The Mechanical Harvesting of Beets and Tops in Great Western Territories

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The irrigated farming areas in which the Great Western Sugar Company operates in Montana, Wyoming, Nebraska and Colorado are some of the choice farming areas of the United States. The irrigated farms generally vary from 80 to 160 acres in size and in the main can be classed as "family type farms." Fairly good systems of crop rotation are followed which include beets, potatoes, vegetables, small grains, corn, beans and alfalfa. The average acreage of beets per contract ranges from 22 to 25 acres. A large percentage of farmers have some kind of a livestock feeding or dairy program, both to market the farm products and to create a supply of barnyard manure.

Since the start of beet raising in these areas the beet laborers (hand laborers) have been the source of the farm workers needed to raise the other crops produced, particularly potatoes, beans and the produce crops. It is understandable then why many growers were not too enthusiastic about mechanizing beet raising when they realized that it meant the loss of the labor supply needed for these other crops. This fact probably accounts in part for the fact that some other beet growing areas such as California earlier took the lead in mechanical harvesting. This reluctance to harvest mechanically was also due to the value placed by many growers on beet tops in their livestock operations, and to the feeling that mechanical harvesting meant sizable losses in the beet tops to be recovered.

Another factor was the "insistence of perfection" in harvesting machines when they were first introduced and to comparisons of machine harvesting with the best quality of hand labor which had been available in previous years.

As the supply of labor for harvesting began to be more difficult to secure, and as this fact began to be realized by growers, there was a noticeable increase in the acreage harvested mechanically.

Probably this shortage of harvest labor has been the greatest single factor in the recent rapid growth in mechanical harvesting in Great Western territories. It undoubtedly was the reason why the Great Western districts, such as Montana where the labor supply was most difficult to obtain, took the lead in mechanical harvesting as compared with areas where the harvest labor situation was not quite as critical.

During the last two or three years the shortage of harvest labor has been getting increasingly acute. The demands of the armed services and defense industries have been a large factor in this shortage. Moreover, the competition offered in the harvest of large cotton crops in Texas and other warmer climates reduced the normal carryover of Texas laborers in all beet growing areas. The misunderstandings and the endless troubles, to say nothing of the expense, of the Mexican National programs made that source

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Table 1.—Summary of Opinions on Various Sugar Beet Harvesters by the Great Western Sugar Company.

Efficiency In Harvesting Beets	International 1,875 machines	JD 2-Row 71 machines	JD 1-Row 660 machines	Marbeet Midget 68 machines	Scott Urschel 164 machines
1. Quality of Topping	fair to good	good	good	fair to good	poor to good
2. No. of beets missed	few (approx. 2%)	High under muddy cond. Breakage causes considerable loss under all conditions	few (appr. 2%)	High under muddy conditions. Require a scavenger. Longer spikes help	High depending on operator and cond. of tops.
3. Dirt Elimination	Too much dirt lifted. Poor without picking table	Poor under muddy cond. Questionable under cloddy cond. Too great a mass of dirt on belt under all cond.	Light friable soil good. Loader principal offender on both trash and dirt.	Good under most cond.	Fair. Cons. trash included with beets
4. Capacity (per day)	2½-3 A. per day.	7 A. per day when running	1½-2½ A. per day	2½-4 A. per day	4 A. ave. per day
5. Mech. Dependability	Good as long as can get traction.	Poor. Machine too heavy but critical parts are too light.	OK on light friable soils. Poor under other cond.	Gen. good as long as they have traction and keep the wheel free of mud	Good under good conditions.

(Table continued next page)

Table 1.—(continued).

Effectiveness of Harvesting Tops

1. Top Disposal	Poor	Fair. Unless care is used tops are run over by trucks.	Good	Fair to poor	Poor
2. Condition of Tops	Poor to fair	Fair to good depending on care exercised	Good	Fair to poor	Poor after trucks run over field.
	International	**JD 2-Row**	**JD 1-Row**	**Marbeet Midget**	**Scott Urschel**
Improvements needed	Take care of tops. Larger tires on cart. Better methods to remove dirt and clods. Improve belt finder. Install beater for mech. thinned beets. Hydraulic snubbers on topper	Strengthen weak parts. Improve dirt elimination. Improve loss by breakage and missed beets. Revise top disposal and topping mechanism	Strengthen mach. including roller chain and good bearings. Use a cart to eliminate loader.	Better dealer service. Longer spikes. Improve top conveyor. Better cleaner on lifting wheel. Better puller points.	Better top disposal. Better topping. Separate trash and clean beets. Use a cart.
Growers' opinions of machines	Not satisfied with top disposal. Don't like excessive dirt and necessity of picking table labor.	Generally disappointed but realize machine worked under bad conditions. Too expensive. Costly to operate in men and trucks because of breakdowns.	Opinions mixed. Growers like topping and top conservation. Main supporters are on light soil and small contracts. Other growers consider machine obsolete. 166 not used in past season.	Generally good. Dislike loss of beets. Adaptable to various tractors. Low labor requirements. Machine shows promise.	A few growers like it while others term it a fair weather machine. It is difficult to operate and adjust. It is useless after hard freezes.

of harvest labor unsatisfactory with growers. Under these circumstances it is indeed fortunate that the harvesting machines have been developed to the point where they could take over the harvest load. Without them, it is doubtful that enough labor could have been secured for the 1950 and 1951 harvests.

