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COSTS OF HARVESTING SUGAR BEETS

A First Year of Experience,

Central New York, 1965

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Sugar beets is a new crop in Central New York. While considerable experience from other areas is applicable to New York conditions for growing the crop, harvest conditions are another matter. A small study was undertaken during the fall months of 1965 to get better estimates of the time requirements and costs associated with the harvest of sugar beets under New York conditions where some of the best agricultural soils were formed from glacial till including stones of various sizes. Because New York farmers had no previous experience in operating sugar beet harvesting machinery, this information about the first year provides only an indication of the level of achievement which may be expected.

This report summarizes the experiences of 17 operators of sugar beet harvesting equipment. All the operators were located in counties close to the processing plant. Most of the sugar beets harvested were grown on upland soils which included some gravel and small rocks. While these records represent only 17 men's experiences, they harvested 2,244 acres of beets, about 12 percent of the total acres harvested in the State and slightly more than 12 percent of the total tonnage.

Records were obtained from each operator throughout the season on a weekly basis. Each of the men made estimates of the time spent in harvesting and provided complete information on loads hauled, quantities of beets handled, sugar percentage and tare from all plots harvested.

The most common size of harvester was a 2-row machine. Among the 17 growers 12 used this size machine. Four men used 1-row machines, and one farmer had a 3-row harvester. All but two of the men harvested some beets on a custom basis. The range in total number of acres harvested was from 80 to 193 acres. All but three of the operators handled 100 or more acres during the season. As suggested by the data in table 1 the six operators who harvested 150 or more acres harvested slightly more beets per acre as well as more total acres. Percent sugar on these farms was slightly higher and the tare slightly lower. In general the men who harvested the largest acreages had some advantage in harvesting better than average beets overall.

Field records were obtained by Darwin Snyder during the fall and winter months of 1965. These records were summarized by Peter Hazell.

Table 1. HARVEST CONDITIONS: ACRES AND YIELDS
17 Operators of Sugar Beet Harvesters,
Central New York, 1965

Description	Your farm	Average 17 operators	Average of 6 operators harvesting 150 or more acres
Row size of harvester	_____	2	2
Sugar beets harvested:			
Acres, own farm	_____	48	44
Acres, custom	_____	84	128
Total acres	_____	132	172
Yield per acre: (all acres)			
Screened weight, tons	_____	8.58	9.09
Net weight, tons	_____	7.32	7.78
Percent tare, all acres	_____	14.6	14.4
Percent sugar	_____	15.34	15.73

Rates of Performance

One way of judging differences in harvest performance is to consider the amount of labor used per acre or per ton in harvesting the crop. The man hours spent in operating the harvester, in making adjustments and repairs, in removing trash from the beets on the harvester, and in other operations such as topping or scalping beets and going to and from the field were recorded. The most common method of harvest was to have one man on the tractor who operated the harvester and stopped to unload beets at the end of the field when the hopper on the harvester was full or nearly so. Where weeds, stones, or trash were a major problem, some farmers placed an extra man on the harvester. It took an average of 3.5 man hours to harvest an acre of beets with slightly more than 2.5 hours of tractor time involved. The additional man hour for each acre represents time spent on repairs, idle time in the field, or getting equipment ready for harvest.

Table 2. PHYSICAL RATES OF PERFORMANCE IN HARVEST
17 Operators of Sugar Beet Harvesters,
Central New York, 1965

Description	Your farm	Average 17 operators	Average of 6 operators harvesting 150 or more acres
		hours per acre	
Hours of harvest labor per acre:			
Operating tractor and harvester	_____	1.80	1.46
Adjusting harvester, repairs	_____	0.52	0.51
Removing tare on harvester	_____	0.42	0.31
Other	_____	0.73	0.90
Total hours per acre	_____	3.47	3.18
Tractor hours per acre	_____	2.57	2.39
Rate of harvesting:		tons	
Yield per acre			
Screened tons	_____	8.58	9.09
Net tons	_____	7.32	7.78
Tons per hour			
Screened tons	_____	2.47	2.96
Net tons	_____	2.11	2.54

As is suggested by comparing the columns in table 2 the men harvesting 150 acres or more were able to reduce the time they spent in the field to a little more than three man hours per acre on the average. Moreover, two of these operators spent only slightly more than two man hours per acre in harvesting, which suggests what can be done under good conditions.

