

QUANTIFYING INSTANTANEOUS ACCURACY OF COTTON YIELD MONITORS

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Introduction

One of the first questions asked by potential cotton yield monitor users is “What is the accuracy of the system?” This question is difficult to answer because yield monitor accuracy is defined at least three different ways. Field accuracy or field error is the accuracy over an entire field and is most commonly used by sales people when discussing a yield monitor because it usually results in the highest accuracy. This occurs because, over an entire field, measurement errors average themselves out. Load accuracy or load error is the accuracy over a basket load of cotton and is most often reported by researchers. Instantaneous accuracy is the accuracy of each yield data point – something very difficult to measure but, ultimately, the most defining characteristic of a yield monitor.

Objectives

To assess the instantaneous accuracy of all commercially available cotton yield monitoring systems.

Materials and Methods

We attempted to obtain (by purchasing or upgrading) the newest version of each of the four commercially available cotton yield monitoring systems. For various reasons, we were only able to obtain functional versions of the Ag Leader® and AGRIPlan®, systems. We equipped two ducts of a John Deere 9965 4-row cotton picker with sensors from each of the systems. Sheet metal bagging mechanisms which allowed us to capture and bag the cotton flowing from each duct were designed, fabricated, and installed in the cotton picker. The intent of the study was to compare the yield monitor yields and bagged yields from the shortest possible harvest interval. Because most yield monitors record data at 1s intervals, in theory, 1s was the shortest possible interval available for comparison. In reality, this was impossible to achieve since the baggers were manually operated. After extensive time trials, we concluded that 3s was the shortest achievable sampling interval. For comparison purposes we also added sampling intervals of 5s and 7s. We bagged and weighed cotton passing by the yield monitors for 3, 5, and 7 second intervals (the “plots”) which corresponded to 15.6, 26.0, and 36.4 ft of travel, respectively. Sixteen randomized plots were harvested. We then compared the weights of the bagged cotton to the yield recorded by the yield monitors for that same interval.

Results and Discussion

We found that instantaneous accuracy was not affected by yield or by the 3 harvest intervals we selected. Instantaneous accuracy errors ranged from 0% (remarkable) to 40% (Fig. 1). In general, most yield monitor readings were within 15% of the bagged weights. There was good correlation between plot weights as measured by the Ag Leader (Fig. 2) and AGRPlan (Fig. 3) systems when compared to the bagged weights with R^2 values of 0.90. These findings are consistent with earlier results which found that when properly calibrated and properly maintained, the Ag Leader® and AGRPlan® cotton yield monitors will reliably deliver load accuracies of 5% or better. Under these conditions, cotton farmers can expect an accurate depiction of yield variability within their fields. At the very least they can expect yield monitors to provide a realistic estimate of the "relative" yield differences within a field.

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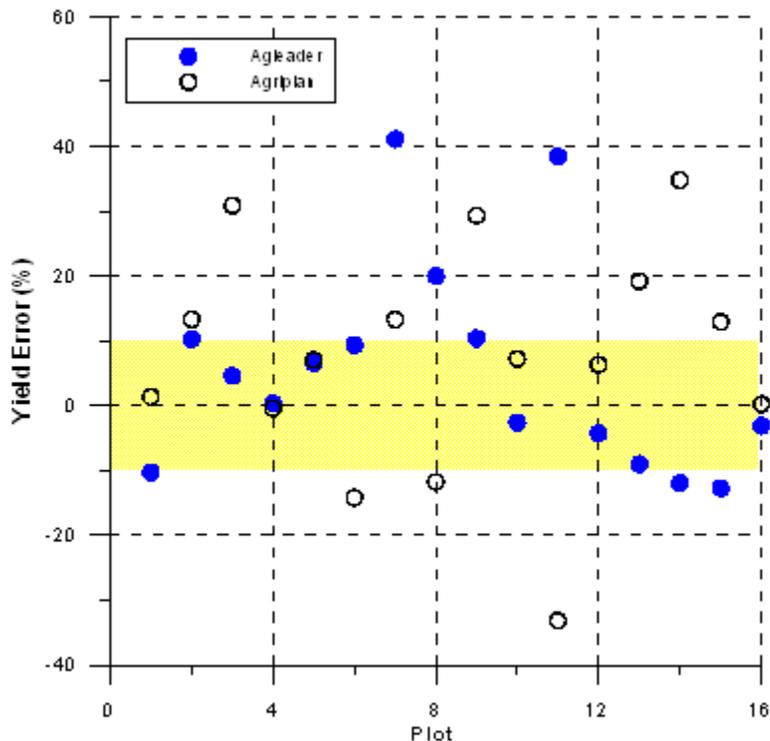


Figure 1. Error in yield determined by Ag Leader and AGRPlan yield monitor system for each instantaneous test plot.

