AGRICULTURAL ECONOMIC REPORT NO. 31

SWEETENERS used by the BEVERAGE INDUSTRY

Their Competitive Position in the United States

ECONOMIC RESEARCH SERVICE U. S. DEPARTMENT OF AGRICULTURE

PREFACE

This is the third report on sweeteners used by food processing industries in the United States. Agricultural Economic Report 20, which dealt with the canning industry, was published in November 1962, and Agricultural Economic Report 30, which dealt with the dairy industry, in April 1963. Other publications are planned for (1) the baking industry, (2) the confectionery industry, and (3) a final summary of the principal findings for each industry.

Research to analyze and evaluate trends in the production and consumption of various sweeteners and in the competition among sweeteners was recommended by the Sugar Research and Marketing Advisory Committee.

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Washington, D. C. May 1963

SUMMARY

The beverage industry (soft drinks, malt, malt liquors, distilled liquors, flavorings) used 13.5 percent of all the sugar consumed in the United States and one-fourth of that delivered to industrial users in the United States in 1961. This was more than was delivered to any other industry. Beverage producers also used relatively small amounts of dextrose and corn sirup and increasing amounts of noncaloric sweeteners.

Manufacturers of soft drinks are the largest users of sugar, followed by the producers of flavorings. However, soft drink manufacturers are the largest customers of the flavoring industry so that much of the sugar delivered to the flavoring industry reaches consumers in the form of a soft drink. Most of the corn sirup and dextrose delivered to the beverage industry is used as part of the fermentation material in the production of beer.

Bottlers producing clear, light-colored soft drinks, sweetened with sugar, generally require sugar of higher purity than that needed for most other types. Industry specifications for sugar of this quality, known as "Bottlers" sugar, have been established jointly by bottlers and sugar refiners. About one-third of the bottlers interviewed reported that they used "Bottlers" sugar, and usually paid a small premium for it. Bottlers of other types of soft drinks purchased imported refined sugar or domestic semirefined sugar whenever such sugars were available. These sugars commonly sell for less than sugars refined in continental United States.

The consumption of sugar by the beverage industry has been increasing since 1952 at a rate of about 49,000 tons per year. Deliveries of corn sirup have increased about 3,200 tons per year, while those for dextrose declined from 1952 to 1959 and then increased to about the 1952 level. The percentage rate of increase in the use of corn sirup was more than twice that for sugar, but the total quantity delivered in 1961 was less than 4 percent of the quantity of sugar delivered.

The consumption of sugar by the beverage industry has been increasing at a considerably faster rate than the population in the United States. This is largely a reflection of the output of soft drinks, which increased about 12.5 percent from 1954 to 1958.

In recent years, the use of noncaloric sweeteners in soft drinks appears to have been increasing more rapidly than the use of sugar, although statistical information concerning the use of noncaloric sweeteners is much less plentiful and reliable than that for other sweeteners. Information obtained from a survey of soft drink bottlers indicates that the primary factors responsible for the increasing use of noncaloric sweeteners are:

(1) Increasing consumer consciousness of the need to limit caloric intake as a means of weight control.

(2) Lower costs of noncaloric sweeteners. Competition among sweeteners, particularly between sugar and noncaloric sweeteners, is a matter of concern to all sweetener producers, because of the immediate shifts in the size of the market for various sweeteners and the potentially much larger shifts which are in prospect if present trends continue. The shift from sugar to noncaloric sweeteners has been small up to the present time, but available information on recent trends and from bottlers indicates that the substitution of noncaloric sweeteners for sugar is likely to become increasingly important. Producers who lose part of their market may find it difficult or impossible to recover their losses if more consumers come to prefer drinks manufactured with noncaloric sweeteners.

SWEETENERS USED BY THE BEVERAGE INDUSTRY

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INTRODUCTION

The beverage industry is the largest user of sugar of any industrial group in the United States. 1/ In 1961 about one-fourth of the sugar delivered to all industrial users in the United States went to firms engaged in the production of beverages. This was equal to 13.5 percent of total consumption of sugar in the United States that year. The industry also uses comparatively small quantities of corn sirup and dextrose. The use of noncaloric sweeteners, principally saccharin and sucaryl, by the manufacturers of soft drinks has been increasing rapidly.

Special attention is given in this report to the use of sweeteners by the soft drink industry. In 1958, the latest year for which Bureau of the Census figures are available, about 53 percent of the sugar used in the commercial production of beverages was purchased by producers of canned and bottled soft drinks. 2/ Some 45 percent was used in the production of flavorings and 2 percent in the production of malt liquors. The Bureau of the Census also reports that in 1958 about 41 percent of the value of shipments by the flavoring industry was purchased by bottlers and canners of soft drinks, indicating that the soft drink industry accounted for two-thirds to three-fourths of total sugar usage by the beverage industry.

Changing conditions in the beverage industry, particularly with reference to competition between noncaloric and other sweeteners, have created a need for more information concerning these shifts and their probable effects on sweetener producers and on consumers generally.

Sugar is still, by far, the most important sweetener used in the production of soft drinks. However, both trade reports and information gathered from a survey of representative bottlers indicates that an increasing share of the output is being manufactured with noncaloric sweeteners.

The specific purposes of this report are (1) to determine trends in the quantity of each type of sweetener used in the beverage industry, (2) to provide information which may be useful to sweetener producers on the problems and practices of various segments of the industry and, (3) to analyze the competition among producers of different sweeteners in selling their products to the beverage industry.

1/ The beverage industry includes commercial establishments engaged in the production of soft drinks, malt, malt liquors, distilled liquors, and flavorings.

