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Double Cropping Soybean Recommendations in Wisconsin

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In A Bean Pod:

• For double crop soybeans in Wisconsin the optimal seeding rate to maximize economic returns was based on seed price but ranged from 234,000 to 156,000, when soybean seed price ranged from $20 to $60 per unit.

• Planting on or before July 10th, a 2.0-2.5 maturity group soybean maximized yield.

• Planting after July 10th, a 0.5-1.5 maturity group soybean maximized yield.

Introduction

Double cropping systems present an opportunity to enhance crop production and profitability for farmers (Kelley, 2003). Defined as the cultivation of two consecutive crops within the same field in a single year, double cropping can maximize land utilization. However, farmers in Wisconsin encounter unique challenges, particularly due to shortened growing seasons, which can limit the feasibility of growing double crop soybeans (Santos Hansel et al., 2019).

In 2023, the United States Department of Agriculture Risk Management Agency expanded the double cropping insurance map to encompass most counties in Wisconsin (Double Cropping Initiative | RMA, n.d.). This policy shift is expected to incentivize more farmers to explore double cropping practices across the state.

Optimal soybean planting date, maturity group, and seeding rates are crucial factors influencing soybean production success. Earlier soybean planting has been shown to increase soybean seed yield (Mourtzinis et al., 2017). Previous research in Wisconsin has provided recommendations for full-season soybean production, with optimal maturity group varying by region—from 1.5 maturity group in the northwest to 2.5 maturity group in the southern part of the state (Mourtzinis & Conley, 2017). Similarly, recommended seeding rates for full-season soybeans are well-established (Gaspar et al., 2020). However, there is a notable gap in recommendations specifically tailored toward double crop soybeans.

Given this knowledge gap, our study investigated the impact of seeding rate and maturity group on double crop soybean yield in Wisconsin. Furthermore, our objective is to

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understand the implications of different soybean planting dates to simulate various double crop scenarios. With the expanded coverage of double crop insurance, optimizing important management practices for double crop soybeans can help farmers capitalize on increased production through the adoption of double cropping practices.

Materials and Methods The study was conducted at two sites located at the University of Wisconsin-Madison Arlington Agricultural Research Station near Arlington, Wisconsin during the 2023 growing season. The experimental design utilized a randomized complete block design with a split-plot arrangement.

Three soybean planting dates were evaluated: June 29, July 10, and July 20, 2023. For the first and second planting dates, the preceding winter wheat crop was cut and baled to simulate early wheat grain harvest. The third planting date occurred after the wheat grain was harvested. Five soybean cultivars were planted with maturity groups ranging from 0.6 to 2.5. Table 1 provides details about the soybean cultivars and maturity groups used at each site. Within each cultivar, six soybean seeding rates were planted at 120,000; 150,000; 180,000; 210,000; 240,000; and 270,000 seeds per acre.

Table 1. Soybean Varieties

Variety Number	Variety Brand	Variety Name	MG
1	NK	NK06-D9E3	0.6
2	NK	NK09-H7E3	0.9
3	NK	NK09-H7E3	1.4
4	NK	NK20-B6E3S	2.0
5	NK	G2570ES	2.5

Results

Seeding Rate

We found that for every additional 1000 seeds/acre planted, soybean yield increased 0.05 bushels per acre which is equivalent to a 1 bushel per acre yield increase for every 20,000 additional seeds per acre (Figure 1). The maximum soybean yield was roughly 21.5 bushels per acre observed at 270,000 seeds per acre. The minimum soybean yield was roughly 18.8 bushels per acre observed at 120,000 seeds per acre.

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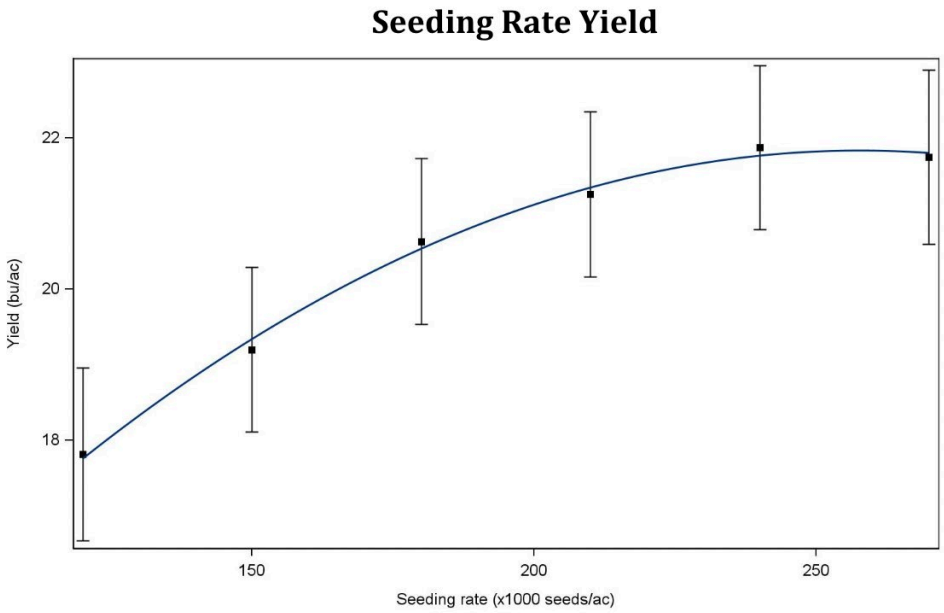

Figure 1. Soybean Yield at Various Seeding Rates.

