Increasing Yields and Profitability for Mid-Atlantic Double-Crop Soybean

Project PSB R2016-04
Final Report
March 15, 2017

Greg W. Roth, Giovani Stephani Fae and Mark Antle
Penn State University

The objective of this study was to assess several management variables to help improve recommendations for double crop soybeans. The first objective was to assess the impact of delayed planting on soybean yields of different maturities. The second objective was to evaluate populations in a double crop seeding for different soybean maturities. The third objective was to validate and calibrate a cropping systems' simulation model to estimate soybean yields in Pennsylvania.

Six soybean varieties from relative maturity groups (RM) ranging from 3.3 to 3.9 were planted after wheat (June 27th, July 6th, 12th and 19th) at the Southeast Agricultural Research and Extension Center - Landisville, PA, and after barley (July 1st, 7th and 13th) at the Russel E. Larson Agricultural Research Center - Rock Springs, PA in 2016. At Landisville, the effect of early high moisture wheat harvest on wheat yield and quality was also evaluated. Data was analyzed for a split-plot design using mixed and reg procedures on SAS. The total precipitation for Rock Springs in June, July, August, September, and October was 3.1, 1.6, 6.6, 2.7, and 1.4 inches, respectively. For Landisville, it was 6.2, 4.0, 2.3, 3.1, and 1.3 inches during the same monthly period. The first killing frost occurred on October 11th at Rock Springs, and October 26th at Landisville.

Wheat was harvested on June 27th, 30th, July 6th, and 12th at 19.3, 15.8, 13.1, and 13 % grain moisture, respectively. The results indicated a decline in wheat test weight and yield with delayed harvest (Figure 1). Harvesting wheat at approximately 20% grain moisture allowed a nine-day soybean planting day anticipation from the traditional 14% harvest level.

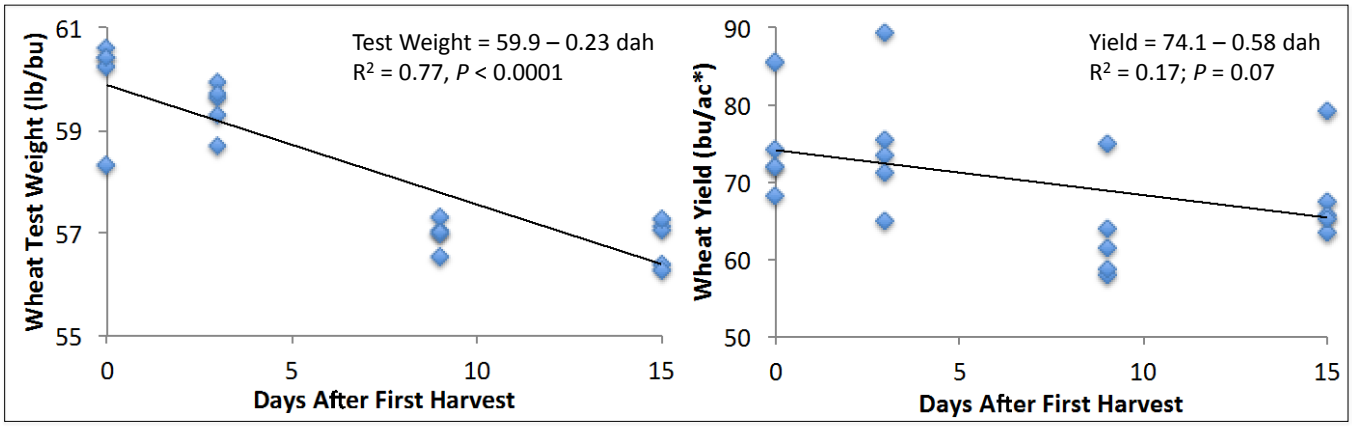

Figure 1: Wheat test weight and yield at Landisville at four different days after the first harvest (dah). * 13% grain moisture.

The final average soybean population at Rock Springs and Landisville was 154,000 and 165,000 plants/acre, respectively. There was no interaction of cultivar x planting date, so soybean yield, height and seed weight was averaged across planting dates (Table 1). The results showed a decline in soybean yields with later planting for both locations. At Landisville, an attack of silver spotted skipper caterpillars reduced the grain filling of the first and second planting dates and the yields were not different than the third planting date (Table 1). At Rock Springs, the October 11th frost impacted the latest planting date.