2/ Census of Manufactures, 1958.

The information on which this report is based was obtained from a sample survey of firms producing soft drinks, from consultation with representatives of various segments of the beverage industry, and from various secondary sources. The industry survey covered 40 firms in 13 States and the District of Columbia. It included representatives of each of the principal types of soft drinks produced in the United States.

SIZE AND LOCATION OF THE BEVERAGE INDUSTRY

Plants producing canned and bottled soft drinks and flavorings in the United States are located in all sections of the country (table 1). They are distributed more or less in proportion to population. Census figures also show that in spite of a few large producers, about two-thirds of the soft drink plants and four-fifths of those producing flavorings were small, having fewer than 20 employees. The 4,362 soft drink plants were owned by 3,994 companies and the 531 flavoring plants by 502, indicating that most companies were small and operated only a single plant.

The number of plants producing other types of beverages was smaller, and such plants tend to be concentrated in various sections of the country. However, since their use of sweeteners is relatively small, the size and location of these plants is of lesser significance to the various segments of the sweetener industry than is true of plants producing soft drinks and flavorings.

The number, size, and geographic distribution of plants in the soft drink and flavoring industries affect the manner in which sweeteners commonly are sold and distributed to these industries. Sales generally are made in small lots, and both sales and deliveries are made in all sections of the country. Costs of sugar and other sweeteners vary with regional differences in the delivered prices of these products.

The production of soft drinks in the United States has increased substantially since World War II. Bureau of Census reports show the total output of soft drinks in 1958 was 12.5 percent larger than in 1954 (table 2). The production of all categories of soft drinks except "still" increased, although by widely varying percentages. Trade sources report an overall increase in the output of soft drinks from 1954 to 1958 somewhat larger than that shown in table 2.

The quantity of sugar used by the soft drink and flavoring industries increased about 10 percent from 1954 to 1958, according to the Bureau of the Census. This rate of increase is smaller than that for the entire beverage industry. Since, unlike various other industrial food products, household production of soft drinks has never been important, nearly all the increased production of soft drinks and the accompanying increase in the use of sweeteners represents a net increase in their use, rather than a transfer from household to industrial use.

QUANTITY OF SWEETENERS USED

About 95 percent of the caloric sweeteners (sugar, dextrose, and corn sirup) used in the beverage industry from 1952 through 1961 was sugar (table 3). This proportion changed only slightly during the period, although it reached its lowest point, 94.4 percent, in 1961. The proportion corn sirup was of the total increased steadily from 1.6 percent in 1952 to 3.4 percent in 1961. Except for some recovery in 1960 and 1961, deliveries of dextrose, as a percentage of the total, declined

Table 1.--Number of plants producing specified kinds of beverages in the United States, by regions, 1958

Region	Soft drinks 1/	Flavorings	Malt liquors	Malt	Wines and brandy	Distilled liquors 2/
New England	312	46	9	---	---	11
Middle Atlantic	706	142	66	7	51	21
East North Central	754	132	84	23	25	16
West North Central	422	40	25	12	4	5
South Atlantic	740	47	18	---	10	9
East South Central	389	13	6	---	1	42
West South Central	529	40	12	---	4	1
Mountain	208	9	13	---	---	1
Pacific	302	62	25	4	144	16
United States	4,362	531	258	46	239	122

1/ Canned and bottled.
2/ Except brandy.

1958 Census of Manufactures, Bureau of the Census.

Table 2.--Production of soft drinks in the United States in 1954 and 1958

Flavor	1954	1958	Increase
	Million cases	Million cases	Percent
Carbonated:			
Kola extract	621.0	637.2	2.6
Orange	47.1	65.0	38.0
Lemon, lime 1/	90.0	118.8	32.0
Root beer and sarsaparilla	35.1	41.0	16.8
Ginger ale	42.7	45.1	5.6
Grape	21.8	22.4	2.8
Carbonated water and club soda	19.3	19.9	3.1
Other flavor	76.5	79.4	3.8
Flavor not reported	103.8	156.4	50.8
Still:			
Orange	11.0	4.6	-58.2
Other	7.8	4.3	-44.9
Canned soft drinks 2/	17.7	18.6	5.1
Soft drinks in bulk	3.3	21.1	539.4
Total	1,097.1	1,233.8	12.5

1/ Separately or in combination.
2/ Except fruit drinks, for which information is not available for 1954.

Census of Manufactures.

Table 3.--Deliveries of sugar, dextrose (corn sugar), and corn sirup, by primary distributors to the beverage industry in the United States, 1952-61

Year	Sugar	Dextrose	Corn sirup	Total	Sugar	Dextrose	Corn sirup	Total
	1,000 tons, dry basis 1/				Percentage distribution			
1952	768	27	13	808	95.1	3.3	1.6	100.0
1953	813	25	17	855	95.1	2.9	2.0	100.0
1954	815	23	17	855	95.3	2.7	2.0	100.0
1955	885	21	20	926	95.5	2.3	2.2	100.0
1956	931	21	26	978	95.2	2.1	2.7	100.0
1957	945	20	26	991	95.4	2.0	2.6	100.0
1958	953	20	28	1,001	95.2	2.0	2.8	100.0
1959	1,114	19	33	1,166	95.6	1.6	2.8	100.0
1960	1,148	27	38	1,213	94.7	2.2	3.1	100.0
1961	1,210	28	44	1,282	94.4	2.2	3.4	100.0

1/ Sugar, refined weight as produced; dextrose 92.0 percent and corn sirup 80.3 percent of weight as produced.

