Image-based remote approach of Canola yield modelling with cumulative temporal ground cover for precision agronomy

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Agronomic technological advancements provide more precise means to establish methodologies that can estimate yield response in many different ways. We are experimenting with a new image-based technique to predict the yield response of Canola using the rate of ground cover accumulation. Our trial was composed of row spacing and seeding rate as factors that influence the growth and the spatial distribution to evaluate its influence on the yield. Using the Visible Band Difference Vegetation Index (VDVI) from digital images, we estimated the ground cover and modelled the change over time. We regressed ground cover accumulation and integrated the function to calculate the area under the curve to regress against yield. Preliminary analysis indicates that the green ground cover accumulation overtime is sufficiently correlated with the yield ($F=168.1$, $p=2.2e-16$, $R^2=0.4694$). Further, our results suggest the amount of green ground cover accumulation over time is dependent on the seeding density and row spacing. The analysis shows the higher seeding densities, 40 plants/m2 and above, acquire biomass rapidly, and the most stable yield predictions with ground cover are likely reached at similar plant densities. The most stable yield predictions in-relation to row spacing obtained from either 0.3m, 0.45m or 0.6m spacing (R-squares 0.94, 0.93, and 0.89, respectively). We are further experimenting to understand what growth period of the crop is most suitable for ground cover based yield predictions. Our primary target is to develop a high throughput image-based methodology to estimate the yield response using the ground cover accumulation rate for on-farm precision agronomy.