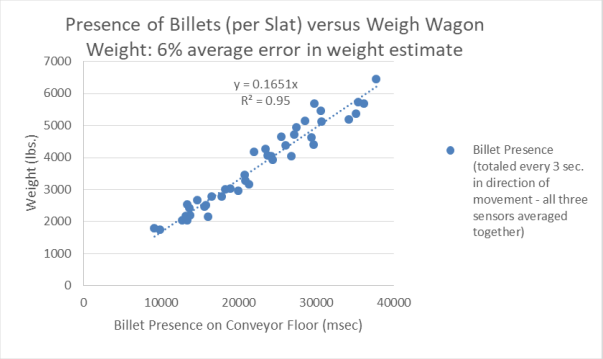
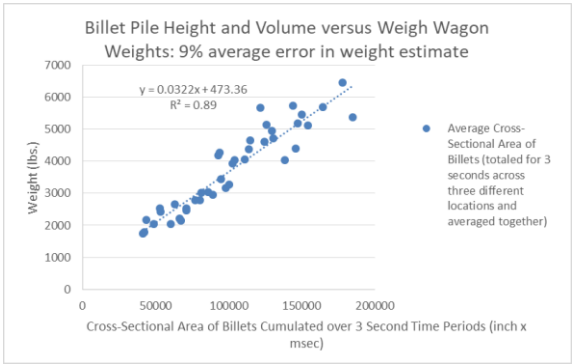
OPTICAL YIELD MONITOR FOR A SUGARCANE HARVESTER

Randy Price
Dean Lee Research Station

A new optical yield monitor was constructed for the sugarcane industry that was composed of three laser distance sensor and a high speed analysis chip. The software was setup in such a way that the data flow from each senor was collected (and stored) individually, and then quickly analyzed (after a certain time period) for floor and material height, area under curve, and duty cycle of billets. This method allowed for a floating floor height to be determined for each timing cycle and reduce problems from sensor drift and temperature change (which had be experienced in previous years). Results for the yield monitor using this approach are show in Figures 1 and 2. Figures 1 show a very good fit between individual weigh wagon weights and sensor readings, with a linear calibration line and an R-square of 0.95 for the billet presence per slat (duty cycle) and 0.89 for the material height factor. An example of a yield variance map made with the





monitor is show in Figure 2.

Figure 1: Calibration results from yield monitor for duty cycle (presence of billet per slat) and hieght and volume.

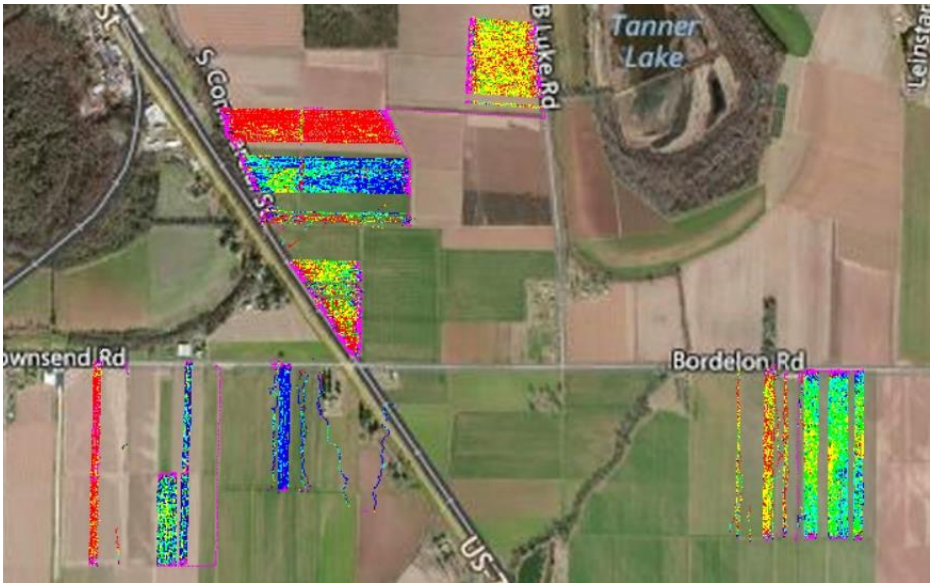


Figure 2: Example of yield maps made with the monitor.

In addition, further studies were performed to determine the number of sensor readings needed to give the best results for yield prediction and are shown in Table 1. These values indicate that the duty cycle reading performed the best when are all three sensors outputs were included, while the material height and area factor performed best with only the right sensor included, or the right and left sensor combined.

Table 1: Error Estimate from Calibration Line Based on Number of Sensors used in Regression Equation

Duty Cycle		
Sensor Combination*	**R-square**	**Error Estimate (%)**
1	**0.73**	**14.6**
2	**0.09**	**34.1**
3	**0.88**	**8.6**
1,2	**0.7**	**15.4**
1,3	**0.85**	**9.6**
2,3	**0.91**	**8.2**
1,2,3	**0.95**	**7**

Height/Area		
Sensor Combination*	**R-square**	**Error Estimate (%)**
1	**0.71**	**16.2**
2	**0.41**	**25.3**
3	**0.93**	**8**
1,2	**0.58**	**19.9**
1,3	**0.93**	**8.2**
2,3	**0.89**	**9.4**
1,2,3	**0.89**	**9.8**

*Sensor numbers relate to 1 - left side, 2 - middle, and 3 – right side in a driver facing forward orientation.

**Testing was performed with the conveyor loading on the left side of the combine, although a few data points were recorded with the conveyor on the right side of the combine.