

THE SUGAR BEET INDUSTRY

in the
Twelfth Federal Reserve District



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INTRODUCTION

BOTANICALLY, the sugar beet is known as *Beta Vulgaris*, the "common beet." Its use, however, belies its name. For from the sugar beet we get one of the most important elements of our diet, one of the cheapest and most concentrated of all energy foods. Sugar is so much a part of our daily life that most of us are not conscious of its real significance until we are restricted in its use or deprived of it.

The sugar beet is a paradoxical plant. It is a vegetable whose principal product, sugar, contains no vegetable matter. As a result, almost the entire vegetable part of the beet—the root itself and the leaves—is available for commercial uses. The vegetable portion is ultimately returned to the soil, either directly or through animals as fertilizer.

A particularly apt description of sugar is "crystallized air, water, and sunshine." For plants take carbon dioxide from the air and water from the soil, and, using energy from the sun, combine these materials by the process of photosynthesis into sugar. The sugar, in effect, stores the sun's energy until it is broken down into its original components, carbon dioxide and water. At such a time—for example, when a man takes physical exercise—the energy which went into the making of the sugar is released to his body.

Some of the sugar manufactured in the leaves of the plant is used in plant growth; part is converted into proteins, starches, oils, and other food elements. The remainder is stored in various parts of the plant. Two plants—the sugar beet and the sugar cane—store sugar more abundantly than any others, but pure sugar can also be extracted from palm trees, maple trees, sorghums, and many of our common fruits.

To the chemist, there are hundreds of different sugars, but only a few of these have the attributes of sweetness. The sugar of commerce—the sugar with which we are most familiar—is known, chemically, as sucrose. Most of us are also familiar with some of the other sugars—maltose (malt sugar), lactose (milk sugar), and dextrose (corn sugar). Of these, sucrose apparently has the ideal sweetness for most tastes. In addition, it is abundant, readily available from the sugar cane and sugar beet, easily produced and packaged, and keeps almost indefinitely.

As with many agricultural crops, the origin of the sugar beet is clouded in the pages of history. It is said to have descended from the wild beet which was found growing in countries bordering on the Mediterranean Sea. Wherever the beet originated, it was not until the middle of the eighteenth century that a German chemist proved that the beet root stored a sugar identical with cane sugar. By that time, cane sugar had become firmly established in all the tropical areas of the world, including those in the New World.

Napoleon provided the impetus for the beginnings of the beet sugar industry. The Napoleonic Wars cut off im-

ports of cane sugar from the West Indies, and Napoleon began an intensive campaign to stimulate beet sugar production. Though this particular project came to an early end, the beet sugar industry continued to grow throughout most of Europe, largely under the impetus of government assistance.

Beet sugar's start in the United States

Beginning in the 1830's, various attempts were made in the eastern part of the United States to grow and process sugar beets, but the ventures met with little success. About a decade later, the newly established Mormon Church began a series of projects to produce sugar from beets. Machinery was imported from France and shipped to Utah by covered wagon. This was the first attempt to manufacture beet sugar in Western America, but the enterprise could produce only syrup and had to be dropped. Succeeding attempts were made in Utah, California, and parts of the Middle West and the East, but these too proved unsuccessful. It was not until 1879 that a factory at Alvarado, California was first operated on a successful basis. Nine years later, Claus Spreckels built the second successfully-operated beet sugar factory at Watsonville, California. Thereafter, the development of the industry—with the encouragement of the Sugar Bounty Act of 1890 and the Dingley Tariff of 1897—was fairly rapid.

Early refining difficulties

The greatest difficulties which had to be overcome in these early years were not related to the production of the beet. Reasonably successful culture was achieved fairly early. But there was a notable lack of technical information about the methods of extracting sugar from beets. Machinery was not available. There were not sufficient experienced men in the country to run the new factories. The extent of the difficulties encountered is illustrated by the fact that in 1880, 14 of the 15 factories which had been erected were failures—only the one at Alvarado was operating. As the pioneers learned through bitter experience and as more information was obtained from the continent, however, success became the rule. The century closed with thirty completely equipped factories successfully extracting sugar.

Since the first beet sugar factory was started in this country over one hundred years ago, a total of 168 have been built in 26 states. Of this number 83 are in existence at the present time in 16 states throughout the Middle West, the Intermountain states, and on the Pacific Coast. The three states, Colorado, Michigan, and California have one-half of the total number. Since the factories must be located close to the areas of production, present acreages are located in the areas mentioned above. For several years California has been the largest producer of beets, followed by Colorado, Idaho, Michigan, Montana, Nebraska, and Utah.

THE GOVERNMENT AND THE SUGAR INDUSTRY

Since the introduction of domestic sugar beet growing the United States Government has played a larger and larger part in the industry. In fact, even before sugar beets were grown extensively, the importation of sugar was under considerable Government control. Probably no other agricultural commodity is subject to more Government control, assistance, and regulation at the present time.

The history of Government intervention in both the growing and processing phases of the industry discloses countless explanations for the necessity for such control and assistance. Originally, sugar policy was based on the need for Federal revenue; protection of a young growing industry was used next, followed by "preserving the American market for American farmers," national security, low sugar prices, protection from low-cost producing areas, surplus supplies, and equality of income for domestic and insular sugar beet and cane producers. The source, production, and distribution of sugar is controlled by import duties, excise taxes, import compensating taxes, allotments, quotas, and conditional payments.

Tariff: revenue and protection

Since sugar was originally known to the western world as a luxury product, it was admirably suited to a revenue tariff. During the 1890's, however, as beet sugar gained a foothold in this country, the tariff became openly protective to both the beet growing and the sugar refining industries. Shortly thereafter, preferential treatment was given to Cuba, and raw sugar from Hawaii, Puerto Rico, and the Philippines was admitted duty-free. As a result of these preferential treatments, imports from the rest of the sugar-producing world were practically excluded.

Under this protection, domestic, insular, and Cuban production increased at a rapid rate. Similar protectionist policies in other parts of the world fostered sugar production in Europe and in the major cane growing areas, and world output increased sharply. After the shortages caused by World War I, production again continued its upward trend, owing in part to technological advances. By the early thirties, the world industry was in a state of chronic surplus. Domestic producers, despite an increase in the tariff rate, suffered severely, and it became apparent that tariff protection alone was inadequate from the industry point of view.

In the early stages of the development of the industry, the tariff had proved effective in preventing the entry of low-cost sugar. But as world surpluses grew and prices dropped, foreign sugar could come in over the tariff and still be competitive with domestic and insular supplies. By 1932 the New York price for raw Cuban sugar¹ had declined to less than a cent a pound, compared with import duties of two cents on Cuban sugar and 2½ cents on all other sugar. With other aid and protection under

¹ Cost plus freight delivered at New York, less duty.

the Sugar Acts, tariff rates were gradually lowered, beginning in 1934. At present the rate is one-half cent per pound for Cuban raw sugar and .69 cents for raw sugar from other countries. The present raw Cuban sugar price is 5¼ cents per pound.

International agreements

The need for some form of international agreement was recognized by most exporting countries early in the history of world sugar trade. Such agreements have been the result and not the cause of governmental intervention in the sugar industry. The many occasions when world surpluses appeared were not due to uneconomic policies in the major exporting countries, but to the support of high-cost production fostered by national protectionist policies and imperial preference in various guises. As a result, international sugar agreements have been necessary to fortify the most efficient producing areas against the excesses of nationalistic policies which effectively kept low-cost sugar out of many world markets.

As early as 1902, the major countries of Europe entered into an agreement to eliminate bounties on the production and exportation of sugar. This agreement, which remained in effect until the start of World War I, did much to bolster world sugar prices. The surplus situation which developed in the 1920's resulted in another attempt at international solution to the problem. In 1931, the major exporting areas agreed to limit their exports to allocated quotas. Production in these countries was subsequently reduced, but the agreement failed to improve the price situation because production increased in the non-participating countries.

The International Sugar Agreement of 1937 corrected many of the failings of previous agreements. The countries included in the agreement comprised the major importing as well as the major exporting countries—accounting for 85 to 90 percent of total world production and consumption of sugar. Exporting countries were allotted specific quotas on the world market, and the importing countries agreed to provide assured markets. Without a doubt, this plan involved one of the most far-reaching surrenders of national sovereignty to international control that had yet been attempted along economic lines. Its effectiveness was never fully tested, however, since the start of World War II made the Agreement largely inoperative. This Agreement is still nominally in effect, though the member countries are currently working on a new one.

United States Sugar Acts

In spite of the increased U. S. tariff and the international agreement which were in effect during the early 1930's, world sugar markets were in the throes of an unprecedented depression at that time. Unrestricted production in and marketing from the areas supplying the United States market (except Cuba) had resulted in price-

depressing surpluses and record low prices in the sugar market, with consequent shrinkage in the income of domestic and insular producers. The Cuban industry was suffering one of the worst economic depressions in its history. The tariff had provided effective protection to domestic producers in former years when the rate of duty was moderate, when the world price was satisfactory, and when Cuba was the principal external source of supply for the American sugar market. It lost much of its effectiveness for domestic producers when world prices collapsed.

Beginning with the Jones-Costigan Sugar Act in 1934 (and continuing with the Sugar Acts of 1937 and 1948) the United States substituted quotas in preference to the tariff as the effective instrument of national policy with respect to sugar. Though these Acts call for considerable Government control and restriction of the sugar industry and give the Secretary of Agriculture wide powers, their use was felt necessary in order to maintain and protect the welfare of the domestic industry.

The present Act, the Sugar Act of 1948, is essentially the same as the two previous Acts. It consists of three basic features—the quota, the conditional payment to growers, and the excise tax.

The quota: Under the quota system, the Secretary of Agriculture determines at the end of each year the amount of sugar needed by consumers in the United States during the next year. The determination must attain that delicate balance where prices are sufficient to protect the domestic industry and yet are not excessive to consumers. The various sources of supply—namely, the mainland beet areas, the mainland cane areas, Puerto Rico, Hawaii, the Virgin Islands, the Philippines, Cuba, and full-duty countries—are each allotted a specific share of the total amount determined as required. The first five areas are allotted a total of about 4¼ million tons on the basis of fixed tonnage allotments; the Philippines may supply nearly a million tons; and of the remainder, Cuba is assigned 98.6 percent and other foreign countries 1.4 percent. Deficiencies from domestic areas are reallocated to other domestic areas and to Cuba, and a Philippine deficit is assigned largely to Cuba.