Interaction of Planting Date and Maturity Group

We found an interaction for yield between the planting date and maturity group combinations in our study. For both sites, the first (June 29th) and second (July 10th) planting dates combined with later maturity groups (2.0-2.5) resulted in higher yields. Meanwhile, the third planting date (July 20th) combined with earlier maturity groups (0.5-1.5) resulted in higher yields at that date.

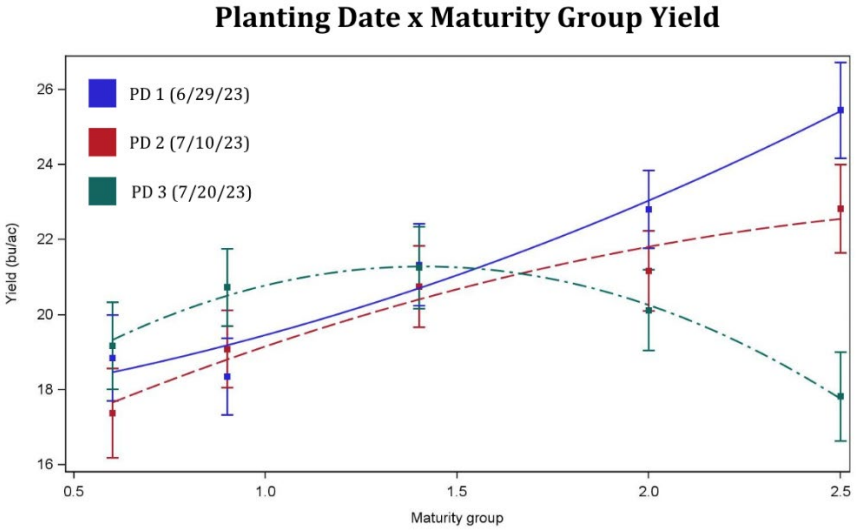

Figure 2. Effect of planting date and maturity group on soybean yield: The differently colored lines represent the different soybean planting dates.

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Seeding Rate Effects Revenue

We compared different seed costs of $20, $40, and $60 per 140,000 soybean seeds (roughly one bag) at a $10 per bushel soybean market price to estimate the optimal economic seeding rate. Seed cost had a significant effect on optimum seeding rate. For $20, $40, and $60 per 140,000 soybean seeds, respective maximum profit was observed at 234,000, 195,000 and 156,000 seeds/ac (Figure 3).

Discussion

A consistent interactive effect between planting date and maturity group on soybean yield at both sites was observed. The first soybean planting (June 29th) and second planting (June 10th) increased yields when later maturity groups were used. However, the third planting (July 20th) decreased yields with later maturity groups. This is likely because the earlier planting dates combined with later maturity groups allowed for more photosynthate to be captured by the canopy. The more photosynthate captured by the canopy the higher the potential for more seeds being produced which is the main driver for soybean yield (Van Roekel et al., 2015).

The recommended seeding rate for full-season soybean production in Wisconsin is 140,000 seeds per acre with a 20% increase on lower-productivity acres and a 20% decrease on higher-productivity acres (Gaspar et al., 2020). The recommended seeding rate increases to 160,000 seeds per acre after June 1st. Seeding rates are typically increased as the PD is delayed compensating for the lack of vegetative growth. The Ohio State University Extension recommendation for double crop soybean seeding rate is between 200,000 and 250,000 seeds per acre (*Double Crop Soybean Recommendations for 2021 | Agronomic Crops Network*, 2021). We found that for double crop soybean in Wisconsin seed cost had a strong effect on the optimum seeding rate which ranged between 156,000 to 234,000 for seed cost between $20 to $60 per bag.

If it has been a dry season and there isn't any precipitation in the forecast around the time that double crop soybean would be planted there is an increased risk that it will be unsuccessful. We were fortunate to receive rain in July and August at our research sites in 2023 to facilitate rapid soybean emergence and crop growth. However, we were unable to obtain any yield data from our 2022 trial because the fall frost killed the soybeans.

Lastly, it's important to recognize that the success of DC soybeans is heavily dependent on environmental conditions, mainly precipitation patterns during double crop soybean planting, wheat harvest dates, and frost damage at harvest time. In 2023, we were fortunate to receive adequate precipitation for rapid germination in our double crop soybeans. We also did not experience any fall frost damage before harvest in 2023. However, this is on a year-by-year basis and important to consider.

