

A HISTORY OF SUGAR MARKETING THROUGH 1974

by

Roy A. Ballinger

INTRODUCTION

Cane sugar has been an important article of food in the world for several thousand years. It has been an important commodity in international trade since shortly after the discovery of America. And since the early 19th century, both cane and beet sugar have contributed importantly to the economic development of most nations of the world, including the United States.

Since colonial times, a large share of U.S. sugar needs has been supplied by imports from various countries. In addition, this country has produced a large amount of cane and beet sugar for domestic consumption. Production of nonsugar sweeteners has also achieved considerable economic importance. As a consequence, domestic and international problems connected with the marketing of sugar and other

sweeteners interest producers, importers, and consumers of sugar. Sugar and other sweeteners have come to be regarded as necessary by consumers in nearly all countries, increasing the need for abundant and reliable supplies.

This report traces developments in the marketing of sugar and other sweeteners in the United States and, to some degree, in other countries. It is particularly concerned with countries from which the United States has obtained large supplies. The influence of Government policies toward sugar in the United States and other countries is described. Also, trade in sugar among nations is examined, since this trade has had a considerable indirect effect on sugar trade patterns and production in the United States.

SUGAR BEFORE THE DISCOVERY OF AMERICA

Early Sweeteners

The oldest sweet substance known to be used, except fruits and other plant materials containing sugar, is honey. The principal ingredient of honey is a mixture of two sugars, dextrose and levulose. A rock painting of the Paleolithic period found in a cave in Spain pictures a man robbing a store of wild honey (30).¹ Apiculture is known to have been practiced in Egypt as early as 2500 B.C. Honey was also well known as a food at an early date in many other countries. It was the most important sweetener used in Western Europe until the 16th century. Honey was also used by Indians in many parts of the Western

Hemisphere when Europeans first arrived and explored the area. Although the natives in America obtained their honey from species of bees not present in Europe and Asia, early European settlers brought honey bees from Europe which have since become the common honey producers in North and South America.

Early attempts were also made to obtain sweet substances from numerous plant materials. Carrots were among the plants recommended for this purpose in England. Early Spanish explorers found Mexican Indians using cornstalks for a similar purpose. A Spanish explorer also reported that California Indians made molasses and other sweet products from certain vegetables. Since a variety of wild beet grows in California, it is possible that this beet was the source of the sweet products prepared by the Indians (18). The sweet ingredient of the beet is sucrose.

¹Numbers in parentheses refer to citations listed at the end of this report.

The best-known sweetener indigenous to the New World was maple sirup or maple sugar. These materials were used by Indian tribes in the Northeastern United States and adjacent areas in Canada. Early European settlers learned of their preparation and use from the Indians (30).

Origin of Cane Sugar

Sugar, as a commodity, was first prepared from sugarcane. Sugarcane originated in the islands of the South Pacific. Although the natives in these islands apparently did not prepare sugar from cane, they doubtless chewed stalks as a source of food and for the sweet taste (4). From the South Pacific, sugarcane apparently spread first to southeastern Asia, then eastward to India, and northward to China, the Philippines, Hawaii, and other places. The manufacture of sugar from sugarcane occurred first in India. The date first produced is unknown, but Deer (28) states "... it may be accepted that not later than 400 B.C., and perhaps earlier, a knowledge of sugar had become general throughout India."

From India the art of growing sugarcane and recovering sugar from it gradually spread westward into Persia, Asia Minor, Egypt, and across northern Africa to the Atlantic. It also reached southern Europe, particularly Sicily, Spain, and Madeira. Much of the sugar produced for many centuries was a crude product which more nearly resembled present-day molasses than refined sugar. A similar molasses-like product is still produced in India in large quantities.

The westward migration of sugarcane and sugar was extremely slow. There was perhaps a lapse of about 2,000 years between the beginning of sugar manufacture in India and the appearance of the industry in the Atlantic islands off the coast of Africa shortly before the discovery of America. The invasion of India by Alexander the Great and the travels of early explorers brought some knowledge of sugarcane and sugar to Greece, but Europeans had no firsthand acquaintance with the product for another thousand years.

Movement Across Northern Africa

The growing of sugarcane and production of sugar did not reach the Mediterranean region until the seventh and eighth centuries. It was introduced by the Moslems after their conquest of northern Africa and Spain. The Arabs had not known of sugar in their homeland, but they became acquainted with it during their conquest of Persia.

Knowledge of sugarcane and sugar among Europeans was greatly increased during the Crusades. Sugarcane was an established crop in parts of the area occupied at times by the Christians. The cultivation of cane and the manufacture of sugar were generally continued in these areas and doubtless small quantities of sugar were shipped to Europe. The European climate was unsuitable for sugarcane in all but the most southern parts.

Sugarcane was introduced to Madeira shortly after its colonization by Portugal about 1420. The crop flourished on the island, and for a time, production of sugar was sufficiently large to influence the course of European trade. The first recorded shipment to England was in 1456. Production in 1496 reached 1,700 tons, but by 1530 it had declined to 700 tons as production in the New World was becoming established (30).²

Until after 1500, sugar in Western Europe, except in parts of Spain, Portugal, and certain Mediterranean islands, was chiefly regarded as a medicine or as an article of luxury available only to the wealthy. Even the development in Madeira was not sufficient to produce any great change in this situation. Honey continued to be the most important sweetener available to most Europeans. However, the spread of sugar production from India to the eastern shores of the Atlantic made it possible for early explorers to easily transport sugarcane across the ocean and develop the production of sugar in newly discovered America.

²Quantities referring to sugar produced or traded come from many sources. Exact measurement in long, short, or metric tons is given where possible.

THE COLONIAL PERIOD IN THE AMERICAS

The development of the sugar industry in America began shortly after its discovery by Columbus, who reportedly brought sugarcane from the Canary Islands on his second voyage. It was planted on some Caribbean island, probably Hispaniola, in the part that is now the Dominican Republic.

Portuguese Colony: Brazil

The first development of a sugar industry of commercial importance in the Americas was made by the Portuguese in Brazil. This followed the growth of the industry in Madeira and other islands near Africa.

