Mediterranean dairy sheep systems.

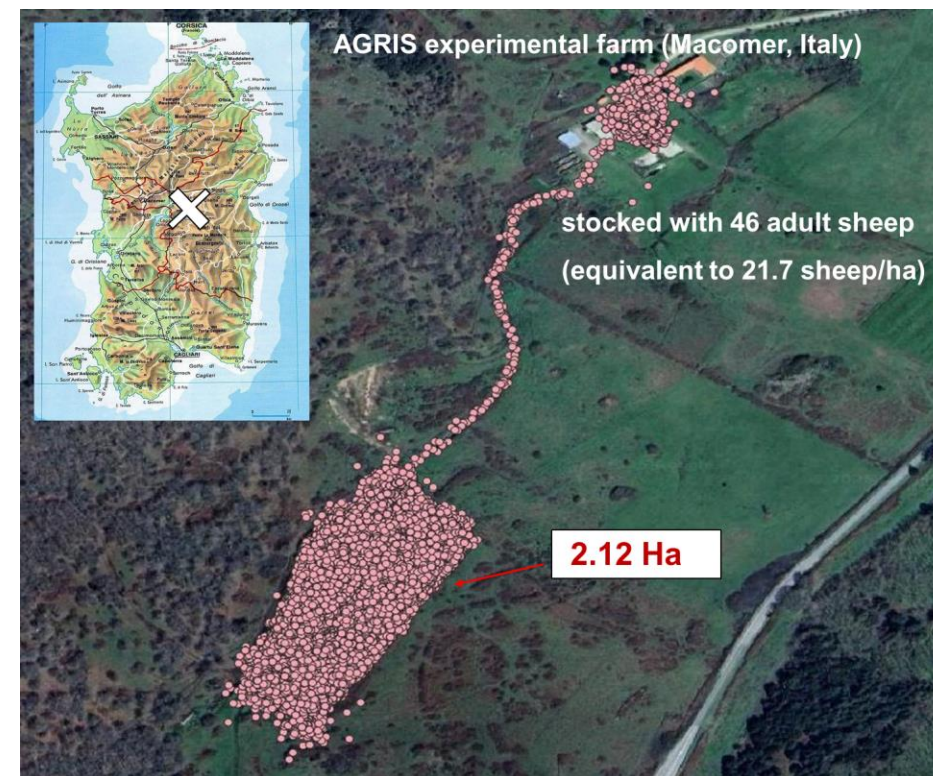


The thinker Rodin



METHODS

Nera di Arbus sheeps, an indigenous Sardinian breed, grazing a **2.12** ha natural pasture area,



were fitted with GPS collars, programmed to collect and store GPS locations, date, and time every 3 min.
in two sessions: **spring (19 March–9 April 2025)** and **summer (26 June–5 July 2025)**.

METHODS

Spatial pattern of pasture use

1

was estimated by **Individual Daily Utilization distribution 95% (UD95)**
using dynamic Brownian bridge movement model

move package of R software, version 4.3.1

the area within which there is a 95% probability to find grazing animals

UD95 represents the pasture area effectively utilized by the animal, encompassing 95% of its space-use probability

Temporal pattern of pasture use

2

was estimated by the **Camargo's index (CI) of space-use evenness**

CI quantifies the uniformity of space use in grazing contexts

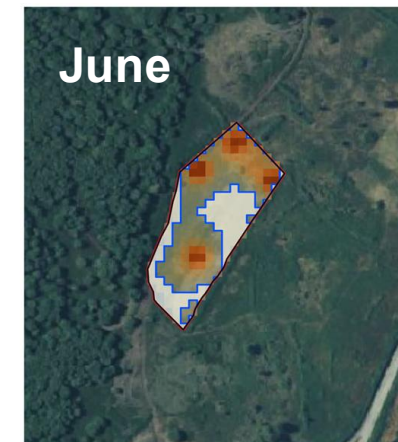
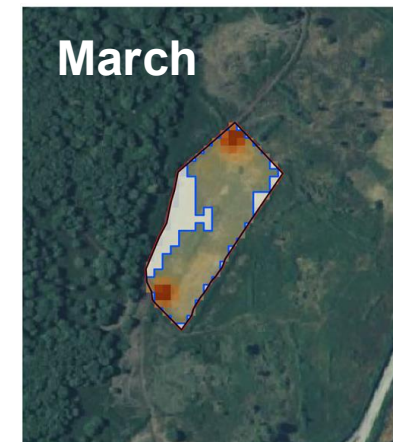
(Pauler et al., 2022)



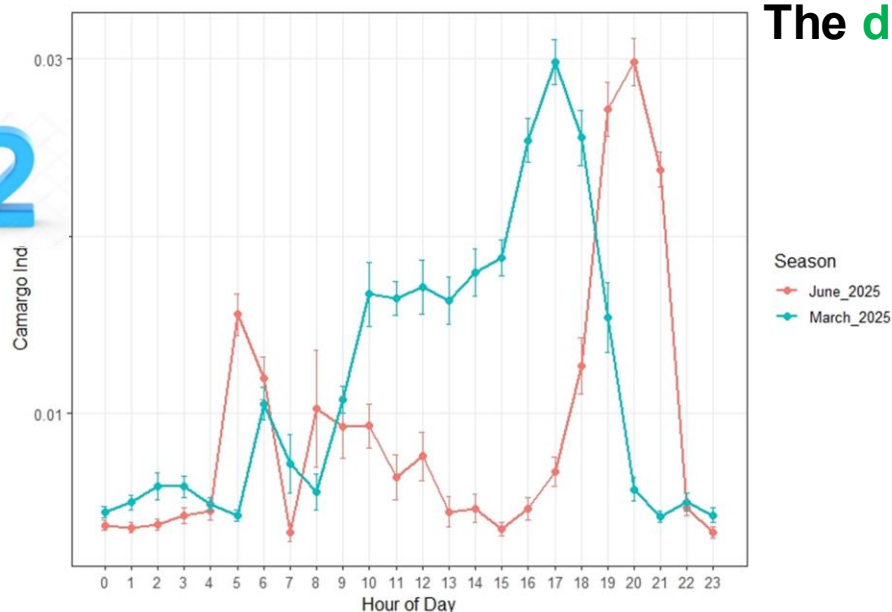
Results

1

Season	Total pasture area (ha)	daily UD95		P-value
		ha (emmeans±SE)	% of the total grazing area (emmeans±SE)	
March	2.12	1.34±0.05	63.5±2.6	0.16
June	2.12	1.20±0.08	56.8±3.9	



2



The **daily UD95** value, ranged between 57% and 64% in both periods



....although the areas of greatest use differed spatially

CI exhibited season-dependent diel patterns. **In March**, animals spread out more uniformly during the central hours of the day, whereas the opposite happened in **June**, indicating reduced movement and spatial aggregation, consistent with heat-avoidance strategies.

Both UD95 and CI, beyond describing animal behaviour, have management implications, such as identifying stocking rate, critical hours for providing shade, or strategies to mitigate heat stress.

Conclusions