Results of Survey of Sugar Beet Harvester Performance

G. W. Howard[1]

Ever since the beet industry started in the United States, people have given thought to mechanical, harvesting of the crop. Many ideas now being put into good effect for harvesters were thought up 35 or 40 years ago. When improved in the manner in which they have been, they are quite effective in making successful harvesting machinery. Lots of progress has been made in the last few years in the development of such equipment. During the past few months, the Foundation has checked on some 25 or more harvesters. Many of these are in the experimental stage, but no inventor is passed up idly because he may have some promise of new ideas. I feel that we are in about the stage that the automobile was in 1915 and with machines in the hands of farmers rapid development will take place. Refinement in drives, separation of clods from beets, handling tops, and the other things that make a complete harvester are gradually resulting. Only about 10 percent of the acreage in sugar beets in the United States in 1945 was harvested mechanically but in some sections in California, where long harvest periods prevail, as much as 87 percent of the crop was entirely handled by machinery. On the basis of a survey made last fall of the industry, there should be around 25 percent of the crop harvested mechanically in 1946. This, of course, depends upon productive capacity of the manufacturers. At the present time this figure of 25% seems a little high. This same survey indicated that in the areas growing beets in the United Slates, 60 percent of the acreage was affected by clods and would require a machine which would properly handle this problem. About 7 percent of the acreage had the problem of rocks which would require a different machine. The survey also indicated that opinion as to the popularity of single-operation machines was about equally divided with a two unit harvester. In other words, about one-half of the areas favored a machine which would handle the crop in two parts, taking care of the tops with the first operation and lifting and handling the roots in the second. It is interesting to note also that farmers on about 86 percent of the acreage included in the survey favored harvesting machines that properly salvaged the beet tops. This would indicate that quite a stress is being made on the importance of the feeding value in the by-products that in many areas are more or less wasted at the present time.

Building a universal harvester probably will never be quite pos-

1Staff Engineer Beet Sugar Development Foundation. Fort. Collins, Colo.

sible because of the variation in size of farming units, difference in climatic conditions, and other factors which influence mechanical operations, such as variation in width of rows, heighth of beets out of the ground, lack of foliage, deep irrigation ditches, bed planting and similar items. For instance, the beet contracts vary in size from 61/2 acres in Wisconsin to 87 acres in Southern California. This means that, in order to make mechanical work economical on the small units, custom work will probably prevail or two or three farmers will have to go together in owning the equipment. Such things are quite possible, as evidenced by present handling of grain combines and threshing machines. There is a variation in row widths from 18 inches in Minnesota to 42 inches in part of Northern California, with various widths between these two limits. I am merely pointing out, these peculiar differences which would seem to make a common type harvester rather improbable.

I would like to describe briefly some of the machines that are in the productive and experimental stages:

Marbeet

This machine is manufactured by the Blackwelder Manufacturing Company of Rio Vista, Calif. There are three sizes or types of the machine, which includes a two-row machine commonly pulled by a D-6, D-8, or T-12 size tractor. The machine has a large capacity and over 500 tons has been reported as harvested in a single day. The machine is a single-operation harvester. My means of spikes on the rim of 6-foot-diameter wheels it lifts the beets and carries them to the top of the machine where the roots are separated from the tops by means of chisels and a sickle bar to remove loose petioles. The roots are then taken over a scroll type screen and into an elevator to the truck. The machine requires from 24 to 32 end rows for efficient turning at the ends of the fields. It is sturdily built for handling dry, heavy soils.

A large one-row Marbeet machine of similar construction is quite popular, particularly in Southern California, for single-row beds.

A Marbeet Jr. one-row machine was designed in 1945 and is powered by a tractor of the size of Interantional "M" This machine is smooth, is powered with V-belt drives, and is capable of handling beets under rather difficult harvesting conditions.

Last year there were approvimately 150 of the Marbeet harvesters in operation, the majority of which were two-row machines. According to present information about 60 of the two-row machines and about 200 of the smaller one-row machines will be built.

1—Julius Sishe two-row complete harvester; 2—Ford-Ferguson topper; 3—Kiest four-row topper; 4—Marbeet two-row harvester; S—Marbeet Junior operating on Herbert Spencer farm at Fort Collins, Colo.; 6—Kiest two-row digger and loader.

