Replanting Guidelines for Sugar Beet Production in the SMBSC Growing Area

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Introduction: Establishing an adequate plant population of sugar beets is one of the first challenges of sugar beet production. Every season a percentage of the acres planted in the SMBSC growing area emerge to a plant population that is less than the population that was planned for the field. There were working thresholds used to determine the plant population that warranted replanting sugar beets, however there was no data that existed in the literature or past research reports to support these thresholds. To develop a replanting threshold for SMBSC, a two-year research study was conducted. This report is an abbreviated version of the full paper published in the Journal of Sugar Beet Research. The full report can be found as follows:

Bloomquist, M. W., A. W. Lenssen, and K. J. Moore. 2019. Replanting guidelines for sugar beet production in southern Minnesota. J. Sugar Beet Res. 56:3-20. DOI: 10.5274/jsbr.56.1.3

Objective: To provide data to support plant population guidelines for the determination of the plant population at which a shareholder would be agronomically and economically better off to replant a field versus keeping a less than desired plant population from the original planting.

Materials and Methods: Three trials were conducted over the 2016 and 2017 growing seasons. In 2016, trials were located near Murdock and Lake Lillian. In 2017, a trial was located south of Renville. These trials were designed as a randomized complete block in a split plot arrangement with six replications. The main plot was the planting dates and the subplots were the six plant populations. Each individual plot was four 22" rows wide by 40' long. All three trials were planted in the first week of May and the replant treatment was planted 19-20 days following the original planting date. Beta 92RR30 was the variety planted at all three locations. The trials were planted at a 3.4" seed spacing to assure all plant populations were met. The trials were hand thinned at the 4-6 leaf stage to the appropriate plant populations. The six plant populations in the trial were as follows: 75, 100, 125, 150, 175, and 200 sugar beets per 100' of row. Normal agronomic practices were used to keep the trial weed and disease free. The center two rows of each four row plot were harvested in late September to mid- October. The harvest dates for the three locations varied depending on field conditions and trial harvest across the Cooperative. Trials were harvested using a four row defoliator and a two row research harvester. The beets harvested from the center two rows were weighed on the harvester and a sample of those beets were used for quality analysis at the tare lab. Data from all three locations was combined for the analysis. The data was analyzed for significance using SAS version 9.4 utilizing the PROC MIXED and PROC REG procedures. Differences were considered significant at $P \leq 0.05$.

Results and Discussion: The results for the planting date analysis is shown in Table 1. These results show the effects of the delay in planting between the two planting dates. The data for each planting date is the mean of all plant populations for that planting date.

Plant Date	Tons/Acre	Sugar %	EST	ESA	$/Acre
1	29.4 a	15.8 a	268.1 a	7842 a	-- a
2	25.1 b	15.6 a	263.4 b	6607 b	-$180 b

Table 1: Effect of planting date on yield across all plant populations.

The results for the plant population treatment analysis is shown in Table 2. These results show the effects of plant population on yield. The data for each plant population is the effect of plant population across both planting dates.

Plant Population (Beets/100')	Tons/Acre	Sugar %	EST	ESA	$/Acre Difference
75	21.9 d	15.6 a	261.9 c	5703 e	-$342 e
100	24.7 c	15.7 a	264.4 bc	6520 d	-$226 d
125	27.9 b	15.7 a	265.1 bc	7364 c	-$113 c
150	28.8 b	15.8 a	267.3 ab	7672 b	-$61 b
175	29.8 a	15.9 a	270.2 a	8033 a	----- a
200	30.5 a	15.7 a	265.6 bc	8058 a	-$15 a

Table 2: Effect of plant population across both planting dates.