Whenever it appears that production in the domestic beet area, the domestic cane area, Puerto Rico, or Hawaii might exceed its quota, the area quota is broken down into specific allotments for each producer. Unlike other

crop control regulations, there is no referendum among growers before quotas or allotments are imposed. All regulations must be observed by any persons involved in production, processing, or marketing of sugar, and violators are fined three times the market value of any excess marketed.

Payments to growers: Regulation of the sugar market through the quota system is supplemented by a system of conditional or benefit payments by the Government to continental and insular producers. These payments are conditional upon the producers' meeting several requirements: employing no child labor; paying farm laborers in full and at wage rates not less than those determined by the Secretary of Agriculture; and, finally, observance of the specific allotments if they have been assigned. The rate of payment is based on the amount of raw sugar commercially recoverable from the production of the farm. Growers whose crop produces less than 350 short tons of raw sugar receive 80 cents a 100 pounds; larger growers receive payments on a descending scale, reaching a minimum of 30 cents a 100 pounds on any production in excess of 30,000 short tons. Payments may also be made to growers whose yield is deficient or who must abandon acreage because of adverse weather, disease, or insects.

Excise taxes: In order to provide funds for these subsidy payments, the Government imposes either an excise or an import-compensating tax on sugar. The excise tax is levied on all sugar refined in the United States, whether from imported or domestic raw sugar. This tax, which amounts to 53½ cents a hundred pounds, must be paid by the refiner at the time the sugar is released for consumption. The small quantities of refined sugar which are imported into the United States are subject to an import-compensating tax of the same amount. This tax is paid in the same manner as a duty.

In effect, the conditional payments to growers compensate for the lower price which the grower receives from the processor as a result of the excise tax placed on the refined sugar sold by the processor. For the vast majority of the smaller producers, the payments are in excess of the tax. But the lowering of the scale of payments for the larger producers means that some of the largest receive payment smaller than the tax. Since producers in foreign countries and Cuba receive no payments, the tax has the same effect as a duty in reducing the net amount received for sugar sold by them in the United States market.

GROWING AND PROCESSING SUGAR BEETS

The sugar beet is not one of the major crops in the Twelfth District. During recent years, it has contributed less than 5 percent to total cash receipts from farming in any one District state. In terms of acreage, sugar beets are even less important. Nevertheless, the sugar beet industry has played a significant part in the development of a permanent system of agriculture in the irrigated regions of several Twelfth District states. It not only provides a cash crop, but fits well into several rotation sys-

tems. Since it is not advisable to grow beets more than once every three or four years, there are few farmers who grow nothing but beets. Even so, sugar beets are grown on about 10,000 farms in the District every year.

Except for short periods, the Twelfth District has always been one of the most important areas of sugar beet production in the United States. As far back as 1916 to 1920, the District produced over 37 percent of the total sugar beet output of the United States. During the curly-

top infestation of the 1920's the District's share of total output dropped more than one-half, but during the 1930's and the first half of the 1940's it remained between 33 and 36 percent. The rapid expansion in production during the last five years, particularly in California and Idaho, has increased the District's share of the nation's beet output. From 1946 to 1950, an average of over 42 percent of the total domestic crop was produced in the District, a high of 48 percent being achieved in 1948.

Sugar beets are grown commercially in all District states except Nevada. Arizona's acreage, in the Yuma area, is negligible, and moderate acreages are planted in the Yakima Valley in Washington and along the Snake River in east central Oregon. In the three principal beet-producing states, California, Idaho, and Utah, acreages are scattered throughout the states. In California, beets are grown in the Sacramento, San Joaquin, Santa Clara, Salinas, and Imperial Valleys, and the south coastal region. The principal producing sections in Idaho are stretched along the Snake River as it winds its way across the southern part of the state. In Utah, where sugar beets are more important than in other District states, acreage is concentrated in the Ogden-Salt Lake area, with smaller plantings scattered on down the state in the agricultural valleys.

Structure of the industry

The average size of sugar beet plantings in the various states of the Twelfth District differs considerably, and in some states there is considerable difference between areas within the state. Based on the 1945 census, the average acreage planted to sugar beets is smallest in Idaho and Utah, 11 and 8 acres, respectively. In Washington and Oregon, the average per farm planting runs about 23 acres, while California sugar beet farmers planted an average of 84 acres to the beet crop. The greater part of these differences among the states in per farm plantings is merely a reflection of the differences in the average size of farms and farming operations; it is not something peculiar to the sugar beet industry.

Similarly, differences in the size of average plantings in various parts of California are due primarily to the varying size of farming operations in these areas. Santa Clara and Monterey counties had the smallest sugar beet acreages per farm, averaging 54 and 67 acres, respectively. Acreages in the Imperial Valley are well above the state average, about 120 acres per farm. The largest acreages of sugar beets are in Colusa County with 158 and San Joaquin County with 207 acres per farm on the average.

The ownership pattern of land planted to sugar beets varies considerably throughout the District. Most of the smaller acreages are farmed by owner-operators; as acreages increase in size, there is a tendency for more of the land to be rented. By far the greater percentage of beet acreage in Utah and Idaho is operated by owners. Estimates place the percentage of tenant-operated beet land at only about 5 percent in Utah and 15 to 20 percent in Idaho. On good beet land in these two states, the cash

rental will range from \$40 to \$50 per acre. With the exception of water and taxes, the tenant assumes all expenses and takes the full proceeds. Where the land is rented on a share-crop basis, the owner's share may vary from 20 to 50 percent of the crop, depending upon the agreed division of growing and harvesting expense. In California, where acreages are considerably larger, the percentage of beet land which is rented is much higher, current estimates being about 60 to 70 percent.

In addition to the usual sources of credit which are available to most farmers, growers of sugar beets in some areas of the District can obtain financing from their beet sugar companies. Even though loans made by the companies are limited strictly to the production of sugar beets, growers often prefer them. Since the grower is usually well known to the company, he can often obtain the cash more readily than from a bank. Commercial bank loans generally cover all crops grown by the sugar beet farmer. Bankers usually consider loans on sugar beets as one of the best crop loans because of the interest and help given the growers by the beet sugar companies. Thus, financing is not much of a problem to the average sugar beet grower in the District.

The necessity for concerted action on the part of the individual growers of agricultural products has been recognized for many years. Being largely a small independent businessman, the individual farmer was too frequently buffeted by the economic forces of the market place; his own output was so small a part of the total supply put on the market that he could not effectively bargain with buyers; and his resources were so small that he could not carry on research and experimentation. Marketing cooperatives and farmers' trade associations grew out of these conditions.

There are three beet grower associations in the Twelfth District—the California Beet Growers' Association, the Idaho Sugar Beet Growers' Cooperative Association, and the Utah Sugar Beet Growers' Association. These organizations represent their growers in contract discussions with the sugar companies, carry out research, hold meetings throughout the growing year on pertinent production and harvesting operations, and represent the growers in the various state and Federal legislatures.

The beet sugar companies have had a similar trade organization for many years, the United States Beet Sugar Association, to which all beet sugar companies in the Twelfth District belong. Just recently, another trade organization, the Western Beet Sugar Producers, Inc., has been formed in the western states, encompassing all District producers in addition to one in Kansas and two in Colorado. It has been commissioned to carry on an intensive advertising and promotion campaign to increase the sale and distribution of beet sugar. The need for such a campaign will be mentioned later. Many sugar companies also belong to organizations engaged in research on sugar and sugar beets.

Soil and climate

The soil and climatic requirements of the sugar beet are not nearly so restrictive as those for most other crops. As a cultivated crop, it can be grown in many areas of the world where other cultivated crops, such as corn or cotton, cannot be grown successfully. The sugar beet is grown in virtually all countries in the temperate zone on a wide variety of soils and at elevations ranging from sea level to altitudes of 7,000 feet. The crop exhibits a unique resistance to the effects of alkali, which contaminates large areas of land in the western states. Extensive reclamation of such land has been made possible in many instances by the introduction of beet culture. Since the root system penetrates to a depth of six or seven feet, the major soil requirement is good depth and fairly high content of humus or organic matter.

Sugar beets thrive best in areas where temperatures are moderate and the growing season is long. Since the beet matures in about six months, it is adapted to those climates in which crops must be produced between the late frosts of spring and the onset of the following winter. An average summer temperature of 70 degrees is desirable for good culture.

Cultural operations

Though the soil and climatic requirements are not too restrictive, the sugar beet must have an adequate supply of water. In its growing season, a beet may take up as much as 15 gallons of water and give it off through the leaves. At harvest time, the root of the beet is 75 to 80 percent water, and the foliage 90 percent. As a result sugar beets must usually be grown as an irrigated crop.

Sugar beets are also a rotation crop, that is, they are grown alternately with other crops. It is actually necessary to rotate sugar beets in order to control the sugar beet nematode, a small worm that feeds on the root, but because of the six months' growing season, beets also fit well into crop rotation plans. Ideal rotation plans include a cultivated crop, a small grain crop, and a grass or leguminous crop. Throughout most of the country, cotton and corn are the principal cultivated crops used in rotation patterns. In areas where these crops cannot be grown successfully, sugar beet culture has reached a peak and contributes recognizable benefits to a complete, well-rounded, agricultural program.

Almost any crop which can be grown in the sugar beet areas will fit well into rotation with beets. The only restriction is that imposed by the nematode; those plants which are host to the nematode, such as garden beets, cauliflower, cabbage, and turnips, should not be a part of the rotation; beans, potatoes, and alfalfa are the usual crops accompanying sugar beets. Planting beets only once in every three or four years is the usual recommendation, though not the usual practice. Many growers are still planting beets every other year or two successive years and suffering varying degrees of nematode infection.