Although the exact date of the introduction of sugarcane into Brazil is uncertain, there is a record of duty paid on sugar from Brazil at the Lisbon customhouse in 1526 (30). The first period of development of the Brazilian sugar industry ended in 1624 when the Dutch, attracted by the reported profits of the industry, attacked and captured the northern part of the country. The output of sugar was greatly reduced by the Dutch occupancy, because the Portuguese proprietors were generally dispossessed and production was disorganized. Production was not fully restored until after Portuguese control of the territory was restored in 1654.

During the century when the sugar industry was first developed in Brazil, Portugal was the largest producer of sugar in the world. And the sugar trade contributed much to the prosperity of that country. It was also a time of great prosperity for the owners and operators of sugar properties in Brazil. Sugar was the first agricultural product to be shipped from America to Europe in commercial quantities.

Spanish Colonies

The Dutch invasion of northern Brazil and the invaders' attitude toward Portuguese proprietors of sugar properties caused a decline in sugar production there. Consequently, the center of world sugar production gradually shifted to the Spanish colonies in the New World. Sugar production had become established in the Canary Islands. Although production there was never large, these islands supplied not only the first sugarcane Columbus brought to America but also most of the individuals possessing knowledge of the cultivation of sugarcane and the manufacture of sugar. The sugarcane first brought by Columbus is reported to have grown well, although the people who made the voyage with the canes became ill and died. So, the venture failed.

The Spaniards reintroduced sugarcane to Hispaniola around 1520; the exact date is uncertain. In 1530, between 1,000 and 1,500 tons of sugar were reported to have reached Spain. The sugar trade became so profitable that sugar was shipped under convoy with pearls and other treasure. However, the prosperity of the sugar industry in Hispaniola lasted a relatively short time. Shortage of labor, heavy taxes, and the requirement of the Spanish Government that all sugar produced be shipped to Sevilla contributed to the decline. Also, heavy exactions (amounting to a tax) by the church further increased costs.

The sugar industry in Cuba developed considerably more slowly than that in Hispaniola, although cane was first introduced there in 1511. Sugar production was first recorded in 1576 in western Cuba. The industry's first substantial growth in eastern Cuba (the most important producing area in the 20th century) began in 1598. By 1617, production amounted to 312 tons. Growth from this point appears to have been

slow for the next century and a half; output amounted to only 490 tons in 1760. After this, the growth of the industry was more rapid, and by 1895, before revolutionary activities interfered with operations, production exceeded 1 million tons.

Sugar production also developed in other Spanish possessions in the New World. Puerto Rico, Mexico, and Peru were among the more important.

In addition, the Spanish developed a fair-sized sugar industry in the Philippines. Sugarcane, from which a low-grade sugar was being produced, was being grown extensively there when the islands were discovered by Magellan in 1521. No commercial sugar industry developed for two centuries or more after Spain took possession of the Philippines about 1565. However, shipments of sugar from the Philippines to the Pacific Coast of America are recorded from about 1800. These peaked at over 300,000 tons in 1894 (51).

The greatest development of the sugar industry in the Philippines was on the island of Negros. This island was placed under the control of a religious order of the Roman Catholic Church. The growth of the industry in Negros in the 19th century was extensive, but technology did not develop beyond the level reached elsewhere in the 18th century. After the Spanish-American War, the United States transferred the church lands to private entrepreneurs. Negros remains the largest source of sugar production in the Philippines.

British and French Colonies

Other European countries envied the sugar profits made by the Portuguese and Spanish. In addition to Dutch efforts in Brazil already mentioned, Britain and France were active in acquiring sugar. First, the British and French attacked Spanish shipping and settlements seeking to capture valuable merchandise including sugar. Sometimes they succeeded. Often, more permanent territorial conquests followed which made possible the establishment of sugar industries under the control of Britain and France.

The most important sugar producing colonies of Britain were the Caribbean Islands, Jamaica, Trinidad, and Barbados, plus British Guiana and British Honduras on the mainland. The principal French possessions were Haiti, Guadeloupe, and Martinique in the Caribbean. Denmark developed a comparatively small sugar industry in the Virgin Islands. The Dutch, after losing their foothold in Brazil, were largely confined to Surinam so far as sugar in the New World was concerned. However, the Dutch developed a large sugar industry on the other side of the world in Java.

Other places where sugar industries still exist, outside the Americas, were developed by European nations and include South Africa, Australia, Fiji, and the islands of Mauritius and Reunion in the Indian Ocean. In general, the development of sugar indus-

tries in these areas occurred later than in the Americas (30). Sugar production in Mauritius, although started much earlier, did not exceed 1,000 tons until after the end of the Napoleonic Wars in 1815.

A commercial South African sugar industry developed in Natal on the southeastern coast beginning after the area became a British colony in the mid-19th century. Sugarcane, however, had been known in this part of Africa for some centuries before it was developed commercially.

Unlike South Africa, Australia was growing no sugarcane when first visited by Europeans. Sugarcane, however, was soon introduced by the English settlers and small-scale commercial production of sugar began early in the 19th century. The industry is still confined to the coastal areas of Queensland and New South Wales where it has grown to be of great importance.

The relatively small sugar industry in Fiji was developed late in the 19th century shortly after the islands became a British colony. It has become of great economic importance to the region. The most successful developer of the industry, and the only one still operating, is a large Australian sugar company.

Trade Restrictions

The production of sugar in the Americas and its shipment, primarily to Western Europe, increased substantially toward the end of the 18th century. During this period, the "sugar islands" were regarded by European countries as their most prized colonial possessions. However, the changing fortunes of war and shifts in the attitudes of various European governments toward the sugar industry in their colonies caused unexpected and, at times, drastic shifts in the profits of colonial sugar planters. Among the more important government actions affecting the sugar industry were the Navigation Acts of England and similar laws in other countries which regulated shipping and customs duties. Tariffs on sugar became important sources of revenue for all countries whose colonies produced sugar.

