Using Hyperspectral Data to Map Agricultural Crop Health and Biomass for Precision Agriculture

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Only very recently has the technology been available to characterise agricultural crop condition in an accurate and synoptic fashion. Airborne hyperspectral sensors now provide unprecedented data quality and spatial detail. Sophisticated algorithms for the analysis of these data have existed for a number of decades in the form of canopy reflectance model inversions. However, data availability and the knowledge of model parameter variations have limited the application of such algorithms.

Theoretically, the inversion of canopy reflectance models can be used to map many significant canopy parameters. Two such parameters are the leaf area index (LAI) indicating the spatial variability in biomass, and leaf chlorophyll concentrations, indicating variability in crop nutritional status. An attempt has been made to map these two parameters for a single agricultural field using *casi* airborne hyperspectral data. Although an acceptable set of LAI values was retrieved, the values for leaf chlorophyll concentration were less encouraging. Further work is being carried out to improve the model inversion process by determining the variability in model parameters by direct measurements. This has been carried out through the complete growth cycle for a range of agricultural crops. This paper discusses the physical basis for the canopy model used and prospects for its application to the mapping of parameters to aid the development of precision agriculture.

Key Words: hyperspectral, *casi*, agriculture, leaf area index (LAI), chlorophyll, canopy reflectance model.