Harvesting Equipment[1]

GEORGE W. NIXON[2]

The fall mechanization of the sugar beet crop has come a long way since its inception in 1943. In American Crystal territory in 1953, utilizing 1,383 harvesting machines, 94.3 percent of the total acreage was machine harvested.

Since the advent of complete mechanization of the crop from spring work through the harvest many serious problems have developed, caused chiefly by trash and clods and small improperly topped beets from over-populated stands because of improper machine thinnning in the spring. The seriousness of these problems is reflected in the factory delays and losses of tonnage and sugar in storage piles.

Storage pile aeration has given commendable results; however, the excess concentrations of dirt and tops often cause heating and the necessity of removing portions of storage piles prior to the time that they are ordinarily removed.

Because of these varied problems it is necessary to carry on an intensive educational campaign with the grower, starting early in the crop year, to make definite plans for mechanizing his beet crop. These recommendations to the grower are as follows:

1. Proper fertilization and good seed bed preparation.

2. Proper planting with a good precision planter, speed of planter never to exceed $2^{1/2}$ miles per hour.

3. Checking row widths carefully and planting as recommended in the particular area.

4. Down-the-row machine thinning done on a timely basis, taking a generous number of stand counts, and never being too conservative or vising a smaller knife than the count indicates. Using every precaution to eliminate bunches and overpopulations.

5. Eradication of summer weed growth either mechanically or by the use of the various chemical sprays.

6. Conditioning of the soil in dry years by light irrigation prior to harvest.

The quality of work with the present available harvester can be directly attributed to the operator. Proper adjustment of the machine as conditions in the field vary, proper depth, speed not to exceed 2 to $2^{1/2}$ miles per hour—these factors are very, important. A pertinent point is that speed in excess of this will cause the average operator to dodge off the row.

In the Red River Valley of Minnesota, fieldmen made a total of 103 strip tests following harvest operations (each test consisting of four rows 100 feet long) , for the purpose of determining the average tonage lost in

[1] This report includes information on lifting, screening and topping with emphasis on trash removal and other innovations for improvement of harvesters.

[2] Agricultural Superintendent, American Crystal Sugar Company, Rocky Ford, Colorado.

the harvesting operation. On an average, a loss of 1.25 tons per acre was found, with a high of 4.18 tons per acre and a low of .07 tons per acre. After a complete study of these tests, it was found that the low or high losses cannot be attributed to any one harvester, which means the good or poor performance of machines is dependent entirely upon the operator.

We can therefore conclude that the principle of the present harvesters is fairly well established and the problem appears to be more in perfecting existing models rather than developing some new approach. Manufacturers, it would appear, should think more in terms of quality of work, by more efficient elimination of dirt and trash and conservation of the tops, rather than large production at the expense of good quality work.

In American Crystal territory the California area harvests practically all beets with the Marbeet 2-Row Harvester. The only improvement which has been added to the machine the past year is the use of the longer spike which is standard now for the Marbeet Midget. These spikes are approximately 1/2 inch longer than the spikes which originally came out on the two-row machine. The longer spikes have resulted in a definite improvement in the ability of the machine to pick up beets. Because of the firm spiking of the beets to the wheel a cleaner job of topping is done.

A local farmer in the Oxnard area has developed a 4-Row Marbeet Harvester which did a very acceptable job and harvested a large tonnage of beets.

In the inter-mountain area, the International Harvester is most widely used. It is considered by the grower to be a dependable machine in that he can harvest his crop of beets regardless of rain, snow or drv and hard soil. The objections to this machine are many, as it is slow under normal conditions, requiring the use of two or three workers on the picking table. However, it does a fair topping job but generally leaves the tops in poor condition.

Several improvements for the International machine were released this year, chiefly the puller wheel attachment which consists of two 24-inch diameter steel alloy cast wheels. These wheels are mounted in such a way that they have a converging action which causes the beets to pop out of the ground. These wheels are furnished as an attachment only, and replace the puller standards, blades, and roller coulter assemblies. Their purpose is the elimination of clods, resulting in a one man operation for the machine. This attachment worked fairly well after many adjustments by factory mechanics under dry conditions, but failed completely under wet conditions and was removed by the growers in most cases.