Beginning in the middle 1920's, the sugar beet industry in the Far West suffered many set-backs at the hands of a virus disease known as curly top. Up to that time, domestic growers were using imported seed from Europe which was not resistant to the disease. Yields dropped off precipitously, and many processing plants had to close down. By the early 1930's the United States Department of Agriculture had developed a partially resistant variety and the domestic industry was no longer entirely dependent upon foreign seed sources. Since that time, many additional and improved varieties have been developed and made available to growers.

The ideal sugar beet variety would be one resistant to curly top and to bolting (producing seed stalks), high in yield, and high in sugar content. No one variety has yet been developed with all these characteristics, but several satisfy one or more. The varieties in use at present produce a multiple-germ seed capable of producing three or more distinct plants. Much of the labor employed in the growing of sugar beets is required because of the necessity of thinning and separating these closely growing plants. Some progress has been made in this regard by the use of processed seed, seed which is broken into smaller pieces with one or two germs. The improvement and more extensive use of mechanical thinning, however, must await the development of a single-germ seed which will produce a uniform stand.

For the best development of the crop, the sugar beet should be given as long a growing season as possible. Though the plant is more frost-resistant than most, it is not the usual practice to plant much before the danger of severe frosts is passed. As a result, planting dates vary with climatic areas. Since some varieties of sugar beets have a tendency to bolt if planted too early, planting dates will also vary with the variety used. In the Imperial Valley of California, seed is often planted as early as September or October of the preceding year. Growers in the Sacramento and Salinas Valleys plant in January and February. In most other parts of California and in the other District states, planting dates usually extend from March to May.

The growing of sugar beets requires considerable labor and attention. Soon after the plants are out of the ground, the thick stand resulting from the multiple-germ seed must be thinned to leave single plants. Until recent years, the thinning operations were predominantly done by hand labor. During the last few years, the use of processed seed has reduced the amount of work necessary in thinning, and machines have also been perfected which do a creditable job.

Thinning is usually completed some time in June. Thereafter until harvest, cultivation and watering are the growers' primary concerns. Of the four major beet-producing areas in this country, the Great Lakes area and the Red River Valley of Minnesota and North Dakota are the only ones that depend on natural rainfall. Irrigation is essential in all western sugar beet producing states

and experience has proven that light, frequent irrigations give the best results.

Harvesting

The beet puts on most of its weight during August and September.¹ When the leaves take on a russet tinge, the farmer knows the crop is maturing and the sugar content is increasing. The actual date for the start of harvesting is determined by the sugar factory through field tests of the sugar content of the beet. Each grower gets a delivery schedule based on the capacity of the plant and the relative maturity of his and all other growers' beets. In central California, harvesting may begin in August. In most other District areas,¹ delivery to the factories starts in September or early October.

The principal harvesting operations consist of lifting the root from the ground, topping off the leaves, and loading on trucks. When entirely hand labor is used, the roots are first loosened and lifted with a tractor-drawn beet lifter; the laborer then picks the beet up with his topping knife and slices off the leaves and crown. The beets are thrown into piles or windrows and later transferred into trucks for transport to the factory or loading station.

Mechanical harvesters are of several kinds. Some machines lift the beets and then top, while others slice off the top first and then lift the root from the ground. Many machines now have loading belts attached so that lifting, topping, and loading are all done mechanically.

Development of machines was increased during the war when hired labor was not readily available, and refinements have continued since then. During the initial period of development, some beet sugar companies purchased machines and rented them to their growers. At the present time, most machines in use are grower-owned, and the balance is owned by contractors who may harvest for several growers in a given area. Until recently, the size of the machines available limited their use to plantings of 100 or more acres. As a result, complete mechanization of sugar beet harvesting has not yet been possible. In California, 75 to 80 percent of the acreage was harvested by machine in 1950. In Idaho and Utah, where acreages are smaller, about 60 and 50 percent, respectively, were harvested mechanically. Further mechanization will depend upon the development of a machine which will be practical to use on small acreages. One such machine—a one-row harvester—has recently come on the market and may be the answer. If it proves practical, there is no reason why sugar beets cannot be harvested almost entirely by machine in the near future.

Processing the crop

Because of the perishable nature of the sugar beet, the production period of the beet sugar factory is a relatively short one. The beet root begins losing some of its sugar as soon as it is out of the ground, which precludes long

¹All crop schedules in central and southern California are considerably earlier than in other District beet areas. For example, harvesting in the Imperial Valley generally extends from May 15 to July 15.

storage at the factory. Later in the season, as temperatures get cooler, beets can be stored for longer periods without significant spoilage. Experiments in California have shown that ventilated piles may be stored from November to early December without too great a loss. The increased use of machines for harvesting necessitates completion of harvesting before the onset of the heavy rainy season. Both controlled harvests and substantial storage at the factory thus become more imperative.

The extraction of the pure, crystal-white sugar from the dirty, topped root of the sugar beet is a fascinating process involving largely chemical procedures. In brief, the fundamental operations include extraction, precipitation, filtration, evaporation, crystallization, and drying. After delivery to the factory, the beets are washed, sliced into long strips called chips or cosettes, which resemble shoestring potatoes, and sent on to the first of the processing operations.

Extraction of the sucrose from the chips is done by submersing them in hot water in large tanks called diffusion batteries or cells. The resultant products of this operation are beet pulp (the exhausted chips) and raw juice. The raw juice is next started on the road to purification. The object of these operations is to remove the impurities which have been extracted with the sugar. First, milk of lime is introduced to precipitate the impurities and then carbon dioxide is bubbled through to precipitate the lime. These solids are removed by filtration. The resulting juice contains only about 10 to 12 percent sucrose because so much water has been introduced during the diffusion process. To remove this water, the juice is boiled down in evaporators until the sucrose content is about 55 percent, and then further boiled in vacuum pans until crystallization begins. Not all of the thick liquid crystallizes, and the resultant mixture of crystals and syrup must next be spun at high speeds in centrifugal machines to separate the white crystals from the liquid.

The sugar crystals are now more than 99.9 percent pure sucrose, and after washing and drying, are ready for packaging operations. The thick liquid obtained from the centrifugal machines is reprocessed several times until no more sugar can be profitably extracted by crystallization. It is then known as molasses.

By-products

Sugar has often been referred to as a by-product of the sugar beet. Actually it is the most valuable portion of the beet, and the products which result from the growing and processing of the beet are properly termed by-products of the beet sugar industry. These by-products come from the two phases of the industry. The growing and harvesting of the beets yields the crown and leafy tops. The extraction of sugar from the beet root yields beet pulp and molasses. These by-products comprise better than 90 percent of the total weight of the plant. Almost the entire vegetable portion of the sugar beet is left over for commercial uses.

Without reference to sugar, the vegetable portion of the sugar beet is important in its own right. Ever since

the first beet was sliced, the feeding of these by-products to cattle and sheep has been an integral part of the whole beet sugar economy. Many thousands of sheep and cattle from the ranges of the western states are annually fattened in the feed-lots of the sugar beet regions. The rise of livestock feeding has been coincident with the expansion in sugar beet culture.

The beet tops and crown, left after the harvesting operation, are utilized entirely for livestock feeding. Though they lose much of their value if left lying in the field too long, they are an excellent protein and fattening feed if used promptly or silaged. The feeding value of tops from an acre of beets is equivalent to one ton of alfalfa hay. Since few growers own livestock, they generally rent the fields for pasturage. Returns may be based on a per head basis, on a per acre basis, or on the basis of the tonnage yield of beets. Outright sale of the tops to dairymen and livestock men for silaging is increasing.

Beet pulp is also used almost entirely as a livestock feed, in wet, pressed, or dried form. Wet pulp direct from the processing plants is the most important by-product of the sugar beet. It comprises an excellent bulky, succulent, carbohydrate feed usually at a cost considerably below the cost of comparable feeds. Since wet pulp is a bulky product, most factories sell it to livestock feeders in the immediate vicinity of the plant. Part of the pulp that is not consumed wet is pressed to remove part of the moisture, but most of it is dried. In the dried form it is widely distributed throughout the United States and is especially well fitted to the ration of dairy cows.

Unlike cane molasses, beet molasses is normally impalatable to humans and finds its way largely into livestock feeding. As a carbohydrate concentrate, it is commonly mixed with beet pulp or alfalfa hay. In addition to its nutrient value, it adds palatability to the entire ration.

The uses of beet pulp and molasses are by no means confined to livestock feeding. It is true that the greater portion of these by-products are so utilized in normal times, but other uses for them are many. Beet pulp has been found to be a potential source of pectin. Though use of pulp for this purpose has not as yet been developed commercially, it was reported that Germany was using sugar beet pectin in jams and jellies during World War II. Molasses has hundreds of potential uses which could be developed in the future. At present, beet molasses is used in the production of yeast and the waste liquor derived from further working of the molasses is a source of glutamic acid, the new food flavorer. A specialized use is its fermentation to citric acid, a process which has almost entirely displaced the older process which used citrus fruits. The thousands of uses to which cane molasses can be put may point to a greater consumption of beet molasses in the future. Cane molasses has always been one of the principle raw materials for the production of ethyl alcohol; it is used in the manufacture of high protein yeast for both cattle and human foodstuffs; it can be used as a fuel, as a composition board binder, as a source of

charcoal and numerous other chemicals; and as a source of aconitic acid which is used in making plastics. The use of sugar beet products in most of these outlets is not commercially feasible at the present time, though research is continuing intensively.

Marketing the beets

Most producers of agricultural crops must give considerable attention to the selling or marketing of their crop. A market must be chosen, buyers contacted and bargained with; information on current supply and demand conditions must be obtained and analyzed; the crop must be transported to market and in many cases graded, washed and packaged. Since most commodity prices may fluctuate considerably over the marketing period, the farmer seldom knows what the price will be when his crop is ready for market. And the final price is determined by factors over which he has no control.

Unlike most farmers, however, the individual grower of sugar beets need not concern himself with these problems. The economic characteristics peculiar to processing and marketing the sugar beet crop have brought about an industry structure which relieves the individual farmer of the necessity of marketing his crop. And he also has fewer uncertainties about the price he will receive for his output since he knows before the crop is planted the basis upon which he will be paid.

