Time Studies on Saving of Labor in Summer Work[1]

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To date only an inconsequential part of the summer sugar beet work in the eastern area has been done mechanically. This apparent lag in mechanization exists not because of indifference to the great need for mechanical blocking nor because of a belief that mechanical blocking is not feasible in the East. Rather, it exists because eastern beet technologists quite generally believe that the need for labor saving in blocking and thinning, great as it is, is not as urgent today as is the need for labor saving in harvest. As a consequence, the summer phase of mechanization has not been pressed as intensively as has the fall phase. Had sufficient personnel been available during the war years the problem of mechanical blocking and thinning, in all its ramifications, doubtless would have received more attention.

In addition to the reason given for lagging mechanization of summer work, there is the problem of obtaining uniformly good stands of seedlings grown from single-germ seed. Plans to eliminate hand work from blocking and thinning are based upon attainment of seedling stands characterized by single plants spaced more or less uniformly in the row. To date, such stands are not consistently attained by farmers in the eastern area. This is not purely a mechanical problem. Frequently, attempts to obtain a uniform stand of single seedlings have failed because, first, the planter failed to place the seed uniformly in the row, and, second, seedlings in portions of the field failed to emerge because of black root, crusting of the soil, and other less known factors which militate against uninterrupted growth. Once the problems of precision planting, seed germination, and seedling emergence have been solved reduction of hand labor in summer work is certain to follow.

The use of sheared sugar beet seed has become popular with eastern farmers. Over 50 percent of Michigan's 1946 acreage of beets will be planted with sheared seed. During the summer of 1945 Michigan State college, in cooperation with the Farmers and Manufacturers Beet Sugar Association of Saginaw, conducted a time study on. the Lee Ferden farm in Saginaw County to determine more accurately the amount of labor saving effected through the use of sheared seed.

Indirectly, the study is closely associated with mechanical thinning, as will be shown.

Ferden Farm Time Study of 1945

On May 2, 1945, 56 plot pairs, each pair consisting of six 28-inch rows 90 feet long were planted with sheared and unsheared seed as follows: The north three rows of each plot pair were planted with unsheared seed at the rate of 15.0 pounds per acre; the south three rows with sheared seed at an average rate of 4.2 pounds per acre (about 12.4 seed pieces per foot of row). The planter was a type commonly used by eastern growers which places the commercial fertilizer in a band 1% inches beneath and 1 inch to the side of the seed.

On June 18 a pre-blocking stand count was made of each row. "Pre-blocking stand" hereinafter indicates number of beet-containing inches, expressed as percentage of total inches of row.

On June 23 and 24 the beets were blocked and thinned. Four Mexican workers were employed for this work, two with long-handled hoes and two with short-handled hoes. Thinning was done concurrently with blocking. Records were kept of the time required to block and thin each 90-foot row.

Labor Requirements.—-Usual estimates of labor saving resulting from use of sheared sugar beet seed range from 20 to 60 percent. As shown in table 1, the results of this study indicate that under conditions definitely unfavorable for seedling emergence, with a planter which distributes the seed imperfectly in the row, and at the planting rates shown, a saving of slightly more than 30 percent reasonably may be expected. It is believed that the saving of labor can be increased markedly beyond this figure through more nearly uniform distribution of sheared seed in the row. Frequently, the workers encountered "skips" of several feet and hence were forced to leave multiple-plant blocks which required hand thinning.

As noted before, the south three rows of each plot pair were planted with sheared seed at an *average rate* of 4.2 pounds per acre. However, the individual rows were planted with sheared seed at dif-

Table 1.—Amount of time required to block and thin sugar beets grown from unsheared seed and from sheared seed.

Type seed	Average planting rate per acre (28-inch rows)	Time required to block and thin one acre*
Unsheared	15.0 pounds	17.5 hours
Sheared	4.2 pounds	12.2 hours

*Difference required for significance at 5-percent level—1.265 hours.

Table 2.—Amount of time required to block and thin sugar beets grown from sheared seed planted at different rates.

Type seed	Average planting rate per acre (28-inch rows)	Time required to block and thin i acre*	Labor saving
Unsheared	15.0 pounds	17.5 hours	
Sheared	6.3 pounds	13.49 hours	22.9 percent
Sheared	3.7 pounds	12.53 hours	28.6 percent
Sheared	2.6 pounds	10.73 hours	38.6 percent

*Difference required for significance at 5-percent level—1.26 hours.

ferenl rates. Table 2 shows the effect of planting sheared seed at different rates upon the amount of time required to block and thin. The greatest saving of labor, in terms of the amount of time required to block and thin the unsheared seed plots, was effected when sheared seed was planted at the rate of 2.6 pounds per acre (about 7.7 seeds per foot). The use of sheared seed at the rate of 6.3 pounds per acre (about 18.6 seeds per foot) resulted in a marked saving of labor, though not as great as that effected by the lower rates. Had conditions affecting seedling emergence been more favorable the use of as much as 6.3 pounds of sheared seed per acre doubtless would have resulted in labor saving considerably less than that shown in table 2.

Pre-Blocking and Post-Thinning Stands.—Table 3 shows the pre-blocking and post-thinning stand counts made on June 18 and June 27, respectively. It is interesting to note the relationship which existed between planting rates and stands. A pre-blocking stand of 15 percent (15 beet-containing inches per 100 inches of row), if characterized by seedlings spaced at more or less uniform intervals in the row, constitutes the basis for a post-thinning stand of 100 or more well-spaced beets per 100 feet of row. However, because the seedlings were poorly distributed in this experiment, a pre-blocking stand of 15 percent resulted in a post-thinning stand of only 74.1 beets per 100 feet of row. Clearly, the use of 2.5 pounds of sheared seed per acre, even in seasons distinctly unfavorable for seed germination and seedling emergence, results in a pre-blocking stand adequate for hand blocking and thinning. However, it is imperative that the seeds be uniformly distributed in the row if a satisfactory post-thinning stand

Table 3.—Pre-blocking and post-thinning stand counts.

