

Conserving and Handling Beet Tops

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Under the varying conditions of the widely scattered operations of growers of beets for the American Crystal Sugar Co., we find many methods of conserving and handling beet tops. Beets contracted to our company are grown in ten of the western states, from within twenty miles of the Canadian border to within a few miles of the Mexican border and from California on the west to Minnesota on the east. Beets are produced under conditions dependent entirely on rainfall and on irrigated farms; from below sea level to areas more than 7,000 feet *in* elevation. It is not surprising that we find beet tops utilized in many ways, depending on method of harvesting the crop, crop rotation and availability of equipment, land and livestock.

When we think of conserving and handling beet tops we generally think of feeding the material, or at least windrowing or shocking the tops for livestock pasture. However, in many of our areas it has been found that the most practical manner of conserving beet tops may be to work them into the soil for their fertilizer value. The tops may be beaten off and worked into the soil immediately, or plowed under after the regular beet harvester. So far as our overall company operations are concerned, in 1953 approximately 71 percent of all beet top acres were plowed under, this representing 102,971 acres of sugar beet tops.

In our East Grand Forks, Minnesota, district, the *practice* of plowing under beet tops after beet harvest has been common since 1935 or 1936, as well as the practice of plowing under a heavy crop of sweet clover. The three-year rotation is grain with sweet clover, the second year plow down the clover and fallow, then beets the third year of the rotation, plowing under the beet tops. It is significant that the average yield of all beets delivered to the East Grand Forks factory for the 11 years prior to and including 1936 averaged 7.19 tons per acre as compared with an average of 10.21 tons per acre for all beets harvested since 1936. These yields were on non-irrigated fields. Certainly a part of this increase in beet yields may be attributed to the beet tops plowed under, and their effect on the fertility and structure of the soil.

Studies by Dunn and Rost (1)² of the University of Minnesota, in 1946, showed a cash value of \$21.94 per acre for the three fertilizer elements in the beet tops from a 15-ton crop of beets. At today's prices their value would be increased to more than \$25.00 per acre, this in addition to the value of the organic material of the beet tops, which may be considered to be comparable in value to the fertilizer elements in the tops. It was found that 12.6 ton of green tops was saved when the 15-ton beet crop was harvested.

Here in our Missoula district, with which we are most familiar, many of our beet growers who do not have manure for their beet land or enough land for any sort of a rotation grow beets year after year applying only

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² Numbers in parentheses refer to literature cited.

commercial fertilizer and plowing under the beet tops. Such a practice is probably not to be recommended, but the results of this practice have been good. We find that such fields have steadily improved in so far as yield and soil structure are concerned, yields from five of these fields for the past ten years being listed in Table 1. Many such fields have been in beets regularly for the past 25 years.

Table 1.—Fields Almost Continuously in Beets—No Organic Fertilizer Except Beet Tops Plus Commercial Fertilizers (200 Pounds Ammonium Nitrate and 160 Pounds Treble Superphosphate)

Year	Bailey & Erickson 38 Acres	Severns & McGinnis 8 Acres	H. D. Hoblitt 14 Acres	Chas. Talbot 24 Acres	Ray Morris 46 Acres
1944	14.18	13.34	15.84	17.70	10.85
1945	15.20	15.50	18.40	19.60	12.80
1946	16.30	15.50	19.30	21.40	13.35
1947	15.90	17.70	20.50	22.80	15.40
1948	14.90	17.45	16.57	20.41	Grain
1949	12.80	16.04	18.13	1	Alfalfa
1950	Lettuce	15.70	18.60	1	Alfalfa
1951	13.48	15.60	19.51	1	14.47 ²
1952	16.11	15.59	21.46	1	16.30
1953	18.22	19.04	19.80	1	20.66

¹ Land bought by another grower, and two contracts put together, but yield well in excess of 20 tons each year.

² No green material plowed down, only the alfalfa roots plowed under in the spring before beets.

Our second most common method of conserving beet tops is to pasture them off the beet field, after the beet harvest, a practice which generally utilizes less than half of the total feed value of the tops. This method of feeding beet tops is popular because it requires less labor. In our entire company operation for 1953 approximately 21 percent of all acres of tops were pastured off the field, this representing 29,720 acres of beet tops.

In a normal season, the practice of pasturing tops off the beet fields is very wasteful because of losses from leaching, trampling and drying. If the season is wet a large part of the feed is lost through leaching and trampling into the soil—which also compacts the soil so it is difficult to work the following season. If the fall is dry the beet tops dry and shatter so that the leaves are mostly lost. Many of our growers, however, feel that the ease of pasturing tops more than outweighs the losses in feed value and the difficulties from scouring and choking. The beet tops to be pastured may be handled in any of several manners after the beet crop is harvested, either leaving the tops where they fall after the harvester, windrowing them with attachments on the beet harvester, windrowing them with a side delivery rake after the harvester or shocking them in the field by hand labor. If the tops are shocked or windrowed they keep better and are more available to stock if snow covers the tops.

To evaluate the gain which could be put on cattle in our area by pasturing tops, on our Missoula farm in 1952, forty acres of beet tops were pastured off the field, from beets yielding fourteen tons per acre. Some 62

steers were put on this beet top pasture October 1, and the number of steers was gradually increased so that October 31 we had 182 steers on the tops. This number of steers was continued on the tops until November 19, when they were put in the feed lot. The beet tops were windrowed with a side-delivery rake after the International beet harvester. These tops were pastured under near perfect condition, by a large number of cattle and during ideal weather. The average grower during the average season realizes less than half of these gains as shown by this test. (Table 2.)

