Trial Type: Management
Growing Season: 2023-2024

Project Objective: Study on plant populations with the objectives of (1) characterize optimum seeding rates in soybeans at the field scale level, and (2) gain insight into which soil and crop attributes explain yield response to seeding

Project Insights:

1. The most economical seeding rates based on current sale price and seed costs are 110K and 80K.
2. Planting a target rate of 80,000 seeds/ac (80k) yielded statistically less than 110,000 seeds/ac (110K), 140,000 seeds/ac (140K), and 170,000 seed/ac (170K). However, that yield loss was not always large enough to offset the additional seed costs.
3. Planting equipment frequently under-seeded at seeding rates of 140K and 170K.
4. Target seeding rate should involve considerations including return on investment, planting conditions, canopy coverage for weed control, and risk tolerance.

2024 Project Results

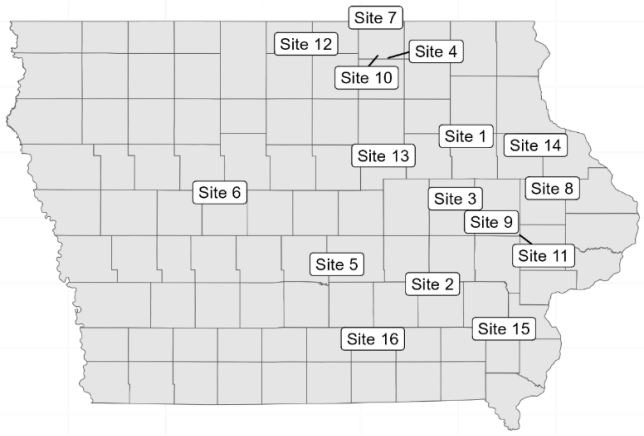

Figure 1. Trial locations for 2024.

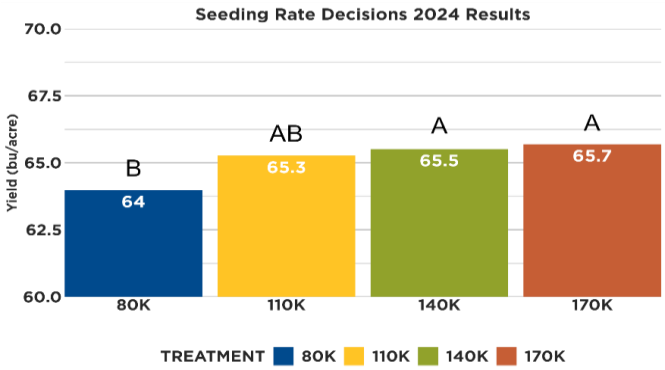

Figure 2. Yield results for 2024. Letters indicate yield groups.

To the left is a map of the trial distribution and location across the state (Figure 1). For 2024, 16 trial locations were successfully conducted.

Below is a graph showing the yield response for all 16 trials (Figure 2). The letters above the bars indicate yield groups. Therefore, for our 2024 trials, we observed the 80K treatment as yielding statistically less compared to 140K and 170K planting rates, and since the 110K treatment shares similar letters with other treatments, 110K was not statistically different when compared to all other rates. If treatments are statistically significant (different letters), there is strong evidence that the observed differences in yield are due to the treatment and not to other field conditions.

Overall Project Results

Below is a map of the distribution of where trials were located across the state (Figure 3). In 2023 and 2024, 32 trial locations were successfully implemented.