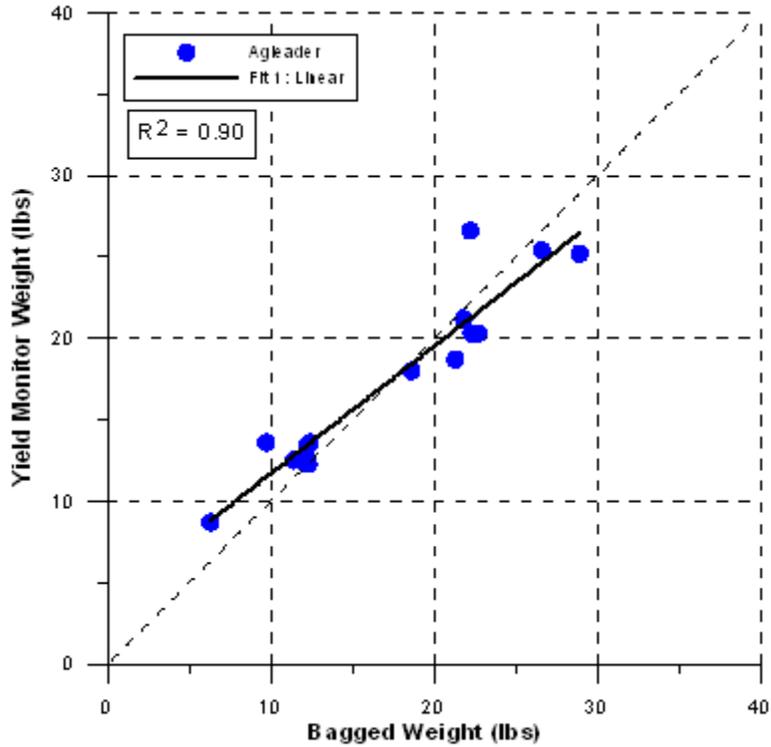


Figure 2. Comparison of Ag Leader weight to weight from bagged cotton in test plots. The diagonal dashed line

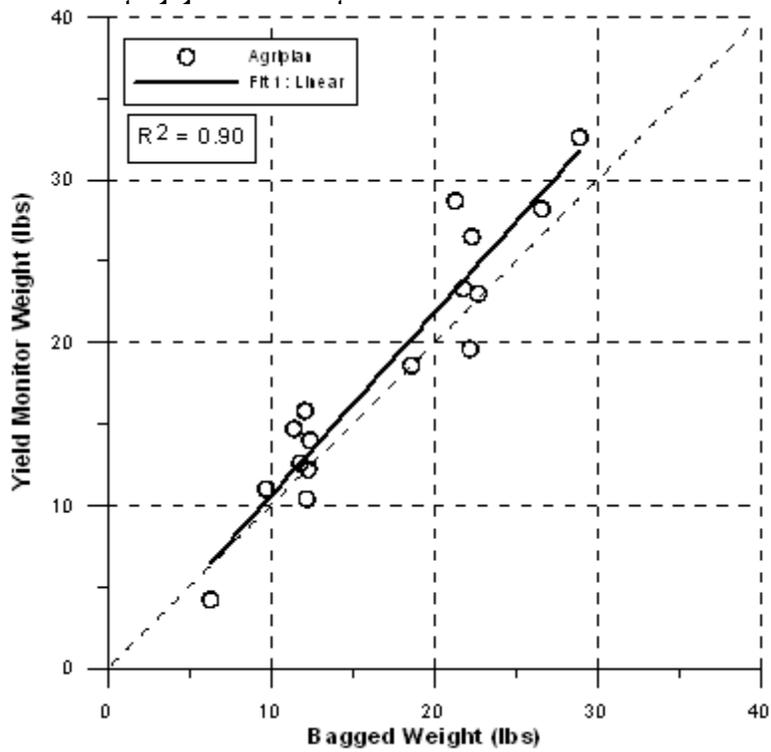


Figure 3. Comparison of AGRiplan weight to weight from bagged cotton in test plots.