The Utilization of Sugar Beet By-Products for Livestock Feeding

E. J. MAYNARD[1]

THE SUGAR beet by-products—beet tops, wet and dried beet pulp and beet molasses—have been used extensively as livestock feeds for many years with little change in the methods of handling and feeding them.

Because of their special adaptability for this purpose, they have exerted a profound influence on the increased volume production of meat and milk in those areas where sugar beets have been grown. This has been due to their succulence and high palatability, to their ability to improve grain and hay rations, and particularly to their very low comparative costs in terms of the actual grain and hay that they have replaced in livestock rations. However, largely because of the wasteful methods in handling them, the fact remains that even today there still exists a wider difference between their actual feeding value, and the lower value attributed to them by many beet growers, than exists for other livestock feeds produced on the farm.

While difficulties encountered in handling and feeding some of these by-products are recognized, a clear conception of their actual feed-replacement value and a better appreciation for the contribution they can make to a sound feeding and farming program should present a challenge to technologists and processors alike to develop more efficient methods for their conservation, and to stimulate and encourage livestock-feeding operations on more beet farms through continued demonstration of their ability to improve rations and to materially reduce livestock-feeding costs.

There is an urgent need today for a more widespread livestock-feeding program on the beet farms of America. There are still too many large centralized feeding operations in close proximity to sugar beet factories, with far too many farms in the outlying beet-producing territory where little or no livestock is being fed. It is time to take stock of this situation and to develop a definite program to obtain a wider distribution of these beet by-products in order to make livestock feeding more attractive on these farms and to insure production of the fertility needed for higher acre yields of beets.

The drying of wet beet pulp has proved an efficient step toward the decentralizing of livestock feeding in beet-growing areas, although this development has also resulted in the marketing of some of this product outside of beet-growing territory. But the fact remains that many beet growers still need information and guidance in developing more efficient methods for handling and feeding their by-products in order to realize and fully appreciate the value of their sugar beet crop as a whole.

[1]General Livestock Consultant, The Great Western Sugar Company, Denver, Colorado

There is a fund of dependable experimental evidence already available to indicate the feeding value of these by-products as they have been handled and fed in the past; evidence that has provided ample proof to indicate that the by-products alone from the sugar beet crop, if given only reasonable care on the farm, can provide as much net feeding value for livestock as an entire crop of corn, barley or alfalfa hay grown on comparable acreage. But there are opportunities today for further studies that can point the way toward even more efficient methods of harvest and conservation, and even greater values for the beet by-products as livestock feed

This year, the American Society of Sugar Beet Technologists has included an agronomy subsection for a more detailed consideration of these beet by-products. Such a move appears particularly important at this time when the rapid transition to the mechanized harvest of the beet crop is creating new problems concerning the harvesting and processing of the beet-top crop, and when dependable data are urgently needed for the further refinement of various types of beet harvesters with regards to methods for salvaging beet tops and protecting them for use as livestock feed. Such problems include for instance, the question as to whether beet tops should be beaten off and disintegrated, to be left lying on the ground exposed to the elements until such time as they may be plowed under, or whether the tops and crowns can be used to better advantage in the long run if they are properly conserved and used as a farm feed for livestock.

Problems such as these require a knowledge of the feeding value of tops as they are used today, as well as more information to show their potential value with the new and more efficient methods now available for their mechanical harvest, and for various methods of processing and storage to better conserve their nutrient values.

Feeding experiments that have been designed to answer some of these questions are already in progress. In one test with cattle, a comparison is being made with ensiled fresh green tops, ensiled wilted tops, and field-cured dried tops.

Another feeding test with lambs is comparing the feeding value of ensiled fresh green tops, fresh green tops ensiled with phosphoric acid, ensiled wilted tops, dehydrated tops and crowns, dehydrated leaves and petioles, and field-cured dried tops.

But we are concerned today, primarily, with the present utilization of these by-products and the values they have already shown as livestock feeds.

Many livestock-feeding tests conducted at various state and federal experiment stations during past years have established some simple basic facts relating to feeding practices that have resulted in more efficient returns from beet by-products than were formerly secured. It may be well to mention the most important of these before discussing the feed-replacement values of these by-products.

It is now generally recognized that livestock rations that are high in beet by-products and that contain little or no grain may give relatively poor results because of a deficiency in phosphorus, due to the low-phosphorus content of the by-products. This situation can be remedied by feeding a phosphorus supplement such as bone meal or some high-phosphorus feed such as wheat bran or one of the protein concentrates. Equally good results are secured from organic or inorganic phosphorus and, consequently, this phosphorus deficiency may not occur later in the feeding operation when more grain is included in the ration. Many experienced feeders today carefully check the phosphorus content of their beet by-product rations, realizing that a lack of phosphorus may be just as serious as insufficient protein in securing most efficient results. It is now a well-recognized fact, too, that in order to secure the full feeding value from dried beet pulp, it should never be fed as a "lone" carbohydrate in livestock rations, but should always be fed mixed with grain or in conjunction with such feeds as corn silage, corn fodder, mill feeds or protein concentrates. Fed alone, it has only three-fourths of a grain value. Fed in these combinations it is fully equal to grain.

Beet tops are of primary importance as a livestock feed, for they are available on every beet farm and constitute a very palatable farm feed that is high in protein of excellent quality and rich in both minerals and essential vitamins. Beet tops today are fed to beef cattle, dairy cattle, sheep and swine, and represent more than 50 percent of the total livestock feeding value of the entire by-products derived from the sugar beet. While their nutrient content would seem to class them as a substitute for legume roughage, many feeding tests have shown them to be valuable as a fattening feed as well.