One can expect that high yields per acre might increase the man hours required to harvest. Hence, one should evaluate one's own experience by relating the tonnage harvested to the time actually spent. The figures on tons per hour reflect both yields and labor efficiency. The larger the number of tons per hour, the greater is the labor efficiency implied. The range in screened tons of beets harvested was from 1.3 to 4.8 tons per hour. The most efficient harvesting pattern in terms of this measurement occurred when trucks moved across the beet field with the harvester allowing direct loading of the beets as they were harvested.

HARVEST COSTS

The total cost of harvesting all the acreage of beets, including labor, tractor and implement costs, is summarized in table 3. In order to make these cost estimates labor was charged at a rate of $2.00 per hour for the operator and $1.50 per hour for regular hired men on all farms. Because tractors were used for many other operations besides beet harvest, a standard rate schedule was used in trying to determine costs for the use of this equipment on an hourly basis. There may be sizable errors in using standard rates for labor or tractors in looking at individual farm situations. However, on an overall basis these standard rates provide a reasonable basis for making comparisons between farms. The following standard rates based on cost account and other experience were used for different sizes of tractors.

Plow Rating	Rate Per Hour
2	$1.15
3	1.30
4	1.45
5	1.60
6	1.75
8	2.00

The major item of expense in harvesting sugar beets is the fixed cost associated with the use of harvest equipment. Because this is the first year that sugar beet harvesters have been used under stony conditions it is difficult to estimate the true rate of depreciation. Two different methods of estimating cost were used on all farms (Table 3). In one case depreciation was charged at 35 percent per annum, which assumes that the equipment would be used up in three years or that in the first year the largest amount of depreciation would be taken. A second set of estimates were made assuming depreciation was taken at 25 percent of the original cost. This reduces costs by a significant amount both in terms of total costs for the enterprise and on an acre basis.

The largest item of cost was depreciation regardless of the way in which depreciation was figured. It made up from 40 to 60 percent of all harvest costs for most operations. Labor was the second largest item, followed by the charge for the use of tractors, and then by interest charged on the capital invested in the harvester. The item for actual repairs is modest because depreciation was large and the machines were new. In the first year of use many of the repairs required were covered under the manufacturer's warranty. One could look at depreciation and repairs together expecting that as equipment grows older, repairs might substitute for a sizable part of depreciation expense.

Table 3. TOTAL COSTS OF HARVESTING SUGAR BEETS
17 Operators of Sugar Beet Harvesters,
Central New York, 1965

Description	Your farm	Average 17 operators	Average of 6 operators harvesting 150 or more acres
Acres harvested	_____	132	172
Net tons harvested	_____	966	1349
Yield per acre, net tons	_____	7.32	7.78
Total Harvest Costs, Depreciation @ 35%			
All labor	_____	$ 800	$ 893
Tractor	_____	502	616
Harvester, depreciation @ 35%	_____	2343	2421
Harvester, interest @ 6%	_____	328	332
Harvester, repairs	_____	173	194
Harvester, other	_____	143	148
Pickup truck, beater or flail	_____	193	326
Total harvest costs	_____	$4482	$4930
Total harvest cost per acre	_____	$33.96	$28.59
Total Harvest Costs, Depreciation @ 25%			
All labor	_____	$ 800	$ 893
Tractor	_____	502	616
Harvester, depreciation @ 25%	_____	1659	1688
Harvester, interest @ 6%	_____	350	358
Harvester, repairs	_____	173	194
Harvester, other	_____	110	112
Pickup truck, beater or flail	_____	180	287
Total harvest costs	_____	$3774	$4148
Total harvest cost per acre	_____	$28.59	$24.05

Harvesting Costs Per Acre

It is possible to look at harvesting costs both on an acre basis and on a ton basis. The primary summary of experience in 1965 was made on an acre basis because most farmers contracted for harvesting beets on an acreage basis and because yields in 1965 were low. One might

expect that the average experience in harvesting beets another year might be not too dissimilar from those in 1965, even though yields were increased significantly because the depreciation level should be lower while repairs increase and additional field time is required to harvest additional beets per acre.

