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FOREWORD

The authors thank the sugarbeet producers who provided the information about their costs and production practices. The cooperation of the American Crystal Sugar Company and Minn-Dak Farmers Cooperative in providing information and lists of producers is also appreciated. Useful suggestions and technical information were provided by Mr. Allen Cattanach and Dr. Alan Dexter. The producer interviews were conducted by Steven Hvinden, David Rice, and Gary Hoots.

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Steven C. Hvinden and Roger G. Johnson*

This report summarizes sugarbeet cost data obtained from 212 personal interviews with Red River Valley sugarbeet growers. The total cost per acre of producing sugarbeets averaged $350 in 1977. Only about one-fourth of the sugarbeets were grown on summer fallow. The study results indicate there is potential for increasing net returns by substituting technology for hand labor in thinning and weeding sugarbeets. Larger sugarbeet enterprises were able to spread the annual cost of machinery ownership over more acres and, thus, realize lower total costs.

Several changes in sugarbeet production practices have been taking place in recent years. Most sugarbeets are now grown on land cropped the previous year, while only a few years ago they were grown almost entirely on summer fallow. Electronic thinners, planting to stand, and increased use of herbicides are replacing some of the hand labor for thinning and weeding. Recent expansion in processing capacity has given growers the opportunity to increase the size of their sugarbeet enterprise. Improved varieties of seed and other technological advances are contributing to higher yields.

These changes, together with price inflation, have made previous information on sugarbeet production costs out of date. Current production cost information is presented to help growers evaluate their own costs and compare costs among production practices and size of enterprise. Production cost data are also useful in sugar policy formulation.

This report summarizes the results of a study of 1977 sugarbeet production costs. Three interviewers visited 212 sugarbeet producers during June and July of 1977. The number of farmers surveyed by factory area is shown in Table 1. Information was collected concerning input costs, production practices, and machinery used. This information was used to calculate production costs for each producer surveyed.

Sampling and Sample Farms

The sample of growers was obtained from American Crystal Sugar Company and Minn-Dak Farmer Cooperative. The sample was stratified by contract size

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TABLE 1. SELECTED CHARACTERISTICS OF SUGARBEET FARMS BY FACTORY AREA, 1977

Item	All Factory Areas	Factory Area					
		Moorhead	Hillsboro	Crookston	East Grand Forks	Drayton	Wahpeton
Number Surveyed	212	41	21	41	40	42	27
Yield (Tons/Acre)	18.1	18.4	18.0	17.4	17.6	17.9	20.1
Sugarbeet Acres Per Farm	281	338	324	292	279	208	265
Total Acres Per Farm	1,528	1,575	1,748	1,242	1,713	1,273	1,843
Percent Beets on Fallow, Average Grower	31	21	32	10	37	65	18

with an equal number of growers randomly selected from each of four groups (0-99, 100-199, 200-299, and 300+). However, many of the smaller contracts were only a part of a larger operating unit. Since a greater proportion of the larger contracts was sampled, enterprise size is larger in the study than for average Valley producers.

Selected characteristics of the farms surveyed for each factory area are shown in Table 1. The growers surveyed raised 59,667 acres of sugarbeets and averaged 281.4 acres of sugarbeets per operating unit.[1] The sugarbeet enterprise ranged in size from 55 to 1,100 acres. The farms surveyed ranged in size from 97 to 7,500 acres, with an average of just over 1,500 acres. The majority of the crop was produced on summer fallowed land in the Drayton area, while only 10 percent was on summer fallowed land in the Crookston area.

Calculation of Costs

Most expenses were obtained directly from the sugarbeet grower. However, machinery costs were calculated based upon the field operations performed and the size and type of tractors and equipment used. Basic machinery data obtained from the growers included the ownership period, acres of use, and speed of travel. Current machinery prices were obtained from local dealers. List prices were discounted 10 percent to represent prices farmers typically pay for machinery.

Machinery ownership costs include machinery replacement costs, interest on average investment, and insurance. Machinery replacement is calculated like

[1]According to the 1974 Census of Agriculture, the average sugarbeet producer in the Red River Valley harvested 170 acres.

straight line depreciation except that purchase price and salvage value are in 1977 prices. This differs from depreciation as used in accounting, which is based on the price in the year purchased. The interest cost was obtained by multiplying the average amount of capital invested in the machine over the ownership period by a 9 percent rate of interest. Insurance was calculated at .6 percent of average value. Per acre ownership costs for specialized sugarbeet machinery were determined by dividing annual ownership costs by the acres of sugarbeets. For tractors, trucks, and other general use machinery, ownership costs were allocated to the sugarbeet enterprise based on hours of use.