All European countries regarded trade with their colonies as being properly exclusive to themselves. Spain went so far as to require, for a time, that all shipments must use the port of Sevilla. The English Navigation Acts, first passed in 1650, did not finally cease operating until 1849. Although the exact provisions of these laws were frequently changed during the two centuries of their existence, their general purpose was to confine the trade of each colony to shipments to and from English ports, or at least to provide strong financial inducements for traders to do so. That is, supplies for the colonies were to come only from England and all products from the colonies were to go to England. During most of the period, sugar and molasses were among the most important items subject to these restrictions (54).

England and other countries applied import duties

on sugar arriving from their colonies almost from the time of their establishment. The colonies were supposed to be profitable to the government of the mother country. The rate of duty in England prior to 1651 was 5 percent ad valorem. Specific duties of so much per pound, the rate varying with the type or purity of the sugar, were substituted for the ad valorem duties that year. The law also provided that foreign sugar should pay double the rate applicable to that from English colonies. This seems to have been the beginning of imperial preference, at least for sugar.

In 1670, England took the first steps toward providing protection for its sugar-refining industry. Refining—remelting and increasing the purity of imported sugar—had become established in most European countries soon after the first shipments of sugar from the New World arrived. The first sugar mills in the Western Hemisphere were small, crude affairs, and the sugar they produced frequently was more like a thick molasses than like the sugar in use today. Better facilities and more skillful workers were available in Europe, and refineries were established there.

However, as equipment and skill improved in the colonies, some of the sugar reaching Europe was of sufficiently high quality to be marketed to consumers without further refining. Naturally, the European refiners were unhappy about this, since it reduced the volume of their business. The English Tariff Act of 1670 provided substantially higher rates of duty on the importation of the best quality sugar, described as "refined loaves" and "white candy." This discouraged refining in the colonies. Even today, this purpose is present in the laws of most countries which import sizable quantities of sugar.

British Mainland Colonies

The attempt to confine the trade in sugar to the sugar producing colonies and their mother countries in Europe gradually led to difficulties between Britain and its colonies on the mainland of North America. Sugarcane could not successfully be grown in the 13 colonies, although attempts were made as far north as Jamestown. Small quantities of molasses or sugarcane sirup were at times produced in South Carolina and Georgia.

With those exceptions, the only locally produced sweeteners available for the use of settlers were honey and maple sirup. The sweet sorghums were not introduced to the United States until the 19th century.

The importance of maple sugar in Vermont about the time of the American Revolution has been described (21) as follows:

"The manufacture of maple sugar is also an article of great importance to the State (Vermont). Perhaps two-thirds of the families are engaged in this business in the

spring, and they make more sugar than is used among the people. Considerable quantities are carried to the shopkeepers; which always find a ready sale, and good pay. The business is now carried on, under the greatest disadvantages: Without proper conveniences, instruments, or works; solely by the exertions of private families, in the woods, and without any other conveniences than one or two iron kettles, the largest of which will not hold more than four or five pailfuls. Under all these disadvantages it is common for a family to make two or three hundred pounds of maple sugar in three or four weeks."

However, maple sugar and honey were inadequate for the needs, or at least the desires, of most of the colonists, although statistics showing the volume produced are not available.

Trade with the sugar islands in the Caribbean soon became important to the settlers. Some of this trade was doubtless legitimate, that is, conducted so as not to violate British law. But, particularly when the laws were most restrictive, much smuggling took place. Products sent to the sugar-producing islands included such items as fish, pork, lumber for barrel staves and other articles, tobacco, and cotton. Frequently, business with producers in French and Spanish islands was more profitable for colonial traders than trade with the British colonies, in part because products of the northern colonies were in greater demand by the French and Spanish settlers.

Sugar and the American Revolution

Opposition in the colonies to the British trading laws, particularly those concerning sugar and molasses, began to appear early in the 18th century. The New England colonies usually were the most vociferous in their complaints. The Molasses Act (also called the Sugar Act), passed by the English Parliament in 1733, levied heavy duties on molasses imported into the Thirteen Colonies from foreign countries. The colonists, especially in New England,

largely ignored the law. It was reported that "In 1763, out of 15,000 hogsheads of molasses that were imported into Massachusetts, 14,500 were smuggled in" (54).

New provisions, intended to provide more stringent enforcement, were incorporated in the Sugar Act of 1764. Although the rates on sugar from British islands were lower than in the previous act, they were considerably higher than rates suggested to Parliament by representatives of the colonies. Britain's need for funds to help pay for the cost of the French and Indian Wars was given as one reason for retaining substantial duties on sugar and molasses. Other acts of Parliament passed at this time hampered trade in other products and were objectionable to the residents of the colonies.

As long as France possessed Canada, and British-French Wars involved the North American colonies, the people in New England and the other colonies felt the need for protection by the British army and navy. This was a strong force muting protests against restrictive British trade laws. However, when Britain acquired Canada from France in 1763, the need for restraint by the colonists largely disappeared.

Under these circumstances, the British Sugar Act of 1764 aroused increased expressions of resentment among the colonists. Smuggling of sugar and molasses from Spanish and French islands in the Caribbean continued, despite increased efforts by Britain to prevent the traffic. In 1772, a British schooner attempting to prevent smuggling ran aground on the New England shore while chasing a sloop. The sloop escaped and reported the location of the grounded British ship. An armed force was recruited which attacked the British vessel and destroyed it by fire.

This and numerous other incidents demonstrate the close connection between the sugar trade and the American Revolution. John Adams wrote (54), "General Washington always asserted and proved that Virginians loved molasses as well as New Englanders did. I know not why we should blush to confess that molasses was an essential ingredient in American independence. Many great events have proceeded from much smaller causes."

SUGAR FROM 1783 TO 1864

The U.S. sugar trade was immediately affected by the newly gained independence from England. The importation of sugar from British possessions in the Caribbean was almost completely eliminated and was replaced by an increase in receipts from other islands, particularly Cuba. Continued British restrictions on American shipping in the trade between the United States and British possessions in the Caribbean were

an important factor in producing these results. Such restrictions were not completely removed until 1849.

