An Analysis of Production Practices of Sugar Beet Farmers in Michigan, 1958[1]

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Received for publication February 5, 1960

Research in methods of reducing spring labor requirements for sugar beets has been given a high priority rating by industry and experiment station workers. In order to coordinate efforts of the two groups a cooperative project was initiated in 1957 between various departments of the Michigan Agricultural Experiment Station and the Farmers and Manufacturers Beet Sugar Association. The objectives of this project were to investigate ways of minimizing spring labor requirements in sugar beet production. As part of this research program, the Soil Science Department and the Agricultural Research Department of the Michigan Sugar Company conducted a study of production practices of sugar beet farmers in Michigan. Practices from approximately 3,000 fields which consisted of 49,000 acres of sugar beets, were obtained by fieldmen. The data were coded and punched on IBM cards and then analyzed through the facilities of Michigan State University under the direction of personnel of the Soil Science Department.

These data are for but one year, but they do represent cultural practices from approximately 70 percent of the acreage of sugar beets in Michigan. It was believed that a description of the methodology involved in this study would be of interest to research personnel of both experiment stations and industry. It also demonstrates the advantages of a cooperative project between two interested organizations, the Company and the Experiment Station.

Procedure

Standard IBM cards were used and the following items coded on the cards:

1. District. Five districts.
2. Year. 1957 to 1966.
3. Fieldmen. Thirty-six fieldmen.
4. Soil type. Mineral, muck, combinations.
5. Tile drained. Yes, no.
6. Surface drained. Yes, no.

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[1] Contribution of the Soil Science Department of the Michigan Agricultural Experiment Station, Michigan State University, and the Michigan Sugar Company, Saginaw, Michigan. Authorized for publication by the Director as Journal Article No. 2579 of the Michigan Agricultural Experiment Station, East Lansing, Michigan.

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26. Pounds of seed per acre. 0-.9, 1.0-1.4, 1.5-1.9, 2.0-2.4, 2.5-2.9, 3.0-3.4, 3.5-3.9, 4.0-4.4, 4.5 or more.
27. Row width (inches). Less than 28, 28, 30, 32, 34, 36, 38, 40, more than 40.
28. Seed spacing (inches). Less than 1.4, 1.5-1.9, 2.0-2.4, 2.5-2.9, 3.0-3.4, 3.5-3.9, 4.0-4.4, 4.5-4.9, 5 or more.
29. Cultivating within two inches of the row. Yes or no.
30. Number of times cultivated. None, 1, 2, 3, 4, 5, 6, 7, over 7.
31. Date planted. Before April 1, April 1-11, April 12-23, April 24-May 6, May 7-18, May 19-30, May 31 to June 11, June 12-23, after June 23.
32. Drill used. Palsgrove, John Deere flex, John Deere 64, International, other.
33. Type of labor. Own labor, Nationals, Texans, Combination, and Local.
34. Cost per acre thinning.
35. Cost per acre hoeing.
36. Total cost per acre.
37. Chemical weed control. Yes, no.
38. Mechanical stand reduction. Yes, no.
39. Date harvested. Before October 1, Oct. 1-7, Oct. 8-15, Oct. 16-23, Oct. 24-30, Oct. 31-Nov. 7, Nov. 8-15, Nov. 16-23, after Nov. 23.
40. Number of acres harvested.
41. Total tons per acre.
42. Acres lost.
43. Reason for loss. Weather, weeds, disease, poor stand, soil bank, flood, other.
44. County. Twenty-two counties.
45. Township. 183 townships.

This coding required 66 out of 80 spaces available on a standard IBM card, thus leaving 14 spaces for other items.

Prior to coding on the cards the field forms were checked by the Agricultural Research Director for the company. The data were then recorded on a standard tabulation sheet provided for that purpose, and were then submitted to the Statistical Laboratory where the cards were punched and the various analyses desired run. A preliminary run of the following comparisons was made.

1. Number of acres and yields per acre as indicated by IBM analyses and company postharvest records.

2. Mineral versus muck soils.
3. Tile drainage.
4. The effect of preceding crops on yields.
5. The number of years beets were preceded by alfalfa.
6. Fall versus spring plowing.
7. Depth of plowing.
8. Number of times field was worked prior to planting.
9. Number of days between last time the soil was worked and planting.
10. Amount of fertilizer plowed down.
11. Amount of fertilizer broadcast before planting.
12. Fertilizer applied with a drill at planting time.
13. Total amount of fertilizer applied.
14. Nitrogen sidedressing.
15. Total amount of nitrogen applied.
16. Relationship of nitrogen application and time of plowing down alfalfa or clover.
17. Amount of phosphate applied.
18. Amount of potash applied.
19. Effect of PK ratio.
20. Date of planting.
21. Date of harvest.