Table 1: Effect of planting date on soybean yield, height and seed weight at Rock Springs and Landisville.

Planting Date		Yield (bu/ac*)	Height (in)	100 Seeds Weight (g)
Landisville	June 27th	40.4 a	22.7 a	13.2 a
	July 6th	40.5 a	22.6 a	13.9 b
	July 12th	38.8 a	21.2 b	15.4 c
	July 19th	35.8 b	18.8 c	15.8 c
Rock Springs	July 1st	49.4 a	22.7 a	16.2 a
	July 7th	45.0 b	21.7 a	15.7 ab
	July 13th	21.7 c	19.6 b	14.9 b

* 13% grain moisture; Means followed by the same letter are not significantly different at the 5% confidence level.

Soybean relative maturity groups showed no effect on yields at Rock Springs. However, RM 3.9 cultivars appeared to be a good strategy to improve yields at late planting in Landisville, but no difference was found at the latest planting date (Figure 3).

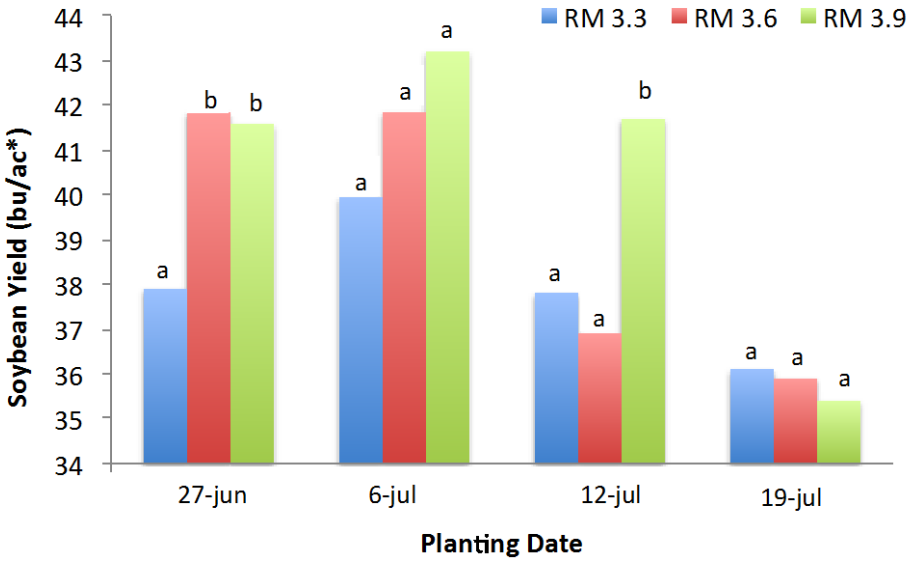

Figure 3: Effect of relative maturity on soybean yield at Landisville.

These results demonstrate the importance of early harvest in wheat that can facilitate early planting of double crop soybeans. Based on work with growers, wheat harvest can be advanced with early planting, earlier varieties, and harvesting at higher moisture contents near 20%. Additionally, even though double-crop soybean after wheat at Rock Springs is traditionally not an economic option, our data suggests that

the earlier harvest date of barley can support viable double-crop soybean production in the region. Finally, longer season soybean varieties can improve yields in double-cropping systems.

In our double crop population study we evaluated treatments from 140000 to 230000 seeding rates ina July 7 planting date. Emergence was less than ideal, however and we obtained final stands that averaged about 112,000. Yields averaged 42.8 bu/acre across all treatments. We also compared three varieties in this test at each population, Chemgro H35-16R2, HiSOY HS36T42, and Pioneer P36T86R and saw no significant differences among varieties. We plan to repeat this study as part of our double cropping project in 2017.

In the modeling project, soil and plant data were collected to calibrate parameters regarding the water balance, soybean development, light and transpiration use efficiency, and harvest index curves in the simulation model. We did this both at the research farm and at the Krall and Grumbine farm in double crop soybeans. This work is ongoing and we hope to have developed an accurate computer based simulation model to predict double-crop soybean yields in Pennsylvania by the end of 2017.

For more information, please feel free to contact Greg Roth at (814) 863-1018.