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Development of analytical tools for drone-based canopy phenotyping in soybean breeding

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Agronomy Department Characterization and selection of phenotypes acquired from image analysis represents a low-hanging fruit for genetic improvement of yield potential in crops. In contrast to point or plant based spectral reflectance, image analysis allows direct measurement of spatial or field based traits that are known to be valuable, such as canopy coverage and vegetation indices, collected from the field with high-throughput platforms such as unmanned aircraft systems (UAS). When applied to breeding pipelines, such phenomic tools are most effective when they overcome bottlenecks created by the limited quality, quantity, and reliability of phenotypic information, such as for early-season and early-generation selection. In addition, metrics derived from UAS imagery can increase the accuracy of yield estimation in advanced yield trials, and provide precision metrics for marketing. Since 2014, our team has been using UAS-based phenotypes in a soybean breeding pipeline and for association mappings and in 2017 we initiated a project to develop more analytical tools for multi-environment data. Preliminary results are promising for use of canopy parameters for selection of soybeans in early generations. We also present some of our existing analytical tools, and progress for those under development.