

REPORT ON MECHANICAL HARVESTING OF SUGAR BEETS FOR 1943

T. W. Cockayne, C. J. Edwards and J. E. Trinnaman^{1/}

Due to the current manpower shortage it is natural and proper that the industry should look to the machine for relief. A survey of the harvesting machinery showed a few good machines were available. Many others were in various stages of development. The mechanical loader, several makes of which had been built and were being used quite extensively in some districts, offered the greatest aid, when used with either hand or mechanical topping.

So, a program was inaugurated to get as many of these machines into the fields as possible. Generally, this program was very successful. Let us now review the operations and results obtained with these machines. The most popular method of harvesting, when using hand toppers and mechanical loaders was as follows:

- a) The field was laid out in 8- or 10-row sections.
- b) The beets were lifted.
- c) 3 or 4 center rows in each section were thrown on to the outside rows.
- d) This open strip was then cleared of leaves and leveled by means of an A frame "V-out." This operation is of the utmost importance and almost without exception the success of the loader could be measured in direct ratio to the quality of this work.
- e) 8 rows were then topped and thrown into this V'ed strip from which they were picked up by the loader and delivered to the truck.

I will cite only a few representative cases;

<u>District</u>	<u>Loader</u>	<u>Acres</u>	<u>Tons</u>	<u>Operating Cost per Ton</u>
	Hall	55.0	873	\$,10
	Hall	3.5	48	.07
Idaho	Sishe	15.0	160	.19
	Diamond	46.2	587	.12
	John Deere	22.0	315	.07
	Hall	20.0	400	.06
	Sishe	64.0	687	.147
Montana	Sishe	45.0	617	.137
	Diamond	80.0	800	.252
Garland-Utah	Diamond*	320.0	6500	

*This was a combined operation on 15 farms. The Loader served 1 mechanical topper and several crews of hand toppers.

For the Washington district I would like to quote from the reports on two farms.

J. P. Cox. Raised 85 acres of beets and produced 1,558 tons with an average of 10 toppers. This farm is located in Ellensburg and is $7\frac{1}{2}$ miles from the receiving station. Due to the fact Mr. Cox used the loader he secured truckers for \$1.00 per ton, whereas an adjoining beet farmer hauling the same distance with no loader paid \$1.25 per ton. Mr. Cox estimated he delivered $\frac{3}{4}$ ton more net beets per load with the use of the loader with a saving in trucking expense of \$400. In addition he figures his harvesting period was reduced 10 days with probably 60 percent of the labor that would have been required otherwise. He estimates his loading costs at 25¢ per ton. This saving, together with the trucking saving, pays for the loader in one year's operation.

Trudeau & Reiter. Raised 160 acres of beets and produced 3934 tons with an average of 10 hand toppers. Average load of net beets to the station was $5\text{-}\frac{3}{4}$ tons. The loader operation required 4 additional men, 2 on the loader and 2 in the field raking up the beets in the windrow, V-ing out, etc., or a daily expenditure of \$30.00. They delivered 684 loads to the receiving station and estimate that they saved one week's harvesting time with the use of the loader. If the loader had not been in the field, it would have required 16 toppers to have made the same number of trips daily, but instead of $5\text{-}\frac{3}{4}$ tons net beets, this would have been reduced to 5 tons, and have required 787 trips to the station. With the use of the loader, it is estimated that there was a saving of 20 minutes on each load. The total cost of operating the loader was 20¢ per ton, together with the intangible saving of the less number of trips required and the harvesting season being reduced, and a reduced tare which reflects in the hauling expense. When these farmers started the harvest the labor resisted the loading machine. However, presently the labor realized that their daily earnings were much greater when the machine was in the field and no hand loading was required.

In all districts and under nearly all operating conditions, the performance of these machines was satisfactory except on rocky fields in which case an occasional rock would lodge between a sprocket and the conveyor chain, resulting in a broken chain or drive if the slip clutch did not function properly. This breakage can and will be eliminated by the use of a satisfactory clutch.