Table 4. TOTAL COSTS OF HARVESTING BEETS PER ACRE
17 Operators of Sugar Beet Harvesters,
Central New York, 1965

Description	Your farm	Average 17 operators	Average of 6 operators harvesting 150 or more acres
Acres harvested	_____	132	172
Yield per acre, net tons	_____	7.32	7.78
Harvest Costs Per Acre, Depreciation @ 35%			
All labor	_____	$ 6.06	$ 5.18
Tractor	_____	3.80	3.57
Harvester, depreciation @ 35%	_____	17.75	14.04
Harvester, interest @ 6%	_____	2.48	1.92
Harvester, repairs	_____	1.31	1.13
Harvester, other	_____	1.09	0.86
Pickup truck, beater or flail	_____	1.47	1.89
Total harvest cost per acre	_____	$33.96	$28.59
Harvest Costs Per Acre, Depreciation @ 25%			
All labor	_____	$ 6.06	$ 5.18
Tractor	_____	3.80	3.57
Harvester, depreciation @ 25%	_____	12.57	9.79
Harvester, interest @ 6%	_____	2.65	2.08
Harvester, repairs	_____	1.32	1.12
Harvester, other	_____	0.83	0.65
Pickup truck, beater or flail	_____	1.36	1.66
Total harvest cost per acre	_____	$28.59	$24.05

If one compares table 3 with table 4 the same items of cost stand out as most important. The effect of harvesting a larger number of acres is shown more clearly when total costs are divided by the number of acres harvested. In general the largest operators were more efficient in terms of labor, tractor expense, and equipment costs per acre.

One effective way of looking at the relationship between costs and size of enterprise is a scatter diagram. In figure 1 every one of the operators' situations is plotted. Each dot indicates the relationship between harvest cost per acre and the total number of acres harvested for that farm. In general, as the number of acres harvested increases, costs per acre decrease because the large items of fixed cost, depreciation and interest, are spread over more acres.