John Deere

About 650 one-row harvesters have been built by the John Deere Wagon Works of Moiine, TIL, during the last 3 years. This company is also experimenting with a two-row two-unit harvester. The one-row John Deere machine is designed for the Model "A" tractor and completely harvests the crop to the evtent of delivering six or eight rows of beets into a windrow with three to four rows of tops windrowed along both sides. The machine is very popular in many areas because the topping performance is very satisfactory and the handling of the tops is equally popular with the farmers who feed. A field

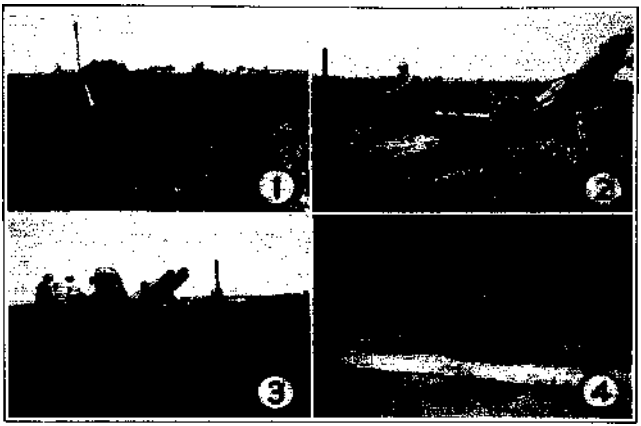
loader is required to elevate the beets from the windrows into trucks. Since the machine was originally built it has been considerably strengthened and improved in design. The lopping is done with a "moon-shaped knife while the beets are still in the ground. The experimental model harvester is still in the development stage and very little can be explained concerning that at the present time. It is expected that at least. 500 of the single-row John Deere harvesters will be made vailable for 1946 harvesting of the crop. The machine has some limitations as to soil, moisture, and soil types but on the whole has given very satisfactory results, particularly on acreages from 40 to 60 acres, harvesting daily an average of 5.2 tons per hour on the basis of reports from many areas. The machine has a capacity per hour of from 3 1/2 to 6 tons, although one case has been reported of 15 tons per hour in a field yielding 25 tons per acre.

International

This machine is being built by International Harvester Company and is designed for one-row operation. It is unique in that a trailer is pulled behind a Model "H" tractor. The beets are topped in the ground by a disk-type knife with the tops moved the distance of the adjacent row where they can later be picked up and windrowed. The beets and soil are taken from a width of about 8 inches, and are lifted and carried over a Reinks type screen into the elevator. If there are clods, the beets are dumped directly onto a trailer and subsequently are loaded into a, truck or wagon at the end of the field by use of a power takeoff operated elevator. The trailer holds between 2,500 and 3,000 pounds of beets and is mounted on two wheels which coincide in width to that of the four wheels of the tractor. If clods are a problem, a 36-inch sorting belt runs directly over the top of the trailer with two men pushing or pulling the beets off the belt into the trailer, the clods then roll over and onto the ground. This belt travels at half ground speed and permits 100 percent elimination of clods as well as a chance to trim beets that are insufficiently topped. In time studies last season the machine had a capacity of about 4 1/2 tons per hour in California and about 3 to 5 tons in Colorado. It is expected that, at least 300 to 500 of the Interantional harvesters may be available if production facilities can be stepped up.

Scott-Urschel

This is a one-row harvester, manufactured by the Scott-Viner Company of Columbus, Ohio. Fourteen of these machines were in operation in 1945 and it is hoped that perhaps 135 can be built for the 1946 esason. The machine has been experimented with for 12 or 15 years and gradual improvements have taken place in its design. In principle it seizes the foliage of the beet between rollers at the same



1—John Deere harvester operating- at Scottsbluff, Nebr.; 2—E. I,. Wilkins machine at Las Animas, Colo.: 3—International Harvester at LaSalle, Colo.; 4—University of California harvester.

time that an "L-shaped" type lifter breaks the tap root, of the beet. The topping- is done very accurately at the upper part of the machine by means of selective rods which are accentuated by a pair of unique heads. The new improvements offer greater screening of the roots and a better handling of the lops. The machine has an average capacity of about 5 acres per day.

Keist

This is a two-unit machine to be built by the Olson Manufacturing Company of Boise, Idaho. In the first operation four or six rows are topped at one time with the.foliage carried into a vehicle by means of a conveyor at the rear of the bell type top rim mechanism. The second operation will lift and elevate into trucks two or three rows at one time. One of the improvements that has been planned is the use of Reinks type rolls to eliminate clods and dirt in two operations. The machine is studily built and should prove quite popular. There have been about 20 of the machines built; it is planned to dismantle and rebuild these. There may be from 100 to 200 of these machines available this year with improvements particularly in use of the V-belt drives. The capacity of the machine has not yet been determined but

probably should be from 8 to 12 acres per day with the possibility in light soil of even higher performances.

Flintjer

This machine is a one-row harvester designed by W. J. Flintjer of Cheyenne, Wyo. The beets are pulled by more or less conventional puller points with the tops being seized between sections of rubber cylinders. The lopping is done with circular knives at the top of the machine, with the beets being conveyed directly into a truck or windrow. The machine is well designed and should prove quite popular, particularly for contracts of from 40 to 60 acres in size.