Sugar Reports, Sugar Division, U. S. Agricultural Stabilization and Conservation Service. The dextrose figures are based on data in table 25, Report No. 120 for 1961 and corresponding tables in earlier issues.

during the 10-year period. In addition to the sweeteners listed in table 3, the soft drink segment of the beverage industry used increasing quantities of noncaloric sweeteners (saccharin and sucaryl) during this period, but detailed statistics as to quantities are not available.

The deliveries shown in table 3 are those made by primary distributors (continental cane sugar refiners, domestic beet processors, importers of direct-consumption sugar, mainland cane sugar mills, and producers of dextrose and corn sirup). In addition to these sources, some beverage companies, particularly those of smaller size, purchased all or part of their sweeteners through wholesalers. Reliable statistical information about the quantities of such purchases is not available. However, it is doubtful if the inclusion of such data would change materially the relationships shown in table 3, except to make the tonnage figures somewhat larger.

Sugar delivered to the beverage industry in 1952 was 10.5 percent of total deliveries of sugar to all customers in the United States. By 1961 this share had increased to 13.7 percent. Deliveries of dextrose to the beverage industry in 1952 was 7.7 percent of total deliveries and in 1961 was 7.4 percent. The tonnage of dextrose delivered to the beverage industry declined consistently from 1952 to 1958 and increased sharply in 1960 and 1961. The reason for this is not clear. Part of it may be due to increased sales of a blend of sugar and dextrose. The quantity of corn sirup delivered to the beverage industry in 1952 was only 2.3 percent of the total deliveries of that commodity; by 1961 the industry was using 4.9 percent of the total. Most of the dextrose and corn sirup delivered to the beverage industry is used in the production of malt beverages, although a few producers of soft drinks used small quantities in certain of their products.

The total quantity of sugar, dextrose, and corn sirup delivered to the beverage industry from 1952 through 1961 increased at an average annual rate of about 52,000

tons per year. The increase was somewhat more rapid in 1959, 1960, and 1961 than in earlier years. The percentage rate of increase, based on the average quantity for the entire period, was approximately 5.2 percent per year.

Deliveries of sugar to the beverage industry increased at an average annual rate of about 49,000 tons per year, a percentage increase of about 5.1 percent. Deliveries of dextrose to the beverage industry showed no particular trend from 1952 to 1961, first decreasing and then increasing to about their original level. Deliveries of corn sirup, however, increased at a rate of 12.2 percent per year. Despite this rapid increase, the quantity of corn sirup delivered to the beverage industry in 1961 was only 3.4 percent of the total deliveries of corn sirup, sugar, and dextrose.

If the trends in the use of sweeteners that prevailed from 1952 to 1961 continue, total deliveries of sugar, dextrose, and corn sirup will amount to about 1,500,000 tons in 1966, 260,000 tons above their 1961 level. With a continuation of present trends, deliveries of sugar will be about 1,421,000 tons in 1966 and those of corn sirup 57,000 tons. Deliveries of dextrose are assumed to remain at their 1952-61 average of 23,000 tons (fig. 1).

Per capita deliveries of sugar, dextrose, and corn sirup increased by about 3.6 pounds from 1952 through 1961. The increase was 3.4 pounds for sugar and 0.3 pound for corn sirup, while the per capita use of dextrose decreased slightly (table 4). The trends were fairly uniform, except that use was unusually large for sugar and corn sirup in 1959, 1960, and 1961, and for dextrose in 1960 and 1961.

The per capita use of sugar in the beverage industry increased at an annual rate of about 3.3 percent of the average quantity delivered during the period. The rate of increase for corn sirup was about 10.4 percent, more than three times that for sugar. The per capita use of dextrose declined sharply from 1952 through 1959 and then increased in 1960 and 1961.

The per capita use of sugar, assuming a continuation of the 1952-61 trend, would be about 14.8 pounds in 1966 (fig. 2). The per capita use of corn sirup, on the same basis, would be about 0.6 pound in 1966. Any projection for dextrose is largely meaningless, because of the reversal in trend in 1960 and 1961.

GEOGRAPHIC DISTRIBUTION OF THE USE OF SUGAR AND DEXTROSE

A larger tonnage of sugar, averaging about 39 percent of the total, was delivered to the beverage industry in the Southern States during 1952-61 than to the industry in any other section of the country (table 5). Although the quantity of sugar delivered to the beverage industry in the Southern States increased at an average rate of about 3.8 percent per year (fig. 3), the proportion going to the industry in these States declined from 43 percent in 1952 to 36 percent in 1961. The highest rate of increase in the use of sugar in the beverage industry was in the North Central States, for which the proportion of total deliveries increased from 17 percent in 1952 to 26 percent in 1961. Sugar deliveries to the beverage industry in the Middle Atlantic States increased at a slower rate than those to any other region. This area received 26 percent of these deliveries in 1952 and 23 percent in 1961.

