(98%–100%). As a result, the overall digestibility of WCMS remained relatively constant across different starch levels. To overcome this problem, we propose to assess WCMS through a 2-compartment (i.e., stover + grain) digestibility model. We tested this approach experimentally with WCMS from a field study evaluating plant density and harvest time of maize. Stover ME was calculated from the sum of the contributions of ME from leaf, stem, and cob structure, using an in vitro digestibility technique. Grain ME content was calculated from the proportion of grain and literature-reported total-tract digestibility of 98%. Both methods showed similar ME content across treatments (average of 10.7 ± 0.21 and 11.6 ± 0.11, respectively), but the ME estimated through the 2-compartment model was 15% greater, realistically reflecting the nutritive value of WCMS. The 2-compartment approach opens new possibilities in remote monitoring of stover and grain, as well as the integration into mechanistic models to assist producers in making informed decisions regarding diet formulation, yield optimization, variety selection, and harvest timing.

Key Words: whole-crop maize silage (WCMS), stover, grain

1588 Understanding and predicting changes in nutritional value of Kikuyu. J. Insua[1,2], M. Correa-Luna[2,3], R. Islam[2,3], F. M. Hasan[2,3], M. Nikoloric[2,3], J. Gargiulo*[4], P. Beale[2,5], and S. C. Garcia[2,3], [1]*National University of Mar del Plata–CONICET, Mar del Plata, Buenos Aires, Argentina,* [2]*Dairy UP Program, Camden, NSW, Australia,* [3]*Dairy Science Group, School of Life and Environmental Sciences, Faculty of Science, University of Sydney, Camden, NSW, Australia,* [4]*NSW Department of Primary Industries and Regional Development, Australia, Camden, NSW, Australia,* [5]*Local Land Services (Hunter), Camden, NSW, Australia.*

Kikuyu (*Cenchrus clandestinum*) is a high-producing C4 grass used by dairy farms in temperate-warm dairy regions of Australia, but its nutritive value declines rapidly. This study aimed to understand and predict short-term (daily) changes in the nutritional value of kikuyu pasture regrowth by modeling the morphophysiological aspects of plant tissue using the Morphological and Digestibility Pasture (MDP) model. The MDP model, originally developed for a C3 grass, uses daily temperature to drive plant morphology traits (leaf number and length) and fiber digestibility. The model was parameterized for kikuyu and evaluated with detailed data from controlled, plot-scale (~10 m^2 each) experimental periods conducted during the austral summer months of 2022, 2023, and 2024. In replicated plots, a randomly selected 1-m^2 pasture area was harvested at consecutive leaf-appearance intervals to measure herbage mass, plant morphology, neutral detergent fiber (NDF), and 24-h in vitro digestibilities of NDF (NDFD) and dry matter (DMD) of leaf blades. In parallel, leaf morphogenetic traits (appearance, elongation, and lifespan) were measured on marked tillers every 3 d. The MDP model, parametrized with data from the first 2 experimental periods, accurately estimated the changes in NDFD observed in the third experimental period, used for independent model evaluation. Root mean square error was 1.9%, $R^2 = 0.94$, and bias correlation factor was 0.80. The primary factor driving the decline in the nutritive value of kikuyu was the consistent loss of NDFD with leaf tissue aging ($R^2 = 0.77$). This leaf-aging effect explained the steady decrease in pasture DMD across all sampling periods ($R^2 = 0.66$; from 65% to 40%) and the strong negative observed relationship between NDFD and herbage mass ($R^2 = 0.63$), with NDFD reducing by 13 to 16 percentage units per ton of DM per hectare. This study (a) highlights the relevance of monitoring the thermal time of kikuyu regrowth period to prevent milk production losses due to nutritive value decline and (b) provides sound evidence to include real-time modeling of morphophysiological aspects to manage pasture quality.

Key Words: fiber digestibility, leaf aging, modeling

1589 Machine learning increases the accuracy of satellite-derived pasture cover estimation. B. N. Azubuike*[1,2], A. Chlingaryan[2,3], C. E. F. Clark[2,4], and S. C. Garcia[1,2], [1]*Dairy Science Group, School of Life and Environmental Sciences, Faculty of Science, University of Sydney, Camden, NSW, Australia,* [2]*Dairy UP Program, Camden, NSW, Australia,* [3]*Livestock Production and Welfare Group, School of Life and Environmental Sciences, University of Sydney, Camden, NSW, Australia,* [4]*Gulbali Institute, Charles Sturt University, Wagga Wagga, NSW, Australia.*

Accurate estimation of pasture cover is critical for effective farm management and feed budgeting. Satellite-derived indices such as the Normalized Difference Vegetation Index (NDVI), though widely used, often correlate poorly with biomass due to saturation effects with canopy closure, highlighting the need for a more efficient approach. Here, we aim to improve pasture cover prediction using machine learning and optimization techniques to develop a unified framework that integrates raw satellite data with paddock-specific and weather information, while evaluating alternative data processing methods to reduce prediction errors. A series of experiments were conducted using both non-interpolated and interpolated data sets, with the data split by farm. Outlier removal and data interpolation were applied to minimize gaps and temporal mismatches between plate meter and sentinel data sets. Hyperparameter optimization was performed using grid search and cross-validations to determine the optimal model configuration. Models were compared under several scenarios: one where models were built with and without standard vegetation indices (NDVI, EVI, SAVI, NDRE) to assess their contributions; another where interpolation was used to effectively enlarge the data set; and a third where the training data were partitioned into 4 subsets based on week-of-month for progressive training. Additionally, a farm-specific approach was implemented by reserving data from some farms for training and using data from others for testing to capture regional variability. The integrated framework explained 62% to 77% of the variability in pasture cover. Interpolation reduced the MAE from 289 kg DM/ha to 224 kg DM/ha, whereas progressive training achieved ~30% reduction in error. This experiment demonstrates that robust remote cover forecasting is achievable using advanced data manipulation and optimization techniques without heavy reliance on vegetation indices. The framework provides valuable insights for optimal model configuration and improved pasture cover estimates. Overall, the techniques significantly reduced prediction errors and suggest further enhancement potential through expanded data integration, real-time optimization, and inclusion of additional environmental variables.

Key Words: biomass prediction, machine learning, optimization

1590 The effect of grazing perennial ryegrass or perennial ryegrass-white clover swards under varying nitrogen fertilizer rates on dairy cow production. M. H. Bock*[1,2], Z. C. McKay[2], L. Delaby[3], D. Hennessy[4], and B. McCarthy[1], [1]*Teagasc, Animal and Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork, Ireland,* [2]*University College Dublin, Belfield, Dublin, Ireland,* [3]*INRAE, L'Institut Agro, UMR Pegase, Saint-Gilles, France,* [4]*School of Biological, Earth and Environmental Science, University College Cork, Cork, Ireland.*