The seasonal production of forage is one of the main factors limiting animal performance in pasture-based systems under tropical climate conditions. It requires the search for alternative feedstuffs to offer animals during periods of forage scarcity to maximize animal performance. The objective of this study was to evaluate parameters of bromatological quality of silage of 3 genotypes of sorghum biomass (B012, B017, and B018) with 4 levels of sugarcane inclusion (0, 20, 40, and 60%). The experiment was conducted using a completely randomized design in a factorial scheme with 4 repetitions. The material was ensiled using PVC silos (10 cm diameter by 45 cm long) that were kept closed for 60 d. Upon opening, dry matter (DM), ash content (AC), organic matter (OM), and pH were measured. The data were analyzed using a 2-way ANOVA followed by the Tukey test (α < 0.05). The silage of the genotype B012 had a higher (P < 0.05) DM (mean ± standard deviation = 29.3 ± 1.90) compared with the other genotypes (B017 = 27.3 ± 1.54 and B018 = 26.4 ± 1.32). We observed a linear negative effect (P < 0.05) of sugarcane on DM content, in which a reduction of 0.30% of DM was observed for each 10% increase in sugarcane inclusion. We observed an interaction effect (P < 0.05) between genotypes and sugarcane levels for OM and AC. There was no effect of sugarcane levels on OM and AC of the B012 genotype silage (P > 0.05). A quadratic positive effect of sugarcane levels was observed on OM of the silages of the genotypes B017 and B018 (P < 0.05), in which the lowest values were observed at 7.63% and 1.29% inclusion of sugarcane respectively. A quadratic negative effect was observed on AC of the same genotypes (P < 0.05), in which the highest values were observed at the same sugarcane level inclusion as for OM. The silage of the genotype B012 had a higher (P < 0.05) pH (4.26 ± 0.07) than the other genotypes (B017 = 4.14 ± 0.04 and B018 = 4.17 ± 0.06). The genotypes of biomass sorghum evaluated in our study responded satisfactorily to the fermentation process, which could result in silages of good quality, but the inclusion of sugarcane is not recommended.

Key Words: alternative feed, scarcity, ruminants

393 Prediction of compressed sward height of Walloon pastures from sentinel-2 images using machine learning algorithms. C. Nickmilder*1, A. Tedde1, P. Lejeune1, I. Dufrasne2, F. Lessire3, B. Tychon1, F. Lebeau1, and H. Soyeurt1, 1TERRA, ULiege, Liege, Belgium, 2Département de gestion vétérinaire des Ressources Animales (DRA) / Nutrition des animaux domestiques, ULiege, Liege, Belgium, 3Fundamental and Applied Research for Animals and Health (FARAH), ULiege, Liege, Belgium, 4Department des sciences et gestion de l'environnement (Arlon Campus Environnement), ULiege, Liege, Belgium.

ROADSTEP is a Walloon research program aiming to develop decision tools to help farmers in their daily herd monitoring on pastures. One of the aims is to develop a modeling tool to predict the availability of pasture feeding based on satellite images, meteorological variables and soil characteristics. 7737 compressed sward heights (CSH) were measured on 2 farms recorded with Jenquip EC20G platemeter in July and August 2019. They were used to calibrate and validate 73 predictive models of CSH. The tested algorithms were linear regression, lars, cubist, generalized linear model, neural network, random forest and linear support vector machine. The explaining variables were the 11 sentinel-2 reflectance bands at the bottom of atmosphere. Those bands and CSH were introduced directly in the model but also through their logarithm, square-root, square and cube forms to test the possible nonlinear relationships between them. The reduction of dimensionality of X-matrix through the estimation of principal components as well as partial least squares factors was also tested. To guarantee independence between calibration and validation, calibration was made on CSH (ranging from 12 to 158 mm with an average value of 59.4±22.3 mm) measured on a farm and validation on CSH (ranging from 13 to 247.5 mm with an average value of 53.2±21.6 mm) measured on another farm. The model that performed the best was a generalized linear model from the gamma family using an inverse link function. Calibration and validation RMSE were respectively equal to 17.4 and 20.7 mm or 29.3 and 28.9% of their respective mean. These results are only preliminary. Additional sampling periods and pastures are needed to improve the models’ robustness. Moreover, the second step of this research will consist in adding information related to meteorological data and soil characteristics to enhance the prediction power of the developed models.