Producers of beverages in the Middle Atlantic States used a larger quantity of dextrose in 1960 and 1961 than those in any other region, although prior to 1960 the largest usage was in the North Central States. Deliveries of dextrose to beverage

USE AND TRENDS in the BEVERAGE INDUSTRY

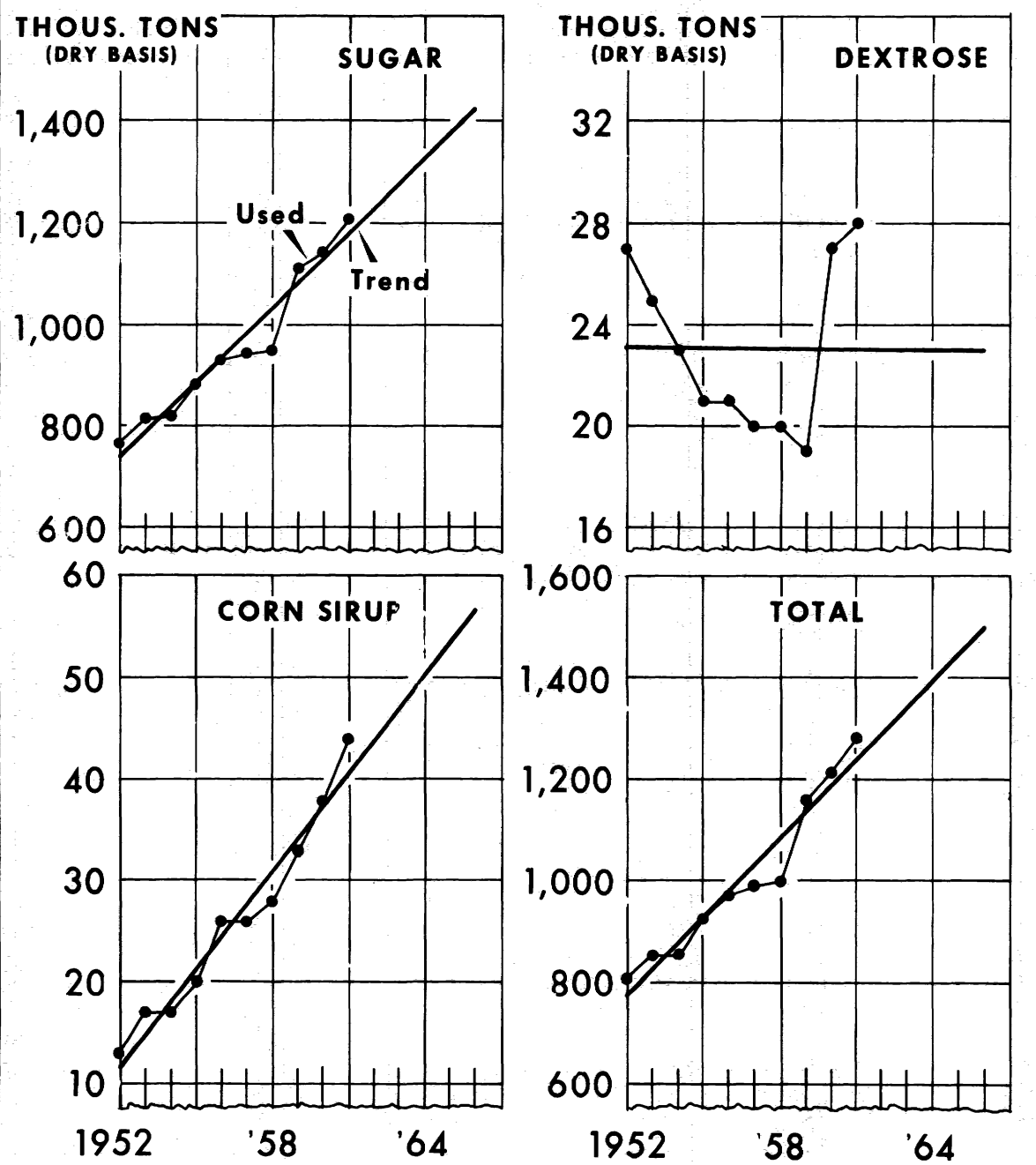

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Figure 1

Table 4.--Per capita deliveries of sugar, dextrose (corn sugar), and corn sirup to the beverage industry in the United States, 1952-61

Year	Sugar	Dextrose	Corn sirup	Total
		-- Pounds, dry basis 1/ --		
1952	9.78	0.34	0.17	10.29
1953	10.19	.31	.21	10.71
1954	10.04	.28	.21	10.53
1955	10.71	.26	.24	11.21
1956	11.07	.25	.31	11.63
1957	11.04	.23	.31	11.58
1958	10.91	.23	.32	11.46
1959	12.57	.22	.37	13.16
1960	12.71	.30	.42	13.43
1961	13.19	.31	.48	13.98

1/ Sugar, refined weight as produced; dextrose 92.0 percent and corn sirup 80.3 percent of weight as produced.

Adapted from Sugar Reports, Sugar Division, Agricultural Stabilization and Conservation Service, U. S. Department of Agriculture.

plants in the Middle Atlantic States increased from 22 percent of the total for the United States in 1952 to 46 percent in 1961, while deliveries to plants in the North Central Region declined from 41 percent of total deliveries in 1952 to 30 percent in 1961.

The decline in the use of dextrose in the North Central Region may be related to the decline in the rate of operations in the malt beverage industry in these States, as indicated by the decline in "value added by manufacture" from 1954 to 1958 reported by the Bureau of the Census. This value declined nearly $33,000,000 or 6.7 percent from 1954 to 1958. For the rest of the country it increased by about $47,000,000 or 4.3 percent. 1958 is the last year for which comparable data are available.

Similiar data for corn sirup are not available.

GOVERNMENT REGULATION OF THE USE OF SWEETENERS

The Food and Drug Administration of the Federal Government has no specific regulations with respect to the use of caloric sweeteners (principally sugar, dextrose, and corn sirup) in the beverage industry. However, there is a general requirement in the law to the effect that the products used shall not be hazardous to health. If noncaloric sweeteners are used, their identity must be printed on the label. The establishment of more specific regulations regarding the use of sweeteners in soft drinks is currently being considered by the industry and the Food and Drug Administration.