U.S. Sugar Tariff

Another early development was the imposition of a tariff on sugar by the United States. The first such law, passed in 1789, provided for duties of 1 cent a

pound on brown sugar, 3 cents on loaf sugar, and 1.5 cents on all other sugar.³ Since their original imposition, the United States has maintained import duties on all imported sugar, except for raw sugar imported from 1890 to 1894. The primary purpose of the early tariffs was to raise revenue for the Federal Government. Between 1789 and 1860, custom duties, including those on sugar, supplied from two-thirds to nine-tenths of the Federal Government's total ordinary receipts (67). Thus, taxes on sugar, a contributory cause of the American Revolution, were promptly imposed by the United States after independence was gained. The need for revenue was a major cause of the tax in both cases.

Prior to the Louisiana Purchase, the United States had no domestic sugar industry, except for the refining of imported sugar. Before the end of 1789, the rate of duty applicable to loaf sugars, the best quality available, was raised. This made the rate on brown (raw) sugar lower relative to the original loaf rate. These rates afforded the first tariff protection to sugar refiners granted by the Government. The purpose and effect was similar to an earlier tariff arrangement by Britain.

Production in Louisiana

The production of sugar in Louisiana began in 1794. Sugarcane had been grown in Louisiana for a number of years prior to this, but it had been used only for the production of various sorts of sirup, since the settlers lacked the skill necessary to obtain granulated sugar from the juice in sugarcane stalks. After 1794, sugar production in Louisiana increased, and by 1803, when the United States purchased the Louisiana Territory from France, it amounted to a few thousand tons a year (42). This was the first domestic sugarcane industry of consequence in territory controlled by the United States.

As soon as Louisiana became a part of the United States, the industry there benefited from the protection of the U.S. tariff. This had comparatively little effect on production until after the War of 1812. Not until then were conditions sufficiently stabilized to encourage capital and management to enter the Louisiana sugar industry. By 1823, production there had risen to 17,050 tons. In addition to the supply obtained from Louisiana, the United States imported 30,350 tons of sugar that year. Both imports and production gradually increased from that time to the outbreak of the Civil War, as both population and per capita consumption rose.

During the years before the Civil War, small quantities of sugar were produced in other Southern States, mainly Texas, Florida, and Georgia. Sugar is

no longer produced in Georgia. It did not become important in Florida until the 20th century.

In contrast to the lack of commercial success in other States, the industry in Louisiana generally prospered. It was, and still is, confined to the delta area in southern Louisiana, where the growth of sugarcane is favored by an unusually fertile soil and a somewhat warmer climate than prevails in most of the State.

Marketing Louisiana Sugar

New Orleans, from the beginning of sugar production, was the chief center for marketing Louisiana sugar, financing the industry, and procuring supplies for plantations and mills. The consumption of sugar in New Orleans and surrounding territory, after the first few years of the industry, was never sufficient to provide a market for more than a small part of the output. Most of the sugar had to be shipped either to east coast ports to compete with imported sugar or to markets in the Mississippi Valley. Early in the 19th century, the largest proportion of shipments from New Orleans went to the Atlantic coast, but this proportion gradually declined with the growth of population and market opportunities in areas adjacent to the Mississippi River.

Most Louisiana sugar planters sent their sugar to New Orleans for sale through a commission merchant or factor, regardless of the ultimate destination of the sugar. However, some planters made direct sales to distant buyers, particularly those located in the Mississippi Valley north of the Louisiana sugar area. The sugar was placed in hogsheads that ordinarily held about 1,000 pounds. There were no set standards or grades and each hogshead commonly sold on its own merits.

Before 1820, the Exchange Coffee House in New Orleans was occasionally used as an auction market for sugar that did not find a buyer by other means. More common, at least after 1830, was the daily sale of sugar at auction on the levee. Facilities for handling this business were extensively improved and enlarged in 1830. Planters commonly consigned their sugar to a factor in New Orleans, whose commission was 2.5 percent of the sales price. Other marketing costs, such as insurance and transportation, combined to make marketing costs to the planter average 10 percent in the 1840's and 1850's.

In addition to selling sugar for their clients, factors frequently served as agents for the planters in obtaining needed credit and supplies. The isolated location of many plantations which made travel to New Orleans difficult and time consuming, together with uncertain banking facilities, combined to make the factors' services as necessary to the production of sugar as to its sale.

Most of the sugar produced in Louisiana before the Civil War was shipped from New Orleans or direct from plantations, without being refined or improved in

³A complete list of U.S. tariff rates on sugar appears in appendix A.

quality beyond the stage at which it left the plantation. A few refineries were established in the area. The largest one was owned by the Louisiana Sugar Refining Company of New Orleans. Comparatively little demand existed for refined sugar from Louisiana during this period, since the market, particularly to the north, used mostly raw sugar. Consumers generally were not inclined to pay the higher price necessary to obtain the refined product (48).

During this period, the total quantity of sugar used in the United States was small but increased rapidly. Consumption amounted to a little more than 500,000 tons in 1860, more than 10 times that of 1822, the earliest year for which figures are available. Per capita consumption increased from 9.5 pounds in 1822 to 32.6 pounds in 1860—about a third of the present-day rate of consumption.

Nonsugar Sweeteners

During this period, people were not as short of sweeteners as these figures indicate. Honey, maple sugar and sirup, cane sirup, and sorghum sirup all added to the supply. In 1840, the production of maple sugar in the United States was reported to be 34,516,000 pounds (21). In 1860, it amounted to 40,120,000 pounds (56). Also, 1,598,000 gallons of maple sirup were produced in 1860. The total, in terms of sugar, equaled 26,451 tons, adding about 5 percent to the supply of cane sugar that year. Additional supplies were probably imported from Canada.

U.S. honey production in 1860 amounted to 23.3 million pounds. Honey was a common product in rural areas and contributed considerably to the sweetening materials available to people there, as well as to consumers in towns and cities.

