Hyperspectral remote-sensing estimation of corn leaf water content
Anthony M. Filippi¹, Eric Guenther¹, Lee Tarpley², Abdul Razak Mohammed², Burak Güneralp¹
¹Texas A&M University, ²Texas AgriLife Research & Extension Center
Corn comprises ~10% of global crops, and it contributes to a large portion of U.S. agricultural production. Water stress is one of the most limiting environmental factors to plant productivity, and it is a primary determinant for plant survival. Leaf water content (LWC) can be used to assess plant growth and estimate biomass. Pervious work has shown that LWC can be accurately estimated via remote sensing; however, research on using hyperspectral remote sensing for LWC retrieval for corn leaves is lacking. The purpose of this research is to determine the accuracy of using field hyperspectral spectrometer data to retrieve LWC for corn leaves. The specific objective is to evaluate the efficacy of nonparametric machine-learning algorithms in estimating corn LWC based on hyperspectral data. The 160 field spectral reflectance curves and corresponding LWC data were used to develop LWC-estimation models using random forests (RF), Multivariate Adaptive Regression Splines (MARS), and Stochastic Gradient Boosting (SGB) nonparametric machine-learning algorithms. Despite high multicollinearity of spectra, all models produced acceptable/reasonable root-mean-square error (RMSE) and coefficient of determination values. MARS markedly outperformed SGB and RF for LWC estimation.