Machinery operating costs include repairs, fuel, and lubricants. Repair costs were calculated based on studies agricultural engineers have done on the incidence of repairs for various types of machines (1). Fuel costs were calculated from fuel consumption rates based on the tractor's horsepower (2). Lubricant costs were assumed to be 15 percent of fuel costs.

The amount of machinery labor was calculated based on the size of machinery used and speed of travel. All machinery labor, including that of the operator, was figured at $4 per hour.

The Valley was divided into three areas for determining the land charge. The land charge was $65 per acre in the Wahpeton and Moorhead factory areas; $59 per acre in the Hillsboro, East Grand Forks, and Crookston factory areas; and $55 per acre in the Drayton factory area. Sugarbeets produced on summer fallow were charged two years of land cost.

Sugarbeet Costs for the Red River Valley and Factory Areas

Sugarbeet production costs for 1977 in the Red River Valley and each factory area are presented in Table 2. The total cost per acre of producing sugarbeets was $350.06. Variable costs accounted for 47 percent of the total costs. The major variable costs were for hand labor and fertilizer, while the major fixed costs were for land and machinery ownership. Machinery costs (machinery ownership, fuel, lube, repairs, and labor) account for 36 percent of total costs, while the land charge represents about 22 percent of total costs.

Total costs ranged from $325.23 per acre for the Wahpeton area to $366.44 per acre for the Drayton area. Wahpeton growers spent less on some of the variable cost items, while Drayton growers had a high land charge because a larger portion of the sugarbeets were produced on summer fallow.

TABLE 2. 1977 SUGARBEET PRODUCTION COSTS PER ACRE FOR THE RED RIVER VALLEY AND BY FACTORY AREA

Item	All Factory Areas	Factory Area					
		Moorhead	Hillsboro	Crookston	East Grand Forks	Drayton	Wahpeton
Variable Costs							
Beet Seed	$ 13.18	$ 12.49	$ 15.78	$ 12.65	$ 13.24	$ 14.22	$ 11.31
Fertilizer	24.84	22.56	21.43	33.06	25.43	23.00	20.50
Herbicides	10.80	7.22	7.80	14.11	12.33	9.51	13.26
Custom Spraying[a]	2.83	3.35	5.32	1.61	2.38	3.74	1.24
Insecticides[b]	5.29	6.77	2.82	5.45	6.02	6.49	1.76
Hand Thinning[c]	14.72	14.81	18.02	14.65	13.67	17.28	9.72
Hand Weeding[d]	15.52	16.22	15.31	16.63	15.56	14.06	15.14
Migrant Housing	3.46	3.45	4.28	3.37	3.12	3.49	3.42
Social Security and Workmen's Compensation	4.06	3.42	4.63	5.71	4.42	3.00	3.16
Custom Hauling	4.01	3.14	2.43	5.59	3.93	6.68	0.11
Fuel and Lube[e]	18.65	18.10	18.97	18.86	18.03	19.15	19.03
Repairs	13.10	12.76	12.77	13.41	13.14	12.83	13.73
Interest on Operating Capital[f]	5.21	4.68	5.15	6.16	5.35	5.21	4.42
Labor[g]	22.14	20.79	22.17	22.62	21.49	23.75	21.88
Miscellaneous[h]	5.60	8.33	6.54	4.50	4.45	5.37	4.42
Total Variable Costs	163.41	158.09	163.42	178.38	162.56	167.78	143.10
Fixed Costs							
Machinery Ownership							
Interest and Insurance	29.55	28.29	30.73	29.75	29.75	29.70	29.76
Machinery Replacement	43.80	41.36	45.95	45.32	44.78	44.32	41.30
Farm Overhead	5.88	7.62	7.85	5.16	4.99	4.97	5.56
Management Charge[i]	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Land Charge	78.42	78.82	78.01	64.64	80.76	90.67	76.51
Interest in Co-op[j]	9.00	9.00	9.00	9.00	9.00	9.00	9.00
Total Fixed Costs	186.65	185.09	191.54	173.87	189.28	198.66	182.13
TOTAL COST	350.06	343.18	354.96	352.25	351.84	366.44	325.23

[a] Includes cost of chemical and application.
[b] Approximately 57 percent of average grower's acreage was hand thinned; average rate paid for hand thinning was $26.02 per acre.
[c] Approximately 90 percent of average grower's acreage was hand weeded; average rate paid for hand weeding was $17.35 per acre.
[d] Diesel fuel at $.46 per gallon and gasoline at $.59 per gallon.
[e] Operating capital was charged from the time each expense was incurred through harvest at a 9 percent interest rate.
[f] Both farm operator and hired labor are valued at $4 per hour.
[g] Includes other custom work hired, rented equipment, labor recruiting fee, soil testing, beet hoes, crop insurance, etc.
[h] Based on 5 percent of typical gross receipts.
[i] Based upon original cost of $100 per share at 9 percent interest.

