

The Beet Sugar Industry

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Much has been written relative to various sugar beet agronomic practices calculated to increase beet tonnage and sugar per acre yields. In considerable part the proceedings of our society contain excellent papers on the production phases of the sugar beet crop. In general they deal with tests concerned with sugar beet varieties, organic and commercial fertilizers, field practices, time and rate of planting, width of row preferences, population studies, frequency and method of irrigation, insect and disease control and other equally important field practices involved in the production of sugar beets. Much progress has been made in increasing the national average of tons beets per acre yield. Similarly, there has been an increased sugar per acre yield, primarily due to increased tonnage beet yield.

While these significant changes have been taking place they have been also accompanied by equally significant downward trends in pounds of extractable sugar from one ton of beets sliced. As an illustration, one factory district whose annual beet production is well above 225,000 tons beets shows the following average performance for the prewar five year period 1936 to 1940 inclusive and the postwar five-year period 1946 to 1950 inclusive.

Table 1.—Comparison of Two 5-Year Periods in Production and Extraction of Sugar Per Acre.

	Tons Beets Per Acre	Percent Sugar Beets Bought	Pounds Extracted Sugar Per Ton Sliced	Sugar Per Acre Pounds Bought	Sugar Per Acre Pounds Extracted
1936-1940	16.81	18.14	303.7	6098	5105
1946-1950	21.16	16.32	255.1	6906	5398
Difference	+ 4.35 tons	— 1.82%	— 48.6 lb.	+ 808 lb.	+ 293 lb.

These averages show some very significant trends. While the yield of beets increased 25.8 percent during the last five-year period, the percentage of sucrose in the beet decreased 10 percent and the extractable sugar from a ton of beets was lowered 16 percent. And despite the 4.35 tons beets per acre increase, the quantity of sugar extracted from an acre of beets was increased by only 293 pounds or 5.74 percent, and which is less than the average pounds extracted from one ton of beets in the prewar 1936-1940 period. Considering the production and harvesting costs of this extra beet tonnage, it is readily apparent that there is much improvement needed because the sugar beet, as a commercial crop, has value only in proportion to the recoverable sugar. This has been recognized by the administrators of the Sugar Act in reducing the estimated quantity of recoverable sugar used as a basis in determining the conditional payments under the Act to sugar beet growers.

The causes for this lowered quality of the beet are several. Probably the first and foremost to consider is the development of sugar beet varieties which are heavy feeders on available plant food, requiring a longer growing

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season and which are of generally lower sucrose and purity values than those varieties which have earlier maturing qualities but which produce significantly lower tonnage yields of beets per acre.

Further, the heavy yielding varieties generally accumulate larger quantities of sodium and other harmful elements which depress purity and reduce the recoverable sugar from a ton of beets. Since the beet purchase contracts are based on the ability of recovering a certain amount of sugar from a ton of beets of given quality, it follows that unless these downward trends are arrested a revamping of the price structure may be necessary.

Another factor contributing to the production of lower quality beets stems from the excessive use of nitrogen. In some areas, notably in certain beet growing localities in California, the only field response obtained is from nitrogen.

The research staff of the American Crystal Sugar Company has for many years been endeavoring through numerous field tests to impress upon its growers the need for more moderate use of nitrogen beet fertilizers and more timely application of them, preferably by applying them immediately after planting. The unit of plant food has been gradually decreased from 150 pounds of nitrogen to 75 pounds of nitrogen per acre, resulting in the production of practically the same amount of sugar per acre and certainly at a considerably lesser expenditure. It is evident that the whole matter of adequate yet balanced fertilization of beets needs to be re-examined and especially so with special reference to the particular sugar beet variety used and the type of commercial fertilizer applied.

A problem of overshadowing importance is that presently arising from the aftermath of mechanical harvesting of beets. Frequently, with a lapse of only an hour or so between harvest of the beet and its actual delivery from the field to the receiving station, the beet has small opportunity to dry out. Consequently, the tonnage yield per acre is greater but the percentage of sugar is generally less than were the beets harvested by hand.

This, as is well known, is quite different from the former practice common in the industry when hand harvest was the method used and the lifted beets lay quite frequently for several hours in the field or windrow before topping was completed. An additional loss in time was experienced before the beet was finally delivered by slower transportation, either to the beet receiving station or to the factory proper. In either of these latter cases, there was considerable loss in yield through dessication but with attendant increase in sugar percentage. Whether the fresher condition of the mechanically harvested beets arriving at the factory is balanced by virtue of the probable increased daily slicing rate is a highly debatable question when the increased transportation costs per hundred weight of sugar are considered. Suffice it to say that in most instances the cost sheet shows a markedly higher transportation cost per hundred weight of sugar since neither truck nor rail transportation differentiates in the cost of hauling lower testing beets as against those which are higher testing.

This then brings us to a practice concerning which something can be done in the improvement of beet quality. This lies in the direction of a

better job of beet harvest, in delivering a cleaner product free from weeds and trash, and in the insistence of an improved beet harvest which has as its objective a properly topped beet. Attention is called particularly to the need of a better job of topping since, with the rapid spread of mechanical harvest, "which is now well past 60 percent of the total United States crop" the quality of topping has steadily deteriorated so as to pose a real challenge to the industry. Field tests have been made repeatedly through the years on the effect of varying amounts of high topping as affecting the recoverability of sugar from the beets. The results through the years have been uniformly the same; namely, the higher the amount of crown tissue retained on the beet the lower the overall extraction of sugar due to an increase in the melassegenic properties.

Periodically, there come proposals relative to the utilization of the entire crown for sugar-making purposes. The object back of this proposal obviously is to so change the method of harvest that the beet is completely defoliated, the crown bud scalped lightly and the "residue" delivered to the factory for sugar making purposes. While it is true that there is some sugar in the crown tissue, it is of such small extractable value that the present basis of purchasing beets is not a fair or reliable means for purchasing this low value material.

Since the feed value of the beet tops is a significant portion of the total value of the crop it should be utilized in this manner, so that the soil will be enriched, whether through the organic matter as in green manure form or through livestock residue, and thus the true position of the beet is maintained through its significant after effects upon crops that follow.

Summary

It behooves the beet breeder to increase his efforts in the development of adapted beet varieties which are more efficient and selective in their utilization of plant food for the production of quality beets with a decreased non-sugar content.

Similarly, the agricultural engineer has his work cut out in the improvement of mechanical harvesting machines which will result in delivery of beets which are well topped, free from trash and weeds and have satisfactory mechanical performance.

In the constant directing of effort in the reduction of field expenditures involved in the production of the sugar beet crop, the agronomist must always keep in mind not only the production of sufficient raw product, but also the critical requirements of quality beets by the factory, if capacity slicing and most economical production of sugar are to result.

Last, but not least, improvement in production of quality beets must begin in the field. The grower after all is the sole arbiter as to the decision he wishes to make, or the course he wishes to pursue relative to recommended practices. Significant progress has been made in many respects. Much more is needed in others.