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Presentation Topic:

PHENOMICS: AN IMAGE-BASED PHENOTYPING TECHNOLOGY FOR CROP IMPROVEMENT IN MAIZE

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Abstract: Phenotyping of crop plants play a key role in crop growth monitoring and breeding better crop plants particularly in maize. However, manual phenotyping methods are labour and time intensive in nature. Most of the manual traits are collected through destructive way as end of season traits. Recent innovations in the field of agriculture includes image-based technologies available to evaluate key morpho-physiological traits throughout the growing season on organism wide scale (Phenome). Variety of imaging sensors are demonstrated to be used in maize crops for crop growth

monitoring through measurement of visible and non-visible morpho-physiological trait, prediction of plant health status and yield, identification of superior donor, QTLs associated with complex biotic and abiotic stress tolerance etc. Tassel Image-based Phenotyping System (TIPS) is one such a system for automated image-based phenotyping of tassel architecture in maize. DeepCob is one another precise and high-throughput analysis platform developed for phenotyping cob in maize. MVS-Pheno is a low cost and portable phenotyping platform for measuring morphometric traits using 3D Reconstruction in maize. 3DLIDAR sensor used for measuring row spacing and plant height in maize. Hyperspectral imaging sensor are used for automatic measurement of leaf chlorophyll content, nitrogen content and sucrose content (physiological and biochemical traits) in maize. Number of researchers have used image-based phenotyping technology for breeding drought tolerant maize varieties. Recent technological advances in drones, sensors, and computational resources are allowing the automatic, high throughput, non-destructive and precision phenotyping data available to breeders. The large-scale field phenotyping of maize crop using unmanned aerial systems and controlled environmental phenotyping systems provide additional advantage in studying the genotype (G) and environmental (E) interaction separately. This is beneficial in a breeding context as it allows breeders to understand variation in environmental responsiveness between varieties and to potentially develop varieties more resilient to increasingly extreme weather events.

Keywords: maize, image-based phenotyping, phenomics, precision, visible, LIDAR, UAV