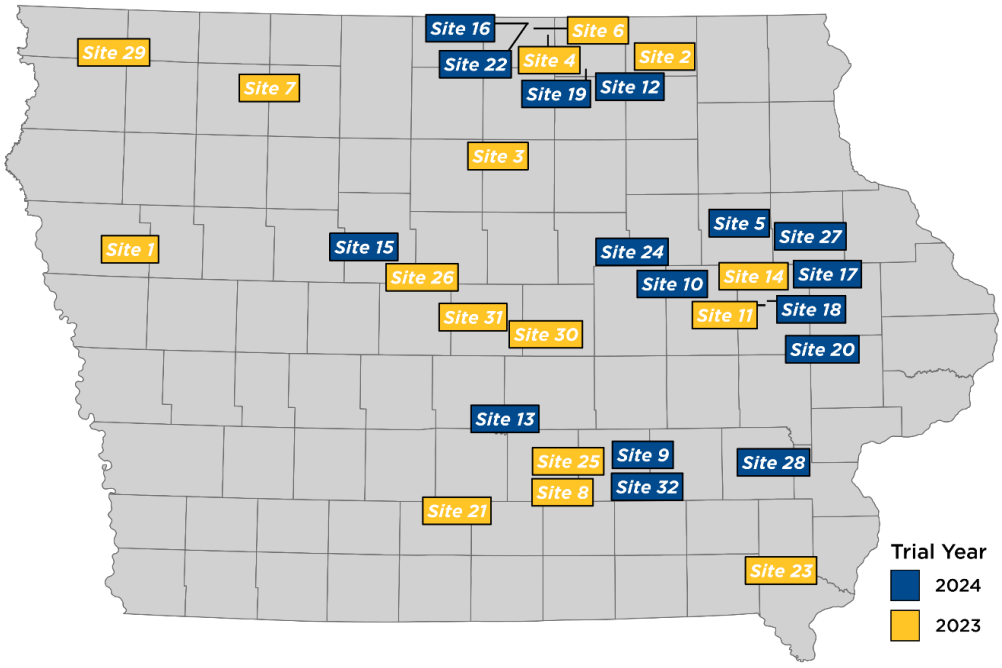

Figure 3. Trial locations for 2023 and 2024.

The following graph shows the yield response for all 32 trials in 2023 and 2024 (Figure 4). In the combined analysis, planting 80K seeds per acre yielded significantly less when compared to all other seeding rates.

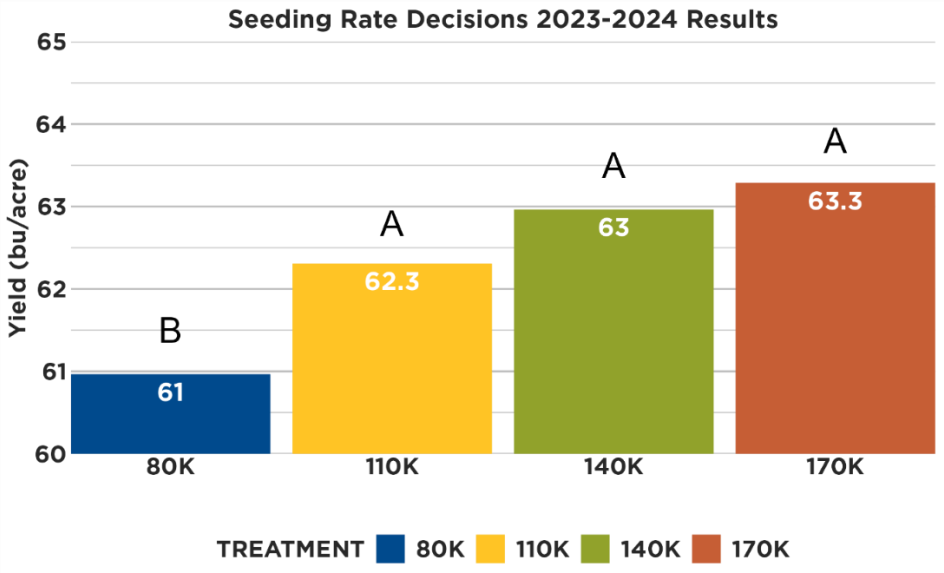

Figure 4. Yield results from the 32 trial sites in 2023 and 2024. Letters indicate yield groups.