Considerable quantities of cane sirup were produced in Florida, Georgia, Alabama, Mississippi, Texas, and Louisiana outside the area where sugar was produced. Sugarcane grew in various parts of these States but not well enough to make sugar production profitable. However, many farmers grew small amounts of sugarcane from which sirup was produced in local mills. This provided a source of sweetening for people in the southernmost parts of the country in addition to granulated sugar.

Sweet sorghum, as distinguished from the varieties used for the production of grain, was introduced into the United States about 1850, or earlier, according to some authorities (26). At the time, the sweet taste of the juice in these sorghums was known to be due to sugar. Since sorghum grows in much cooler climates than sugarcane and is adaptable to a much larger area of the United States, early attempts were made to obtain granulated sugar from it. Means of doing this on a small scale on individual farms were described by William Clough in 1865 (26). Admittedly, the process was slow and uncertain; sometimes no sugar was obtained. Dr. Harvey W. Wiley and others

in USDA conducted extensive studies on the use of sorghum as a source of sugar from 1867 to 1890. Although they did not succeed in establishing a commercial sugar industry based on sorghum, the production of sirup or sorghum molasses developed into a fair-sized home industry.

The Bureau of Census reported production of 7 million gallons of sorghum sirup in 1859. A peak output of 28 million gallons was reached in 1879. At 7.85 pounds of sugar per gallon of sirup, these amounts are equivalent to 27,000 and 108,000 tons of sugar, respectively. Production gradually declined after 1879 until the outbreak of World War I.

Starch Sweeteners

Gottlieb Sigismund Kirchoff accidentally discovered that sweet substances could be prepared from starch while working at the Academy of Science, St. Petersburg, Russia, during the Napoleonic Wars. Kirchoff needed gum arabic for use in manufacturing porcelain. No gum arabic was available because of the continental blockade imposed by the British at that time. However, a Frenchman, Bouillon-Lagrange, had reported that dry starch, when heated, acquires some of the properties of the vegetable gums. Kirchoff attempted to make a substitute for gum arabic from starch by adding some water and acid before heating. As a result, instead of a gummy substance, he obtained a sweet-tasting sirup and a small amount of crystallized sugar (dextrose), a finding he reported in 1811.

Because of the extreme shortage of sugar in Europe at the time, the discovery attracted immediate notice in scientific and commercial circles. Starch, largely obtained from potatoes, was already being manufactured in a number of countries in Europe. With this supply of raw material available, numerous small factories were erected to convert starch to either sirup or sugar. Means were soon discovered by which either sirup or sugar could be obtained as desired. The fact that neither beet sugar nor any other acceptable substitute for imported cane sugar had as yet become available encouraged the development of starch sweeteners. However, the new industry, after the defeat of Napoleon and the lifting of the continental blockade, declined almost as rapidly as it had grown. Sugar became very cheap for a while as the large supplies that had accumulated in exporting countries were shipped to Europe.

But it had been discovered that all starches, regardless of the plant from which obtained, yielded the same sweet substances and that the sugar obtained from starch was identical with that contained in grapes. This last point was of some importance because brewers and winemakers had discovered that the addition of grape sugar could improve their products. However, the supply of sugar from grapes was too small to meet this demand, so

the substitution of dextrose made from starch was welcomed. This development helped to revive the starch sweeteners industry, particularly in France and Germany.

Few statistics are available concerning the early operation of the starch sweetener industry in Europe. But 11 million pounds of dextrose were reported to have been produced from potato starch in France in 1855 and about 44 million pounds in Germany in 1874. German factories had also produced 40 million pounds of sirup in 1874. Starch sweetener production developed more slowly in the United States than in Europe, since there was no sugar shortage here early in the 19th century. A small factory near Philadelphia processed potato starch in 1831-32. The next plant established in this country to make dextrose from cornstarch was in New York City in 1864. However, industry sources say that the superintendent was apparently the only person who understood the process, and the company failed soon after his unexpected death.

The Beet Sugar Industry

Developments in U.S. sugar production and marketing during the early 19th century were overshadowed for the rest of the world by the establishment and development of the beet sugar industry in Western Europe. In 1747, a German chemist, Andreas Marggraf, proved that beet sugar is identical with that in cane. Nothing much happened as a result of this knowledge for a half century. Not until 1799 was the first factory established for the production of sugar from beets (47).

The first large-scale impetus toward the commercial production of sugar from beets came from the efforts of Napoleon to find a substitute for imported sugar which was no longer available because of the continental blockade. The French attempted to discover new sources of supply. They first extensively investigated grapes. They also tried to obtain sugar from trees, as is done with maple trees in North America, from sweet sorghum, and from starch. None

of these were commercially successful, although small amounts of sweet substances were obtained in each case.

Beet sugar production did succeed, however, and numerous small factories were established, especially in France. Production declined immediately after the Napoleonic Wars but did not disappear.

The French practice of protecting the domestic beet sugar industry from competition with overseas cane sugar was adopted soon after the end of the continental blockade, although more by accident than design at first. Import duties on sugar received from colonies and other countries were an important source of revenue to most European governments before the development of the beet sugar industry. Beet sugar produced within the country was not subject to a tariff but received the benefit of the tariff applied to imported sugar. In nearly every country where it is produced, beet sugar has continued to receive government protection, by tariff or other means, from sugar produced in other countries.

The production of beet sugar in Europe soon spread from France and Germany into other continental countries, including Italy, Holland, Austria, and Russia. An attempt was made to establish a beet sugar industry in Britain in 1830. The effort did not succeed, and the production of beet sugar did not become established there until much later. The British Government at the time was obtaining tax revenue on sugar from its Caribbean colonies, and it opposed the establishment of a domestic beet sugar industry which would reduce this revenue. Also, in the 19th century, cane sugar refiners and persons having a financial interest in sugar production in the British colonies opposed the establishment of a beet sugar industry in England (30).

Early attempts to establish a U.S. beet sugar industry consisted mainly of the construction of four small factories between 1838 and 1846. By 1855, the last of these had ceased to operate. They produced only insignificant quantities of sugar. The first successful beet sugar factory in the United States was not established until after the Civil War.

