Assessing crop and weed management impacts on wheat crop and weeds through drone-based remote sensing

Shirmith Nirmal[1], Rob Gulden[1], Steve Shirtliffe[2], Christian Willenborg[2] and Dilshan Benaragama[1*]

[1]Department of Plant Science, Faculty of Agricultural and food Sciences, University of Manitoba, 66 Dafoe Road, Winnipeg, MB, R3T 2N2, Canada

[2]Department of Plant Science, College of Agriculture and Bioresources, University of Saskatchewan, 51 Campus Drive, Saskatoon, SK S7N 5A8 Canada

[*]dilshan.benaragama@umanitoba.ca

Advances in drone-based remote sensing have enabled the detection of crop and weed responses to management practices, addressing challenges posed by spatial-temporal variability in large-scale farming. Field experiments were conducted at the University of Manitoba and the University of Saskatchewan to explore the possibilities of detecting crop and weed spectral and structural responses to integrated weed management-IWM (high seeding rate, narrow row spacing and early planting vs. standard) and some of the 4R nutrient practices: N rate (100% vs 50%), N timing (fall vs. spring), and N placement (broadcast vs. side banding) using drone attached multispectral sensor. The Green Normalized Difference Vegetation Index (GNDVI) was able to best distinguish crop temporal spectral response to IWM strategies. Similarly, GNDVI and excess green index could detect differences in weed spectral changes due to IWM. Weeds under IWM had 26% and 19% lower weed ground cover compared with standard practices at two and four weeks after seeding, respectively. The effect of fertilizer management was not prominent due to dry conditions in 2023. These preliminary results showcase the capability of detecting crops and weed spectral and structural information with the potential to develop into spatial or temporal maps for data-driven decision making.