That the growth of mechanical harvesting in Great Western territories has been very rapid in recent years is shown by the following:

Year	Acres Harvested	% of Acreage Harvested Mech.
1946	17,924	8.98
1947	46,718	21.00
1948	63,504	44.17
1949	78,639	50.13
1950	119,902	59.51
1951	132,978	76.71

This rapid increase in mechanical harvesting resulted in a very strong demand on the part of growers for harvesting machines. Dealers were able to quickly dispose of allotments of machines from manufacturers and many arranged for the transfer of additional supplies from other beet growing areas where the demand was not so acute. Some growers went many hundreds of miles to purchase used machines and brought them into the territory. Such an active demand could easily be misinterpreted by manufacturers as complete acceptance of the harvesters in their present state of development, particularly if the acute shortage of harvest laborers was not known and taken into account.

The 1951 harvest was one of the worst experienced in recent years. Heavy rains covered practically all districts just before or during the start of harvest. Additional moisture in the form of rains and snows kept the fields muddy throughout October and November. Severely cold temperatures occurred early in November, ranging down to —17° F. in several districts. This froze the tops, crowns and upper portions of the beet roots severely and delayed harvesting. Normally our harvest is about completed in the first week of November but this year approximately 625,000 tons remained in the ground after November 5. Harvest of this tonnage was not completed till after December 10, or fully 30 days past normal.

Much of the harvesting in November and December was done under very adverse field conditions. This was indicated by the fact that for several week the average percent dirt tare was above 20 percent, or approximately 3 times the normal. Farm labor was scarce, high priced and undependable. Many growers were unable to hire "picking table" workers at any price during periods of unfavorable weather.

In spite of all these unfavorable conditions—77 percent of the crop was harvested mechanically. One thing this harvest did was to accentuate both the strong points and the weaknesses of the several makes of harvesters used. Thinking that a "grass roots" appraisal of the various machines might be of value in furthering improvements in the future, we asked our 71 fieldmen to submit their frank opinions of all..rnachirres used—based on their contacts with growers.

Each fieldman furnished a questionnaire on the different makes of harvesters operating in his district. The questions were designed to cover the following points:

A. Effectiveness of the Machine in Harvesting Beets.
   1. Quality of topping.
   2. Number of beets missed.
   3. Dirt elimination.
   4. Capacity.
   5. Mech. dependability under various conditions.
B. Effectiveness in Harvesting Tops.
   1. Top disposal.
   2. Condition of tops.
C. Improvements needed.
D. Growers' opinions re machine.

An attempt was made to summarize these various reports covering the principal beet harvesting machines in use in our district. (See table on pages 626 and 627) .

From the table it can be safely stated that all of the present harvesters in use have serious drawbacks both to the farmers and to the factories. It is to be hoped that a recognition of these and a realization of their magnitude will stimulate efforts on the part of manufacturers to improve these machines in the immediate future. For our area these improvements should cover the following points:

1. Better topping of beets to include mechanically thinned beets. The beaters used in conjunction with the standard topping devices on International machines look promising.

2. Better harvest of beet tops. With the exception of the old No. 54 John Deere harvester, the loss in feed value of the tops is very high. This loss probably averages 75 percent of the potential value. The realization of this loss is one reason many growers have been reluctant to use harvesters instead of hand laborers. Some still refuse to use harvester machines.

It is conservatively estimated that the feed replacement value of well handled field cured tops (average of 27 separate tests) is 46 lb. corn and 150 lb. hay per ton of beets and at present prices this amounts to:

Corn	$1.56	(3.40 per cwt.)
Alfalfa	2.25	(30.00 per ton)
	$3.81	Total

This year the average selling price of mechanically harvested tops was approximately $1.00 per ton of beets, or a loss of $2.81 per ton. With an average yield of 15 tons per acre, this loss was more than $40.00 per acre ($42.15) . On the other hand, fields where hand labor was used brought a premium price (up to $2.75 per ton of beets) .

Manufacturers should recognize this loss for, without doubt, the popular harvester in the future will be the one which best handles the tops.

3. Better elimination of dirt and trash. This is important, both to growers and to factories.

a. From the growers' viewpoint.
The excessive dirt handled makes a serious increase in harvesting costs, both through the extra labor needed to separate beets from dirt and in the extra tonnage of dirt handled. That there is more tare on mechanically harvested beets is shown by a study of comparative tares from hand topping and machine harvested beets at one station in each of 14 factory districts. This showed an average of 15.40 percent for machines and 12.34 percent for hand topping, an average increase of 3.06 percent, or approximately a 25 percent increase in tare over hand topping.

b. From the factory viewpoint.

The excessive amounts of dirt and trash delivered with mechanically harvested beets create several serious problems, among which are:
1. Storage pile losses are increased materially.
2. Factory slicing is reduced and costs increased.
3. Disposal of excessive quantities of mud and rocks is a serious problem and an added expense.

While the problems of machine harvesting seem large at present, I am hopeful that by continued suggestions for improvements, and experimentation on the part of everyone connected with the beet industry, the major weaknesses can be quickly improved.