Some States have regulations concerned with the quantities of various sweeteners that may be used in soft drinks. However, none of the bottlers from whom records were obtained reported that these regulations had any material effect on their operations.

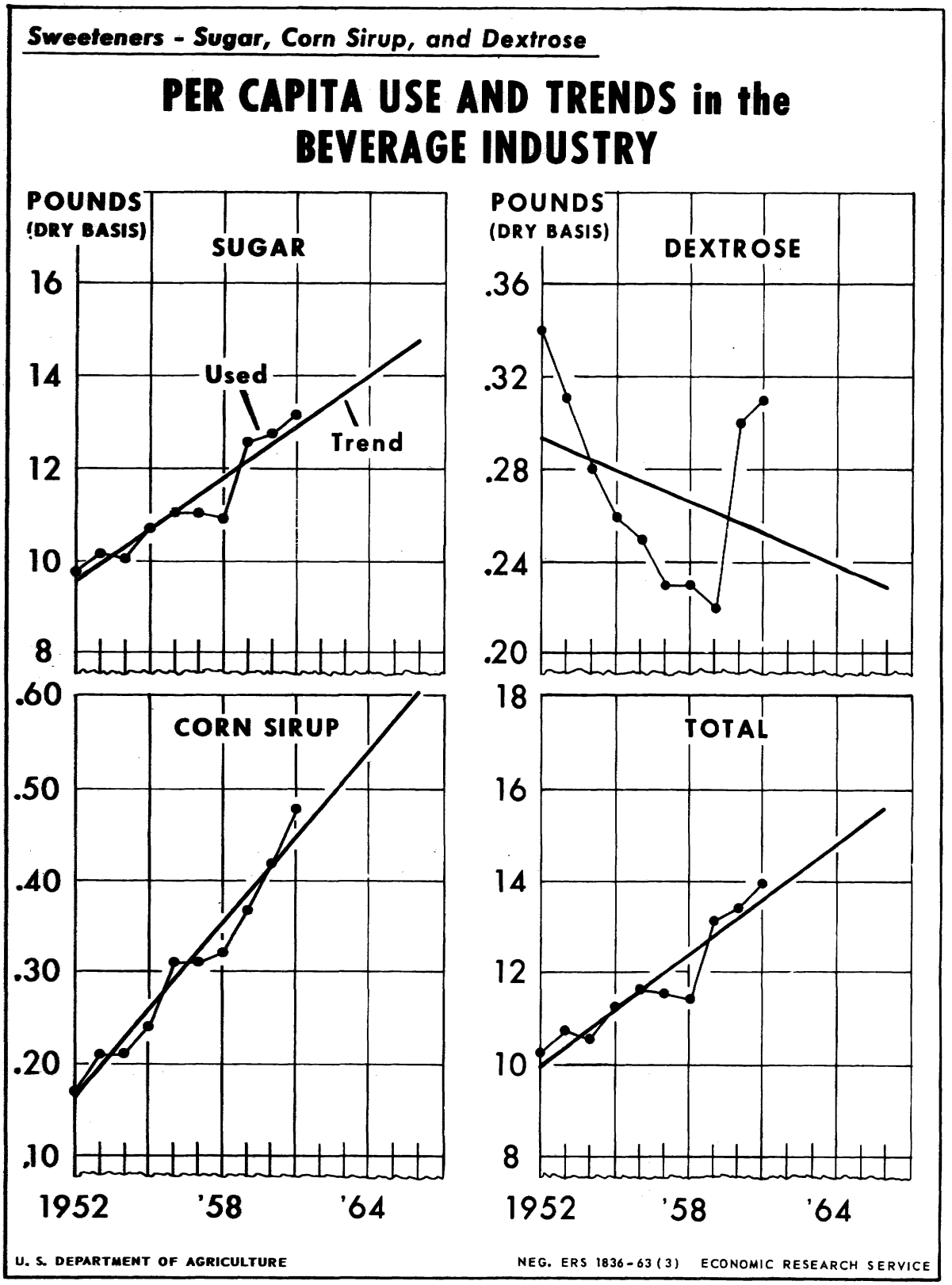
PER CAPITA USE AND TRENDS in the BEVERAGE INDUSTRY
POUNDS (DRY BASIS)
SUGAR
16
14
12
10
8
Used
Trend
POUNDS (DRY BASIS)
DEXTROSE
.36
.32
.28
.24
.20
CORN SIRUP
.60
.50
.40
.30
.20
.10
TOTAL
18
16
14
12
10
8
1952
'58
'64
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Figure 2

Table 5.--Deliveries of sugar and dextrose to the beverage industry, by geographic regions, 1952-61 1/

Year	New England	Middle Atlantic	North Central	South	West	United States
Sugar:			-- 1,000 tons, refined --			
1952	32	203	134	329	70	768
1953	31	202	172	321	87	813
1954	28	204	170	344	69	815
1955	32	227	191	361	74	885
1956	31	220	202	378	97	928
1957	32	238	204	365	104	943
1958	35	229	216	367	106	953
1959	41	253	272	429	119	1,114
1960	40	255	284	449	120	1,148
1961	45	273	318	442	132	1,210
Dextrose:			-- 1,000 tons, dry basis --			
1952	1.9	5.9	10.9	4.0	3.9	26.6
1953	1.5	5.4	9.9	2.9	5.4	25.1
1954	1.3	5.3	9.2	2.9	3.9	22.6
1955	1.1	5.5	8.5	3.1	2.9	21.1
1956	.9	5.3	8.6	3.3	2.9	21.0
1957	.8	4.9	8.0	2.8	3.2	19.7
1958	.7	5.6	7.9	2.5	3.2	19.9
1959	.6	6.3	6.7	2.3	3.1	19.0
1960	.9	12.3	8.5	2.4	2.9	27.0
1961	.7	13.1	8.6	2.6	3.2	28.2

1/ Area boundaries shown in figure 3.

