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Sheep performance, behavior, and thermal status in silvopasture systems

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Black walnut silvopasture: Sheep "actively" utilizing shade.

Introduction:

Silvopastures integrate trees with forages for grazing livestock. Some studies report similar animal gains in silvopasture systems despite lower forage productivity compared to open pastures. Some studies indicate that **the microclimate created by trees produces more nutritious forages, which offsets the reduction in available biomass** (Kallenbach et al., 2006). However, previous work at Virginia Tech has demonstrated that there is a limited nutritive value benefit in silvopastures (Fannon-Osborne, 2012). We tested an alternative hypothesis: **that animal performance in silvopastures is a consequence of physiological and behavioral modifications**.

Methods:

Study site and characteristics:

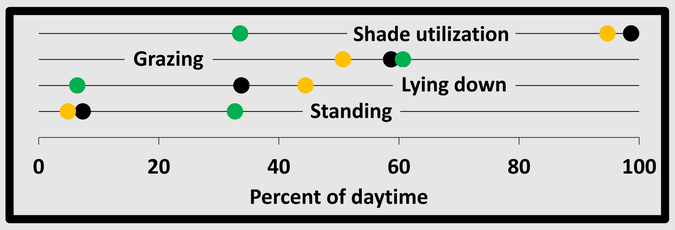
- Kentland Farm; Blacksburg, Virginia
- 12 weeks, June through August 2015
- 3 replications x 3 treatments stocked with lambs
  - **Black walnut silvopastures**: 5 ewes
  - **Honeylocust silvopastures**: 5 ewes, 1 wether
  - **Treeless pastures**: 5 ewes, 1 wether

The behavior and status of the ewes were monitored with:

- **Vaginal temperature** loggers
- Time-lapse cameras documenting **shade utilization** and **behavior**
- Acoustic recordings analyzed by software for **prehension** detection

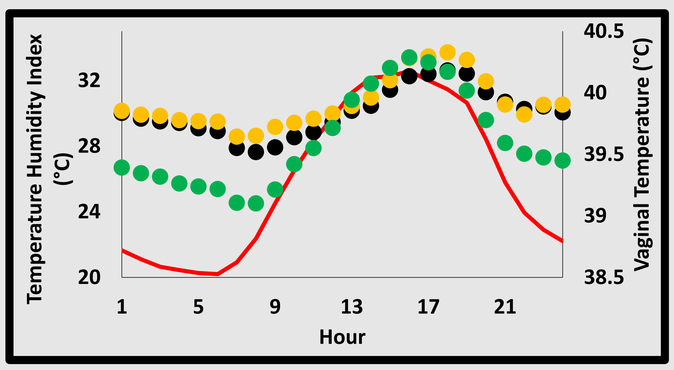
Honeylocust silvopasture: Sheep browsing leaves from stump suckers.

Objective: To integrate forage quantity and nutritive value characteristics with spatial and temporal grazing behavior and body temperature data to understand the effects of silvopasture systems on animal performance and well-being.