While feeding values have been rather definitely established for such standard feeds as corn, barley, hay, dried beet pulp and even wet beet pulp as they are harvested or processed at present, it has been more difficult to determine the actual feed-replacement value of beet tops as they are handled and fed today, due to the wide variation in present methods of handling them. The fact is clearly demonstrated by an extensive survey made by the Beet Sugar Development Foundation in 1946[2] which covered some 67 percent of the total beet acreage harvested in the United States and Canada. This survey indicates that nearly 50 percent of the tops from all beets harvested were left lying out in the field without being windrowed or piled, that only 29 percent were field-cured and dried in small piles, while only 1 percent were ensiled. Although it is evident that a portion of those tops that received no care at harvest time were eventually pastured by livestock, it is evident too that there would be an unaccountable loss of nutrients from any feed harvested and handled in such manner. However, in view of the fact that many of these beet tops are pastured by cattle and sheep while they are still green, it would seem reasonable to use the field-

[2]Beet Sugar Development Foundation Report, Vol. III, No. 7

cured dried-top replacement value in attempting to determine the present average feeding value of beet tops as a whole.

In 1945, I published a general summary of livestock feeding tests with the beet by-products which had been conducted at the various western state and federal experiment stations throughout the years. This summary included all experimental data available where each beet by-product had been fed in a ration with grain and alfalfa hay, and where its feed replacement value in terms of the actual pounds of grain and hay that it replaced had been determined on the basis of unit feed required and unit gains secured on fattening livestock, by comparison with a check lot of livestock which had been fed a ration of grain and hay alone in the same experiment. The summary included 27 feeding tests with field-cured dried beet tops that had been handled according to customary methods of harvest on the farm; 29 feeding tests with wet beet pulp of approximately 11 percent dry matter content, and 42 feeding tests with dried beet pulp.

Those familiar with the feeding of the sugar beet by-products as supplements to a grain and hay ration will recognize the fact that they replace *both* grain and hay in producing equal gains in weight on livestock, and that, consequently, their feed-replacement value will be shown by the amounts of both grain and hay that they replaced in these experiments.

A weighted average of the results of all these tests showed that the field-cured dried tops from a ton of beets (approximately 200 pounds of dry substance) replaced 46 pounds of corn plus 150 pounds of alfalfa hay; that the wet beet pulp produced from a ton of beets (approximately 560 pounds of 11 percent dry matter pulp) replaced 41.6 pounds of corn plus 99.5 pounds of alfalfa; that the dried beet pulp produced from a ton of beets (approximately 90 pounds of 90 percent dry matter pulp) replaced 80.2 pounds of corn plus 37.6 pounds of alfalfa hay, and that the Steffens discard molasses produced from a ton of beets (approximately 35.4 pounds) replaced 20.1 pounds of corn plus 26 pounds of alfalfa hay.

These experiments showed, then, that in the aggregate, the by-products from a ton of sugar beets replaced 107.7 pounds of corn plus 275.5 pounds of alfalfa hay on a wet-pulp production basis, or 146.3 pounds of corn plus 213.6 pounds of alfalfa hay on a dry-pulp production basis.

It is interesting to note what these actual feed-replacement values show field-cured dried beet tops to be worth as livestock feed with the present fantastically high prices of other feeds. With corn at $4.50 per hundredweight, and alfalfa hay at $20 per ton, the tops produced from a ton of sugar beets would have a feed-replacement value of $3.57. Each ton of wet beet pulp replacing 148.6 pounds of corn plus 355.4 pounds of alfalfa hay would be worth $10.24. Each ton of dried beet pulp replacing 1,782.2 pounds of corn plus 835.6 pounds of alfalfa hay would be worth $88.56 bulk basis, and each ton of molasses replacing 1,136 pounds of corn plus 1,469 pounds of alfalfa would be worth $65.81.

These figures based on the present market prices of corn and alfalfa may surprise you. I have burdened you with these details for two reasons. First, to attempt to demonstrate that the replacement feed value of the beet by-products are not yet clearly or widely enough established to be accepted by many beet growers who could benefit accordingly, and then to afford an opportunity to compare these authentic feed-replacement values to the current market prices of these by-products to indicate the contribution they are making to more efficient livestock-feeding operations on the farm, and the advantages they provide to those beet growers who fully appreciate their value and who conserve and use them to best advantage.

While any widespread survey and study of many feeding operations must naturally be expected to represent an approximation of replacement feed values, it should be recognized that the improvements in beet by-product rations during recent years would appear to make these general findings conservative. In these feeding tests, field-cured dried tops, even with the nutrient losses sustained with this method of harvesting, have shown feed-replacement values equal to the digestible nutrients they have been shown to contain, while wet pulp, dried pulp and molasses have shown even higher values than those attributed to them by this method of evaluation. This can be accounted for by the well-recognized fact that the beet by-products have a common tendency to keep livestock on feed and gaining steadily by adding palatability to the ration and by eliminating indigestion and bloat, a rather common occurrence that tends to reduce average daily gains where the small grains and hay are used alone.

The magnitude and feed-replacement value of this sugar beet by-product crop presents today a real opportunity for the development of a universal livestock-feeding program on all beet farms; a program that will fit in well with the national plan to increase fertility of the soil, and with benefits to beet grower and processor alike.

Consider, for instance, that this past year some 12¼ million tons of sugar beets produced in the United States have provided some 1¼ million tons of dry matter in beet tops, 1,300,000 tons of wet beet pulp, 318,000 tons of dried beet pulp, and 217,000 tons of molasses—a supply of livestock feed that, according to available evidence, is capable of replacing some 28 million bushels of corn and nearly 1½ million tons of alfalfa hay.

Such a crop, capable of building the fertility and improving the soil on many thousand beet farms, can well justify any efforts expended to better establish its value in the minds of those it can benefit most.