An analysis of the most economical seeding rates at varying seed costs and sale prices is seen below (Figure 5). The analysis was performed on all 32 trials for 2023 and 2024 combined. Average yield values for the years were used as the baseline yield values when calculating the most economical planting rate. The rates that are most economical at current prices are 110K and 80K. Even though these rates yielded lower on average, the losses in yield are not great enough to overcome the additional costs of seed when planting at rates of 140K and 170K. Profitability wise, to justify planting at higher seeding rates, sale prices would need to increase and seed costs would need to decrease.

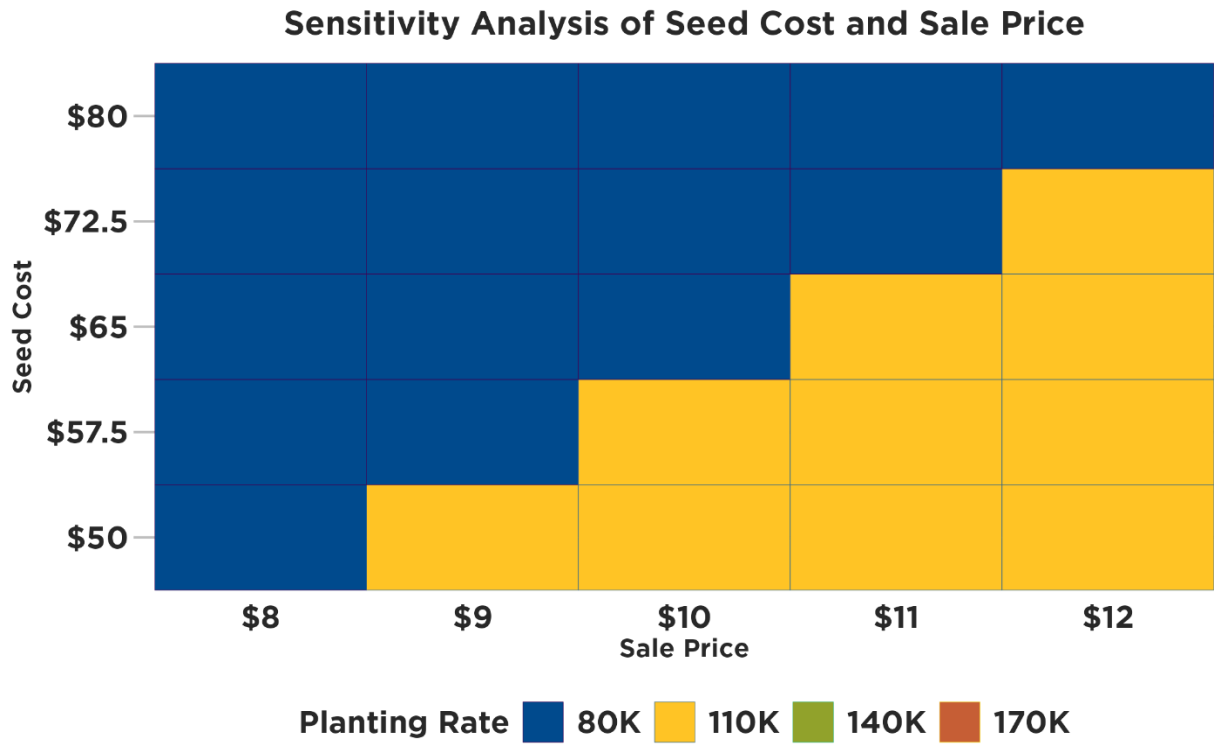

Figure 5. This matrix displays the most economical seeding rates at varying sale prices and varying seed costs. Estimates of economic outcomes were based upon the average yields for each seeding rate for 2023 and 2024 combined. Seed cost is based upon a rate of 140,000 seeds/unit. At current ranges for sale price and seed cost, 110K and 80K are the most economical rates.

Planter Performance

Target seeding rates compared with the as-planted map are seen below (Figure 6). Applied seeding rates were averaged and then subtracted by the target seeding rate at that location. Negative values indicate instances of under seeding, and positive values indicate over seeding. During this research trial, planter performance was the most accurate at lower seeding rates and there was significant under seeding occurring at the highest rate of 170k per acre. If planting at higher rates, it is recommended to ensure your planter is calibrated and it may be recommended to reduce the speed.

