

UTILIZATION *of* SUGAR BEET TOPS

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THE growing of sugar beets in Minnesota is an industry of comparatively recent development. It is probable, however, that the acreage devoted to this crop will be considerably increased in the future, if market conditions are favorable.

Beets marketed at the factory represent only about two thirds of the crop by weight. The tops remaining in the fields have a considerable feeding value, and questions arise, especially with the beginner, as to the best method of utilizing this part of the crop. The value of sugar beet tops for feed is confirmed by the experience of livestock men in Europe and in those sections of the United States where the crop is grown.

The total feed value per acre depends upon the yield of beets, price of other feeds, and the livestock available. Sometimes livestock men pay from \$4 to \$6 per acre for the tops, and at other times the price is based upon the yield of beets, 40 to 50 cents for the tops per ton of beets being a common figure. Some growers who have livestock conveniently at hand value the tops at prices considerably higher.

VALUE OF BEET TOPS COMPARED WITH OTHER COMMON SUCCULENT FEEDS

Beet tops and beet-top silage have essentially the same composition and feeding value. The following figures giving the average digestible protein and total digestible nutrients furnish a basis for comparing their feeding value with that of other feeds.

Table 1. Digestible Protein and Nutrients of Beet Tops Compared with Other Feeds

	Digestible crude protein in 100 pounds	Total digestible nutrients in 100 pounds
	lbs.	lbs.
Beet top silage.....	1.4	9.4
Corn silage	1.1	17.7
Sunflower silage	1.0	12.6
Mangels	0.8	7.4
Rutabagas	1.0	9.4
Potatoes	1.1	17.1
Alfalfa hay	10.6	51.6

Fresh beet tops and beet-top silage compare rather closely in feeding value with the roots, mangels and rutabagas. Beet-top silage is roughly half as valuable as the same weight of good corn silage and is by no means as satisfactory to feed as corn silage. For this reason, few experienced feeders would care to trade a ton of corn silage for two tons of beet tops or beet-top silage.

PILING BEET TOPS IN THE FIELD

A practice widely followed is to throw the tops into small piles at the time the beets are harvested. If piled at this time, while fresh, the dirt can be shaken off readily. Some consider the results more satisfactory, however, when the tops are allowed to dry partially by lying in the field two or three weeks before piling. Larger piles can then be made without danger of molding.

Cows or sheep are often turned into a field and allowed to eat the tops either before or after the piles are made. If this plan is followed, care should be taken not to let the stock overeat, as the fresh beet tops are quite palatable. Owing to the high mineral content of the tops, which are notably purgative, eating an excessive amount results in scouring. It is reported that excessive consumption with dairy cows may also taint the milk. Because of this, stock should be left in the field only for short periods and then given access to some dry roughage. A safer, and as a rule a more satisfactory, plan, especially with dairy cows, is to keep the stock out of the field and haul a desirable amount of tops to them daily.

STACKING TOPS

As fall plowing is generally followed in the sugar beet areas, grazing the tops in the field limits the time available for plowing before frost. To avoid this trouble, some growers have followed the practice of curing the tops and stacking them for winter feeding. In such cases, the tops are allowed to dry in small piles in the field and then hauled to the feed yards for stacking. If weather conditions prevent sufficient drying, straw is usually intermixed, serving to absorb some of the excess moisture.

A ten-ton crop of beets will yield about a ton of dry tops. Dried beet tops are fed like hay. The feeding value varies considerably, but omitting the straw, which may be used, the feeding value is not far from that of alfalfa hay.

BEET TOP SILAGE

Grazing the tops in the field or hauling from the piles seems to meet with the most favor. But some growers favor the plan of preserving the tops in the silo. By this means, the loss is kept at a minimum, and the feeding period may be extended over the entire winter. In Europe, the use of the trench silo for this purpose has been common for many years, but in the United States, results reported concerning the use of the silage have not all been so favorable.

The Idaho Experiment Station made an investigation of beet-top silage as used in that state, when losses of livestock were reported. It was found that much of the silage as prepared contained an excessive amount of dirt and in many cases was in very bad condition from decay. It was found that animals eating 35 pounds of the silage a day were consuming 4.6 pounds of dirt. According to the report it is difficult to avoid some dirt, but the amount found in the silage investigated was unnecessarily high owing to faulty methods of handling.