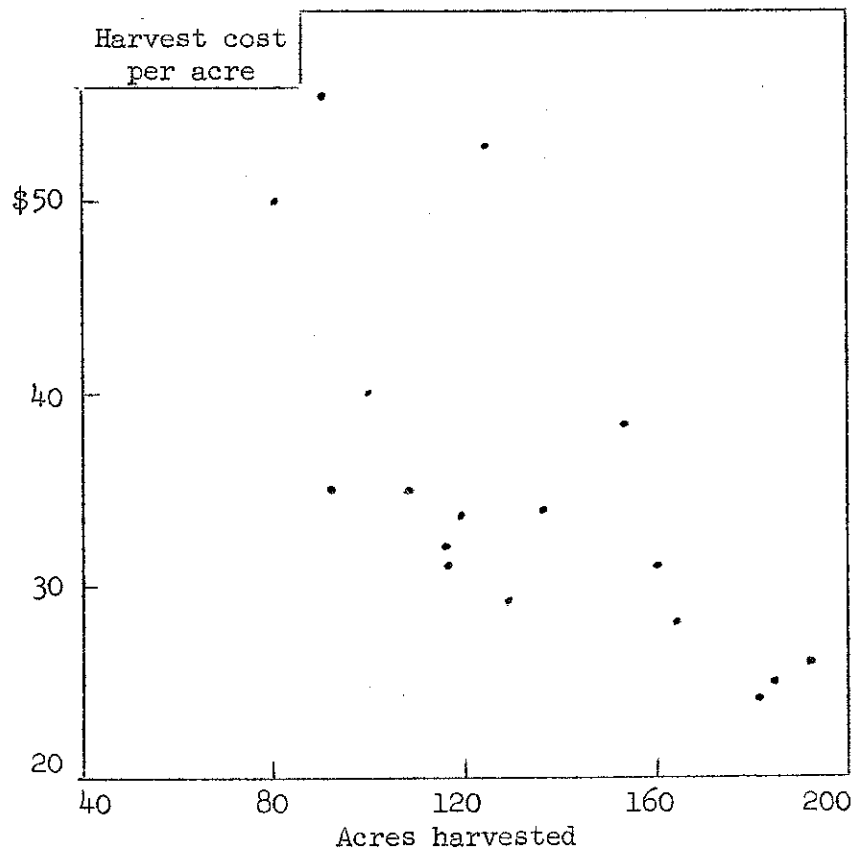

Figure 1. ACRES HARVESTED AND HARVESTING COSTS PER ACRE
DEPRECIATION ON HARVESTER @ 35%
17 Central New York Operators, 1965

Custom Rates

At the end of the season all of the operators were asked to indicate the final custom rate charged during 1965 for harvesting sugar beets. A listing of each rate and the combination of services provided for that rate is given in table 5.

Table 5. A LIST OF CUSTOM RATES CHARGED FOR HARVESTING SUGAR BEETS
14 Operators, Central New York, 1965

Description	Charge
Charged by the acre:	
1. One man, tractor, harvester	$25.00 per acre + grower provides man on harvester to pick trash
2. One man, tractor, harvester	$25.00 per acre
3. One man, tractor, harvester	$25.00 per acre minimum or $2.00 per ton screened weight
4. One man, tractor, harvester	$28.00 per acre + tractor fuel
5. One man, tractor, harvester	$28.50 per acre + tractor fuel
6. One man, tractor, harvester	$30.00 per acre
7. One man, tractor, harvester	$30.00 per acre
8. One man, tractor, harvester	$30.00 per acre
9. Two men, 2 tractors, 2 harvesters (1-row), 1 chopper	$30.00 per acre
10. Two men, 2 tractors, 2 harvesters (1-row)	$30.00 per acre
11. Two men, 2 tractors, 1 harvester, 1 topper	$30.00 per acre
Charged by the ton:	
1. One man, tractor, harvester	$2.00 per ton screened weight
2. One man, tractor, harvester	$2.00 per ton screened weight
3. One man, tractor, harvester	$2.50 per ton screened weight

HAULING COSTS

A major cost associated with the harvest of sugar beets is the hauling of these beets from the field to the plant or to a receiving station for subsequent transfer to the plant. Hauling beets is a critical consideration in the location of production and in the scheduling of harvest operations. Because of its importance efforts were made to estimate all the hauling costs associated with beet harvest for the 17 operations studied.

Estimates of hauling costs are greatly influenced by charges made for use of trucks. This study of hauling costs was made using standard costs per truck mile rather than in determining all the costs of operating trucks over a year and then allocating these costs to the sugar beet enterprise along with all the other productive uses of this equipment. The hauling costs as presented in the following two tables were calculated from direct estimates of the labor used in hauling, the number of loads hauled, and the correct number of miles involved in hauling the crop. Costs for the use of trucks themselves were charged on a standard unit basis. The scale of charges for trucks uniformally used for all farms was:

Type of Truck	Cents Per Mile
$\frac{1}{2}$ to $2\frac{1}{2}$ ton	20¢
10 wheeler	22¢
Tractor trailer	25¢
Pickup	8¢

Total Costs of Hauling

The single most important determinant of differences in hauling costs was the location of a farm and its fields relative to a receiving station or the processing plant. The averages presented in this report do not adequately take into account the differences in distances from one farm to another in estimating these costs. Total costs simply reflect the total number of miles and the total tons hauled. Because the screened weight of beets is the basis for most custom hauling rates, it is presented in table 6 along with the net weight of beets, the basis on which a farmer is finally paid for his crop. The men with the larger operations had somewhat above average distances to travel and hauled less tons of beets per hour as a result.