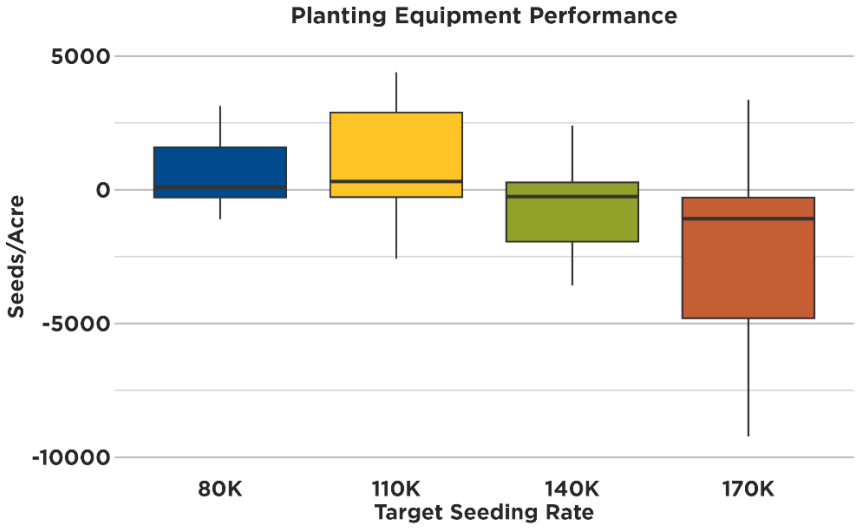

Figure 6. Comparison of planting equipment performance at each seeding rate. At higher rates of seeding planting equipment tended to under seed as compared to the lower rates.

The results comparing stand count populations with target seeding rates are seen below (Figure 7). Stand counts were collected early in the growing season in each treatment pass. Assuming a 90% germination rate of 80K, 110K, 140K, and 170K, we would have expected stand counts of 72K, 99K, 126K, and 153K plants per acre. As target seeding rates increased, the difference between the target rate and stand count increased. A good example of this is that the average 80K target rate, the stand count was about 70,000 plants per acre, and the average 170K target rate, the stand count was about 140,000 plants per acre. These differences were likely influenced by the improved planting equipment performance at the lower seeding rates compared to at the higher seeding rates.

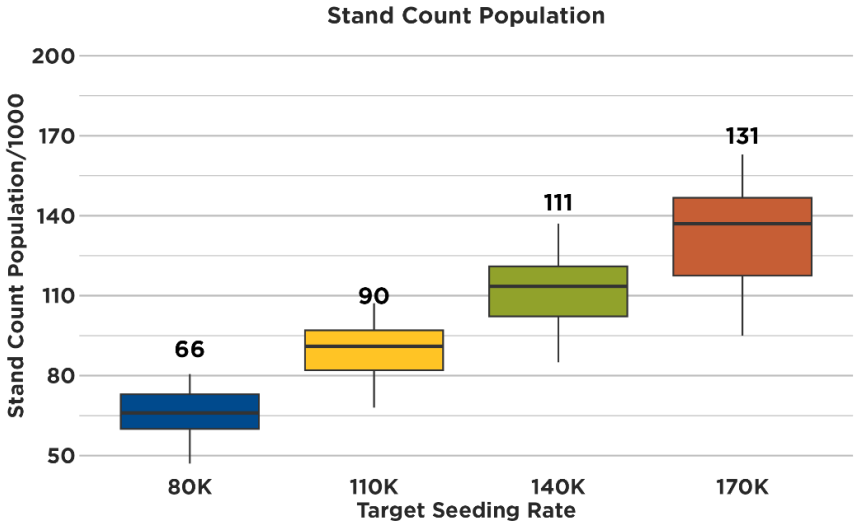

Figure 7 Comparison of stand count population at each seeding rate. The higher the rate of seeding the greater the difference between the target seeding rate and the stand count population. Stand count population (y-axis) is expressed as population/1000. Mean values are labeled above each target rate.