The principle characteristics which make for these conditions stem from the processing aspects of the industry. First of all, the sugar beet crop is both bulky and semi-perishable so that it cannot be transported for great distances nor can it be stored cheaply and safely for long intervals of time. Secondly, the initial outlay necessary for the construction of a processing plant is so great that, like the utility enterprises, the duplication of facilities within a single territory is uneconomic. Thirdly, the processor must be assured of sufficient volume to make full use of his plant capacity during the short processing period in order to reduce unit operating costs to a minimum.

One of the first effects of these conditions is that the crop must be grown in relatively close proximity to the processing plant. The great advances in the speed and availability of transportation have increased the practical distance between field and factory. Even so, some geographical limits are placed on the growing of beets. And the raising of beets is thus restricted to those farmers who own land or who can rent and operate reasonably close to a plant. This does not necessarily mean that a rapid expansion of acreage could not be accomplished. Since the acreage in sugar beets in any one year in a given area is small relative to total acreage in crops in that area, the expansion potential is large.

The second effect of these conditions in the industry is that the producer of sugar beets ordinarily has only a single market for his crop—the plant of the nearby processor. There are only a few areas in the District where the plants of two different processors are close enough to allow the grower some choice in selling his crop. The

existence of this single market for the producer gives the processor, in some degree, a buyer's monopoly. In the earlier stages of growth of the industry, this fact may have caused considerable controversy between the grower and the processor. Today, however, the terms offered by beet sugar factories are quite uniform. In addition, the trade associations formed by the growers give them considerably more bargaining power.

Grower-processor relationships

The contract: Because the processor must be assured of sufficient volume to make full use of his plant capacity, a contract is entered into by both the grower and the processor prior to the planting of the crop. The processor is thus assured of as much volume as his plant can handle and the grower is assured of a market for his crop on a predetermined price basis. According to the contract, the grower must deliver and the processor must accept all beets grown on the contracted land. The grower is bound to deliver the beets in a cleaned and topped condition at whatever times and places the company may dictate. In Utah and Idaho, the grower must pay all expenses of trucking his beets to the factory or loading station. In California, the sugar companies give the growers a hauling allowance to help meet these expenses.

Rates of payment: The rates of payment are printed on the contract and depend, for each grower, upon two factors—the average net return of the company and the sugar content of the beets. In California the average sugar content is determined for each grower's entire crop. In Utah and Idaho, the sugar content of the beets is determined either for all beets sliced by the company during the season or the average sugar content for beets sliced from a certain district. This tends to take away some of the incentive on the part of the grower to grow beets with high sugar content. Apparently, to offset this, the rates of payment for corresponding sugar contents and net returns are higher in Utah and Idaho than they are in California.

The average net return, used as the other factor in arriving at the rate of payment to growers, is determined by subtracting from the average gross sales price received for all sugar sold by the company during the sales year¹ all costs of selling and marketing such sugar² and by deducting the excise tax on refined sugar which is paid to

¹ The sales year for California companies is from August 1 to July 31 of the following year. In Utah and Idaho, the sales year runs from October 1 to September 30.

² In contrast to the usual practice, beet sugar companies do not deduct processing costs in calculating average net returns for rates of payment to growers.

the Government. One California company, as an added inducement to growers to continue selling to that company, agrees to use the average net return of the competing processor in the area if that return is higher.

Timing of payments: Even though the average net return, and consequently the rate of payment to the grower, is not known until the end of the marketing year six to eight months after harvest, initial payments are made to growers shortly after they deliver their beets to the processor. The rate of this initial payment is based on anticipated company net returns in the light of the current selling price of sugar. This payment, historically, has represented 80 to 90 percent of the final rate. An additional payment is often made in December or January. Within one month after the close of the sales year, final payments are made to adjust the rates to the actual average net returns of the company.

Advice and assistance: As a result of the contractual relationship between the growers and the processors of sugar beets and because of the desire of the processor to receive beets with as high a sugar content as possible, the relationship between the processor and the grower is probably closer for sugar beets than for most other agricultural crops. On the one hand, the processor is interested in the efficient production of high-yielding and high-quality beets on the part of the grower. The grower, likewise, wants to get as high a return per acre as possible. Consequently, all sugar beet processing companies employ agronomists, entomologists, agricultural engineers, agriculturists, and fieldmen who are constantly attempting to improve varieties, combat pests and diseases, improve production techniques, mechanize farming operations, and in general, aid growers in every way possible. The processors, through their fieldmen, may suggest and recommend varieties, production methods, or harvesting techniques. Though the growers are not bound to follow such advice, most of them do.

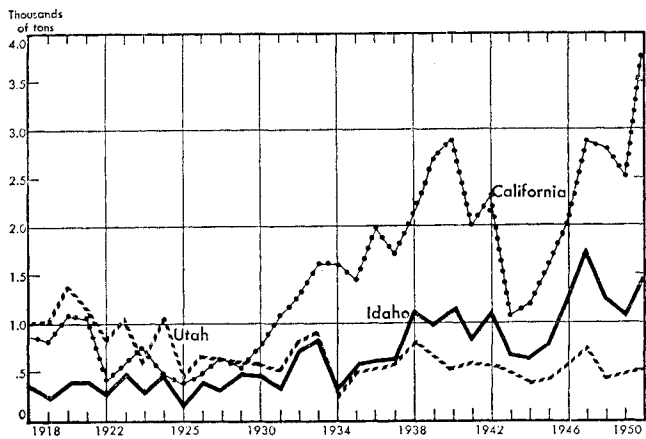
As a group, sugar beet producers probably receive more advice and aid in their production and harvesting operations than does any other producing group. Company fieldmen spend most of their time visiting and advising growers from pre-planting time through harvest. As a result, relations between the companies and their growers are excellent and have contributed to a stable harmonious industry. Even though processors in some areas represent the only outlet for the grower's crop, their attitude toward their growers is one of paternalism rather than of exploitation.

PRODUCTION TRENDS

In addition to the influences of price and demand conditions, the acreage and production patterns of sugar beets in Twelfth District states have been markedly affected by diseases, competition from other crops, and the supply of farm labor. After the establishment of successful beet sugar factories around the turn of the century, the industry grew rather rapidly. During the early 1920's, a

severe outbreak of curly top drastically reduced output in all District states and actually halted production in the state of Washington where sugar beet culture had just been successfully started. By 1935, however, the United States Department of Agriculture had successfully developed curly top resistant varieties and the industry once again started expanding.

PRODUCTION OF SUGAR BEETS—THREE TWELFTH DISTRICT STATES, 1918-50



Source: United States Department of Agriculture, Bureau of Agricultural Economics.

During World War II, several factors caused cutbacks in the production of sugar beets in District states. Excessive stocks of beet sugar, following three years of record production, made necessary in 1941 the first acreage reduction in the continental beet area since the introduction of the sugar quota system in 1934. No allotments were necessary in 1942, however, and production increased.

A combination of factors resulted in a precipitous decline in both acreage and production in 1943. Even though sugar beets had the benefit of a price support program, these support prices were not high enough in relation to the support and market prices of other competing crops. In addition, the supply of farm labor had become increasingly short. It was not until 1946 that production approached pre-war levels in the District. By that year, sugar beet growers were receiving more than twice the prices they received in 1940, and mechanization, particularly on the larger farms, had gone a long way towards ameliorating the tight labor situation.

Supplies of sugar available to the United States increased during 1946 and 1947. Domestic and Cuban production had increased to such an extent that stocks were considerably above prospective domestic demand at the start of the 1948 season. The resultant decline in raw sugar prices prompted sugar beet growers to reduce their acreages for the 1948 crop year, and a further reduction was made in 1949.

Record crop in 1950

Another factor entered the picture as growers were planning their 1950 plantings. For the first time since the war, acreage allotments were being imposed on several important District crops, releasing 1¼ million acres for planting to other crops. In addition, the market and support prices of many crops which compete with sugar beets for land had been declining since the middle of 1948. Though sugar beet prices had dropped some too, they had not decreased as much and growers were, of course, still getting their conditional payments of about \$2.50 per ton from the Government. As a result of these factors,

much of the land taken out of cotton, wheat, and other crops with acreage restrictions was planted to sugar beets. The 209,000 acres of sugar beets harvested in California set an all-time record and Idaho's growers planted an acreage second only to 1947. If it were not for the fact that growers must have a contract with a sugar company before planting, acreages might have been even higher. Most District companies refused thousands of acres at sign-up time last spring. California's record production pushed the District total to a new record high. Total United States output will also be the highest on record.

Yield per acre and sugar tonnage per acre

Most producers of agricultural crops, once they have the crop in the ground, are interested in one thing—the yield per acre which they will get. Sugar beet growers, on the other hand, are concerned primarily with the number of pounds of sugar they will produce per acre. Sugar tonnage is determined by the tonnage yield of beets per acre and the sugar content of the beets. More can be done through cultural practices to increase the beet yield per acre than to increase the sugar content. Less is known about the various factors that influence the final percentage of sugar which a beet will contain. As the beet matures, more and more sugar is sent to the root for storage. If vegetative growth stops for a time and then starts again, however, the stored sugar is depleted.

Since the return per acre depends upon the yield of sugar per acre, data on the yield of beets per acre gives only half the picture for any one season. An individual grower may get high returns per acre if the beet yield is low and the sugar content high, or if the sugar content is low and the beet yield high. For the United States, sugar content has averaged about 15 or 16 percent, with variation from 12 to 20 percent from grower to grower and from year to year. Though the beet yield per acre for any one year is not a reliable indication of the sugar output of a given area, the long time trend in yields does show the effect of improved cultural practices, disease control, and the use of better adapted varieties.