Sugar Reports, Agricultural Stabilization and Conservation Service, U. S. Department of Agriculture.

INDUSTRY PRACTICES IN THE USE OF SWEETENERS

Refined sugar is the most important, and in many plants the only, sweetener used in soft drinks. All the plants in the survey used sugar, one plant used dextrose in addition to sugar, and about 20 percent of the plant managers interviewed reported the use of one or more noncaloric sweeteners in some of their products. The noncaloric sweeteners never were used in combination with sugar or dextrose.

Bagged and Bulk Sugar

Nearly one-half the plant managers from whom records were obtained purchased all their sugar in bags. Approximately an equal number used only liquid sugar. Four plants used both bagged and liquid sugar and one plant used sugar in dry bulk form. Managers of five plants reported the use of imported refined sugar.

A few of the plant managers interviewed had switched to the use of liquid sugar in recent years, and others indicated that they were planning to make this shift

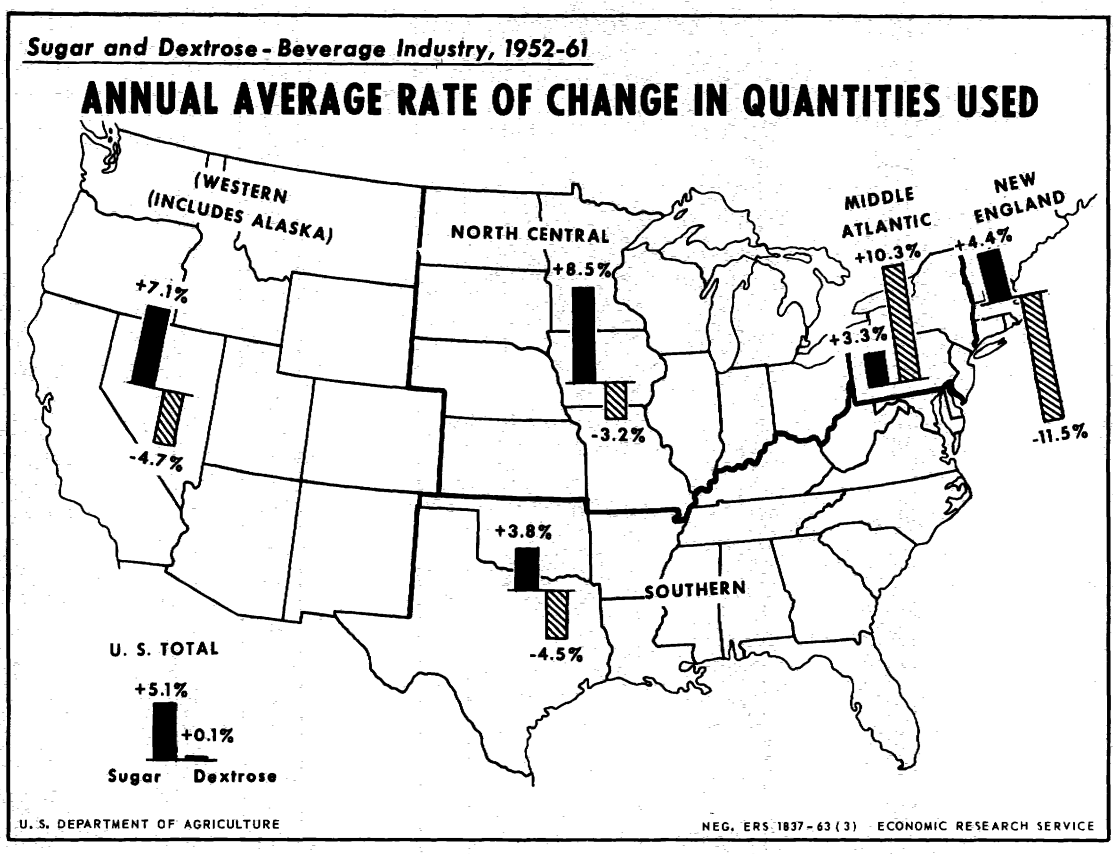

Figure 3

sometime in the next few years. Also a few were considering the installation of equipment for handling sugar in dry bulk form. The most common reasons cited for shifting to the use of sugar in bulk form, either liquid or dry, were (1) lower handling costs, (2) improved sanitation, (3) reduced pilferage, and (4) lower prices.

Bulk sugar requires less manual handling than sugar in bags. It is delivered to plants in enclosed containers, either trucks or especially designed railroad cars. These trucks or cars usually are equipped with pumps or other devices for transferring the sugar to storage facilities in the plant, thus reducing the equipment needed in the plant. Bulk sugar frequently is moved from storage tanks to the point of use in the plant by gravity, although mechanical means sometimes are employed.

Sugar in bags requires considerable manual handling both in moving it from a truck or railway car to the storage area in the plant and from storage to the point of use. However, less mechanical equipment is required for bagged sugar, offsetting at least part of the higher labor costs of using it.

The mechanical handling of liquid and dry bulk sugar and the use of closed containers in transportation and storage reduce the chances for contamination with foreign material which, if present in the final product, would render it unmarketable. On the other hand, liquid sugar is an excellent medium for the growth of various organisms so that storage tanks and pipes through which the liquid flows need to be kept scrupulously clean.