There are several other comparisons that could be made. As a matter of illustration a few of the tables of data are cited. For example, in Table 1 the relationship of the number of acres and yield per acre as indicated by IBM analyses and company post-harvest records, 1958, are recorded. There are a few small discrepancies in the total acreage harvested between the two methods of analysis, particularly for the Alma, Caro, and Saginaw Dis-

Table 1.—Number of Acres and Yield per Acre as Indicated by IBM Analysis and Company Post-Harvest Records, 1958.

	IBM Analysis		Actual	
District	Acres	Tons/Acre	Acres	Tons/Acre
Alma (a)	4,226	14.2	4,155	14.4
Caro	10,772	16.5	10,452	16.6
Croswell	6,760	11.9	6,957	11.9
Saginaw	9,583	18.0	9,511	17.1
Sebewaing	17,449	16.1	17,760	15.8
Total	48,790	15.8	48,835	15.6

(a) Alma figures include acres of beets grown in the Lansing area.

tricts. The only major discrepancy is shown in the average yield per acre in the Saginaw District. In this case, the IBM analysis shows nine-tenths tons per acre more beets produced than the company's final figures. When considering this with the acreage harvested in relation to the entire acreage, the figures appear reasonably accurate.

The effect of tile drainage on the yield of beets also shows some interesting information. On the average, tile drained land produced 3.2 tons per acre more beets than did untiled land. However, there was quite a wide variation between districts as to the effect of tiling. The figures show that approximately 80 percent of the total beet acreage was tiled land and the greatest apparent benefit from tile drainage was in the Caro District where the beets produced on tiled land averaged 4.8 tons per acre more than those grown on land not tiled.

Table 2.—Yields of Beets as Affected by Tile Drainage, 1958.

District	Tile Drained	Acres	Tons/Acre	Difference
Alma	Yes	2,750	14.8	1.3
	No	341	13.5	
Caro	Yes	9,047	17.2	4.8
	No	1,643	12.4	
Croswell	Yes	1,578	13.4	1.7
	No	4,285	11.7	
Saginaw	Yes	7,618	18.5	3.7
	No	1,332	14.8	
Sebewaing	Yes	14,131	16.2	0.2
	No	3,171	16.0	
Total	Yes	35,124	16.7	3.2
	No	10,771	13.5	

Another interesting comparison was obtained by the number of times the field was worked prior to planting. The trend generally occurring at all plant areas both individually and collectively indicates that the highest yields were obtained with either once or twice over the field before planting. This brings out the marked advantage of the minimum tillage idea in production of sugar beets. Not only are yields maintained at the highest levels, but there is a considerable advantage in the reduced expense involved in seedbed preparation.

Table 3.—Beet Yields as Affected by the Number of Times a Field Was Worked Prior to Planting, 1958.

Times Worked	Acres	Tons/Acre
One	10,316	16.8
Two	17,350	16.7
Three	9,237	15.2
Four	3,303	14.8
Five	947	14.2
Six	723	14.3
None	4,019	14.0

Another interesting comparison was obtained from the amount of phosphate applied. As the amount of phosphate increased, the average yield per acre increased, up to and including 350 pounds of P_2O_5 per acre. A more complete report of the results can be obtained from the Michigan State University Agricultural Experiment Station Quarterly Bulletin, Volume 42, No. 2, pages 401-421, 1959.

Table 4.—Beet Yields as Affected by the Amount of Phosphate Applied, 1958.

Pounds/Acre	Acres	Tons/Acre
Less than 50	2,463	14.3
50- 99	14,331	15.5
100-149	22,025	16.3
150-199	5,712	16.2
200-249	1,197	17.5
250-299	114	17.9
300-349	46	18.0
Over 349	6	17.2

It is realized that there is confounding of factors that should be considered in the interpretation of these results. For example, farmers on tile drained farms are more likely to be better farmers and, in general, better farmers tend to follow the better practices. However, this type of processing of data does provide some interesting trends. Furthermore, where acreages of less than 1,000 acres are involved, care should be taken in the degree in which the effect of this particular factor at this level of acreage is assessed.

While the data are for but one year, it is planned to continue this type of study, possibly not on a year-to-year basis but at various intervals and in this way a good comparison can be made

with changes in practices over time. The cost of this analysis is comparatively reasonable, particularly if the data are collected by the fieldmen as a standard procedure by the company. Apparently, most companies do keep some sort of record on each field of beets and after the data are collected this appears to be a satisfactory way of analyzing a large number of figures.

Extreme care should be taken in training personnel to provide accurate information. This, in itself, is good training for the fieldmen and it also provides a close check on the fieldmen's operation.

This study also provides an opportunity for combining data from year to year and studies of this kind should contribute much to the progress of sugar beet production.