Key Words: remote sensing, compressed sward height, machine learning
Achieving high animal productivity without degrading the resource base is the primary target in pasture-based dairy farming. This study investigated the effects of changing the forage base in spring from grass-clover pastures to forb or legume-based pastures on milk yield, N partitioning and methane emissions of Jersey cows in Western Oregon. Twenty-seven mid-lactation dairy cows were randomly assigned to one of 3 pasture treatments: grass-clover based pasture composed of festulolium, soft-leaf tall fescue, orchardgrass, and white clover (Grass); forb-based pasture composed of chicory, plantain, and white clover (Forb); and legume-based pasture composed of red clover, birdsfoot trefoil, berseem clover and balansa clover (Legume). Pasture were arranged in a randomized complete block design with 3 replicates. Production and nutritive quality of the forages, animal performance, nitrogen partitioning, and methane emissions were measured. Data were analyzed by ANOVA with pasture as main effect and plot as random (n = 3). Significance was declared with P ≤ 0.05. Herbage production, feed quality, and DMI of cows were greater in Legume and Forb vs. Grass, with consequent larger milk yield and milk solid concentration. Cows grazing Forb also had higher lactose in milk compared with the other pastures, and lower somatic cell counts compared with Grass. Cow grazing Forb had substantially lower N in urine compared with cows grazing the other pastures but, together with cows grazed on Legume, larger fecal N. Both Forb and Legume had a diuretic effect on cows, as indicated by the lower creatinine concentration in urine but larger proportion of allantoin:creatinine and a tendency (P = 0.08) for greater microbial N production. Methane emissions tended (P = 0.07) to be lower in cows grazed on Forb vs. the other pastures. The results indicated a potential for legume- and forb-based pastures to fulfill nutritional deficiencies in late spring resulting in improved animal performance and health and reduced environmental impact of pasture-based dairy production.

Key Words: pasture systems, nitrogen partitioning, methane emission

396 Ruminal metabolism and plasma amino acids in Jersey cows grazing forage canola. L. H. P. Silva1, Y. Zang2, M. Ghelekhkhan1, Y. Geng2, S. L. Dillard1, K. J. Soder3, and A. F. Brito1, 1University of New Hampshire, Durham, NH, 2Chinese Academy of Agricultural Sciences, Beijing, China, 3Auburn University, Auburn, AL, 4USDA-Agricultural Research Service, Pasture Systems and Watershed Management Unit, University Park, PA.

Forage canola is known for high biomass yield and exceptional supply of rapidly digestible carbohydrates, which can alter ruminal fermentation profile. It is also used to extend the fall grazing season. We aimed to evaluate the effect of canola as grazed herbage on ruminal fermentation and plasma AA in lactating dairy cows. Twelve multiparous and 6 primiparous mid-lactating Jersey cows were blocked by parity and, within block, assigned to control (CTRL) or canola (CAN) in a randomized complete block design. Cows in the CTRL group were kept in confinement, while cows in the CAN group were assigned to one of the following pastures (3 blocks each): grass-clover (G), festulolium, tall fescue, orchardgrass and white clover), legume (L; red clover, birdsfoot trefoil, balansa clover and berseem clover), and forb (F; chicory, plantain and white clover). Cows grazed for 39 d over 2 periods. Blood was collected following morning milking at 7 time points over the 2 periods. Twenty-six parameters were assessed in plasma and data were analyzed using GLIMMIX with pasture as the main effect and block (n = 3) as random effect. Compared with G, cows grazed in both F and L pastures had significantly lower (P < 0.05) BHBA (0.45(F) and 0.51(L) vs. 0.59(G) mM) and creatinine (63.9(F) and 64.7(L) vs. 69(G) mM) and higher vitamin E (12.7(F) and 12.8(L) vs. 8.8(G) μg/mL) and FRAP (213.3(F) and 216.8(L) vs. 201.8(G)), supporting an effect on the microbiome, a diuretic effect, and improved antioxidative status. Compared with both G and L, cows in F pasture had significantly lower (P < 0.05) urea (2.9(F) vs. 4.4(G) and 7.4(L) mM) and urea:creatinine ratio (45.8(F) vs. 64.7(G) and 113.9(L)), indicating improved utilization of urea in the rumen. Compared with both G and F, cows in L pasture had significantly higher (P < 0.05) hematoctrit, bilirubin, cholesterol, albumin, β-carotene, retinol, and thiols groups but lower ceruloplasmin, paraoxonase, and myeloperoxidase, indicating a positive health effect of L pasture on liver, inflammation, and red blood cells. Overall, these results indicate that chicory-plantain and legume pastures rich in secondary metabolites can improve animal health, and efficiency of N utilization, compared with the typical grass pasture.

Key Words: pasture, dairy, metabolites