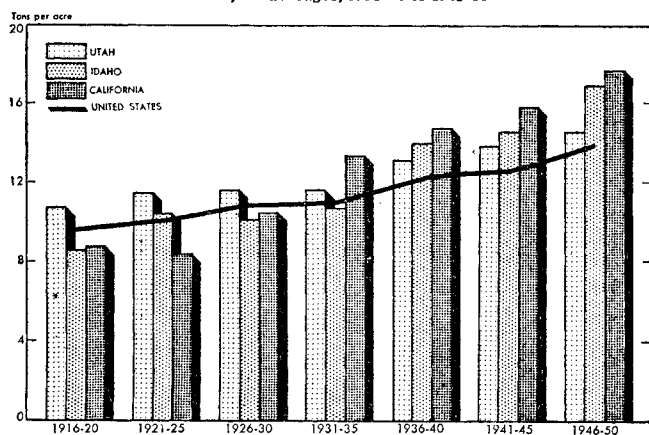
In all three important District states, yield of beets per acre has been increasing steadily over the last 35 years. Year to year fluctuations in the yield have been pronounced largely because of changes in weather and prevalence of disease, but the long-time upward trend has persisted. The big jump in yields in the early thirties came with the use of domestically developed varieties resistant to curly top. Since that time, improved cultural practices, a greater use of rotation plans, and the development of higher-yielding and more disease-resistant varieties have all improved yields. Both California and Idaho, in recent years, have been getting yields double those of 35 years ago, and Utah's yields have increased 50 percent. Since the middle 1930's, District yields per acre have consistently been above the United States average.

Factors influencing output

District sugar beet production fluctuates considerably more from year to year than production of most other

**SUGAR BEET YIELD PER ACRE—TWELFTH DISTRICT STATES
AND UNITED STATES**

Five-year averages, 1916-20 to 1946-50



Source: United States Department of Agriculture, Bureau of Agricultural Economics.

annual crops. The various factors which make for these wide variations in output are reflected through either the acreage planted or the yield per acre, the two items which determine total production. Particularly in Utah, and to a lesser extent in Idaho and California, there have been more year-to-year changes in production than in acreage, indicating that changes in the yield have been more important in causing production variation than have changes in acreage.

When a farmer is determining whether or not to plant sugar beets, and how much to plant, he considers the same factors that most growers of annual crops consider: namely, the price he received the preceding year and the prospective price for the coming year; the labor requirements of the crop in relation to the labor supply and to his equipment; weather conditions during the past year, at planting time, and as expected during the coming year; and the competitive position of sugar beets with respect to their alternative crops. In addition, however, the prospective sugar beet grower must take into account several other factors in planning his beet acreage. One of these, which is especially important to the owner of the land, is the rotation plan which is being followed. Since sugar beets must, or at least should, be used in rotation, such patterns act as a deterrent to flexible crop acreages. Some growers do plant sugar beets on the same ground for two or three successive years in times of high prices or a short sugar supply. But as a general rule owners are reluctant to break up the rotation pattern from year to year. The

expansibility of sugar beet acreage arises from the fact that most beet growers have only part of their total acreage in beets.

Another factor, which is tied in with rotation, is disease control. One of the principal reasons for rotation plans when growing sugar beets is to prevent the spread of nematode. Even when rotations are followed, the prevalence of this disease may cause acreage reduction in certain areas. Curly top, which once practically wiped out the industry, is no longer the danger that it was. Last year bears testimony to the hardness of the resistant varieties now being grown. Infestation of curly top in the Central Valley of California was the worst since the disaster of 1925, yet the damage was negligible.

As with more and more crops these days, Government programs and their attendant restrictions and regulations must be considered by the farmer in planning his crop year. The Sugar Acts under which the whole sugar industry has been operating since 1934 authorize the use of acreage allotments to cut down production when the Secretary of Agriculture finds it necessary. Allotments have been given to growers several times over the last fifteen years, but in only one year, 1941, did the allotments require an actual reduction in acreage. With world production of sugar increasing, beet growers may have to reckon with allotments in the future.

The wide variations in the yield of beets per acre, which are largely responsible for the fluctuations in production from year to year, are caused primarily by weather and disease conditions. Cultural practices and the extent of irrigation and fertilization are important, but District farmers have attained a certain method of production from which they do not vary much from year to year. Though the sugar beet is more frost resistant than most cultivated crops, early plantings may be severely damaged by frost or even by cold weather. Any shortage of water will, of course, hinder the full development of the beet.

In addition to curly-top disease and nematodes, sugar beets are plagued by many other diseases and insects of lesser importance. Damage from curly top on a large scale has been nullified by the use of resistant varieties, but local damage can still occur if proper cultural operations are not carried out. Nematodes are quite prevalent, especially in Idaho and Utah, and can seriously reduce yields when infestation becomes heavy. There is no effective means of eradicating them; they can only be kept under control by proper rotation practices.

BET SUGAR

As mentioned earlier, the rate of payment which the grower will receive for his sugar beet crop depends upon the sugar content of his beets and the net return which the company gets for the refined sugar when marketed. The beet grower has nothing to do with the marketing of the sugar produced from his beets, nor has he, through his growers' association, engaged in promotion or adver-

tising programs to the extent that other agricultural producers have. Even so, he is vitally concerned with the profitable distribution and sale of the final product.

Who uses sugar?

Most people are probably not aware that almost as much sugar is used by industry as is used on dinner tables.

Since the war, an average of 43 percent of the total civilian consumption of sugar has gone into industrial uses and 57 percent has been used on the tables of households and institutions. In the years before the war, industrial use was somewhat less, averaging about 31 percent; during the war industry took over 50 percent of the total.

The baking industry is the largest single industrial user of sugar, followed closely by the bottling trade. Large amounts are also used in canning and preserving, in the curing of meats, and in making candy and ice cream. Sugar is equally necessary for making flavoring extracts, syrups, and miscellaneous products, such as pickles, relishes, breakfast cereals, chewing gum, and salad dressings. In the nonfood industries, sugar is used in scores of curious and unsuspected ways—in hair tonics and shoe polishes, in adhesives, photographic materials and explosives, in tanning leather and silvering mirrors, and as a necessary ingredient of pharmaceuticals.

In many of these uses, sugar is used in forms other than the standard, hard, granulated grade. Some uses require a soft, spongy type of grain. Others may require a hard sugar crystal of larger or smaller size than that made for table use. Considerable quantities of sugar for industrial use may also be marketed as liquid sugar, a thick, high-purity syrup. Cane refineries can produce liquid sugar by stopping the refining process before crystallization, but beet factories must crystallize the sugar and then re-melt it. Similarly, cane refineries make brown sugar by processing residual liquors which contain molasses. Since beet molasses is not palatable to humans, beet processors must add cane molasses to beet sugar in order to market a brown sugar.

Competition keen despite quota system

Throughout the short history of the United States, the protection of the American market for the domestic producer has been a conviction held by policy makers in our Government. Tariffs, import duties, and other restrictive measures have long been used to preserve the home market for American agriculture and industry. Domestic sugar producers, however, are further protected from foreign competition by use of the quota system. The Secretary of Agriculture, in setting the total quota needed for domestic consumption, practically assures that the American market will not be glutted by a surplus. Other agricultural groups have tried through marketing cooperatives, marketing programs, and other schemes, to curtail the supply of their product that is placed on the market, but none have been able to do it so well and with so much Government assistance as have the producers of sugar.

Limitation of the total supply of sugar placed on the market in any one year does not preclude competition in the industry. It does prevent serious over-supply of the market and ensures, theoretically, that all the sugar produced or refined in the United States will find a market. It does not ensure that any individual beet company or cane refinery will be able to sell all its production at

profitable prices. Intense competition exists between individual companies and between the cane and beet segments of the industry. The most significant effect of this Government restriction of sugar supplies is that once the quota has been determined, the market price for sugar is dependent almost entirely upon demand factors.

Beet sugar marketing problems

Even though the total amount of sugar that can be placed on the United States market is limited by the Government, beet sugar companies must engage in aggressive selling of their product. In most areas of the District there are several beet companies putting sugar on local markets. In addition, there is one large cane sugar refinery in the District which competes with the beet companies. Competition between these sources of supply, in conjunction with many other factors, limits the markets which are available to the beet sugar processors.

Basing point system and market areas: One of the most important limitations upon the marketing of beet sugar is a geographical one. Since sugar is marketed under a basing point system, profitable market areas are definitely limited. The basing point pertinent to far western markets is San Francisco. This means that a sugar company, in selling its sugar, charges the buyer transportation costs from San Francisco to the buyer's location. A refined sugar buyer in Seattle, Washington, for instance, must pay the base sugar price plus transportation from San Francisco no matter where the seller's factory is located. If he buys from the sugar company in the Imperial Valley in California, he pays only the transportation charges from San Francisco to Seattle. The sugar company must absorb as an added cost the transportation charges in excess of those from San Francisco to Seattle. If the Seattle buyer obtains his sugar from the factory in Toppenish, Washington, he still must pay the transportation charges from San Francisco to Seattle. In this case, the Toppenish sugar company "picks up" the difference in transportation charges as added revenue. The net result of this system is that beet sugar companies selling in markets reasonably close to their plants make higher net returns than either cane or beet companies who must ship some distance into those markets. Thus the whole Intermountain area is a pick-up area in which local sugar factories receive phantom freight. Companies outside the area can and do sell in that area, but sales made there are less profitable than sales made closer to their factory sites.

The principal markets for California beet sugar companies are located in the Pacific Coast states. The larger companies who produce more than can be sold in these areas must sell their excess in the south-western states and in the St. Louis-Chicago area where competition from Intermountain and New Orleans processors is keen. Beet sugar companies in Utah and Idaho supply the Intermountain area almost exclusively, but since that market is relatively small they must also sell in the mid-western states. Companies which sell east of the Rocky Moun-

tains must meet intense competition since sugar beets are grown in every state except Missouri in the area from the Utah-Idaho borders to Michigan and Indiana. In addition, cane refineries located around New Orleans—the basing point for the Mid-west—ship heavily into the mid-western market area.

Packaging: The market for beet sugar is further limited by the fact that until recently no beet sugar company marketed a complete line of packaged sugar. Cane refineries have packaged granulated, powdered, cube, and brown sugars in small units for many years, while the beet sugar producers packaged only larger units of granulated. Since refined sugar is largely a homogeneous product, grocers usually stock only one brand, and it is logical that they stock the brand with the most complete line. Beet processors, who could offer granulated sugar only, have had a difficult time getting their product on the grocers' shelves and have had to confine themselves largely to the industrial and institutional market. Attempts to remedy this situation are currently being made by several District beet companies. Two California processors now market a complete line of specialty sugars in small consumer packages, and several processors in the Utah-Idaho region have recently added one or two of the specialty sugars to their granulated line.