Sugar purchased in bulk frequently can be obtained at slightly lower cost, delivered to the plant, than sugar in bags. The cost of the bags is eliminated, and the cost of handling bulk sugar at the refinery and transporting it to the user's plant is frequently lower than for bagged sugar.

Despite the trend toward the use of sugar in bulk form, the use of bagged sugar is advantageous in certain plants and for certain types of operation. Among the circumstances favoring the use of bagged sugar are:

1. The small quantity used by some plants makes deliveries in dry bulk or liquid form uneconomic. Small plants and those without suitable storage space are unable to use sugar efficiently in either dry bulk or liquid form. Under most circumstances, the cost of installing the equipment necessary to handle sugar in either of these forms more than offsets the savings in labor costs obtainable from bulk handling for plants using less than 4,000 or 5,000 tons of sugar per year.

2. Preference for brands available only in bags. Some producers prefer to use sugar imported from foreign countries or partly refined sugar produced in domestic cane-growing areas. Ordinarily, sugar of these types is available only in bags. It usually sells at a somewhat lower price than sugar refined in mainland plants, the amount of the discount varying with the quality of the sugar and the quantity available when needed. Amendments to the Sugar Act in recent years have greatly reduced the quantity of refined or semirefined sugar which may be imported into the United States without further refining in this country. There is no limit on the quantity of such sugars that may be made in Louisiana and Florida.

Also, some plants which were bottling part or all of their output under franchise from another company were restricted to the use of certain designated brands of sugar. Sometimes these brands were available only in bags.

3. Plants located in areas where deliveries in dry bulk or liquid form are not available. Some plants were located in areas where it was difficult or impossible to obtain deliveries of sugar except in bags, usually because of the distance the sugar would have to be shipped in special trucks or railway cars. The distance, together with the small volume of sugar that would be used, would make the special equipment needed for delivery in bulk uneconomic. Cases of this sort are apparently becoming less common as the trend toward deliveries in bulk or liquid sugar continues among industrial food processors in other industries, as well as for soft drink bottlers.

"Bottlers" Sugar

The domestic sugar industry in collaboration with the bottlers of carbonated beverages have developed specifications for sugar to be labeled and sold as "Bottlers" sugar. These specifications, which provide maximum limits for the content of various impurities that may be present in sugar, such as ash, color, sediment, and bacterial content, are generally more stringent than those for sugar intended for most other uses.

"Bottlers" sugar, either dry or liquid, usually sells at a slightly higher price than other kinds, except refined sugar. Soft drink bottlers producing a light-colored, clear product are most likely to purchase this special grade of sugar. About 38 percent of the plant managers interviewed stated that they used "Bottlers" sugar, in either dry or liquid form. The darker colored soft drinks commonly were manufactured with less expensive sugar.

Blends of Sweeteners

While only one of the plant operators interviewed reported using dextrose as a sweetening agent, and this was used in combination with sugar, industry reports indicate that certain distributors in recent years have begun promoting the sale of a liquid mixture of sugar and dextrose to the bottling industry in their territory. The most common proportions of the sweeteners in this mixture are reported to be 10 percent dextrose and 90 percent sugar. No data are available with respect to the volume of such mixtures being sold to bottlers.

Most of the dextrose and corn sirup used in the beverage industry is used in the production of beer and cereal beverages. Their primary function is as fermentation material. However, corn sirup also may have some effect on the flavor of the product since a small part of the solids present in the sirup are not fermentable. Some sugar and dextrose also are used in the production of wine in some States, but their use for this purpose is illegal in California. The flavoring industry also uses some dextrose and corn sirup in addition to much larger quantities of sugar. However, as explained earlier, the soft drink industry is a major customer of the flavoring industry and a considerable part of the sweeteners delivered to the flavoring industry are finally used in the production of soft drinks.

Noncaloric Sweeteners

The use of noncaloric sweeteners by the soft drink industry appears to have been increasing rapidly in recent years, although relatively few statistics regarding their use are available. Trade sources estimate that 25,000,000 cases of low-calorie beverages were sold in 1961 as compared with 20,000,000 cases in 1959 and only 500 cases in 1950. 3/ The estimated production of low-calorie soft drinks in 1961 was about 1.6 percent of the total output of soft drinks in the United States in that year. Reports from bottlers and other trade sources indicate a general opinion that they expect the recent rapid rise in the use of noncaloric sweeteners in soft drinks to continue, and perhaps accelerate. Important factors in this projected trend are the concern of many people with weight problems and the necessity for diabetics to restrict their use of sugar.

Most of the plant managers who reported the use of noncaloric sweeteners used only calcium cyclamate although a few used sodium cyclamate or sorbitol. Soft drinks manufactured with noncaloric sweeteners have a market somewhat separate from that for products manufactured with sugar. The separation is far from complete since many consumers, particularly those who are merely concerned with weight problems, have a genuine choice regarding the product they consume. However, differences in the appeal of soft drinks sweetened with caloric and with noncaloric sweeteners reduce the influence that considerations such as comparative prices, convenience, and quality have on the volume of sales of soft drinks manufactured with noncaloric sweeteners.

About one-half of the plant managers interviewed reported that a noncaloric sweetener was the only suitable substitute for sugar in their product. About 10 percent of the managers who were not using noncaloric sweeteners reported an interest in switching part or all of their production to such sweeteners.

3/ National Bottlers' Gazette, June 1962.

Purchasing Practices

Approximatley three-fourths of the plant managers interviewed reported that they purchased sugar through some type of broker. In most cases purchases were made largely on a routine basis as sugar was needed. Long-term purchase contracts were used by only three plants. Where a number of plants were controlled by a single company, the purchases of sugar and other sweeteners commonly were made through a central purchasing office and sweeteners were delivered to the plant upon request to the central purchasing office.