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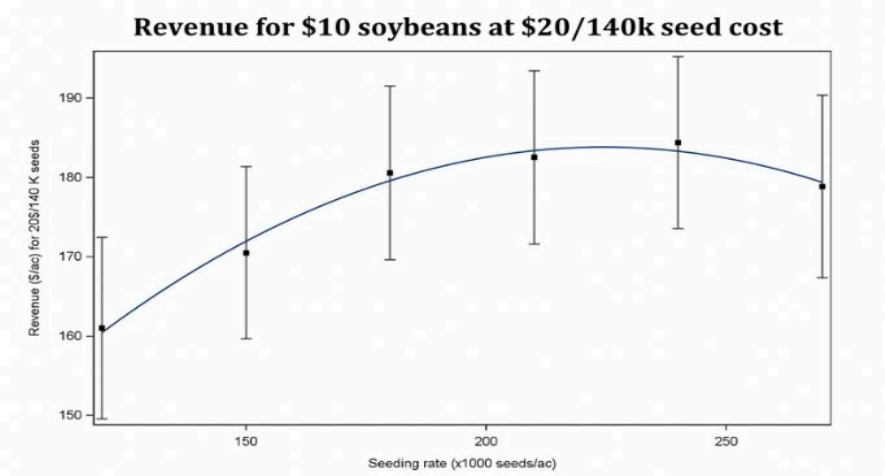

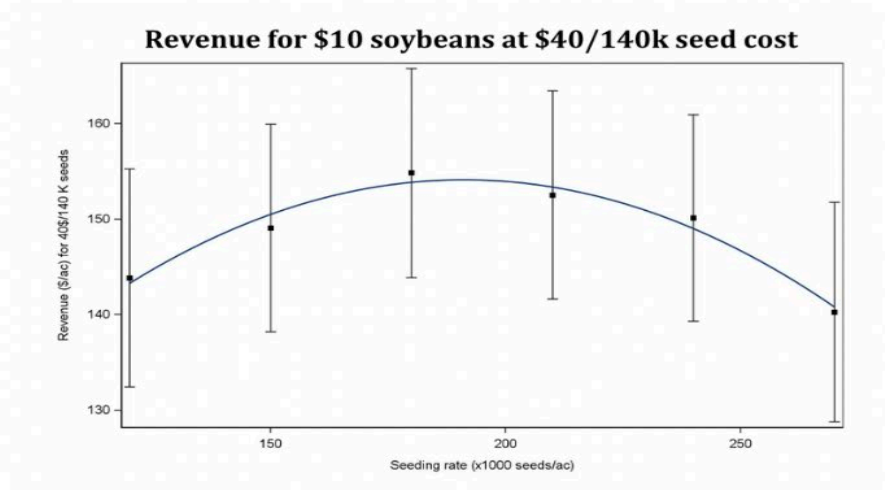

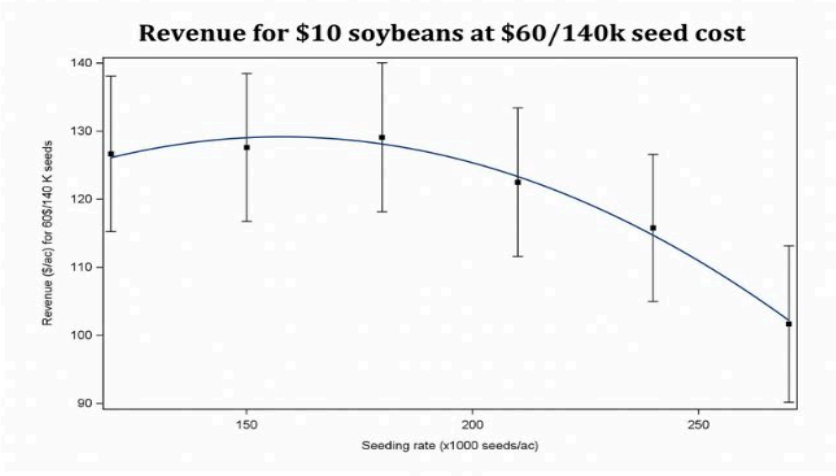

Figure 3. Revenue ($ per acre) for $20, $40, and $60 soybean seeds (140,000 seeds) at $10 per bushel soybean market price:

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Conclusion

Wisconsin soybean farmers can typically plant double crop soybeans in mid-July. Therefore, we found that planting earlier maturity group soybeans (0.5 – 1.5) lead to higher yields. Furthermore, our study identifies a variable and seed cost dependent optimal seeding rate range between 156,000 to 234,000 seeds per acre. The observed yield differences across seeding rate ranges were marginal, ranging within a mere 3 bushels per acre. Seeding rate considerations should be made to balance yield potential with economic feasibility.

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