High Yielding Soybean Production

(findings from the Soybean Yield Benchmarking Survey)

Farmer fields from the soybean yield benchmarking survey were clustered together using technology extrapolation domains (TEDs). The TEDs are based on four attributes that govern crop yield and inter-annual variability: total annual growing degree-days, aridity index, annual temperature seasonality, and plant available water holding capacity within the root zone.

Only 5 TEDs with coverage in Iowa contained the critical number of surveys in 2014 and 2015 (Figure 1). This summary only includes TEDs that contained greater than 98 surveyed fields. Project-wide each TED averaged 137 fields.

The average yield gap from farmer realized yield to estimated yield potential was 23.4% (Figure 2). Based on survey respondents, the average soybean yield was 58 bu/ac across TEDs (range of 50 to 63 bu/ac. The 2-year state average was 54 bu/ac and the average estimated yield potential was 75 bu/ac.

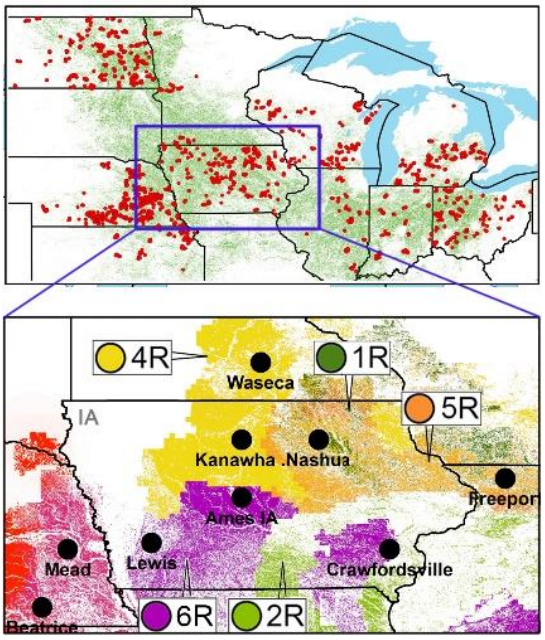

Figure 1. Map showing five technology extrapolation domains (TEDs, bottom map) with a critical number of survey respondents in 2014 and 2015 with Iowa coverage. The location of all survey respondents are illustrated by red points in the top map.

A first approach to explaining the yield gap required breaking the fields within TEDs into thirds using the upper and lower third of fields to represent the high and low yielding management practices. This approach identified planting date, tillage, in-season foliar fungicide and/or insecticide, artificial drainage, and soybean maturity group as statistically significant soybean yield indicators.

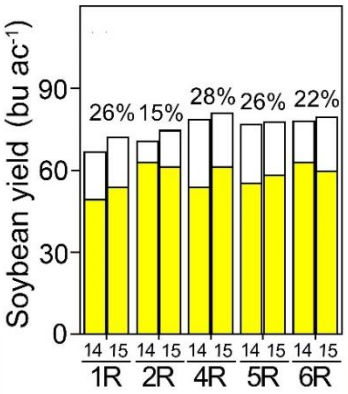

Figure 2. Yield potential for identified TEDs in 2014 and 2015 for Iowa. Solid bars represent the average farmer reported soybean yield and open bars represent the estimated yield potential. The percentage values is the 2-year average yield gap for the individual TED.

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An early planting date was a strong indicator of high yield potential, especially in the TEDs 1R, 4R, and 5R in northern Iowa where the yield decline was greater than 0.4 bu/ac/day. In the southern TEDs (2R and 6R) there was only a 0.15 – 0.20 bu/ac/day yield decline (Figure 3).

Overall, in 7 of 10 TEDs there was a significant management affect associated with foliar fungicide/insecticide use (Figure 4). Whereas there was only a significant tillage or artificial drainage management effect in only 4 of 10 and 2 of 7 TEDs, respectively (Figure 4).

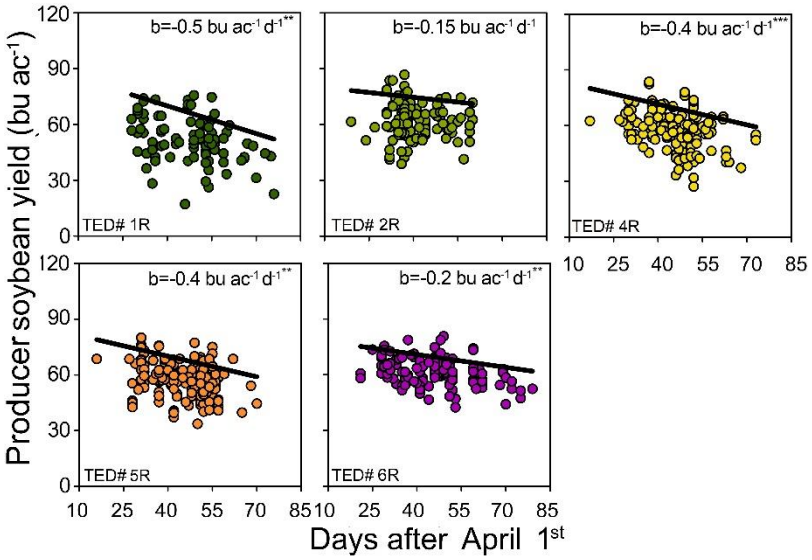

Figure 3. Farmer reported soybean yields plotted against the planting date. The solid line is the fitted boundary function using the 90th percentile.

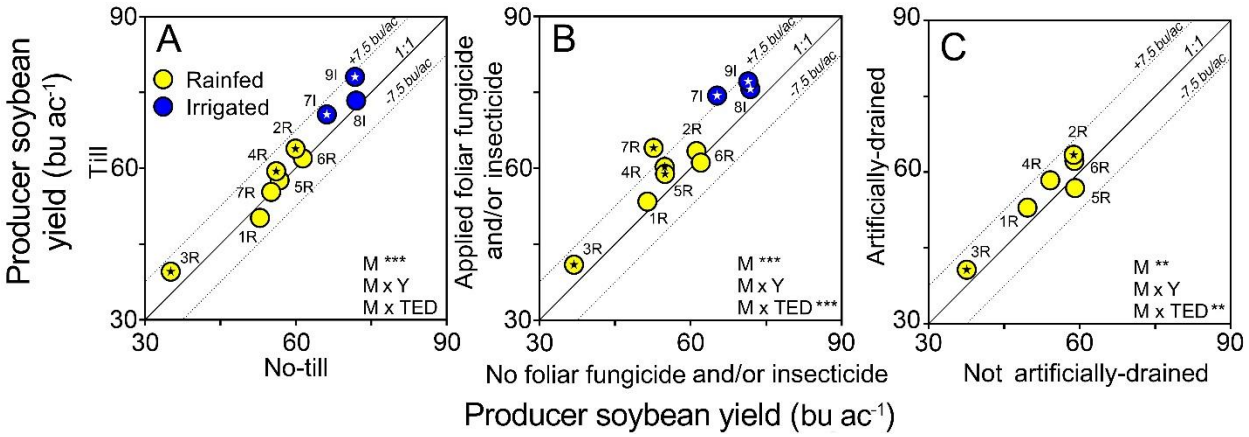

Figure 4. Comparison of farmer reported soybean yield between management groups (left, tillage vs no-tillage; center, fungicide/insecticide vs no fungicide/insecticide; and right, drainage vs no drainage). The TEDs with stars indicate significance of the impact on yield with respect to the specified management factor.

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