Consumer prejudice: The beet sugar industry has not been able to get its share of the household market for another reason. Housewives evidently hold a prejudice against sugar made from beets. In the infancy of the industry, this prejudice may have been justified. Equipment and techniques were new and untried and quality often varied. These difficulties have been corrected for many years but the prejudice still seems to remain. To a much smaller degree, a similar situation exists among industrial users. Since both cane and beet sugar are 99.9 percent pure sucrose, any differences in the 0.1 percent non-sugars present can be detected only by exacting chemical tests.

Beet sugar versus cane sugar: As a result of these various conditions, considerably more of the District's beet sugar finds its way into industrial and institutional outlets than onto consumers' tables. Roughly 60 percent of the District's beet sugar output goes into the former two outlets, the remainder going into household use. In supplying the industrial and institutional market, beet processors have been more than able to compete with cane sugar. In 1948, for example, beet sugar companies supplied more than three-fourths of the industrial market in the West.

Traditionally, refined beet sugar has been quoted for 10 cents per hundred pounds less than cane sugar on western markets. (In the Mid-west the differential is 20 cents.) This differential applies in the household market where preference for cane sugar is stronger. In the industrial market, cane sugar is generally sold at the same price as beet sugar, since most industrial users will not pay the higher price for cane sugar.

The effects of the basing point system on cane and beet processors are somewhat different. The District's one cane refinery is located within 30 miles of the basing point, San Francisco. On most of its sales in western markets, therefore, it receives very little pick-up. Most District beet processors, on the other hand, have several factories in different parts of the District. On sales to markets close to factory locations they may receive substantial pick-ups.

When Twelfth District cane or beet processors sell in the mid-western market, however, they must absorb some of the transportation costs since they are farther from the mid-western market than is the basing point of New Orleans. District beet processors are at a further disadvantage in that they must reduce their base prices another 10 cents below the cane price. Obviously, transportation charges absorbed by western beet processors on sales to mid-western markets are an offset against the phantom freight received on sales made in local western markets.

PRICES AND RETURNS

Most producers of agricultural commodities cannot significantly influence the price they receive for their crop. Once a crop has matured it must be harvested and sent to market, and the price the grower gets depends largely upon the supply of that commodity placed on the market at that time and the demand for the commodity at that particular time. Sugar beet growers, likewise, cannot do much to affect the price they receive for their crop, but for somewhat different reasons. They can, in a limited way, influence the sugar content of their beets, one of the price-determining factors, but once the crop has been harvested, the farm price depends upon the price the processor is able to get for the refined sugar he extracts from the beets. Consequently, the various economic forces which affect the sugar industry do not reflect directly on the farm prices of sugar beets, but upon the prices of refined sugar, both cane and beet.

Actually, the price of refined sugar, like the price of all goods and services, is determined ultimately by the forces of supply and demand. The various supply and demand factors operating in the sugar industry, however, are probably more complex than those that affect the prices of most other agricultural commodities. For instance, the price of strawberries in Sacramento on any given day is dependent largely upon the total number of crates arriving at the market that morning, the supply and price of other fresh fruits, the level of consumer income at that time, and probably the weather. There are many more factors influencing sugar prices and their interrelationships are more complex.

Refined sugar prices eventually rise and fall with the raw sugar market. Though the refined and raw sugar markets are separate and distinct, the price of refined sugar, either cane or beet, is based largely upon the cost

of raw sugar to the cane refiner. Generally cane refiners establish their quoted refined prices by adding to the current cost of raw sugar their various processing and administrative costs. Since beet sugar has always been quoted at a discount under the cane price, the raw cane market is as important to the beet sugar refiner as to the cane sugar refiner.

Supplies and prices

Timing of sales: Some persons believe that the supply side of the sugar price picture is determined each year when the Secretary of Agriculture sets the sugar quotas for the coming year. It is true that the quota determines the total amount of sugar that may be placed on the United States market during the year and this exerts a strong influence on United States prices. Though the total supply that can be placed on the market may be limited, the timing of sales of both raw and refined sugars through the marketing year can exert price influences on the United States market. Timing of sales may be affected by sugar supplies in the exporting sugar countries, particularly Cuba. If Cuba has a large crop, she may be under more pressure to sell her United States quota in a short period of time, thus putting a downward pressure on United States market prices. A relatively small crop would likely produce the opposite effect.

The timing of sales may also be affected by the length of the processing period. In some areas which supply the United States market, the crop is harvested during a four to six months' period. As a result, the processors have, during a short space of time, a tremendous financial and storage burden which often may force selling of raw sugar through necessity. Beet sugar processors have a similar storage and financial problem. The sugar beet crop is harvested and processed during a short period of time and must be held for many months if the processor is to have a continuity of offerings. An unusually large crop, lack of adequate storage facilities, a low level of working capital, or difficulty in obtaining financing, may force selling in less profitable market areas where the company must absorb some transportation charges.

The supply of sugar placed on the market at any one time may also be affected by costs of production and general economic conditions in the areas supplying the United States market. Differences in average production costs from area to area and from mill to mill make some areas more willing than others to sell at a certain price. Differences in economic conditions between areas often cause one area to press sugar on the market more aggressively.

Location of sugar producers: The geographic distribution of sugar production in the United States is another important factor affecting refined sugar prices. Beet sugar production is concentrated in California, the Intermountain states, and the Michigan-Ohio area. Domestic cane production is located in Florida and Louisiana. Cane refineries which use imported raw sugar are concentrated on the Atlantic Coast and in the New Orleans area, in addition to the one on the Pacific Coast. More sugar is

produced in each of these areas than can be consumed locally, so that supplies placed on the markets are often in excess of demand. In addition, surplus supplies from most of these producing areas are shipped to mid-western markets. As a result, there is keen competition in this area and in the producing regions.

Response to price changes: One other characteristic of the supply side of the sugar industry must be mentioned as it affects sugar prices; that is, the reaction of sugar production to price changes. In the short run, sugar supplies do not increase or decrease appreciably in response to sudden changes in demand or prices. A sharp increase in demand will consequently result in a sharp rise in sugar prices, and a drop in demand will cause prices to fall. Over a longer period, however, sugar supplies are quite responsive, either to changes in demand, tariff protection, or preferential treatment. In the early thirties, expansion occurred under tariff protection in many importing countries, particularly the United Kingdom, India, and the continental United States. As a result of preferential treatment for their product, there was also a substantial increase in output in some exporting areas, notably in the Philippines, Formosa, Australia, and the Union of South Africa. The short-run inelasticity of sugar supplies, either upward or downward, tends to accentuate price fluctuations. Conversely, the greater elasticity in the long-run tends to mollify long-run price fluctuations.

Demand and prices

World demand: The demand side of the sugar price picture is no less complex than the supply side. Though the demand for sugar refined in the United States is confined entirely to the continental United States, the demand for raw sugar on the world market may significantly affect United States prices. The influence of world demand on the United States sugar market is reflected primarily in the aggressiveness or lack of aggressiveness with which quota countries, particularly Cuba, sell to the United States. If world demand is off, these countries are obliged to rely on their United States quotas, thereby bringing a greater concentration of sugar on the United States raw market in a shorter space of time than would be the case if world demand were greater. The opposite is true, of course, when world demand is high, as was the case during 1950. An active demand in the world market absorbed pressures to sell that generally exist at the start of Cuba's crushing season, and strength was given to the United States market.

Consumer and industrial demand: The demand for refined sugar in the United States comes from two sources—industrial users, and households and institutions. The characteristics of these two demands are quite distinct. Statistical studies have shown that the demand for sugar from institutions and households is relatively stable. Consumer demand for sugar does not change appreciably either with changes in the price of sugar or with changes in the incomes of consumers. Compared with per capita disposable income, sugar prices have gradually decreased

over the last 40 years. Today, the expenditure on sugar is a relatively insignificant portion of the consumer's yearly food budget.¹

In contrast, demand from industrial users is relatively flexible. Since more than half of these users of sugar produce what are sometimes referred to as semi-luxury products, their demand is responsive to changes in consumer incomes. Furthermore, in most industrial uses, other sweetening agents, such as corn sugar, compete with sugar. Industrial demand for sugar, consequently, is also affected by the price of sugar in relation to the price of these competing sweeteners.

Another differentiating characteristic between industrial and household demands is the seasonal pattern of demand throughout the year. Demand from consumers for home and institution use is fairly constant during most of the year, with some rise in the summer months because of home canning. The pattern of industrial use, however, is markedly seasonal, rising sharply in the spring, remaining high during the summer, and falling off sharply during the fall and winter. This pattern is the result of the increased consumption of bottled beverages and ice cream, and the intensive operation of the canning industry during the summer months.

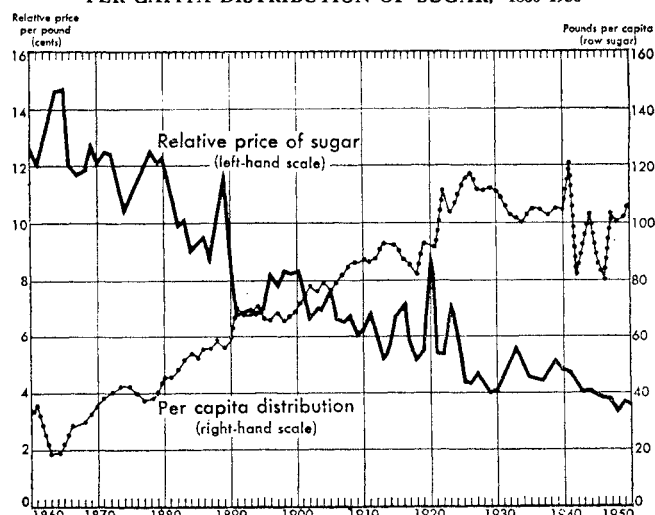
Factors influencing individual sugar company prices

All these factors obviously come into play in determining the average refined sugar price in the country as a whole. Likewise, they affect the price an individual refiner may receive. In addition, however, there are several factors which, though less important on the national market, are often quite significant to the individual refiner or processor. Since most beet sugar companies do not market a complete line of packaged sugar, they cannot sell on an even basis with the cane refiners because the grocer does not want to be inconvenienced. Those handling limited lines, consequently, must often sell at a discount. At times when the refined sugar market is dull, the complete assortment refiner may have to cut his prices to keep his share of the market.