Silver

This machine probably will be based upon an experimental model engineered by the Great Western Sugar Company during the past 12 years. It will be manufactured by the Silver Engineering Works of Denver, Colo. A unique feature of the machine is the clod separating chains. The machine probably will be a two-row two-unit outfit. Tt is uncertain at the present time how many machines might be attempted this season.

Sishc

This machine has been experimented with for several years by Julius Sishc of Torrington, Wyo., who has had a great deal of experience in building the popular "Sishc" field loader. Changes and improvements are being made in the model which operated in 1945. No definite statement can be made as yet as to the details of this machine but it is hoped that it can be completed in time to make a contribution to the harvest of 1947.

Healy

This machine was designed by Alexander llealy, -Jr., and is being built by the H-Engine Company of Billings, Mont. Tt is a one-row complete harvester which operates on a wringer roll principle with the beets being topped out of the ground. The machine is simple in design and can he cheaply built. It is planned to test the machine in the Imperial Valley in California this spring.

Harvall

This machine is being built by the Sterling Machine Company of Minneapolis, Minn. This is a two-row complete harvester which operated very successfully in the 1945 season in the Red River Valley in Minnesota. The principle of this machine is a series of 6-foot-diameter rims on the outside perimeter of which are 2-inch "Christmas tree shaped spikes. The lifter points are rather simple in

design and do not impale much dirt on the rims. The topping is done with two circular saws with the crowns of the beets being elevated to the proper height by a series of cog wheels. The machine should have a capacity of around 10 acres per day when powered by a caterpillar type tractor. It is planned to build 16 of these machines for the 1946 harvest.

Wilkins

This is a machine designed by E. L. Wilkins of Las Animas, Colo., and is a two-row complete harvester. The beets are topped by rather simple disk toppers while in the ground, with the beets being elevated in separate troughs onto a screen from where they are placed into the truck traveling alongside. The machine is still in the ex perimental stage but there may be others constructed for the 1946 season.

Braden

This machine was designed by John L. Braden of the Olson Manufacturing Company of Boise, Idaho. The topping is done in the ground by a knife which splits the crowns. The tops are put into windrows by a small attached side-delivery rake. One improvement that is planned for this year is a Reinks type screen to assist, in dirt and clod elimination.

Hall

This machine was designed by J. L. and Harold Hall, of Wapato, Wash. Tt is a four-row two-unit machine having a lawn mower type topping machanism. At the present time no effort has been made to salvage chopped up tops. The machine is very simply designed and has some interesting ideas.

Nicholson

This machine is a four-row topper and four-row harvester which is being built by Oscar W. Nicholson, of Riverton, **Wyo.,** for operation in 1946. Very little can be said about its performance as yet.

Nichols

This machine is a two-unit and either a one or two-row outfit. The topping is done in the ground by a lawn mower type device, with an effort being made to conserve the tops that are chopped up. It is contemplated to construct 10 or 20 of these machines for the 1946 harvest which will include some improvements in screening.

Ford-Ferguson

This machine is being developed by Harry Ferguson, Inc., and work has been taking place on it in the last 3 years in the vicinity

of Greeley, Colo. The machine will probably be a two-unit outfit with two rows topped and the tops elevaled by a wheel mechanism into a vehicle alongside. Two rows of beets will be lifted by a unique type of lifter and elevated into a, truck. Topping is done by means of a knife which is controlled by a clever linkage device. The top disposals and clod elimination appear to be excellent. It is hoped that, a number of these machines might be built in time for the 1946 harvest.

Rassmann

This machine has been designed by Hugo Rassman of the Diamond Iron Works of Minenapolis. It is a one-row complete harvester but very little can yet be said about its performance.

University of California

This machine was designed by the engineering staff at the University and is a one-row complete harvester. One unique feature of the machine is that it carries about 1 ton of beets in a conveyor bin over one side of the tractor. The beets are grasped and carried up an open elevator which largely removes clods. The topping is done by a straight blade with a clinging finger pushing the tops against a baffle board out of the way of the wheels of the tractor. Improvements are being made of the gear and drives with a more gradual slope also being given to the puller points and elevator. The machine harvested about 24 acres in 1945 and it appears to be on the way to being an acceptable harvester machine, particularly for small contracts where there is not room for large machines.

Grew

This machine was designed by Dolphus Grew of Saginaw, Mich., and tops and handles one row at a time. The beets are lifted by a large diameter wheel which is equipped with spring type spokes that seize the beet out of the ground, elevating it to a hopper on the machine. This machine is very simple, light in weight, and has some excellent possibilities.

Hydrographie

This consists of six-row windrower, manufactured by the Hydrographic Company of Seattle, Wash. Beets have to bo topped by hand.

There are a number of other experimental machines which are still in their initial stages. This would include Bowman Wheel harvester of Chaska, Minn., Wright cam type wheel harvester of Berthoud, Colo., Ellwein harvester of Sidney, Mont., and the James A. Harwood two-row harvester of Denver, Wyo,