# Soybean Planting Date Response in Illinois

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## Introduction

Planting date recommendations for soybean [*Glycine max* (L.) Merrill] have been revised over time, and recently late April and early May plantings have shown to increase yields over mid- and late May-planted soybean. These recommendations are important for soybean producers; however, there has been some inconsistency in planting date responses and the scope of these studies have been limited within Illinois.

## Objective

Utilizing two previous studies, our purpose was to evaluate planting date response throughout Illinois. In addition, we sought to investigate the consistency of the planting date response across environments.

## Study Design and Sites

- Design varied by study with planting date as main plot in a split-plot design or as part of a factorial design. Trials were laid out as a RCBD.
- Six locations: Brownstown (south central IL); DeKalb (north central IL); Dixon Springs (southern IL); Monmouth (northwestern IL); Perry (west central IL), and Urbana (east central IL)
- Three years: 2010, 2011, and 2012
- Experimental units were 3 m wide and ranged from 7 to 18 m long

## Materials and Methods

- Four target planting dates with windows of 15 to 22 April, 3 to 10 May, 20 to 27 May, and 7 to 14 June.
- Trials also included factors of row spacing (76 and 38 cm) in all years. In 2010 and 2011 seeding rate was included. In 2012, foliar fungicide use was included.
- Previous crop was corn [*Zea mays* L.]
- Soybean varieties were chosen by location to be locally adapted, mid-range maturity, and glyphosate-tolerant. Seed was treated with fungicide and insecticide.
- Trial maintenance consisted of both pre-emergence and post-emergence herbicides, plus hand-weeding as needed.
- Each plot was harvested using a plot combine, with yields corrected to 87% dry weight.

Table 1. Monthly rainfall by environment

| | Brownstown (BRN) | | | | DeKalb (DEK) | | | |
|---|---|---|---|---|---|---|---|---|
| Month | 2010 | 2011 | 2012 | Avg† | 2010* | 2011* | 2012* | Avg |
| | mm | | | | | | | |
| May | 139 | 51 | 113 | 138 | 123 | 220 | 81 | 103 |
| June | 229 | 302 | 25 | 105 | 175 | 107 | 19 | 114 |
| July | 138 | 97 | 1 | 101 | 99 | 101 | 62 | 105 |
| August | 40 | 12 | 227 | 76 | 119 | 108 | 61 | 114 |
| September | 74 | 86 | 188 | 81 | 50 | 97 | 39 | 85 |

| | Dixon Springs (DXS) | | | | Monmouth (MON) | | | |
|---|---|---|---|---|---|---|---|---|
| Month | 2010 | 2011 | 2012 | Avg | 2010* | 2011* | 2012* | Avg |
| | mm | | | | | | | |
| May | 121 | 190 | 11 | 141 | 279 | 172 | 119 | 121 |
| June | 100 | 196 | 31 | 103 | 285 | 176 | 120 | 114 |
| July | 54 | 116 | 99 | 98 | 81 | 53 | 14 | 104 |
| August | 68 | 102 | 42 | 84 | 46 | 11 | 92 | 120 |
| September | 63 | 168 | 139 | 90 | 137 | 72 | 119 | 95 |

| | Perry (ORR) | | | | Urbana (URB) | | | |
|---|---|---|---|---|---|---|---|---|
| Month | 2010* | 2011 | 2012 | Avg | 2010* | 2011* | 2012 | Avg |
| | mm | | | | | | | |
| May | 125 | 111 | 32 | 107 | 78 | 122 | 90 | 124 |
| June | 271 | 279 | 19 | 109 | 198 | 107 | 46 | 110 |
| July | 291 | 3 | 27 | 110 | 90 | 40 | 14 | 119 |
| August | 95 | 8 | 86 | 98 | 40 | 45 | 142 | 100 |
| September | 122 | 27 | 116 | 92 | 76 | 71 | 142 | 80 |

† 30 Year Averages from 1981 to 2010 (Illinois State Water Survey)
* Indicates sites with mean yields exceeding 3,800 kg ha$^{-1}$

## Results

Table 2. ANOVA by high and low yield levels of soybean yield for planting date and environment effects, as well as interactions.

| Effect | High Yield | Low Yield |
|---|---|---|
| Planting Date (D) | NS† | NS |
| D$^2$ | * | NS |
| Environment (Env) | * | * |
| Block(Env) | * | * |
| Env*D | NS | * |
| Env*D$^2$ | NS | * |

* Significant at the *P = 0.05* probability level
† NS = not significant at *P = 0.05*

