

Understanding the Phenotypic Variation Among the Soybean (*Glycine max* L.) Lines by Using Crop Modeling and Remote Sensing

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Abstract

ORCID: [<https://orcid.org/0000-0003-0655-2343>] Increasing weather variability is affecting the overall productivity of agriculture. In this scenario, current crop improvement science is essential to improve productivity while retaining the quality of plant products. There has long been an interest in using process-based modeling to examine the interaction between environment and genotype. The methodological challenges to better predict how various environmental conditions may impact novel genotypes and it has been a fundamental barrier to model parameterization. Thus, a phenotypic campaign was conducted to collect a comprehensive physiological dataset from a panel of 25 genotypes (including both breeder panel and diversity panel) in the summer of 2022. Additionally, an unmanned aerial vehicle (UAV) was used to gather remote sensing data. The red-green-blue (RGB) 3D point cloud, NDVI (Normalize difference vegetation Indices), and LIDAR (Light detection and ranging) were also used to identify the trait variations among the genotypes. The data is being analyzed to explain the physiological and phenotypic trait differences. The outcome of this project would help to develop a genetically informed, realistic soybean model. Finally, it will help breeders and growers in locating high-yielding cultivars for the appropriate geographical areas.



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Increasing weather variability is affecting the overall productivity of agriculture. In this scenario, current crop improvement science is essential to improve the productivity while retaining the quality of the plant products. There has long been an interest in using process-based modeling to examine interaction between environment and genotype. The methodological challenges to better predict how various environmental conditions may impact novel genotype and it has been a fundamental barrier for model parameterization. Thus, a phenotypic campaign was conducted to collect a comprehensive physiological dataset from a panel of 25 genotypes (including both breeder panel and diversity panel) the summer 2022. Additionally, unmanned aerial vehicle (UAV) was used to gather remote sensing data. The red-green-blue (RGB) 3D point cloud, NDVI (Normalize difference vegetation Indices), and LIDAR (Light detection and ranging) were also used to identify the trait variations among the genotypes. The data is being analyzed to explain the physiological and phenotypic trait differences. The outcome of this project would help to develop a genetically informed, realistic soybean model. Finally, it will help breeders and growers in locating high-yielding cultivars for the appropriate geographical areas.