DEVELOPMENTS IN THE LATTER 19TH CENTURY

The consumption of sugar in the United States declined during the Civil War from an annual average of 508,000 tons in 1857-61 to 330,000 tons in 1864. Presumably most of the decline was in the Southern States where food supplies were shortest. However, recovery in consumption after the war was rapid, reaching 505,000 tons in 1866. The increase continued, and consumption exceeded 1 million tons for the first time in 1880; by 1900 it amounted to 2,660,000 tons.

Decline and Recovery in Louisiana

The Civil War had a disastrous effect on the Louisiana sugar industry. Production, which averaged 177,000 tons per year from 1857 through 1861, amounted to only 5,400 tons in 1864. It did not recover to the pre-Civil War average until 1888. Peak production in the 19th century was 348,000 tons in 1897.

The slow recovery of the Louisiana sugar industry

was only partly due to the physical destruction of property. Probably the necessity of changing from a slave labor system to a wage system with free labor caused the greatest difficulty. Neither the employees nor the employers had any experience with a wage system in the Louisiana industry, and it was several years after the end of the war before working conditions were reasonably stabilized (46).

Another factor delaying recovery was the increasing capital investment necessary to establish an efficient operating unit. Improvements usually involved the purchase of more and larger machinery. The general impoverishment of the area as a result of the war made such purchases difficult and many improvements were delayed. The number of sugar mills declined as the average size of the remaining ones increased. This resulted in an increasing number of plantations which no longer had a mill as a part of the operation. This in turn led to the sale of sugarcane from many of the smaller plantations to some neighboring mill owner.

The sale of sugarcane rather than sugar involved some new and perplexing problems. Harvested sugarcane is a perishable commodity which has to be processed within a few days after it is harvested or it spoils and becomes worthless. It is bulky and cannot be transported very far without incurring excessive costs. Its value to a processor depends largely upon how much sugar can be obtained from the cane and the price at which the sugar can be sold. Both factors at the time varied widely and unpredictably. Under the circumstances, agreement on the price to be paid for sugarcane was difficult. This led, in the 1880's, to the practice of buying cane on a "scale" plan so that the price was determined by the price of sugar. Originally there were many variations in the details of the plan used by different mills, and discussions between growers and processors continued. Nevertheless, the device proved useful, and some form of it is still in use today in Louisiana and most other areas where sugarcane is grown.

By the 1890's some mills were also varying the price they paid for sugar according to the yield of sugar per ton of cane. This device, now commonly stated in terms of the percentage of sugar in cane juice, is also in use today. Thus, two of the main features of present-day grower-processor contracts for the sale of sugarcane had their origin in the last 20 years of the 19th century.

Reciprocity with Hawaii

While the Louisiana sugar industry was still striving to regain its economic health following the Civil War, the United States signed a treaty of reciprocity with the Kingdom of Hawaii which became effective in 1876. Under this treaty, sugar from Hawaii was allowed to enter the United States free of duty. The first attempt to manufacture sugar commer-

cially in Hawaii was made in 1802, and the first surviving sugar plantation was established in 1835 (31,67). In 1875-76 Hawaii produced about 13,000 tons of sugar. By 1898-99 production there had increased to 283,000 tons, slightly more than the 278,000 tons produced in Louisiana that year. Except in 1886-87 when Louisiana's crop was unusually small, the 1898-99 crop was the first in which Hawaii produced more sugar than Louisiana. The rapid increase in sugar production in Hawaii continued until it exceeded 1 million tons in 1930-31. The protective effect of coming within the U.S. tariff boundary, first by treaty and then as a part of the United States, was undoubtedly a major factor inducing this rapid increase in sugar production.

Introduction of Beet Sugar in the United States

The production of beet sugar in the United States also began to develop late in the 19th century. The first successful beet factory in this country was established at Alvarado, Calif., in 1870. It operated through 1967. The early beet sugar factories erected in the United States were mostly small, and many of them operated for only a few years. By 1899, there were about 29 beet sugar factories in existence, of which all but 6 had been built in 1897, 1898 or 1899. In spite of the expansion in the production of beet sugar, sugarbeet factories in 1968 were operating on the sites of only 3 of the plants in existence in 1899. Many of the early promoters of the beet sugar industry were immigrants from Europe, particularly Germany, who brought a great deal of knowledge of the European industry with them, but frequently they did not succeed in selecting the best sites in the United States for the growth of sugarbeets over the long-term (18).

The average annual production of beet sugar in the United States during 1866-71 has been estimated at 448 tons. It did not exceed 2,000 tons in any year until 1888. However, production then began to increase fairly rapidly, reaching 82,000 tons in 1899. This was still well below the output in Hawaii and Louisiana and accounted for only 3.4 percent of U.S. consumption that year.

Imports and Tariffs

In spite of the recovery of production in Louisiana and the beginning of a domestic beet sugar industry, the United States relied on imports for most of its sugar supplies from 1866 through 1899. In 1897 when domestic production reached a peak of 399,000 tons, imports (smaller than in most years) amounted to 1,338,000 tons, about 78 percent of the total amount available for consumption. These imports included duty-free shipments from Hawaii, since Hawaii at that time was not part of the United States.

During the 30 years following the Civil War, the quantity of sugar available to U.S. consumers increased from 440,000 tons in 1866 to 2,800,000 tons in 1896. Domestic production, entirely confined to the mainland during this period, rose from 26,000 tons to 399,000 tons in 1897 (fig. 1). This amounted to about 6 percent of the total U.S. supply at the beginning of the period and 14 percent at the end. Imports from Cuba, 321,000 tons in 1866, reached a peak of 1,064,000 tons in 1893, yet they declined from 73 percent of the total supply in the earlier year to 43 percent in the latter one. The largest increase was in imports from countries other than Cuba. These rose from 97,000 tons in 1866 to 1,084,000 tons in 1893. After 1893 the rise in these countries was even faster as revolution in Cuba reduced production in that country.