A regression analysis was utilized with the means of all plant populations for each of the two planting dates for extractable sugar per acre. The results of this analysis are shown in Figure 1. The blue diamonds represent the yield for each of the six plant population treatments in the first planting date. The red squares represent the yield for each of the six plant population treatments in the second planting date. The difference between the two lines is the extractable sugar yield difference that occurred between the two planting dates at each plant population. By looking at Figure 1, you can compare the extractable sugar per acre yield at each plant population for each planting date. The extractable sugar yield for Plant Date 1 of 100 sugar beets per 100' of row is approximately equal to the highest extractable sugar per acre yield of any of the plant populations for Plant Date 2. This data would indicate that if a producer has a sugar beet plant population of 100 sugar beets per 100' of row from an original planting, there is no potential to increase extractable sugar yield by replanting the field. For plant populations from an original planting that are below 100 sugar beets per 100' foot of row, the potential does exist to increase extractable sugar yield if the replanted population of sugar beets exceeds 125 sugar beets per 100' of row. This data indicates that the replanting threshold for sugar beets in the SMBSC growing area would be 100 sugar beets per 100' of row.

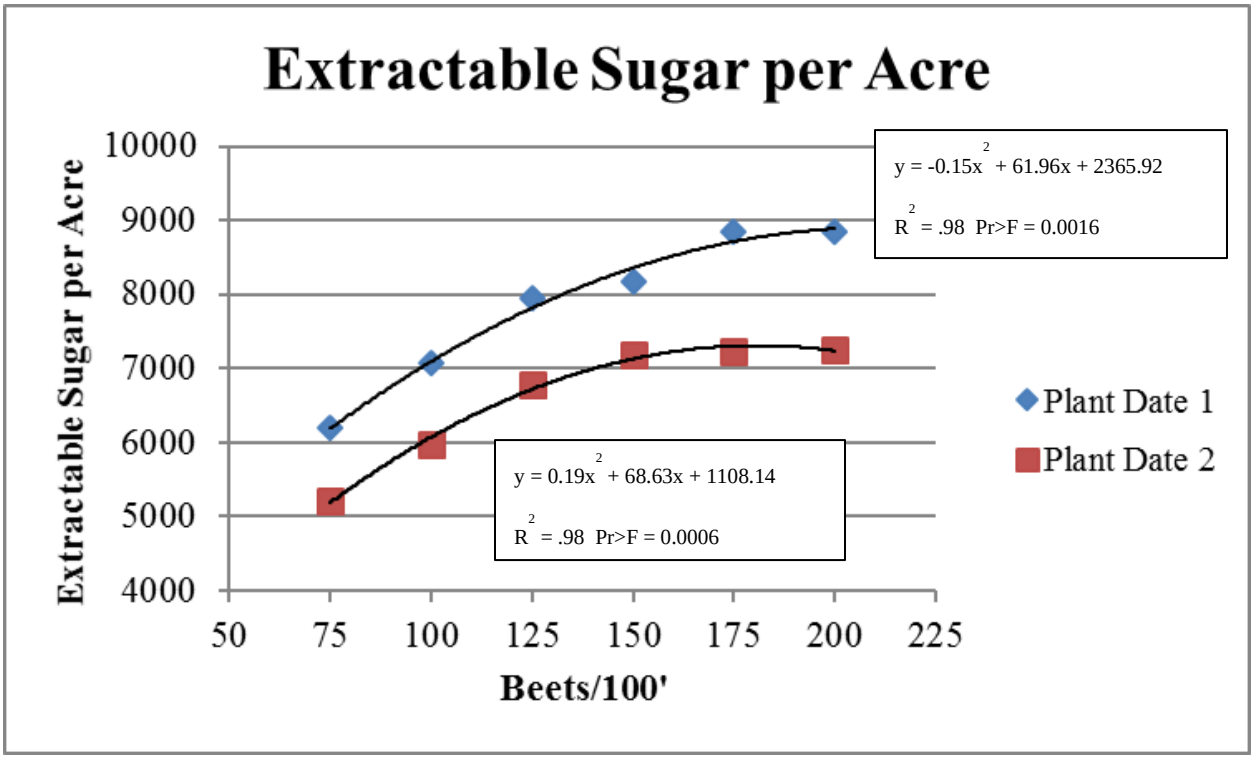

Table 1. Regression analyses of extractable sugar per acre yield by plant population for each of the two planting dates used in the study.