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QUALITY, SAFETY AND SUSTAINABILITY
OF AGROFORESTRY PRODUCTIONS

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In France, silvipastoral arrangements in grasslands can mitigate moderate heat stress in sheep

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Theme: Quality, safety and sustainability of agroforestry productions (processes and products)

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Abstract

In the coming years, with the multiplication and intensification of the effects of climate change, the European livestock farming systems will have to adapt and gain in resilience to maintain their production. For those livestock systems that largely rely on grazing, the augmentation of climatic hazards and the associated periods of drought and heat waves (Moreau 2015), will have both direct consequences on animal welfare and production (Polsky et al. 2017; Herbut et al. 2018), and indirect ones on grass production and quality. The presence of silvopastoral facilities in grasslands could be a way of adaptation to climate change by providing a more favourable microclimate and limiting the thermal stress of animals. The objective of this study, conducted in the mid-mountainous French region Auvergne, was to assess the impacts of the presence of trees on the thermal load and behaviour of sheep submitted to different tree arrangements, thanks to the use of a set of different sensors.

The experimental set-up was composed of three 0.8-ha permanent pasture plots: a control plot C, composed of a single tree and two trees plots: HT composed of a hedge (7.6 trees/ha) and IPT composed of an intra-plot tree plantation (60 trees/ha). In each plot, 12 dry adult ewes were grazed during the entire grazing season (2020: between June 6 and September 5; 2021: between May 12 and September 9). During this period, each animal was equipped with a bolus measuring ruminal temperature, an activity collar and a Hobo® light data logger positioned on the animal's withers to assess whether it is in shade or sun. A weather station was installed on each plot to characterise the intra-plot environment. The statistical treatment of the data was based on mean homogeneity tests carried out according to mixed ANOVA or Kruskal-Wallis-tests.

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From the 183 days available, we created 4 classes based on climatic conditions: 1=cool and humid day; 2=cool and sunny; 3=hot day (>25°C) and cool night (<19°C); 4=hot day and warm night (>19°C). The main results show that animals in IPT have a lower ruminal temperature (39.4°C) than animals in C and HT (39.5°C) (pvalue =0.001). This is confirmed with the results of Figure 1 below, the ruminal temperature of the animals increases according to the daily classes from 1 to 3 for the three treatments. In class 4, although this is the most thermally stressful class, the ruminal temperature of the ewes is equivalent to classes 1 or 2. The analysis of their activities shows that the animals had a behavioural adaptation between classes 3 and 4 by decreasing their ingestion time (13%) and spending more time in the shade (19%). However, the environment of the IPT plot seems to be more favourable for the animals to effectively decrease their ruminal temperature.

In our context, these results show that agroforestry systems can play a positive role in adapting to climate change by providing a more favourable microclimate for animals, allowing them to better regulate their internal temperature and thus improve their welfare under stressful conditions.
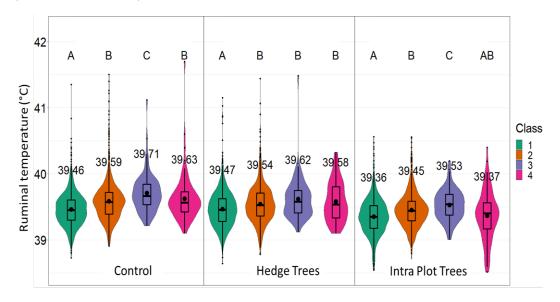

Figure 1. Comparison of the average ruminal temperatures of ewes on the three plots, according to the daily weather classes (statistical comparison by plot)

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