The type of market a particular refiner serves may also affect the demand for his product and the price he receives. The amount of his production he sells to industrial users, the amount he sells for household use, the proportion of his output that he sells each year under continuing commitments—all these determine the ease or difficulty he may have in disposing of his output and the extent to which he may have to make price concessions to move his production. Those refiners who have a good part of their output committed to specific industrial users or wholesale grocers year after year will not be so pressed to make price concessions as refiners who may have only a small portion of their output committed.

¹ Per capita consumption of sugar is close to 100 pounds a year. Half of this is bought in the form of sugar, the rest being purchased indirectly in prepared products, such as soft drinks, bakery goods, etc. For the average family of three persons, the yearly expenditure for direct purchases of sugar, at present average retail prices, comes to only \$15.

SUGAR PRICES IN RELATION TO PRICES OF OTHER FOODS¹
and
PER CAPITA DISTRIBUTION OF SUGAR,² 1860-1950



¹ Wholesale price of sugar divided by index number of wholesale prices of all foods (1935-39 = 100). ² Quantity distributed by primary distributors divided by population.
Source: United States Department of Agriculture, Production and Marketing Administration, *Sugar Reports*, December 1950, p. 26.

Price trends

In spite of the fact that sugar price fluctuations have in general followed the fluctuations in the general price level over the years, sugar has become cheaper and cheaper to the American consumer. Two relationships give clear evidence of the increasing cheapness of our principal sweetening agent. In relation to the prices of other foods, the price of sugar has declined greatly over the past 90 years. An almost identical trend is evidenced if the price of sugar is related to per capita disposable income. Since 1910, the cost of a pound of sugar has represented a lower and lower percentage of American consumers' disposable income. During that period, sugar prices in relation to income have decreased over 60 percent.

These decreasing relative price trends over the years have largely been the result of increased production bringing about greater competition for the United States market, more intensive cultivation, more efficient processing, and technological developments in both production and processing.

With a few exceptions actual sugar prices at the various levels of distribution have generally followed the inflationary and deflationary trends of the whole economy. Premature decontrol in the spring of 1920 allowed sugar prices to shoot up sharply, but they fell with equal abruptness a few months later. In contrast to the gradual increase in most other agricultural prices, sugar prices gradually decreased during the 1920's, largely as a result of the increased production in the areas supplying the United States market. Since 1940, sugar prices have risen less than the prices of other farm products.

Retail and wholesale sugar prices have followed remarkably similar patterns over the years. The equivalent prices received by sugar beet growers have also followed

this same general movement, but the year-to-year fluctuations have been much more frequent and of greater magnitude, the usual case for prices at the farm level.

The big boost given to farm prices by the Government sugar programs, which began with the 1933 crop, is clearly shown in the accompanying chart. Payments to growers from 1933 to 1935 were made under the Jones-Costigan Act which was made inoperative in 1936 along with the AAA. Payments were again resumed in 1937 with the passage of the Sugar Act. The basic rate of 60 cents per 100 pounds of recoverable sugar afforded growers somewhat higher payments than they received in the earlier period. In 1942, the rate was increased to the present figure of 80 cents. When ceiling prices were established on sugar during World War II, growers received, in addition to their Sugar Act payments, price support payments in order to bring forth needed production and insure growers fair returns. These price support payments further increased the equivalent prices growers received during 1943, 1944, 1945, and 1947.

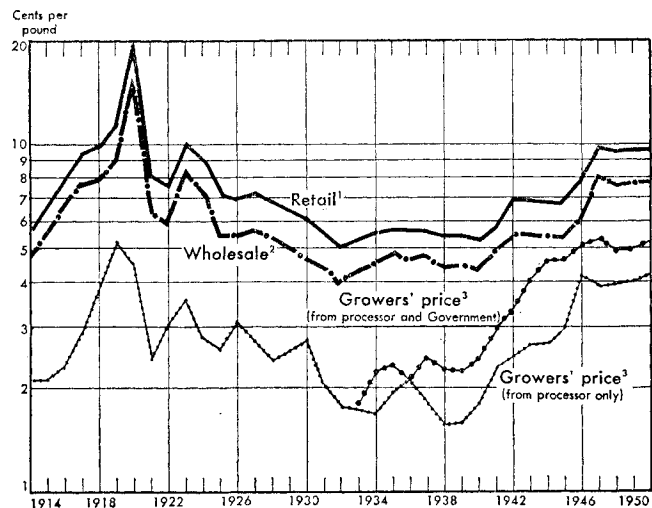
Grower returns

Most agricultural producers either sell their products in wholesale markets or sell them outright to agricultural processors. Their return for their products, therefore, depends solely upon the price they receive, less any selling commissions or transportation charges. Sugar beet growers, on the other hand, do not sell for a specific price after harvesting their crop. Nor is their return dependent solely on the interplay of supply and demand factors on a particular market. The price the processor gets for the refined sugar is, of course, important to the grower. But the grower's share of the total net returns received by the processor is equally important in determining the grower's final return for his crop.

Data published by the U. S. Department of Agriculture show that the percentage of the total net returns received by United States beet growers has been increasing over the last 35 years. In 1916, growers were getting only 35 percent of the net returns received by processors. From then until 1930, their share increased steadily, reaching a high in that year of 67 percent. With the advent of the depression, the growers' share dropped off and varied between 47 and 49 percent until 1940 when it began increasing again. Over the last five years, growers have been receiving an average of 58 percent of the total net returns taken in by the processors.

The gradual upward trend in the growers' share of total net returns has been partly due to the increasing efficiency of processors in extracting sugar from the beet. In the early days of the industry, around 1900 to 1910, processors were recovering about 77 percent of the total sugar in the beets. Technological developments in processing operations gradually increased extraction efficiency. Beet factories have averaged 87 percent extraction in recent years. The sugar content of beets has increased only slightly during the last half century, from about 15 percent to 16 percent. This slight increase, however, when

SUGAR PRICES: RETAIL, WHOLESALE, AND EQUIVALENT PRICE RECEIVED BY BEET GROWERS, 1914-50



Note: This chart is plotted on a semi-logarithmic scale on which equal vertical distances represent equal percent changes rather than equal absolute amounts.

¹ U. S. average, U. S. Bureau of Labor Statistics. ² New York, net cash, Production and Marketing Administration, *Sugar Reports*. ³ U. S. average price received by growers per pound of refined sugar extracted from their beets. Computed from data in *Sugar Reports*.

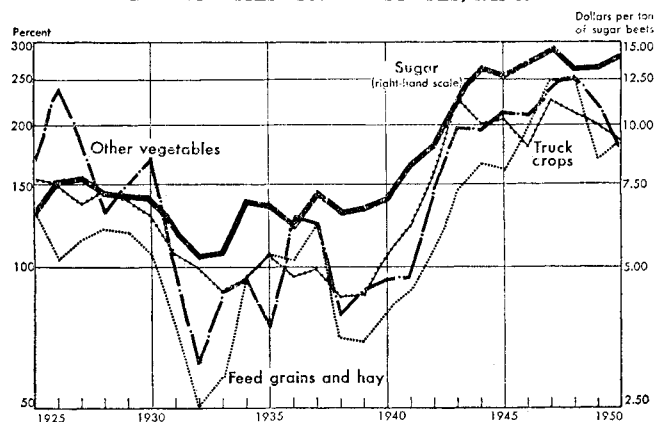
coupled with the increased factory recovery rate, has meant that processors have increased their production of sugar from a ton of beets from an average of 230 pounds in 1901-05 to 290 pounds during 1941-45. Obviously this increase has reduced the unit costs of refined sugar and allowed processors to return a greater proportion of their net returns to the grower.

If refined sugar prices increase from one year to the next, it is more than likely that a processor's unit costs will not rise accordingly. Thus, he is able to give the grower a greater portion of his net returns per unit. That this is done is clearly brought out in an examination of the payment schedules in the sugar beet contracts. For example, one California processor returns to growers whose beets have a 12 percent sugar content 42 percent of the net return he receives for 120 cwt. of the growers' sugar when the net return per unit is \$4, and 56 percent when the net return per unit is \$8. Growers whose beets have a 24 percent sugar content receive shares of 48 and 58 percent,¹ respectively, at net returns per unit of \$4 and \$8. Sugar beet growers, consequently, profit more than growers of most other agricultural products when the prices of their products increase.

The characteristics of the demand for sugar also make it more profitable for growers when sugar prices are high. It has been mentioned before that the demand curve for sugar is relatively inelastic, that is, the consumption of sugar does not change much when prices change. When this is the case, the total returns to producers are greater when prices are high than when prices are low.

¹ At any given net return for the company the grower receives a greater percentage of the total net return the higher the sugar content of his beets. The increase in the percentage share, however, goes up faster with increases in the net return to the company than with increases in the sugar content.

**AVERAGE PRICES RECEIVED BY FARMERS FOR SUGAR BEETS
and
INDEXES OF PRICES RECEIVED FOR SELECTED GROUPS OF
COMMODITIES—UNITED STATES, 1925-50**



Note: This chart is plotted on a semi-logarithmic scale on which equal vertical distances represent equal percent changes rather than equal absolute amounts.

Competitive returns

Sugar beets are not known as a big money crop in the terms that wheat, cotton, or truck crops are. Their reputation is rather one of providing reasonable profit year in and year out; a crop which isn't likely to make the farmer rich in a few years but will provide him with a steady income. Because of this, sugar beets must meet serious competition from cash crops for the use of land, especially

when farm prices are on the upswing. The possibility of growing more profitable cash crops was one of the reasons for the sharp reduction in sugar beet production during the war years.

The greater stability in sugar beet prices, and, consequently, returns, is brought out in the accompanying chart which compares the relative changes in the farm prices of sugar beets and competing crops. Grower prices for beets decreased less than for competing crops during the early 1930's and have increased less since then. Though this characteristic works to the advantage of beet growers when farm prices are declining, they are placed at a disadvantage when farm prices rise.