Companies operating a number of plants and purchasing supplies through a central office were in a somewhat better position to take advantage of the occasional fluctuations in the price of sugar that have been common in recent years than were operators of the smaller, independent plants. Regardless of the type of plant some attempt usually was made to purchase larger amounts of sugar prior to price increases, which usually are announced some time in advance by primary sugar distributors. The extent of such purchasing, however, is limited by two factors. Dealers selling sugar frequently set a limit on the quantities they will sell prior to the effective date of the higher price, and limited storage facilities prevent some plant managers from buying as much as they otherwise would. A few plant managers expressed interest in the use of cheaper brands of sugar, imported or domestic, if any of these should become available in their locality.

COST OF SWEETENERS RELATIVE TO OTHER RAW MATERIALS USED BY SOFT DRINK MANUFACTURERS

Sugar and other sweeteners are part of the raw materials, frequently the most expensive part, purchased by the manufacturers of soft drinks. The amount of sweetener used varies with the flavor and the formula used in a given plant. Caloric sweeteners, primarily sugar, vary from about 7 percent to 20 percent of the volume of the drink, and constitute nearly all of the solids. The remaining solids typically consist of small quantities of coloring and flavoring material. Cola type drinks usually contain 10 percent or more of sugar, while many of the other flavors are prepared with only 7 or 8 percent.

Soft drinks prepared with a noncaloric sweetener require a much smaller proportion of sweetener, of course, because of the vastly greater sweetening power of these materials. In several plants included in the survey where noncaloric sweeteners were used, sorbitol was added primarily as a filler to give body to the product similar to that obtained in products sweetened with sugar. Where used, sorbitol was added in amounts varying from 14 to 20 percent of the weight of the product. Other substances occasionally were used as filler in soft drinks manufactured with a noncaloric sweetener.

The cost of sweeteners, as a proportion of total costs of raw materials used in manufacturing soft drinks, is even more variable than the physical proportions, for a number of reasons. The cost of materials such as flavoring and coloring constituents may vary. Costs are likely to be higher when the product is marketed in cans or nonreturnable bottles rather than in returnable bottles. Noncaloric sweeteners generally are cheaper to use than sugar. Also, there are significant geographic differences in delivered prices of sugar which vary with conditions in the sugar market.

Changes in the price of sugar and other sweeteners which affect all the bottlers in a given territory equally, usually can be offset by corresponding changes in the

price of the product, unless the change in cost is so small that most producers do not think it justifies the trouble of instituting a change in the price of their product. If, however, an individual producer should pay a higher price for his sweeteners than his competitors paid, he would not be in a position to raise the price of his product to offset his increased cost. The relative stability of sugar prices has made this problem less acute in recent years, but price changes still are sufficiently large and frequent to cause soft drink manufacturers, especially the large-scale operators, to give careful attention to their buying practices.

Large companies, particularly those operating a number of plants, are likely to have one or more specialists who devote more or less continuous attention to the market for sweeteners and who attempt to make purchases at the most favorable times and on the most favorable terms. Deliveries of sweeteners so purchased may be made at intervals extending over several months after purchase agreements are made. Other companies, usually of small or medium size, may rely on a single supplier for one or more of the sweeteners used, hoping that the prices they pay will be, at least, no higher than the average for their location. The smallest companies use such a small volume of sweeteners that they merely make purchases as needed from local dealers.

ECONOMIC IMPLICATIONS

Since 1952, the distribution of sugar to the beverage industry, most of it used in the production of soft drinks, has been increasing at a more rapid rate than the total distribution of sugar to all consumers in the United States. This is largely a result of the fact that the consumption of soft drinks in the United States has been increasing more rapidly than the population and that sugar is the predominate sweetener used in the production of soft drinks. Moreover, the use of dextrose and corn sirup is not only very small but their potential seems limited, although a few producers are using a mixture of sugar and dextrose in liquid form. Even in these mixtures, however, 80 to 90 percent of the sweetener commonly is sugar. Only in the production of beer and cereal beverages are dextrose and corn sirup commonly used to the exclusion of sugar. The lower prices of these products, together with the fact that they serve primarily as fermentation material rather than as sweeteners, are the major factors accounting for their replacing sugar in the brewing industry.

One trend, which appears to be of growing importance, is the rapid increase in the use of noncaloric sweeteners in the production of soft drinks. Two factors of importance underlying this trend are (1) the increasing consciousness of consumers of the need for controlling body weight and (2) lower costs of noncaloric sweeteners. Greater restrictions on the importation of refined sugar, which usually sells at a somewhat lower price than sugar refined in continental United States, may increase the cost advantage of noncaloric sweeteners for certain bottlers unless the reduced imports are offset by increased supplies of domestically produced sugar of similar quality and price. Deliveries of imported refined or partly refined sugar to the beverage industry declined from about 100,000 tons in 1952 to 20,000 tons in 1961. So far, the growing use of noncaloric sweeteners and corn sirup in the manufacture of soft drinks has had slight effect on the volume of business of sweetener producers. However, the trend toward the use of sweeteners other than sugar and the influence of the relative costs of sweeteners on this trend are important to all producers. Often the full economic effects of relative costs develop slowly, but they also have a way of lasting a long time, sometimes becoming permanent. As consumers become accustomed to the characteristics of soft drinks manufactured with noncaloric sweeteners or a mixture of sugar and corn sirup, more of them may

come to prefer such products, particularly when sold as highly advertised brands, and may resist attempts by manufacturers to return to products sweetened only with sugar.