Total variable costs ranged from $143.10 per acre for the Wahpeton growers to $178.38 per acre for the Crookston growers. The Wahpeton growers planted 46 percent of their acreage to stand and, consequently, had lower seed and hand thinning costs. Wahpeton growers also spent significantly less on fertilizer, custom spraying, insecticides, and custom hauling. Crookston growers spent significantly more than other growers on fertilizer, herbicides, social security, and workmen's compensation. The high fertilizer expense is, in part, due to the fact that Crookston had the highest percentage of sugarbeets raised on land cropped the previous year.

Total fixed costs per acre ranged from $173.87 for the Crookston area to $198.66 for the Drayton area. This difference is primarily due to the land cost. The average grower in the Crookston area raised only 10 percent of his sugarbeets on summer fallow compared to 65 percent for the average Drayton area grower.

Sugarbeet Costs for Summer Fallow and Previously Cropped Land

In recent years there has been a dramatic shift in sugarbeet production from summer fallow to land cropped the prior year. A study of sugarbeet costs completed in 1971 (3) indicated that almost all sugarbeets produced in the Valley were on summer fallow. The present study shows that in 1977 only about one-fourth (26.4 percent) of the sugarbeets were grown on summer fallow. Nearly half (49 percent) of the growers produced sugarbeets on both summer fallow and previously cropped land. Forty-two percent produced on previously cropped land exclusively, while 9 percent used only summer fallowed land.

Total costs per acre for sugarbeets grown on summer fallow are $58.21 per acre higher than for previously cropped land (Table 3). Variable costs, however, are $6.42 per acre lower using summer fallow. The lower cost is primarily due to the lower fertilizer costs for the summer fallow production practice. Due almost entirely to the two-year land charge, fixed costs per acre are $64.63 higher for beets raised on summer fallow. The appropriate land charge for summer fallow depends upon the net value of the crop that could have been produced instead of summer fallow. This varies among farmers depending upon their situation and may be greater or could be less than the extra year's land charge used in this study.

The yield advantage for sugarbeets on summer fallow was 1.9 tons per acre. The percent sugar was the same for both production practices. At a price of $20 per ton, the value of the higher yield, $38 (1.9 x $20), would not cover the $58.21 higher cost for producing on summer fallow. However, there are factors in addition to yield, such as reduced risk, improved weed control, and government program provisions, that need to also be considered when making decisions whether or not to use summer fallow.

Sugarbeet Costs by Utilization of Hand Labor

Hand labor costs for thinning and weeding sugarbeets are the major variable costs. In 1977 the recommended rates were $25.75 per acre for

TABLE 3. 1977 SUGARBEET PRODUCTION COSTS PER ACRE BY NONFALLOW AND FALLOW PRODUCTION PRACTICES

Item	Production Practice	
	Nonfallow	Fallow
	n=194	*n=122*
Variable Costs		
Beet Seed	$ 13.20	$ 13.57
Fertilizer	26.44	19.20
Chemicals	19.77	16.12
Hand Labor	30.54	29.94
Fuel and Repairs	30.91	32.34
Labor	21.51	22.64
Other Variable Costs	21.48	23.62
Total Variable Costs	163.85	157.43
Fixed Costs		
Machinery Ownership	71.77	77.87
Land	60.47	118.82
Other Fixed Costs	34.89	35.07
Total Fixed Costs	167.13	231.76
TOTAL COST	330.98	389.19
Yield (Tons/Acre)	17.5	19.4
Percent Sugar	15.0	15.0

thinning and $16.60 per acre for weeding, for a total of $42.35. Reducing this cost without sacrificing yield is of prime concern to growers. The average surveyed grower was saving about $11 an acre in hand thinning costs by using an electronic thinner. Approximately 47 percent of the acres covered in the study were either machine thinned or planted to stand in 1977.

Are growers who are reducing hand labor realizing lower total costs? How do their yields compare with those who use all hand labor? To answer these questions, two groups of growers were identified: high and low hand labor producers. High hand labor producers used hand labor to thin and weed all of their sugarbeet acreage. Low hand labor producers had less than one-half of their acreage hand thinned and less than three-fourths of their acreage hand weeded.

