SSARE GSG

Final Report - Appendix

Acoustic analysis: A novel way to measure livestock grazing behavior

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**Figure 1: ADG of lambs declined over time, with a significant treatment by period interaction**

**Figure 2: Sheep gains by system demonstrate lower black walnut silvopasture system output**

**Figure 3: Average *H. contortus* counts and FAMACHA scores increased over time, with only minimal control with use of anthelmintics**

**Figure 4: Forage mass prediction models for pre- and post-graze scenarios in the systems based off the rising plate meter double sample data**

**Table 1: Calculated equation of lines and associated R2 values for forage mass prediction models**

|  |  |  |
| --- | --- | --- |
| Treatment | Pre-graze | Post-graze |
| Equation of line | R2 | Equation of line | R2 |
| Black walnut silvopasture | y = -7.918x2 + 439.59x - 353.53 | 0.5709 | y = -38.293x2 + 915.81x - 661.85 | 0.5831 |
| Honeylocust silvopasture | y = -12.883x2 + 581.9x - 660.39 | 0.3983 | y = -27.925x2 + 803.94x + 175.17 | 0.5983 |
| Open pasture | y = -8.5014x2 + 481.98x - 496.08  | 0.5156 | y = -27.632x2 + 848.74x + 208.9 | 0.6043 |

**Figure 5: Forage availability by treatment over the course of the season as predicted by the rising plate meter model**

**Table 2: Forage mass estimates by treatment over the course of the season**

|  |  |
| --- | --- |
| Sampling date | Forage mass estimates (kg/ha) |
| Black walnut | Honeylocust | Open |
| 5/29/2015 | 3480 | 5030 | 4970 |
| 6/6/2015 | 3850 | 5060 | 5210 |
| 6/13/2015 | 3680 | 5330 | 5130 |
| 6/20/2015 | 3870 | 5160 | 4980 |
| 6/27/2015 | 4290 | 5610 | 5560 |
| 7/4/2015 | 4080 | 5290 | 5500 |
| 7/11/2015 | 4220 | 5400 | 5500 |
| 7/18/2015 | 4060 | 5190 | 5060 |
| 7/25/2015 | 3390 | 5180 | 5340 |
| 7/31/2015 | 3510 | 4840 | 4970 |
| 8/6/2015 | 2850 | 4330 | 4370 |
| 8/10/2015 | 2430 | 3940 | 3900 |
| 8/14/2015 | 2830 | 4310 | 3960 |
| 8/19/2015 | 2570 | 3770 | 3740 |
| Season mean | 3510 | 4890 | 4870 |

**Figure 6: Average ewe vaginal temperature fluctuates with temperature humidity index (THI) with variability by month**

**Figure 7: Number of ewes grazing, standing up, or lying down, either in the shade or in the sun**

**Figure 8: Total time spent by each ewe grazing, standing up, or lying down**

**Table 3: Prehension events, determined detection thresholds, and corresponding start times as calculated manually in video analysis and automatically in acoustic analysis by GRASS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Ewe | Detection threshold (V) | Prehension event | Video event start time (sec) | GRASS event start time (sec) | Difference in start times (sec) |
| 1657 | 0.2200 | 1 | 798.31 | 798.344 | -0.034 |
| 2 | 798.93 | 798.553 | 0.377 |
| 3 | 799.992 | 800.008 | -0.016 |
| 4 | 800.131 | 800.018 | 0.113 |
| 1692 | 0.0350 | 1 | 874.521 | 874.530 | -0.009 |
| 2 | 875.595 | 875.615 | -0.020 |
| 3 | 876.32 | 876.269 | 0.051 |
| 1757 | 0.0500 | 1 | 807.741 | 807.733 | 0.008 |
| 2 | 808.223 | 808.110 | 0.113 |
| 3 | 808.535 | 808.444\* | 0.091 |
| 4 | 809.092 | 809.097 | -0.005 |
| 1647 | 0.0350 | 1 | 568.112 | 568.060 | 0.052 |
| 2 | 570.9 | 570.876 | 0.024 |
| 3 | 571.894 | 571.902\*\* | -0.008 |
| 4 | 572.328 | 572.333 | -0.005 |
| 1684 | 0.0171 | 1 | 696.348 | 696.472 | -0.124 |
| 2 | 700.899 | 700.903 | -0.004 |
| 3 | 702.146 | 702.164 | -0.018 |
| 1737 | 0.0171 | 1 | 642.682 | 642.689 | -0.007 |
| 2 | 642.964 | 642.987 | -0.023 |
| 3 | 643.749 | 643.645 | 0.104 |
| 1716 |  |  | invalid | invalid |  |
| 1752 | 0.0171 | 1 | 471.298 | 471.297 | 0.001 |
| 2 | 471.967 | 472.000 | -0.033 |
| 3 | 472.755 | 472.762 | -0.007 |
| 4 | 473.176 | 473.176 | 0.000 |
| 5 | 473.404 | 473.411 | -0.007 |
| 6 | 473.589 | 473.594 | -0.005 |
| 7 | 473.884 | 473.871 | 0.013 |
| 1853 |  |  | invalid | invalid |  |

\*Event not detected by GRASS in analysis of file because it was calculated as 350 ms long, or larger than the maximum event length of 200 ms

\*\*Event not detected by GRASS in analysis of file because it was calculated as 17 ms long, or shorter than the minimum event length of 20 ms

**Figure 9: Time lag of event start times as calculated by GRASS as compared to manual observation**

**Figure 10: Correlation between time-lapse image indications of grazing time and bite rate from the GRASS output of each audio file over time**