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Evaluating Different Learning Tools for Spring Wheat Nitrogen Content Estimation from UAV-Remote Sensing Data

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Monitoring the nitrogen status of spring wheat under different nitrogen treatments is important for effective nitrogen management in precision agriculture. Unmanned aerial vehicle (UAV) integrated with machine learning techniques shows to be a promising tool for precisely estimating crop nitrogen content. In this study UAV-base spectral indices, artificial neural network model (ANN) and Support Vector Machine (SVM) were used to estimate spring wheat nitrogen content. The experiment was conducted on 144 spring wheat plots located at Parma Research and Extension Center, ID on six different spring wheat varieties and six different nitrogen rates. A rotary-wing UAV equipped with a multispectral sensor (RededgeM, Micasense Systems) was used to acquire very high spatial resolution images of the related plots. Validation of the methods was based on the cross-validation procedure and using three statistical indicators: R^2 , RMSE and relative RMSE. The cross-validated results identified all models providing accurate estimates of canopy nitrogen content in spring wheat crop.