THINK TWICE BEFORE REPLANTING SOYBEANS

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Introduction

Soybean planting date trends have steadily shifted earlier within the Northern Corn Belt while inclement weather, insect pressure, and disease pressure associated with spring planting can require replanting some years (USDA-NASS, 2011). Furthermore, recent studies have reported similar yields among reduced plant stands due to the soybean plants compensatory ability (Carpenter and Board, 1997) and diminished yield potential of replanted or essentially later planted soybeans (Conley et al., 2012; De Bruin and Pedersen, 2008). Ultimately, producers would like to know the potential yield gain or loss from replanting sub-optimal plant stands to help determine if replanting is economical. Therefore the objectives of this study were to:

- determine the threshold for replanting soybean stands.
- evaluate replanting options.
- quantify the effect of seed treatments and planting date on replant decisions.

This study was conducted in 2012 and 2013 at the Arlington Agricultural Research Station, Arlington, WI. Twelve different replant scenarios were planted in 15 inch rows during early May, late May, and mid-June. The replanted portions of the plots were interseeded between the rows of the initial soybean stand. ApronMaxx RFC and CruiserMaxx (Syngenta Crop Protection) seed treatments were used to compare a fungicide only seed treatment with one that also contains an insecticide.

Determine the Initial Plant Stand

The first step in making an informed replant decision is determining the initial plant stand. Soybean stands can be deceiving to the eye sometimes, especially in narrow rows (<15 inch), where stands can be greatly underestimated. Therefore, using the hula hoop method or counting the number of plants in a row is needed to accurately determine the plant stand. If severe weather causes stand reduction and/or plant injury, stand counts should be performed 3-5 days after damage has occurred to give the plants time to recover. Only live plants that are expected to survive should be counted (Table 1).

Table 1. Plant conditions when determining survival after severe weather.

Plant Condition	Will the plant survive?
Plant cut off below the cotyledons	No
Plant missing only one cotyledon	Yes
Plant missing both cotyledons but growing point intact	Yes
Plant cut off above unifoliate leaves	Yes
Plant lightly bruised on the stem	Yes
Plant heavily bruised and folded over	No

Counting Plants in a Row

When determining the plant stand with this method, count the number of plants in a length of row based upon your row spacing (Table 2). Do this at least five times in different areas of the field and calculate the average, then multiply that number by 1,000 to get the number of plants per acre (plant stand).

Table 2. Length of row to count for 1/1000th of an acre at different row spacings.

Row Width (inches)	Length of Row*
30	17.4 feet
20	26.2 feet
15	34.8 feet
10	52.3 feet
7.5	69.7 feet

*Length of Row = (43,560 ÷ row width(ft)) ÷ 1000

Hula Hoop Method

When determining the plant stand with this method, randomly toss any round hoop with a known diameter on the ground and count the number of plants within the hoop. Do this at least five times in different areas of the field and calculate the average, then multiply that number by the appropriate multiplier (Table 3) to get the number of plants per acre (plant stand).

Table 3. Multiplier to use based upon the diameter of a round hoop.

Hoop Diameter (inches)	Multiplier*
18	24,662
21	18,119
24	13,872
27	10,961
30	8,878
33	7,337
36	6,165

*Multiplier = 43,560 ÷ ((hoop radius^2 x 3.14) ÷ 144)

Replant Threshold

Our study showed that the highest yields were achieved with initial plant stands >100,000 plants/a (Figure 1). This is consistent with Lee et al. (2008), who stated soybeans in Kentucky require plant stands above 100,000 plants/a to achieve 95% of maximum yield. This is further demonstrated by the initial seeding rates of 40000, 60000, and 80000 seeds/a with no replanting, which produced final plants stands well below 100,000 plants/a and yielded 10, 5, and 4 bu/a less than the maximum yield, respectively (Figure 1). However, when these same plant stands were filled in and the final plant stands were subsequently increased above 100,000 plants/a; significant yield increases of 7, 2, and 2.5 bu/a were attained, respectively (Figure 1). Replanting initial soybean stands <100,000 plants/a significantly increased yield, but not to levels attained by initial plant stands >100,000 plants/a, where replant is not beneficial. Therefore, the threshold for soybean replanting is 100,000 plants /a.