Perhaps the most surprising thing about the trends in sources of supply of sugar for the United States is the relatively small growth in domestic production despite the continuous protection from the U.S. tariff and, from 1891 to 1894, from the bounty paid on raw sugar production.

Prior to 1861, different classes of sugar, to which different rates of duty applied, were specified in such descriptive terms as raw, brown clayed, loaf, and refined. In 1861 the Dutch color standards of classifying sugar for assessing import duty were introduced, although usually in combination with older descriptive terminology. The color test was not entirely abandoned in the United States for purpose of tariff classification until 1913.

Because of shifts in specifications for various classes of sugar, it is difficult to make accurate comparisons of tariff rates at different times during this period. At the outbreak of the Civil War, the duty on what was termed raw sugar was 0.75 cent per pound. This was the lowest rate since the establishment of the Republic. However, the need to raise revenue for conducting the war resulted in a number of increases, and by 1864 the rate was 3 cents per pound. Also, an excise tax was imposed on refined sugar from 1862 to 1869 at rates varying from 1.5 to 3.0 percent of the sugar's value. Although some reductions were made after the war ended, the rate on raw sugar generally remained above the pre-Civil War rate until 1891.

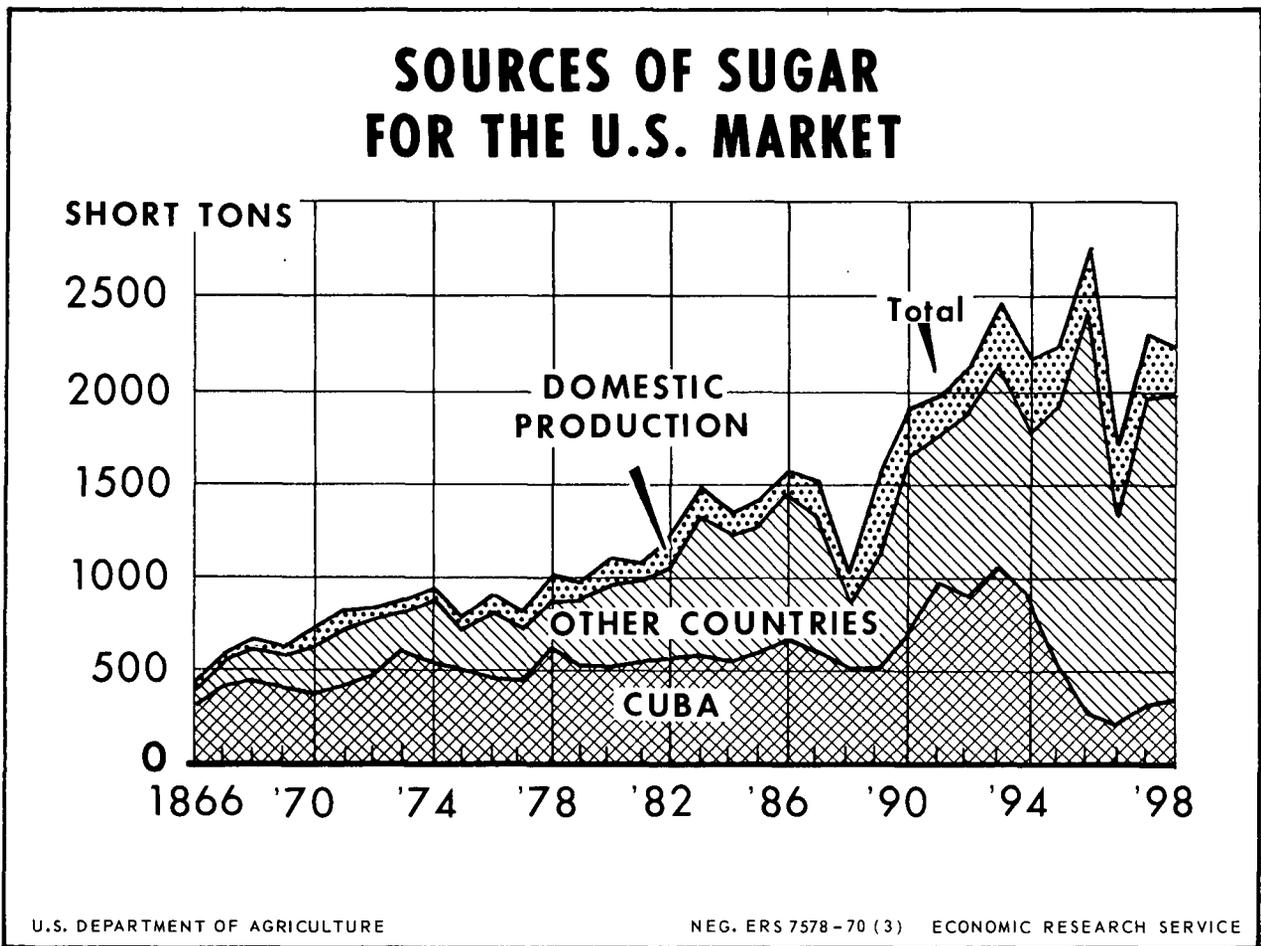


Figure 1

In 1891 raw sugar was admitted to the United States free of duty, and a subsidy was paid to domestic producers. This arrangement was in effect from July 1891 to August 1894. The rate of bounty was 2 cents per pound on domestic production for sugar testing not less than 90 degrees by the polariscopic test, and 1.75 cents for sugar between 80 and 90 degrees. During this period refined sugar remained subject to a duty of 0.5 cent per pound, thus continuing the protection for cane sugar refiners. U.S. imports of raw sugar increased about 40 percent during the period it was admitted free of duty. Imports from Cuba increased by an even larger proportion.

A surplus of funds in the U.S. Treasury was the principal reason advanced for substituting a bounty to domestic producers in place of the protection of the tariff which they had formerly enjoyed. Producers, nearly all in Louisiana, were not entirely happy with the arrangement. The subsidy was visible to everyone, whereas the benefit obtained from the tariff was less so (53).