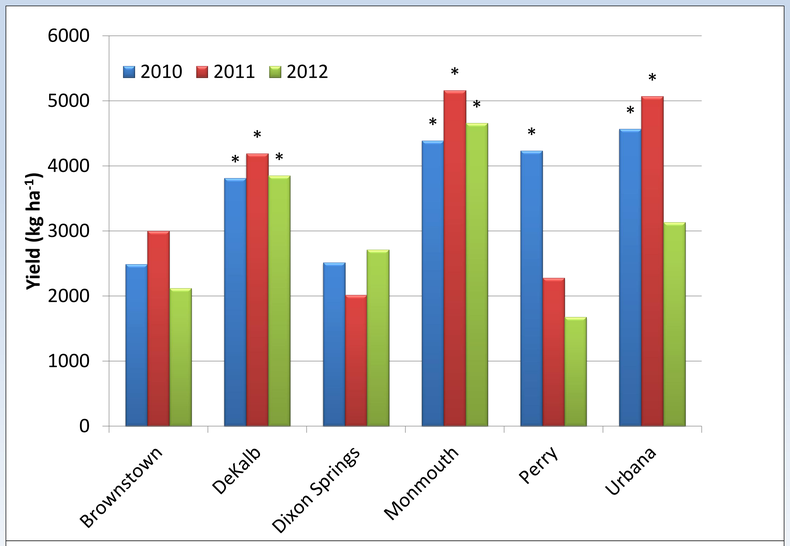


Figure 1. Yield of individual environments averaged across other treatments. High yield level is indicated by *.

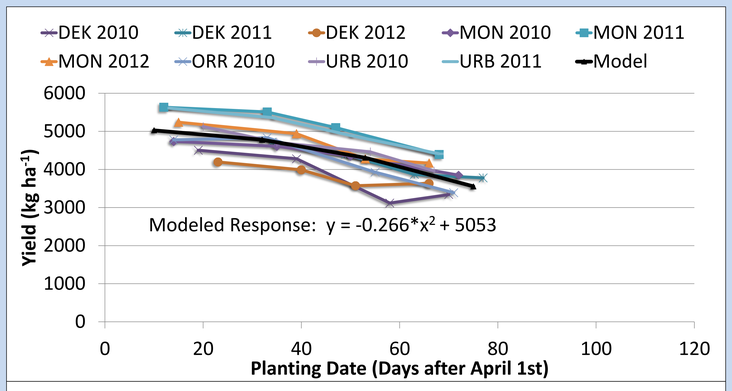


Figure 2. Mean yield response of soybean to planting date in high-yielding environments and modeled response across these nine environments.

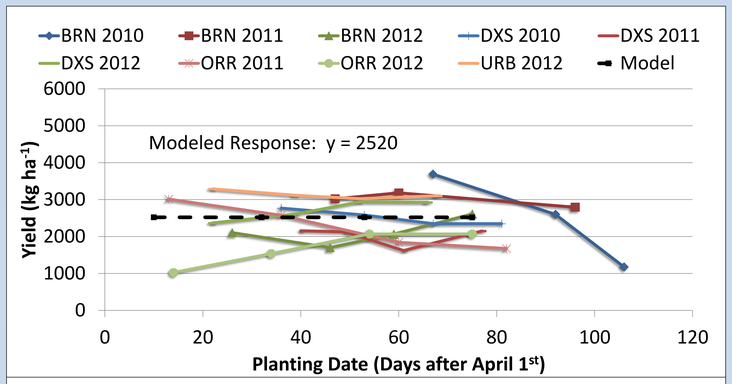


Figure 3. Mean yield response of soybean to planting date in low-yielding environments modeled response across these nine environments.

## Summary and Conclusions

- Soybean yields responded consistently to planting date when the trial average yield was greater than 3,800 kg ha$^{-1}$ (Table 2; Fig. 2).
  - Yields declined in a curvilinear fashion as planting was delayed.
  - Yield loss per day more than tripled, from 10.1 on April 18$^{th}$ to 37.8 kg ha$^{-1}$ day$^{-1}$ on June 11$^{th}$ for the high yield level sites.
- Sites with yields below 3,800 kg ha$^{-1}$ did not respond to planting date on average (Fig. 3), though there was variability among environments (Table 2, Fig. 3).
  - Extremely dry conditions often caused flat or only small planting date responses, especially in southern IL (Fig. 1; Fig. 3).
  - Rainfall late in an abnormally dry summer in 2012 caused late-planted soybean to yield more than early-planted ones in some cases (Fig. 3).
- Late planting can be a major yield-limiting factor under very favorable growing conditions, but may have little effect on yield under less-favorable conditions.
- With seasonal growing conditions typically unknown before the season, sound management should include early planting when possible as a way to maximize yield potential.

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