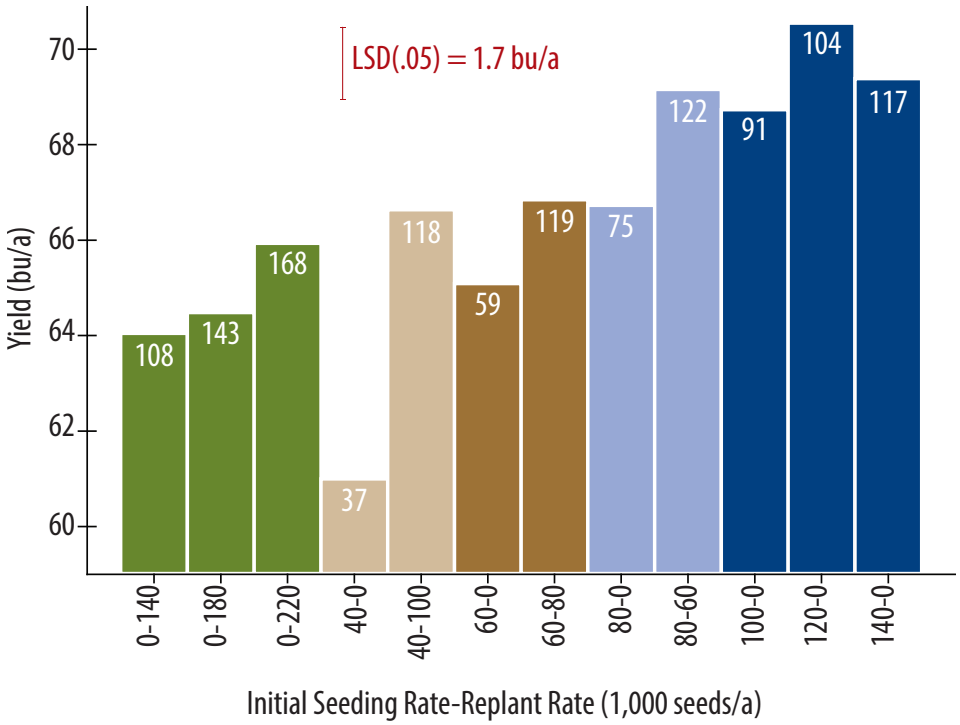
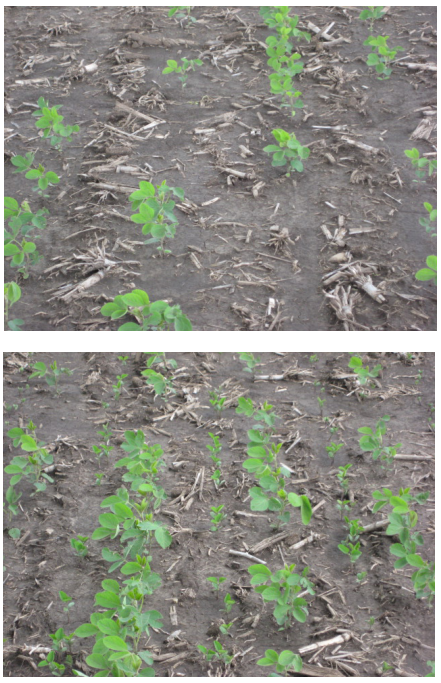


Figure 1. Yield (bu/a) of twelve replant scenarios across all three planting dates. The number printed at the top of the bars represent the final plant stand (1000 plants/a) after replanting.

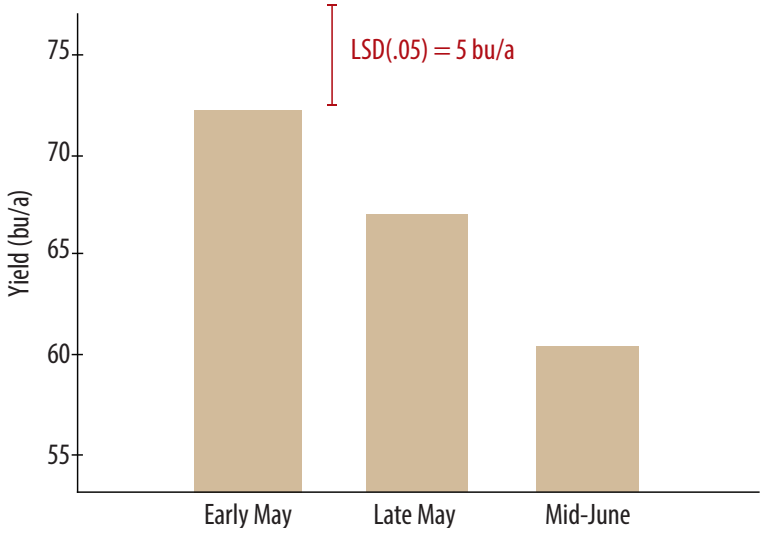
Figure 2. An initial soybean stand of 37,000 plants/a that was not filled in (top) and filled in with 100,000 seeds/a (bottom).



