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## **Sensing System for Real-time Corn Seed Localization (Seed Spacing, Depth, and Geo-location)**

Planting is one of the most critical stages in crop production because this stage provides an opportunity to place seeds in conditions for uniform emergence, setting the foundation for attaining maximum yield. Uniform seed spacing and uniform seeding depth are two of the most essential parameters to achieve desired plant density and uniform emergence. To overcome this gap a promising sensing and measurement system (SMS) system to measure real-time seeding depth, seed spacing, and seed location during planting has been developed at Kansas State University by a team including Ajay Sharda as Primary Investigator, Sylvester Badua as Graduate Research Assistant, and David Flippo Researcher.

This novel technology consists of an all integrated SMS package to precisely measure real-time seed position in the trench, depth of seed trench, and seed geo-location (collectively called Seed Localization System) with capability to be mounted on row-by-row basis. The SMS is precisely mounted between opening disc and closing wheel, with additional lighting to rapidly capture data from all sensors to provide accurate data to quantify seed localization. This system was expected to substantially improve the ability to acquire seed localization on a spatial scale. In addition, it was expected to almost eliminate the practice of digging plants to ascertain seeding depth, thereby tremendously helping researchers conducting planting systems research within academia, and industry. It was also expected that this kind of sensing system could provide equipment manufacturers an opportunity to acquire real-time feedback of spacing and seed trench depth to optimize row unit operation both from metering and downforce management.

The SMS system was validated during real-field operation by capturing real-time data from all the sensors and images of seeds in the seed trench during planting. Overall, the results indicated that 98% of the recorded seeding depths were within the acceptable tolerance of 10% error, which suggests that the SMS can measure seeding depth accurately and in real-time.