1942 AND 1943 MECHANICAL THINNING SUMMARIES [1]

E. M. Mervine and Ray Barmington [2]

The theories of mechanical thinning of sugar beets have been studied and techniques developed until the work in recent years has been chiefly fitting different systems to large-scale production. In 1942 four systems of thinning were used in a 30-acre field and in 1943 the same systems of thinning were repeated on 8- and 5-acre fields respectively in different communities and in different conditions of fertility, weed growth, etc.

The 30-acre field in 1942 was planted with 7 pounds of segmented seed per acre, using a segmented seed planter which gave a 40-percent germination stand, 64 percent of which was singles. This field was cross blocked and was reasonably free from weeds. Where 4-inch by 2-inch cross blocking was done followed by laborers using a long-handled hoe, 42 percent as much time was necessary for thinning as was necessary for hand blocking and thinning. Where 2-inch by 1-inch cross-blocking was used, 49.6 percent of the hand thinning time was necessary. Where the long-handled hoe alone was used the time was 57.4 percent, and where the machine only was used the time necessary was only 9 percent as much as for hand blocking and thinning.

Table 1.- 1942 Mechanical thinning experiments.

Method of blocking and thinning	Labor involved, man-hrs. per acre	After-thinning stand		Harvest stand, beets per 100'		Relative yield expressed as percentage
		Hills per 100'	Percent singles	Marketable	Unmarketable	
4"2"cross block followed by laborer with hoe	11.6	90.65	68.5	103.12	12.95	93.
2"1"cross block followed by hoe	13.5	90.30	70.0	101.50	10.75	98.
Hoe only	15.6	97.7	62.0	116.0	13.25	94.
Hand block and thin	27.2	108.8	95.0	100.25	3.75	99.
Machine only 3"1"	2.45	83.65	63.0	113.12	14.25	100.

Before thinning: 40 percent germination stand (40 beet-inches per 100 inches of row).

64 percent singles.

1/ Data obtained on a project carried out in cooperation with the U.S.Department of Agriculture, Bureau of Plant Industry, Soils, and Agricultural Engineering

2/ Colorado Agricultural Expxriment Station.

The number of hills per 100 feet, after thinning, averaged from 83.65 to 108.8, the percentage singles from 63 to 95, and the marketable beets at harvest time from 100.25 to 113.12 (table 1). The highest yield was produced on the part of the field where the least thinning time was used, but statistical analysis failed to show any significant difference in yield between the plots.

Since this field was comparatively free from weeds the question arose as to what could be done in the way of mechanical thinning in a weedy field. With this in mind the Experiment Station rented two fields for 1943 experiments, one of which was fairly free from weeds and the other the weediest piece of land that could be found. The results of these experiments are shown in table 2.

The blocking for the 1943 experiments was done with a row blocker rather than cross blocking because of the nature of the field.

Seven pounds per acre of segmented seed planted with a flute-feed drill gave 33.8 percent germination stand with 43.4 percent singles.

In this weedy field 4-inch by 2-inch blocking followed by long-handled hoe thinning required 43.2 percent, hoe only required 49.3 percent, and machine only required 2.38 percent of the time required for hand blocking and hand thinning with an additional saving of 4.35 man hours per acre at weed-hoeing time. It actually required 4.35 man hours per acre less for the first hoeing following the 3-inch by 1-inch mechanical thinning than following the hand blocking and thinning.

In this field the number of hills per 100 feet, after thinning, averaged from 64.75 to 90.75 and the percentage singles from 70.0 to 98.9. Marketable beets per 100 feet of row ranged from 81.75 to 113.75. In this field the plot thinned with the long-handled hoe showed the highest yield, and the difference between the highest and lowest yield was significant.

The other field was planted with 7 pounds of segmented seed per acre using a segmented seed planter which gave 31 percent germination stand and 64.35 percent singles. This stand and distribution in a clean field made hand and hoe work easy, which shows up in the thinning time required. The ratio of the saving for mechanical work was not changed materially. The 4-inch by 2-inch blocking plus long-handled hoe required 39.6 percent, hoe only 48.4 percent, and 3-inch by 1-inch machine only 3.7 percent as much time as conventional hand blocking and thinning. The differences in yields are not statistically significant, although hand blocking and thinning shows the highest yield.

Table 2.- 1943 Mechanical thinning experiments.

Method of blocking and thinning	Labor involved, man-hours per acre	After-thinning stand		Harvest stand, beets per 100'		Yield, tons per acre
		Hills per 100'	Percentage singles	Marketable	Unmarketable	
		Box Elder Farm 1/				
4"2" followed by laborer with hoe	10.89	77.5	70.0	96.75	20.25	13.8
Hoe only	12.41	88.0	72.2	113.75	28.75	14.8
Hand block and thin	25.26	90.75	98.8	81.75	14.5	14.6
Machine only 3"1"	0.60	64.75	78.2	90.00	35.75	12.4
		Portner Farm 2/				
4"2" plus hoe	6.41	82.5	77.5	101.5	24.0	14.9
Hoe only	7.83	96.17	83.4	123.0	32.5	14.2
Hand block and thin	16.2	98.5	99.0	99.5	8.0	15.1
Machine only 3"1"	0.60	99.7	73.0	107.0	42.0	13.3

1/Before thinning: 33.8 percent germination stand (33.8 beet-inches per 100 inches of row)
43.4 percent singles

First hoeing required 4.35 man-hours per acre more for hand block and thin than for machine only in this field.

Evidently some of the beets recovered that we counted blocked out in "machine only" since there are more beets counted at harvest time than at thinning time.

2/ Before thinning: 31.0 percent germination stand (31 beet-inches per 100 inches of row)
64.35 percent singles

The work over the last decade has led to some general conclusions:

1. Good cultural practices are necessary for satisfactory mechanical thinning.

2. It is possible in most germination stands to use labor-saving methods of thinning.

3. The use of single-germ seed increases the saving in labor and makes possible more satisfactory stands following mechanical work.

4. Accurate seed placement by the planter is a definite labor saver.

5. There is more danger of leaving too many beets than there is of leaving too few when mechanical methods are used.

6. Long skips in the row, after mechanical blocking, are not as serious as it was first thought provided the after-thinning population per 100 feet of row is satisfactory.

7. A few multiples are not too serious if the average population is reasonably near the desired number. Usually only two beets in a multiple will survive and grow to marketable size.

8. A field properly thinned mechanically, appears to be ruined at the time the thinning work is being done.

9. Most laborers become mechanical in their use of a hoe and may not leave as many single plants as a machine.

10. Germination stands less than 25 percent seem more suitable to long-handled hoe thinning than to machine work.

11. Lack of a universally accepted mechanical harvester has retarded the acceptance of mechanical thinning.

The method of thinning to be used is largely determined by germination stand, distribution of seedlings, weed growth, timeliness of operations, and availability of labor. The success of mechanical thinning probably depends more upon carrying a system through to completion than it does upon any particular machine. Experience at the Colorado Agricultural Experiment Station has shown that there is a mechanical thinning method which will give satisfactory results under almost any field condition.

Table 3.- Comparative blocking and thinning labor requirements 1942-1943.

	Relative Time Required in Percentage				
	Hand block, Hand thin	Hoe thin	4"2" machine block, Hoe thin	2"1" machine block, Hoe thin	Machine thin
1942 40% germination, 64% singles	100	57.4	42.0	49.6	9.0
1943 Box Elder Farm 33.8% germination, 43.4% singles	100	49.3	43.2	-	2.4
1943 Portner Farm 31% germination, 64.35% singles	100	48.0	39.6	-	3.7