Returns from sugar beets do not fluctuate so much as the prices of most competing crops, primarily because of the payments received by growers under the Sugar Act. These payments over the last ten years have represented from one-fifth to one-fourth of the total returns. The dollars and cents amount of the payment, of course, does not change when farm prices drop. This tends to keep sugar beet returns from falling as much as returns from other crops. In addition to the regular conditional payment, the deficiency and abandonment payments tend to take some of the risk out of sugar beet growing. Though these payments seldom amount to more than \$15 per acre, they at least cover part of the costs incurred by the grower, and probably increase the competitive position of the sugar beet.

FUTURE OF THE INDUSTRY

Few farmers can look to the future with as great a feeling of security as can the growers of sugar beets. This feeling of security does not arise from the certainty that prices and incomes will continue to be profitable into the indefinite future. It stems, rather, from the greater degree of favoritism, protection, and assistance received by sugar beet growers from both the Government and the sugar companies. As a result of Government programs, growers can expect protection from excessive market supplies and a continuation of their subsidy payments. Their very close relationship with the sugar companies means that they do not have to face future problems alone. Most of the individual production problems of the grower are taken over by the companies who can devote more time and resources to their solution. In addition, marketing problems with which most agricultural producers must be concerned do not confront sugar beet growers.

Grower problems

Production techniques, from planting the seed to harvesting the mature beet, have changed considerably since the inception of the sugar beet industry in the United States. Many problems have been solved, and the most serious ones have been lessened. The pests and diseases which once threatened the existence of the industry have largely been brought under control by the use of disease-resistant varieties, cultural practices, and crop rotation.

Processed seed was developed to reduce the amount of labor required in thinning the stands and to permit more rapid mechanization of this operation. Though no serious production problems exist at present, the industry is carrying on extensive research along many lines.

Varietal improvements: Exceptional improvement has been made in sugar beet varieties during the past 20 years. Much remains to be done, however, in developing varieties adapted to the varying growing conditions of the western states. All Twelfth District areas need a variety which will produce a higher sugar content. Growing areas in central and southern California need a variety with less tendency to bolt so that advantage can be taken of the favorable fall growing weather. Such a variety could be planted earlier and harvested earlier, thus lengthening the processing period and easing the end-of-season rush.

Mechanization of many production and harvesting operations has introduced several problems. A variety which produces a single-germ seed with a high germination rate would help to hasten more widespread use of precision planting and mechanical thinning. Mechanical harvesting could be more efficient if beets were more uniform in shape and height. Intensive research along these lines is being carried on by Federal, state, and industry specialists, and some significant progress has been made.

The recent development of hybrid varieties should give new impetus to the breeding program. The development of new varieties, however, is a slow process and the results of current study will not be available to growers for at least several years.

Mechanization: The extremely high labor requirement of sugar beet production has been one of the industry's most important problems. Historically, the labor situation has prevented improvement in the competitive position of the beet crop. At the present time, the mechanization of harvesting operations has been practically completed on the larger District acreages. Minor refinements are still needed to make the operation more efficient. Most of the inefficiencies, however, probably must be corrected through plant and cultural improvements—such as single-germ seed, more uniform root size, precision planting, mechanical thinning, and weed control—rather than through improvement in harvester design.

Machine harvesting has not progressed nearly so far on the smaller sugar beet acreages as it has on the larger. The recent introduction of a small harvester will permit small growers to take advantage of the lower costs of machine harvesting. Growers who find it uneconomic to purchase a harvester could still reduce their costs by renting a machine or hiring a custom operator.

With no mechanical harvesting, about 75 to 85 man-hours (as much as 100 man-hours on the smaller farms in Utah and Idaho) are needed to grow and harvest an acre of sugar beets. This compares with about 35 man-hours for alfalfa, 20 for beans, and 6 for barley. With mechanical topping and loading, beet labor requirements can be reduced about 25 man-hours. Machine harvest, however, does not complete the mechanization of sugar beet production. Precision planting and the mechanization of thinning and weeding would effect additional savings in labor and costs. Developments along these lines are awaiting solution of the problem of uniform seedling emergence. A variety which produces a single-germ seed has been developed experimentally, but uniform seedling stands cannot be attained without higher germination rates, uniform moisture and depth of planting, and well prepared seed beds. It is not likely that thinning and hoeing will ever be completely mechanized. Since the problem is largely one of developing new varieties and perfecting pre-planting and planting operations rather than one of engineering, further mechanization will be slow. When it can be accomplished, however, it does promise further cost reduction and an improvement in the competitive position of the sugar beet.

Rotation: Though the above problems have been listed as grower problems, they are actually important to the whole western sugar beet industry. As such, they are being dealt with on the industry level and the individual grower is largely leaving their solution to beet company and Government specialists. There is one problem, however, which each grower must face and solve in the light of his own conditions. That is the problem of fitting sugar

beets into his farm plan. Some of the factors which a grower must consider in planning his sugar beet acreage have been mentioned earlier. Probably the two most important are the competitive position of sugar beets and the value of beets in rotation plans. The use of sugar beets as a rotation crop has long been advocated and most farmers are well aware of their value. With more and more stress being laid on diversification and a well rounded farm plan, sugar beets should attain greater importance in District agricultural areas.

Returns: From a strictly economic viewpoint, sugar beet growing should be in a stronger position in the future. It is entirely possible that sugar beet prices relative to prices of competing crops will improve. There is increasing evidence of public dissatisfaction with the farm price support program. Elimination of support or at least reduction in support levels is a possibility at some future date. The sugar program, on the other hand, has not received the attention that the price support program has. The public knows much less about the sugar program, and criticism has been negligible. As a result, it is much less likely that payments to growers under the sugar program will be reduced or eliminated than that price supports will be lowered or done away with. If the latter did happen, the prices of some of the crops which compete for land with sugar beets would fall relative to sugar beet prices. The greater possibility of additional mechanization should also improve the competitive position of beets relative to other crops. As this is accomplished, production costs will decrease; there will be less dependence upon seasonal labor; and net returns will rise. Sugar beets, which now have the reputation of fitting well into rotation plans and providing a dependable source of income, should become increasingly profitable relative to other crops.

Industry problems

As with beet culture, processing techniques in the beet sugar industry have evolved to a point where few basic changes can be expected. Technological advance in equipment and extraction processes has been steady. The most recent major change has been the development of the continuous diffusion battery. Future changes in factory operations will consist largely of refinements of present processes. One refinement recently adopted by several District companies is the storing of granulated sugar in silos for reprocessing or repackaging later during the marketing year as demand requires. This is considerably less expensive than the older practice of bagging and storing in warehouses and will undoubtedly become more widespread.

The seasonal nature of factory operation seems inevitable in beet sugar production. Yet the possibility of prolonging the annual working period or utilizing the factory between seasons is an attractive one. The need for extending the processing period has been brought into sharper focus by the advent of mechanical harvesting.

Since these machines cannot work in muddy fields, it is necessary to complete harvesting before the advent of the rainy season. Beets are thus delivered at a faster rate than they can be processed. If beets could be safely stored at the factory, harvest could proceed as quickly as possible and the factory could process to capacity. Some reasonably successful experiments have been conducted by one California company. The results indicate that ventilated piles may be stored from late October to early December, for a period of 40 to 50 days, without too great a risk. Two promising means of lengthening the processing season may be found in plans for storing diffusion liquor and dehydrating and storing beet chips which are being studied in California. Both this plan and the stockpiling of beets at the factory hold promise as a means of reducing processing costs and achieving more efficient factory operation.

The processing or manufacture of products not connected with the sugar beet industry could also reduce the time factories stand idle. Some preliminary work has been done in California with processing starch, glucose, and sorghums. A less certain opportunity for utilizing beet sugar factories during the off-season lies in making use of sugar beet by-products and the waste materials of the extraction process. Considerably more research is needed, however, to develop products with commercial value. Even when this is done, producing such products would require additional capital investment on the part of the companies in the form of new equipment. No developments along these lines can be counted on for some time to come.

Over the years, persons connected with the sugar industry in the United States have paid more attention to the supply side of the picture than they have to demand. They have attributed most of the ailments of the sugar industry to changes in supply conditions. That these changes are important is obvious, but it is becoming increasingly apparent that the industry can no longer overlook demand factors. From almost the beginnings of the industry to the middle 1920's per capita demand increased steadily. (See chart on page 14.) Since then, however, per capita consumption has leveled off and even declined slightly. It is obvious, of course, that the depression and war-time controls were influential in this change. But even during the last four years, when consumer incomes were relatively high and sugar prices relatively low, consumption per person has not regained the level of the 1920's.

Whether or not per capita demand for sugar is declining, it is fairly certain that it is not continuing its steady increase of pre-depression days. Statistical evidence also indicates that neither an increase in consumer incomes nor further decreases in sugar prices can be counted on to increase per capita sugar consumption appreciably. This is particularly true for household and institutional demand. (Industrial demand is more responsive to price and income changes.) It seems, therefore, that the sugar industry would be well advised to actively promote new uses for sugar, particularly in the industrial line.

In addition to this problem, which affects the entire sugar industry, the beet sugar segment has long had the problem of increasing the demand for its product. Beet processors have supplied their share of the industrial market for many years, but demand from household users has not been on a par with the demand for cane sugar. The lack of complete packaged lines of specialty sugars, which has been the major deterrent in gaining a greater share of the household market, is gradually being remedied. Within several years most of the beet processors in the District should be able to offer complete lines. Then the problem will be one of stimulating household demand for beet sugar.

The District beet sugar industry has already made some significant strides in increasing its share of the western sugar market. Since the war, beet sugar deliveries in the West have increased relative to total sugar deliveries. Last year, beet sugar made up more than half the total deliveries of sugar. The aggressive advertising campaign of western processors should result in a continuation of this trend. Even though per capita sugar demand may be leveling off, the greater relative increase in population in the western states will mean an increasing total consumption of sugar here.

In order to continue increasing its share of this total market, however, the beet sugar industry must stabilize its output to a greater extent than it has in the past. During and immediately following World War II, for instance, sharp cutbacks in District beet production resulted in decreased beet sugar deliveries in spite of the fact that total market demand remained high. The problem is largely one of improving the competitive position of sugar beets so that beet production will be maintained at a high and stable level year after year. The close working relationship between the grower and the company and the intensive research being carried on to solve existing problems should help bring this about.