Table 2.—Gain from 40 Acres of Beet Tops (14-Ton Beets) by "Pasturing Off."

Total days steers on beet top pasture	6,423 days
Total grain on beet tops	9,250 lbs.
Gain per day per steer.	1.44 lbs.
Acreage of tops pastured	40 acres
Tonnage of beets from which tops were pastured	560 tons
Pounds gain per acre of tops	231 lbs.
Pounds gain from tops per ton of beets	16.8 lbs.

In our Missoula area, beet tops for pasture sell for only 75 cents to \$1.00 per beet ton or 10 cents per head of cattle per day on tops. If these tops had been sold for these figures they would have netted us \$560.00 at \$1.00 per ton or \$642.00 at 10 cents per steer per day—plus the value of the manure.

When it is remembered that practically all of the fertilizer in the beet tops passes through the steer as manure, some 87 percent of the nitrogen, 87 percent of the phosphorus and 90 percent of the potassium, it appears that more than 88 percent of the total fertilizer value of tops from the 15-ton crop mentioned by Dunn and Rost, or \$22.50 per acre, is returned to the soil, in addition to the gain put on the steers. A large part of these fertilizer elements may be lost before being worked into the soil. In areas where livestock are available, and weather suitable, pasturing beet tops off the field after windrowing them, and then discing or plowing to mix the soil and manure would be a worthwhile practice—not as good as making ensilage out of the tops but better than plowing the tops under for their fertilizer value.

Our best, and least common, means of conserving beet tops is by making them into ensilage. This method of utilizing tops is not affected by weather and the feed is available for a long feeding period. Over our company operations, tops from approximately .6 percent of all beets were utilized for ensilage, this representing 830 acres of beets.

Morrison shows a potential gain of 100 pounds of meat per 700 pounds of t.d.n. and as average beet top ensilage is 14.9 percent t.d.n. we can figure that one ton of ensilage will put on 21.5 pounds of gain. This is indeed cheap feed, if the beet tops can be handled economically at harvest time, and if equipment is available to do a proper job of saving the tops.

In our Mason City, Iowa, area, where the Scott-Urschel harvester is the common means of harvesting the beet crop, one of the growers built a beet top elevator which conveyed the green tops to a 4-wheel trailer which is pulled behind the harvester. The load is pulled off the tractor into the

silo, which consisted of a concrete slab—80 feet by 24 feet—with plank sides to a height of 8 feet. The ends were left open. The tractor and trailer drive over the tops with subsequent loads, and out the other end, which packs the material. A layer of tops was laid down, then a layer of corn silage to soak up the juice from the tops, and then more tops. Some 200 tons of excellent beet top ensilage was made, the silo filled to about three quarters capacity. The harvest of beets was not delayed as two trailers were used, and the amount of extra labor was very small, and a very clean product is available for feeding.

An Allis-Chalmers hay chopper was used to remove as many petioles and leaves as possible from beets at Missoula, blowing the green material into a trailer. Some difficulty was encountered in dropping the sickle cutter bar of the chopper low enough to pick up the leaves as the frame for the bar knocked over beets. By putting on "lifter guards" most of the leaves were lifted so that the cutter bar removed them. Recovery of green material averaged 1,250 pounds per ton of beets until the first frost when the yield of tops was reduced to only 650 pounds per beet ton.

In the Rocky Ford, Colorado, area a Lundell hay chopper was used to harvest the beet tops, this chopper resembling a rototiller with three-cornered cutting blades welded to the arms. Three rows are topped at a time. The top and crowns of the beets are cut off near the leaf scar line, and all thrown into a worm scroll which feeds the materials into a blower that blows it into a trailer behind the chopper. Top recovery was good, and with proper tare in adjusting the machine there is little dirt in the silage.

All of the standard hay choppers are being used to pick up beet tops which have been windrowed six to eight rows behind the beet harvesters. These machines all work well and recover most of the tops, but excessive amounts of dirt are picked up with the tops. Where the tops are siloed green, it is usually necessary to use straw, corn ensilage, or some such material to retain the juices. Dried beet pulp is the best material for this purpose, each 100 pounds of pulp retaining up to 1,600 pounds of juice. Our growers have found that 20 to 30 pounds of dried pulp per ton of wet material will hold all juice, and make the best ensilage of any method tried as yet. It has been found that by field curing the tops one or two days after the harvester that the weight of tops to be handled is reduced by almost half, but valuable feed is also lost. If a corrugated roller is used to pack down the soil onto which the tops are ejected from the harvester a much cleaner product is received for feed.

Our most successful feeders here in Montana believe that the best method of handling beet tops is to pasture about half of their beet top acreage, having enough cattle to clean up the tops before November 15, then put the cattle in a dry feed lot, and feed a balanced ration utilizing the other half of the tops as ensilage.

As this is written we know of no really successful commercial beet-top harvester which is available on the market, one that with little manpower does a good job of topping the beet, recovering the top without dirt, and loading it in a trailer or truck either whole or choped. The beet roots are

easier to harvest after the tops are removed—another reason to harvest the tops as a separate operation. It would appear, from looking at the figures above, with less than 1 percent of all beet tops in our company saved as ensilage, that such a commercial machine would find a good market. If our company operation is representative for the nation as a whole, only 1 percent of the tops from the million beet acres of the country are utilized to full advantage as ensilage. Certainly there is a tremendous market for beet-top harvesting equipment, when such is available.

Literature Cited

- (1) L. E. DUNN and C. O. ROST.
1946. Yield and nutrient content of sugar beet tops, Agricultural Experiment Station, University of Minnesota.