When used with hand topping the labor saving was from 30 percent to 50 percent. Trucking expense was reduced due to the time saved in loading and to the fewer trips required; due to the reduced tare.

Several minor mechanical weaknesses were noted on all makes of machines and should be reviewed here.

DIAMOND

- 1 - Slip clutch gave some trouble
- 2 - Excessive wear on pick-up roll, roll drive and elevator chain.
- 3 - Wheel bearings are overloaded.

JOHN DEERE

- 1 - Elevator chain was overloaded.
- 2 - Some difficulty was experienced with narrow pick-up.
- 3 - Frame generally light for heavy duty work.

SISHC

- 1 - Power take-off shaft and Universal was overloaded.

HALL

- 1 - Pick-up fingers were too long,
- 2 - Position of reel with respect to the fingers and conveyor was not satisfactory for all operating conditions.

The mechanical beet loader has proven itself to be a useful and profitable machine. The manufacturers have now, or are in the process of establishing agencies in all our principal factory districts and these people are familiar with the conditions above mentioned and in most cases have assured us that all items will be corrected on future machines.

I believe the loader has taken its place along with the planter, the cultivator, the tractor and the plow.

The topper or harvester presented an entirely different picture. John Deere offered the only commercial machine available. It is a tractor mounted unit accessory to the John Deere tractor only. It tops, lifts and windrows the beets and tops, in one operation. Several of these units were placed in the various districts and I would like to review the results obtained in a few specific cases which are representative of some of the better operations:

<u>District</u>	<u>Acres</u>	<u>Tons</u>	<u>Operating Cost Per Ton</u>
	27	334	\$.87
Idaho	30	495	.63
	26	301	.63
	27	361	.47
	6	145	.54
Washington	17	473	.51
	* 12	270	1.10
Garland-Utah	70	1360	

*Comprised of 5 plots with rows as short as 50 feet

This harvester has several advantages. Being a tractor mount its maneuverability and control is limited only by the skill of the operator. Very little headland is required for turning. It is a single operation requiring but one operator. The tops are delivered to the windrow free from dirt, due to the ingenious design of the leaf pick-up.

We had some difficulty with the large crowns fouling this pick-up, however, and we hope this can be eliminated as its performance is otherwise perfect.

The machine still has some mechanical weaknesses which can be easily corrected.

In making a universal machine, it is of necessity quite complicated and no doubt the manufacturer with more experience behind him will simplify and perfect it, especially with respect to the number of controls and the sensitivity of adjustment.

Feeling the need of a trailer type harvester, we built several Kiest machines.

This unit has a sliding-floating shoe finder and a revolving flat disc topping knife. The beets are lifted on to a link chain elevator which delivers on to an adjustable boom conveyor for windrowing.

A separate power unit was used to drive the harvester, the reason being that the disc topper is very sensitive to speed change. The tractor power takeoff could be used if the tractor were operated at a constant speed. A machine operator is required to "follow the row"; although the topping disc does not have to stay right on the line it is necessary to hold the machine within narrow limits because of the rigid lifter.

Because of the size and weight built into this machine to operate in heavy ground, it cannot be used on very wet or loose soils and requires considerable headland for turning.

The topping unit does a very good job under all field conditions at 1-1/2 miles per hour and is not fouled by weeds or trash.

In view of our experience, many pleasing facts stand out and several problems present themselves.

Several topping units have been proven which may be called universal toppers and do a job possibly better than hand toppers.

It has been demonstrated that the harvester is practical, economical and a labor saver.

Can field size row length and row spacing be re-arranged to facilitate harvesting?

Is it economical to build a universal harvester?

Can the trailer type be built light and compact enough to perform with the tractor mount?

Would a two-operation machine be better for the grower who silos his tops?

What method shall be used to separate the clods from the beets on heavy soils?

Before another season passes, most of these questions will have been answered and we will be well on our way to complete mechanization of the fall work.