It is not necessary to put the tops through a silage cutter, altho this is done sometimes because the cut material packs to better advantage. The crowns which accompany the tops are rather large for animals, especially sheep, to eat and this is an additional reason for using the silage cutter.

RESULTS AT THE MINNESOTA EXPERIMENT STATION

Sugar beet tops were put into experimental silos at University Farm for four seasons beginning with 1924. In all, eleven silos were filled. The first year the tops were put into the silo immediately after removing the beets and without any drying of the tops in the field. The result was an inferior silage which was unpalatable to the cows. It had a bad odor and much of it was too decayed to use. There was a leakage from the bottom of the silo, which indicated that the moisture content was too high for good results.

In later trials, the green tops were left in the field to dry before being put into the silo. Two silos filled with tops that had dried for a week gave satisfactory silage. In this case, the weather was such as to allow extensive drying and most of the leaves were partially wilted when put into the silo. Another year the tops were left in the field for a longer period, but owing to conditions, little drying occurred, and the silage was unsatisfactory.

The tests proved that high moisture content in beet tops is disastrous to the silage and that weather conditions may make it impossible to reduce the water content materially by leaving the tops in the field to dry.

Two silos were filled the following year, using freshly-cut beet tops and adding oat straw to absorb the surplus moisture. In one silo, one-third straw, by volume, and two-thirds beet tops were used. The result was silage of good quality that was eaten readily. In the other silo in which the proportion was about half and half, the result was not so satisfactory. Evidently, the proportion of straw was too large.

The following year three silos were used and dry corn fodder run through the silage cutter was used to absorb the surplus moisture. The amount of corn fodder varied from 10 to 20 per cent by weight in

the three silos. The results were quite satisfactory for all three, but that containing 20 per cent fodder was the best. The moisture was absorbed by the fodder and the silage was the best of any produced.

The results indicate clearly that some provision must be made to reduce the moisture in the fresh tops in order to obtain good silage. If the weather is favorable, this can be accomplished by drying the tops in the field until the leaves are wilted. If the weather does not permit, the same result can be obtained by adding about one-third straw or one-fifth chopped corn fodder.

TRENCH SILOS FOR BEET TOPS

It is not necessary to erect an expensive permanent silo for beet tops. The pit type with earthen sides, or better, with concrete retaining side walls, is less expensive and quite satisfactory if care is used in filling. The silo should be placed in a well-drained location, conveniently near the feeding yards or barn. A long deep pit is better than a broad, shallow one. When the tops are packed to a depth of 6 to 8 feet, the air is excluded more completely than in a shallow pit, and a better quality of silage results.

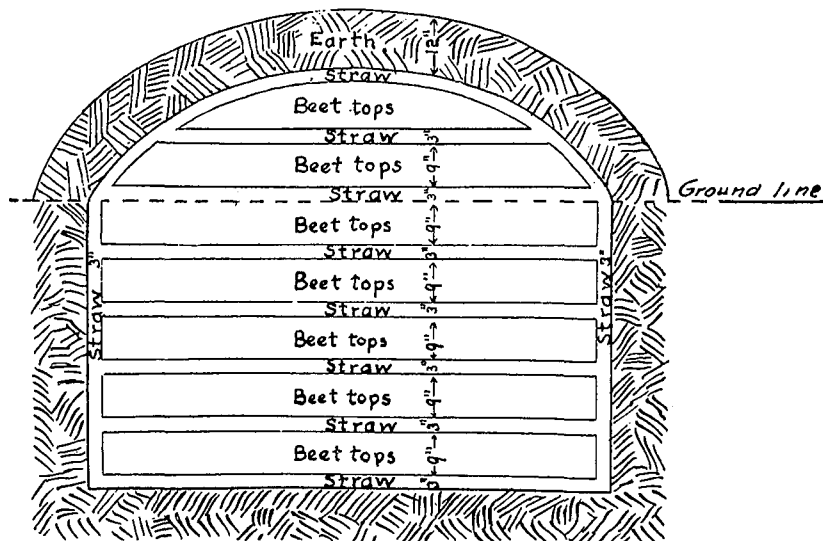


Fig. 1. (From U. S. Dept. Agr. Farmers Bulletin 1095.) Sectional View of a Trench Silo with Earth Walls

The tops are gathered fresh when straw is used to absorb the surplus moisture. It is essential that the air be carefully excluded. A layer of straw should be placed in the bottom and along the sides. Thoro packing is very essential when straw is used. The walls of the pit may be made sloping outward from the bottom to the top. Wagons hauling the tops are generally driven through the pit over the material to help the packing.