Type seed	Average planting rate per acre	Pre-blocking stand	Average number of plants per 100 feet of row June 27
Unsheared	15.0 pounds	43.3 percent	99.7
Sheared	6.3 pounds	27.1 percent	88.3
Sheared	3.7 pounds	16.3 percent	19.6 percent	70.6	79.7
Sheared	2.6 pounds	15.0 percent	74.1

is to be attained and if labor savings are to exceed markedly those shown in table 2.

Although the acre-yields of roots in this experiment were relatively low because of unfavorable weather conditions, and in spite of a decidedly lower post-thinning stand count, the roots from the sheared seed plots outyielded those from the unsheared-seed plots by 6.6 percent, a value statistically significant at the 5-percent level.

Other Studies

In connection with hand thinning following row blocking, interesting data have been obtained at East Lansing. Sheared seed and several combinations of unsheared seed separates having varying percentages of single-germ seed pieces were planted in 4-row plots, each 30 feet long. The two center rows of each plot were used in a time study. In all, there were 31 plots each replicated 6 times. The entire set of plots first was blocked with hong-handled hoes, with an approximate spacing of 12 inches from center of block to center of block. Following blocking, the two center rows of each plot were thinned by hand. Records were kept of the time required to thin each plot. The results of this study are presented in figure 1.

The correlation that existed between number of multiple-plant blocks per 100 feet of row and hours required to thin the multiple-plant blocks in 1 acre was very high, the coefficient being +0.99. The data further indicate that the time required simply to traverse an acre of beets growing in 28-inch rows, exclusive of thinning, was 3.5 hoars. To thin each multiple-plant block required, on the average, an additional 3.32 seconds.

In the eastern area the planting of shreared seeds at approximately 2-inch intervals in the row frequently results in seedling stands which are characterized by 75 to 80 percent single plants. It will be noted in figure 1 that the time required to thin by hand a blocked stand having 25 multiple-plant blocks per 100 feet of row was about 7.8 hours per acre. The latter value corresponds closely with experimental field results obtained elsewhere in the eastern area. Mr. Perc Reey, agricultural supervisor of the Farmers and Manufacturers Beet Sugar Association of Saginaw, reports that during the summer of 1945 an experienced beet worker using a long-handled hoe was able to block and thin satisfactorily at the rate of 2 acres per day a portion of a field characterized by a 22-percent germination stand and 77 percent single plants. In view of such evidence it appears that weed-free fields characterized by 75 to 80 percent single plants and a germination stand sufficiently high to permit of satisfactory
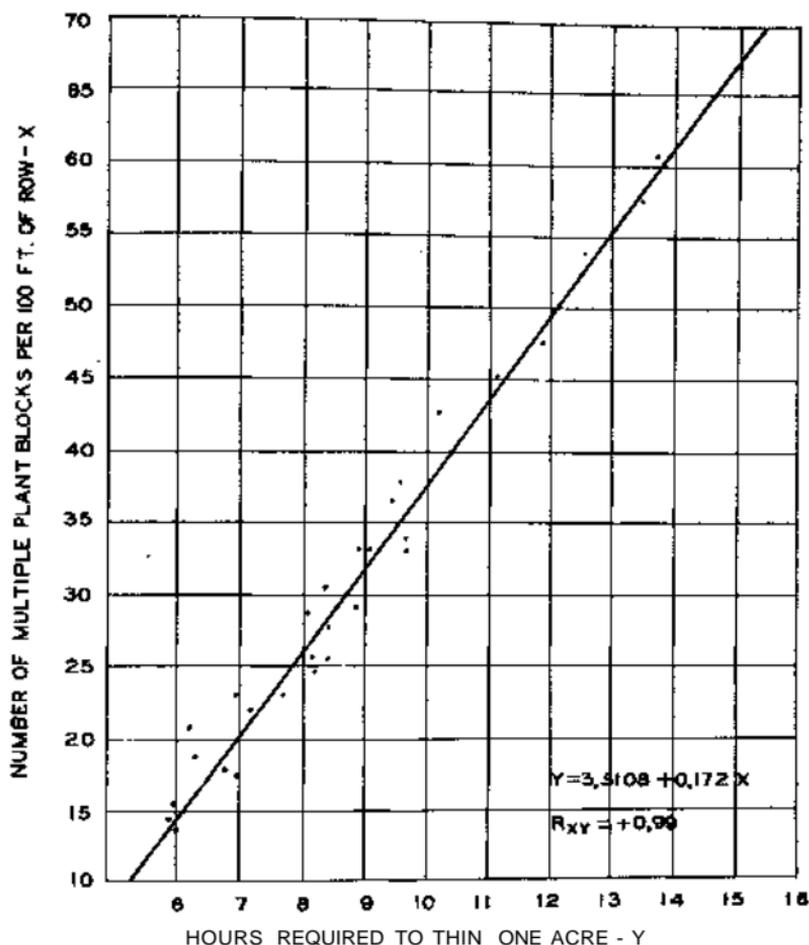
Figure 1.—Relationship between numbers of multiple-plant blocks per 100 feet of row and hours required to thin one acre.

mechanical blocking at 12-inch intervals should be blocked and thinned by hand in preference to mechanical blocking at 12-inch intervals followed by hand thinning.   Experimental evidence from the eastern area in the use of mechanical blockers adjusted to leave blocks separated by distances which are a fractional portion of the desired average distance between beets in the post-thinning stand is insufficient at this time to justify its being reported.