Table 6. ESTIMATED HAULING COSTS FROM FIELD TO PLANT
17 Operators of Sugar Beet Harvesters,
Central New York, 1965

Description	Your farm	Average 17 operators	Average of 6 operators harvesting 150 or more acres
Acres harvested	_____	132	172
Tons screened beets	_____	1132	1572
Total tons, net weight	_____	966	1349
Truck miles per ton (screened weight)	_____	4.41	4.74
Tons hauled per hour (screened weight)	_____	3.28	3.02
Total Costs of Hauling:			
Labor	_____	$ 546	$ 853
Truck @ _____ mile	_____	1007	1443
Hauling charge, station to plant	_____	656	983
Total hauling cost	_____	$2209	$3279

The range in truck miles per ton of screened beets hauled was from 1.6 to 6.1. In general, the man with the shortest distance to travel had the largest number of tons hauled per hour. Total hauling costs were generally smaller than total harvest costs, but still a very significant part of the total harvest operation.

Two items of trucking were listed for each farm -- the initial cost of hauling beets to the main plant or to the receiving station, and the additional charge of hauling the beets from the receiving station to the plant. A uniform rate of $1.00 per ton was used for this service. On the farms included in the study about 30 percent of the total hauling costs were associated with movement of beets from the receiving station to the Montezuma plant.

Hauling Costs Per Acre and Per Ton

Total costs were divided by the number of acres harvested and by the number of tons of screened beets and the net tons delivered. The final hauling costs reflect both distance from the plant or receiving

station and the number of tons harvested per acre. While hauling costs increased per acre when there was a large yield, at the same time the hauling cost per screened ton was reduced. If one were to use these averages in making estimates for another year, one might expect that hauling costs per ton could be reduced somewhat by increased yields per acre. However, hauling costs per acre would be larger if greater tonnage per acre is obtained.

Table 7. ESTIMATED HAULING COSTS PER ACRE AND PER TON
17 Operators of Sugar Beet Harvesters,
Central New York, 1965

Description	Your farm	Average 17 operators	Average of 6 operators harvesting 150 or more acres
Acres harvested	_____	132	172
Total hauling cost	_____	$2209	$3279
Hauling cost per acre:			
Labor	_____	$ 4.13	$ 4.95
Truck	_____	7.63	8.37
Hauling, station to plant	_____	4.97	5.70
Total cost per acre	_____	$16.73	$19.02
Hauling cost per screened ton:			
Labor	_____	$0.48	$0.54
Truck	_____	0.89	0.92
Hauling, station to plant	_____	0.58	0.63
Total cost per screened ton	_____	$1.95	$2.09
Hauling cost per net ton:			
Labor	_____	$0.56	$0.63
Truck	_____	1.04	1.07
Hauling, station to plant	_____	0.68	0.73
Total cost per net ton	_____	$2.28	$2.43

SUMMARY

It took an average of about $50 to harvest and haul 7.3 net tons of sugar beets per acre from individual farms in Central New York to the factory in 1965. On an acre basis this amount is somewhat higher than most farmers had estimated harvest costs to be for this level of yields. However, this was the first year of harvest operations. High rates of depreciation were reflected in these cost estimates. Hauling costs were probably conservative since standard rates were used in computing costs on a mileage basis. An individual farmer making estimates for his own situation should look at costs of operating his trucks for a year and the proportion of costs that would be charged to sugar beets in making a more realistic estimate for his own farm. A more complete statement of the harvest experience in 1965 will be prepared in a second more general report. Consideration will be given to common procedures followed in harvesting, problems in machine use, and general recommendations suggested for another year. The effect of field size on labor use as well as basic cost information will be presented as well.