In using a silo of this type, it is a common practice to drive the team and wagon through from one end to the other. This contributes to thoro packing, which is essential in order to prevent spoilage. Thoro packing is even more imperative when straw is mixed with the tops. It has been found a good plan to put a layer of straw in the bottom, against the sides and on the top, to aid in excluding dirt from the silage.

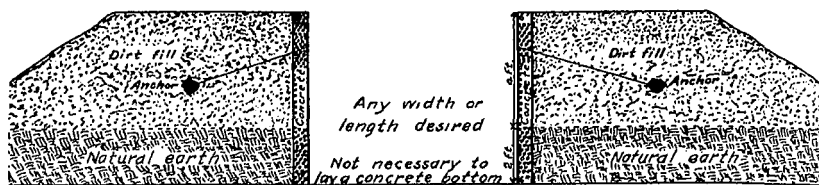


Fig. 2. (From U. S. Dept. Agr. Farmers Bull. 1095.) A Trench Silo with Concrete Retaining Walls

The wall is anchored at intervals to prevent its being pushed in when a heavily loaded wagon is driven over the dirt fill. The trench should be wide enough to allow a team and wagon to be driven through. This makes it convenient to fill and again to load the silage for feeding. It also assists in packing the material.

In sealing the silo after the mass of tops has been well packed, provision must be made to make the mass as nearly air-tight as possible. A layer of straw topped with a layer of earth is effective.

In removing the silage from a pit silo, a large hay knife may be used and the silage cut across one end and forked out as needed.

EXCLUSION OF DIRT

When beet tops are stored, it is essential that as much of the soil adhering to the tops be shaken loose as possible. Cases have been reported where severe digestive disturbances have occurred with livestock fed silage containing a large percentage of foreign material. Some soil is bound to remain on the tops, but this should be removed as fully as possible. Ordinarily when the tops are grazed from piles in the field, the stock will shake enough of the dirt loose while feeding.

DANGER FROM FEEDING DECOMPOSED SILAGE

Unless reasonable care is used in making beet-top silage, spoilage may result. Decayed silage should be discarded. Instances are known where the consumption of decayed and moldy silage has had fatal results upon the cattle. Horses are said to be even more susceptible.

FEEDING SUGGESTIONS

Beet-top silage is used to advantage by cattle, including dairy cows, and by sheep. It is not recommended for horses, pigs, or calves. If it is of good quality, the same feeding recommendations as for corn

silage would apply. However, it should not be fed as the sole ration. Ordinarily, 30 pounds per day is the upper limit of feeding, altho more is often fed. When reasonable quantities are fed, no bad effect is noticed in the milk. The most successful results with beet-top silage have been secured when it is fed with alfalfa or other roughage and supplemented with grain when necessary.

Table 2. The Composition of Sugar Beet Tops and Beet-Top Silage

	Beet tops		Beet-top silage		
	U. S. D. A., 22 samples*	Minnesota Expt. Sta., 5 samples	Idaho Expt. Sta., 10 samples†	Minnesota Expt. Sta., 5 samples	Henry and Morrison‡
	Per cent	Per cent	Per cent	Per cent	Per cent
Water	74.80	78.30	70.71	78.80	71.2
Dry matter	25.20	21.70	29.29	21.20	28.8
Ash	6.36	5.19	3.92	7.90	13.0
Protein	4.03	3.74	3.27	2.75	3.2
Ether extract	0.26	0.62	0.65	0.65	0.6
Crude fiber	2.73	2.56	2.36	3.04	2.4
Nitrogen-free extract.	11.81	9.59	9.73	6.86	9.6

* United States Department Agriculture Circular 319. 1924.

† Idaho Experiment Station Circular 17. 1921.

‡ Henry and Morrison, Feeds and Feeding. Appendix, Table 1.

OTHER PUBLICATIONS ON SUGAR BEETS AND THE USE OF SUGAR BEET TOPS

Beet top silage and other by-products of the sugar beet. United States Dept. Agr. Farmers Bulletin No. 1095.

Sugar beets in Minnesota. (Gives directions for growing sugar beets.) Minn. Agr. Expt. Sta. Special Bull. 90.

Composition of sugar beet pulp and tops and of silage therefrom. United States Dept. Agr. Circular No. 319.

Trench silos in Minnesota. Minn. Agr. Expt. Sta. Extension Circular No. 100.