Comparative cost data are presented in Table 4 for the 36 high hand labor producers and for the 24 low hand labor producers. The major differences between the two groups, of course, are in the expenditures associated with hand labor. The low hand labor producers spent $38.61 less per acre than the high

TABLE 4. 1977 SUGARBEET PRODUCTION COSTS PER ACRE BY USE OF HAND LABOR

Item	High Hand Labor	Low Hand Labor
	n=36	*n=24*
Variable Costs		
Beet Seed	$ 12.93	$ 12.77
Fertilizer	25.09	20.60
Chemicals	17.52	19.86
Hand Thinning	26.10	4.90
Hand Weeding	17.18	5.38
Migrant Housing	5.04	1.41
Social Security and Workmen's Compensation	4.18	2.20
Fuel and Repairs	31.62	32.20
Labor	23.45	21.38
Other Variable Costs	17.41	10.45
Total Variable Costs	180.52	131.15
Fixed Costs		
Machinery Ownership	66.20	76.72
Land	78.86	82.05
Other Fixed Costs	35.02	34.22
Total Fixed Costs	180.08	192.99
TOTAL COST	360.60	324.14
Yield (Tons/Acre)	18.6	17.5
Sugarbeet Acres Per Farm	220.5	312.4
Percent Beets on Fallow, Average Grower	34.2	37.6
Percent Beets Machine Thinned, Average Grower	0	81

hand labor producers for hand thinning, weeding, migrant housing, social security, and workmen's compensation. The savings are, in part, offset by higher costs for herbicides and custom spraying. Machinery ownership costs also are higher for the low hand labor producers because of the electronic thinner cost. Total costs per acre were $36.46 lower for the low hand labor producers.

The yields were 1.1 tons per acre less for the low hand labor producers. At $20 a ton, the value of the yield difference ($22) offsets much of the $36.46 per acre cost savings. Although other factors affecting both costs and yields were not constant between the two groups of producers, the data

are indicative of the potential for increasing net returns by substituting herbicides, electronic thinners, and other management practices for hand labor in thinning and weeding sugarbeets.

Sugarbeet Costs by Size of the Operating Unit

Machinery ownership costs are a large part of total costs. The question often arises as to the size of sugarbeet enterprise needed to make the most efficient use of sugarbeet machinery. One of the problems with sugarbeet machinery is that it comes in only certain sizes. For example, electronic thinners are usually six-row or twelve-row. A grower may have too many acres for a six-row and too few acres to justify owning a twelve-row. Past studies of sugarbeet costs have shown that larger sized operating units have had lower total costs since the machinery ownership costs are spread out over more acres (3, 4, 5). To analyze the effects of size, the survey farms were divided into four groups, based on the acres of sugarbeets. Costs were determined for each group to see how machinery ownership costs and other costs varied by size (Table 5).

The most important savings achieved by the larger sugarbeet enterprises were in machinery ownership costs which were nearly $20 an acre lower for the largest size group compared to the smallest. Lower labor costs were also achieved by the largest size group compared to the smallest group, but the difference was only just over $3 per acre. The similar labor cost indicates that little difference exists in the average size of equipment used. The chief advantage of the larger enterprise is in being able to spread the annual cost of machinery ownership over more acres. A much larger portion of the producers with small units grew their sugarbeets on summer fallow than the producers with larger units. This is, in part, due to the fact that more of the small growers are located in the Drayton factory area where summer fallow is most common. Other cost items showed no consistent pattern with regard to farm size.

TABLE 5. 1977 SUGARBEET PRODUCTION COSTS PER ACRE BY SIZE OF SUGARBEET OPERATING UNIT

Item	Acres of Sugarbeets			
	Less Than 190	190-324	325-459	More Than 459
	n=66	*n=81*	*n=38*	*n=27*
Variable Costs				
Beet Seed and Fertilizer	$ 35.71	$ 39.48	$ 36.91	$ 40.89
Chemicals	17.08	20.26	19.00	19.29
Hand Labor	33.76	30.48	22.39	31.94
Fuel and Repairs	30.91	31.61	32.68	32.82
Labor	23.91	21.41	21.54	20.82
Other Variable Costs	22.12	23.74	19.93	22.02
Total Variable Costs	163.49	166.98	152.45	167.78
Fixed Costs				
Machinery Ownership	80.98	73.73	67.76	61.52
Land	83.39	76.74	79.03	70.46
Other Fixed Costs	34.25	35.37	34.44	35.57
Total Fixed Costs	198.62	185.54	181.23	167.55
TOTAL COST	362.11	352.82	333.68	335.33
Yield (Tons/Acre)	17.9	18.3	18.3	18.1
Sugarbeet Acres Per Farm	126.6	252.8	383.5	602.2
Percent Beets on Fallow, Average Grower	41.9	28.9	30.1	13.7
Percent Beets Machine Thinned, Average Grower	30.2	45.4	61.6	43.0

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