The Marbeet Midget was introduced to the area in 1952 and was well received by growers. This machine operates under normal or extremely dry conditions very satisfactorily. However, under extremely muddy conditions, such as were experienced in the Texas area following 10 1/2 inches of rain, this machine did not perform satisfactorily.

The Marbeet Midget does a good quality job of topping and reduces tare in comparison to other machines as shown bv Table 1 on data compiled in the Rocky Ford district.

Table 1.—Relation of Tare on All Machines Compared with Mabeet at 100 Percent.

Type of Machine	No. of Machines	Tons Harvested	Tons Harvested	% Tare	Percentage
International	33	1,494	21,686	4.70	+27.02%
Marbeet	11	686	11,036	3.43	
John Deere 2-Row	2	137	1,590	5.15	+33.39%

In the eastern territory at Mason City, Iowa, the Scott-Urschel machine is used chiefly. The Scott-Urschel's principle of handling the beets by their tops eliminates large quantities of dirt which has to pass through other types of machines. The Scott-Urschel has introduced a roto-beater gadget which, mounted in the elevator, does a good job of removing loose leaves, streamers and clods.

Walter Quandt, a grower in the Chaska, Minnesota, area has developed a 4-row harvester mounted on a No. 212 Caterpillar road patrol. Mr. Quandt through good farming practices has been able to go to 12-row planting, thus making a 4-row harvester feasible. The Quandt machine uses John Deere spike lifters and has a five-roll Molnau screen mounted to receive the beets from the potato chain. Mounted above the screen is an Olson roto-beater flair, operating against the flow of beets.

Zuckerman topper units were brought in from California and growers of the area built one 6-row topping unit, one 4-row unit and five 3-row units. The 3-row and 6-row units were used with the 3-row harvesters. The Zuckerman unit has roller finders with a knife under each roller. This was a very fine topping unit for the area when the operator did not exceed a speed of two miles per hour. The tops are removed by a side delivery rake and a very clean field is left.

Splendid results were secured by welding a rim of plow point steel on the rim of the John Deere lifter wheels. Quantities of clods being lifted were reduced by 75 percent. This is an exceptional improvement for the area under very dry soil conditions.

Table 2.—Progress of Machine Harvesting, 1943-1953, in American Crystal Sugar Corn-any Areas.

Year	Number Machines Harvesting	No. Acres Machine-Harvested	Acres Per Machine	No. Tons Machine-Harvested	Avg. Tons Per Machine	Percent of Total Acreage Machine
1953	1,383	122,569.8	88.6	1,484,576	1,073.4	94.3
1952	1,266	108,560	85.7	1,275,072	1,007.1	88.6
1951	1,184	100,663	85.0	1,326,722	1,121	78.15
1950	943	83,069	87.6	1,039,938	1.097	56.36
1949	671	48,769	72.7	676,757	1,009	46.25
1948	565	46,116	81.6	604,706	1,070	46.40
1947	305	22,913	74.2	371,369	1,202	27.60
1946	172	16,246	94.4	270,758	1,574	20.61
1945	82	11,126	135.7	167,698	2,045	16.22
1944	36	3,711	103.1	61,226	1,701	7.64
1943	9	1,908	212-0	30,000	3,333	4.01

The International Harvester is used to some extent in the area. Growers are using a small Molnau trash-removing screen mounted at the top of the elevator, consisting of two bed rolls and two raised rolls. This installation removes a tremendous amount of trash.

The northern Minnesota area does not conserve the tops for feed to any extent and efforts of growers of that area to eliminate trash are concentrated in the field by the use of the roto-beater ahead of the harvester, which takes care of the problem fairly well. Table 2 shows progress of mechanical harvesting in American Crystal territory in the past eleven years.