Development of Remote Sensing Tools to Evaluate In-Field Results of Best Management Practices (BMPs) for Peas

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Abstract

Remote sensing technologies such as LiDAR are gaining traction for high-throughput plant phenotyping, though its use in agronomic decision-making remains under-exploited. This study investigates the application of LiDAR technology to evaluate pea crop growth and development for farm-scale assessment of crop response to BMPs. A field experiment was conducted in 2024 at the Carman Research Field, Manitoba, Canada, where field pea (*Pisum sativum* L.) was grown with different sowing times (Early and Late) and five different rates. A drone-based LiDAR sensor was employed to image crops at weekly intervals. Ground truth data was collected during each drone flight. Digital Surface Models (DSM) and Digital Elevation Models (DEM) were generated from the LiDAR point cloud. These were used to create Canopy Height Models (CHM). A strong linear relationship (R^2 = 0.92, RMSE = 6.2) between LiDAR-derived crop height and ground-truth measurements was observed. Interestingly, LiDAR-derived crop volume, which can be a proxy for crop biomass, clearly showed a non-linear sigmoid relationship as a response to increasing seeding rate. Further, a similar sigmoid relationship was observed between volume and grain yield. These preliminary results indicated the potential for exploring these tools further for spatial and temporal pea growth and yield mapping.