

Energy Beet Establishment Factors

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Energy beets are a possible new source for ethanol fuel in North Dakota. The areas being evaluated as potential sites for a processing facility are located outside typical sugarbeet growing regions. As such, many agronomic evaluations need to be made to understand energy beet growth and development in the new regions. These evaluations should have alternative uses in mind for beets, including saline soil bioremediation and livestock feed. Several energy beet studies were conducted in 2013 and 2014 to determine how energy beet yields are influenced by several establishment factors including planting method, plant population and planting date.

Planting Method

When considering a soil bioremediation use for energy beets, broadcasting the seed, instead of using a planter, would be an attractive option for a producer. Broadcasting and incorporating would allow for rapid seed dispersal, less investment in planter equipment/settings, as well as less demand on planting equipment. In 2013, a study was established to evaluate how broadcasting and incorporating the seed compares to using a planter. The study also included multiple planting dates to capture differences that could occur between the two planting methods throughout the planting season.

On the first planting date, there was not a statistical difference between the two planting methods although broadcasting the seed resulted in a numerically lower yield (Table 1). There were much larger differences during the second and third planting dates. Using a planter doubled or tripled the energy beet yield compared to broadcasting for those dates. Some yield increase can be attributed to moisture. After the first planting date there was adequate moisture for germination. After the second two dates, there was little to no moisture for quite some time. Since the broadcast seed was only incorporated 0.5", whereas the planted treatments were placed at 1", the broadcast seeds likely did not receive enough moisture to imbibe until much later in the growing season (many plants emerged in mid-July).

Table 1. Differences in the yield of energy beets due to using a planter vs. broadcasting and incorporating the seeds.

Planting Date	Increase ¹
24-May	17%
7-Jun	284%
20-Jun	181%

¹Represents the yield increase achieved by planting, compared to broadcasting.

This research supports the use of broadcasting energy beet seed provided the conditions are adequate for germination. However, using a planter will ensure proper seed to soil contact and provide a much better opportunity for success.

Plant Population

Establishing sugarbeet populations can be challenging, with sugarbeet seedlings requiring better soil/environmental conditions than many other annual crops. Companion crops are still utilized in many cases to assist the emergence and early-season growth of sugarbeets. Sugarbeets are also not able to compensate for stand loss as well as a crop like soybeans, making the plant population even more important. In 2014, a study was established to model the yield trends across a range of plant populations and planting dates.

There was a strong, almost linear, correlation between plant population and yield (Figure 1). The direct correlation of plant population and yield across planting dates was greater than the comparison of each planting date separately (data not shown). This could suggest that plant population is more important to yield than planting date. However, it should be noted that at the later planting dates, lower overall populations were achieved with the average plant population decreasing by roughly 5000 plants per acre per planting date. While it is still likely that plant population is one of the more important establishment factors, the results may also bias that importance due to the lack of high population representatives at the later planting dates.

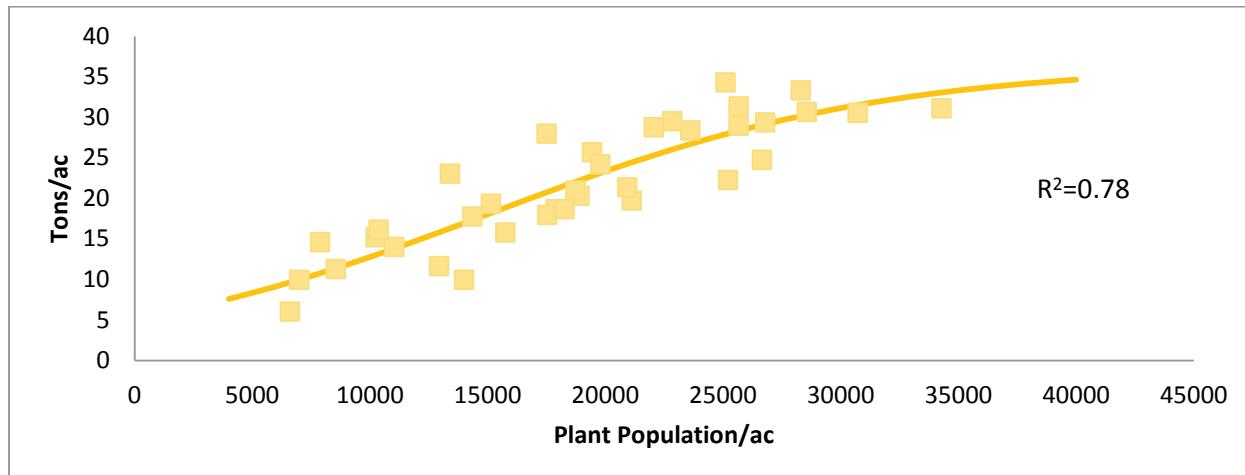


Figure 1. Energy beet yield changes due to increasing plant populations.

Planting Date

If energy beets were used in a salt remediation setting, planting date is a key component to evaluate. Many of the saline regions in the state are not suitable for field work until the latter part of the planting season. Understanding the yield potential of energy beets after later planting dates may help determine what end-use, if any, there will be for the beet crop. In 2013 and 2014 planting dates studies were conducted at the Carrington Research Extension Center to determine the yield loss associated with delayed planting.

In 2014, there was a significant yield loss for each two week delay in planting (Table 2). In 2013, there was only a significant drop with the last planting date. Over the two years' worth of data the yield loss experienced over the month difference in planting date ranged from 5 to 0 tons/ac. When averaged across years, this amounted to a 14 and 27 percent loss for the early-June and mid-June plantings, respectively. While that amount of loss would be discouraging to someone producing the beets for biofuel, there would still be a significant benefit of approximately 15 tons/ac beets for both livestock feed and for soil remediation. One of the main obstacles in soil remediation is producing enough plant material to remove soil water from the profile, as saline soils generally have reduced productivity (for most crops). A mid- or late-June planting would still provide a significant benefit in the form of deep soil profile nutrient/water use, tap root penetration, and contributions to soil organic matter (assuming either the top or root is not harvested). These benefits will indirectly reduce the soil salt level over time through natural processes.

Table 2. The effect of planting date on the yield of energy beet.

Planting Date	2013	2014	Average yield loss ¹
	ton/ac	ton/ac	%
Late May	23.8	28.4	
Early June	22.2	22.1	14.4
Mid June	17.4	14.8	27.3

¹Represents the percent loss compared to the next best planting date.

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