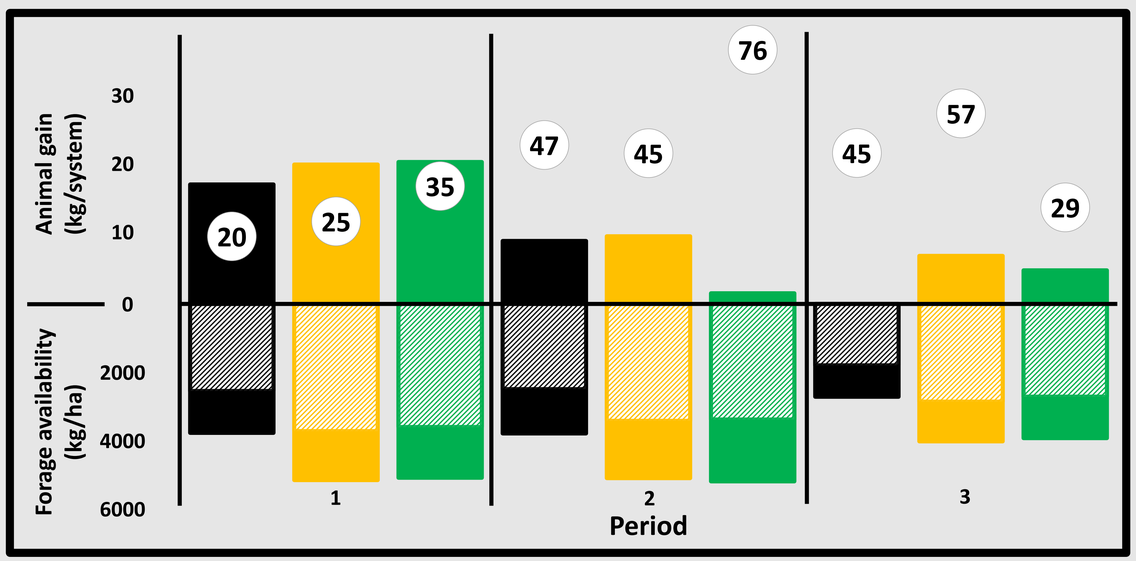
Daily behavioral activities

- Ewes in the black walnut silvopastures (●) and the honeylocust silvopastures (●) utilized available shade heavily.
- Ewes in the silvopastures spent slightly less time grazing and more time lying down; ewes in the open pasture (●) spent more time standing.



Vaginal temperatures

- Ewes in the open pastures (●) had the greatest temperature fluctuations; trees modulated ambient conditions (—) for ewes in the silvopastures.
- Ewes in the black walnut silvopastures (●) had the lowest peak temperatures.
- Interestingly, ewes in the honeylocust silvopastures (●) had the highest peak temperatures by a small margin.

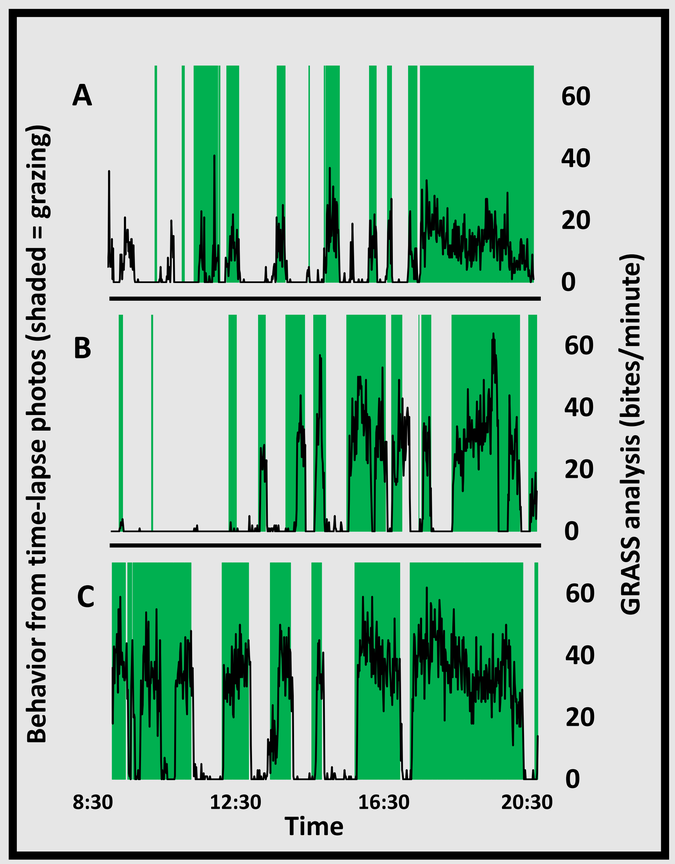


Forage availability, system gain, and fecal egg counts

- Walnut systems (■) had lower forage availability; gain per hectare was lower due to lower stocking rates.
- High fecal egg counts (⬭; eggs/cg of sample) in periods 2 and 3 suggest parasites depressed animal gains, particularly in the open pastures (■); 100% of the open pasture ewes were dewormed after the 2nd period, compared to 87% of the silvopasture ewes.
- Honeylocust systems (■) supported the most consistent animal gains, along with greater forage availability and improved total digestible nutrients (▨).

Conclusions:

Tree species had a variable effect on forage availability and nutritive value, sheep behavior, and thermal status. Animal gains in the silvopasture systems were equivalent to or better than the animal gains in the open pasture systems. Silvopastures appear to offer significant performance benefits through altered animal behavior and physiology.



Grazing distribution and biting events

- Ewes in walnut (A) and honeylocust (B) silvopastures spent less time grazing and had slower biting rates.
- The ewe in the open pasture (C) grazed heavily in the morning and evening, while grazing events of ewes in silvopastures were more evenly distributed throughout the day.

References:

- Fannon-Osborne, A. G. (2012). *M. S. Thesis, Virginia Polytechnic Institute and State University*. - Kallenbach et al. (2006). *Agroforestry Systems 66(1):* 43-53.

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