Replanting Options

When below threshold soybean stands arise (<100,000 plants/a), producers are faced with the decision to fill in the initial stand or perform a tillage operation and completely replant the entire stand. Our study found that a tillage operation limited yield potential by essentially delaying planting and reducing cumulative light interception of the entire stand compared to only a portion of the stand when the fill in method was used (Gaspar and Conley, 2014). In Figure 1, we see that when the initial plant stand was reduced to zero (by tillage), replanting with up to 220,000 seeds/a only significantly increased yield over a final plant stand of 37,000 plants/a. However, when this plant stand was filled in with only 100,000 seeds/a, its yield was the same or higher than replanting the entire stand with 220000, 180000, and140000 seeds/a (Figure 1). Furthermore, final plant stands >59,000 plants/a produced similar or higher yields compared to using tillage and replanting with 220,000 seeds/a (Figure 1). Therefore, filling in soybean stands below the replant threshold (100,000 plants/a) is the best method of replanting and replant seeding rates should be high enough to increase the final plant stand over 100,000 plants/a. Figure 2 depicts a stand with 37,000 plants/a being filled in with 100,000 seeds/a.

Figure 3. Yield (bu/a) of soybean planted at three different dates across all replant scenarios and seed treatments.



Seed Treatment and Planting Date Effects on the Replant Decision

We observed no effect of seed treatment use on replant decisions and therefore should not be a factor considered. However, seed treatment use (especially insecticide/fungicide treatments) may help avoid replanting because it is an effective management practice for increasing initial plant stands stands by 20% on average (Gaspar et al., 2014).

Our study indicated a large yield decline as planting was delayed past the first week in May (Figure 3). This yield decline is most likely due to decreased light interception of later planted or replanted soybeans. The earliest planting date yielded 73 bu/a (Figure 3). We observed a 0.25 bu/a/day yield decline between the early May and late May planting dates, which then doubled to 0.5 bu/a/day between the late May and mid-June planting dates. The average yield decline through the whole planting season was 0.32 bu/a/day. However, the replant decision was not affected by planting date and therefore the replant threshold (100,000 plants/a), method (fill-in), and seeding rates (>100,000 plants/a) are appropriate until June 20th in southern WI. Replanting past this date greatly increases the risk of fall frost damage (Conley and Gaska, 2013).

Conclusion & Recommendations

The first step in deciding if replanting is required is to determine the initial plant stand. Our study demonstrated that replanting soybean stands below the threshold (100,000 plants/a) by filling in the existing stand, increased yields regardless of the date (May-June 20th) and seed treatment use. Below threshold plant stands should be filled in with enough seed to bring the final stand above 100,000 plants/a. Using tillage and replanting the entire stand greatly limited yield potential, even at replant seeding rates of 220,000 seeds/a. This is due to the entire plant stand being replanted or essentially planted later, which reduces yields by 0.32 bu/a/day on average. These replant recommendations are applicable through June 20th in southern WI, where replanting after this date is not advised. Traditionally, the notion of adequate weed control has led producers to desire higher plant stands to quickly shade out competing weeds. However, pre-herbicide use and modern post herbicide technology has essentially eliminated this concern. This study only evaluated soybean replanting in terms of yield and did not take into account the economics of a replant decision, which include additional seed, fuel, labor, and machinery costs; along with potential crop insurance replant payments. Producers should consult their crop insurance agent before making any replant decisions. Ultimately, the producer's efforts should be placed on using this data in conjunction with their own finances to determine if replanting will increase economic return.

References

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