Another feature of the sugar tariff introduced in 1890 was a countervailing duty of 0.1 cent per pound. In 1897 the rate of this duty was changed to make it equal to the export bounty paid in the country where the sugar was produced. The countervailing duty was established to offset the growing practice in some European countries of making payments to their producers to encourage the export of surplus quantities of beet sugar. One result of this was to encourage European exporters to seek markets where there were no special duties to offset export subsidies.

With the exception of Hawaii, countries exporting raw sugar to the United States benefited from the removal of the duty. Sugar from Hawaii had entered the United States without payment of duty since 1876. Extending duty-free status to other nations merely increased the competition to which Hawaiian sugar was subjected. Because Hawaii was independent, producers there did not receive the subsidy granted to domestic producers. As a result, the production of sugar in Hawaii, which had increased from 13,000 tons in 1876 to 140,000 tons in 1890, remained relatively static during the next 4 years, amounting to 148,000 tons in 1895. Production then resumed its rapid growth, reaching 360,000 tons in 1900. This experience appears to have been a factor encouraging Hawaii to become a part of the United States in 1898.

U.S. consumers benefited from cheaper sugar during this period. The wholesale price of refined sugar in New York City declined from 6.2 cents per pound in 1890 to 4.1 cents in 1894.

Sugar Refining

Perhaps the first sugar refinery built in what is now the United States was constructed in 1689 on

Liberty Street in New York City (62). By the time of the Revolutionary War, several other plants apparently had been established in New York, Boston, Philadelphia, and other cities. No record of the volume of business of these plants appears to exist, but it is known that most of their sales were made to the more wealthy colonists. Other people used raw sugar or perhaps none at all.

The earliest statistics concerning sugar refining in the United States are contained in a report by Tenche Coxé, Commissioner of Revenue, which covers the year ending September 30, 1795 (62). According to this report, 578,939 pounds of sugar were refined that year in Massachusetts, Rhode Island, New York, Pennsylvania, and Maryland. Gross taxes collected on the business amounted to \$34,527.86. However, the quantity refined in Rhode Island and Pennsylvania is not included in the report, although the tax collected in these States is included. It has been estimated that inclusion of the quantities omitted would have resulted in a total output of 1,092,000 pounds.

Reports indicate that in 1836 there were 38 refineries in the United States, 3 in New Orleans, 8 in Baltimore, 11 in Philadelphia, 11 in New York, 3 in Boston, 1 in Salem, Massachusetts, and 1 in Providence, Rhode Island. The value of the product of sugar refineries was reported to be \$2 million (62). Four years later there were 43 refineries in the United States with an invested capital of \$5,640,000; an average of \$131,000 per plant. Refineries were, for the most part, small and equipped with only crude and meager machinery. It was well after the Civil War before important technological advances were made in the art of refining sugar, and refineries then began to resemble those of the present time.

By 1870 the number of sugar refineries had increased to 59 with a total capitalization of \$20,545,000. Reports are fragmentary and sometimes conflicting, but it appears that the number of sugar refineries did not increase much, if at all, after 1870. The average size of the plants did increase as new and larger types of equipment became available.

From their beginning in colonial times, sugar refineries were nearly all located in port cities which were centers of population where the product could be sold. They were also convenient places for unloading raw sugar shipped to this country. By 1870 waterfront sites in these port cities began to assume greater importance than they had in earlier years. At such sites, the refinery could build its own wharf and move sugar directly from a ship into the refinery. The larger plants made the most use of these waterfront sites.

Despite the rapid increase in sugar consumption in the United States, sugar refiners complained of excess capacity and low profits. An industry representative testified at a congressional hearing that there were only 42 refineries in 1875 and that these had

diminished to 27 by 1880. This number is reported to have been reduced, through failures, to 24 in 1887.

The Sugar Trust

An indication of the profitableness of the sugar refining industry is the size of the margin between the price of raw and refined sugar. In general the wider the margin, the higher the profit, although profit is also affected by the cost of operating the refinery and selling the sugar. The margin between the price of raw (centrifugal) and refined (granulated) sugar declined from 1.437 cent per pound in 1882 to 0.712 cent in 1885, and it remained low through 1887. These reduced margins appear to have been a major factor inducing the formation of what was commonly called the Sugar Trust. This organization was established in 1887 as the Sugar Refineries Company. Attempts at forming a combination of sugar refiners had been made at least as early as 1881, but they never achieved more than temporary and local effects on the sugar market (62).

The formation of the sugar combination in 1887 was not an isolated phenomenon. Other trusts organized at about the same time included those concerned with milk, rubber, cottonseed oil, envelopes, elevators, oilcloth, petroleum, meat, glass, and furniture.

The Sugar Refineries Company as originally established had eight sugar refining corporations as members. These were soon joined by others and within a few months 20 refiners were included; 11 of these were in New York, 4 in Boston, and the other 5 in Portland, St. Louis, New Orleans, and San Francisco. The company reduced to 10 the number of plants that continued to operate. It is estimated that the original 20 plants had a combined daily capacity of 33,500 barrels. Yet the 10 plants which continued in operation had, as a result of better management, a capacity of 34,000 barrels. Only five refineries remained independent, which reportedly had a daily capacity of 10,400 barrels.

Each member of the Sugar Refineries Company was organized as a corporation. The stock of these corporations was exchanged for trust certificates issued by the holding company. The affairs of the Sugar Refineries Company were managed by 11 trustees. All dividends of the member companies were paid to the Sugar Refineries Company and redistributed to the members according to an agreed-upon formula. In this way the owners of plants which had been closed, because of excess capacity in the industry, could still receive an income. By closing certain plants and operating the rest at more nearly full capacity, the output of the industry could be maintained, costs reduced, and total profits increased.

The operations of the Sugar Refineries Company appear to have succeeded reasonably well for a time. Refiners' margins in 1888 and 1889 were substan-

tially above those of 1887 and the immediately preceding years. However, the operations of the company were soon challenged on legal grounds, and the charter of the North River Sugar Refining Company, a member, was annulled. This decision was confirmed by the Supreme Court of New York in November 1889. The Sugar Refineries Company was reorganized in January 1891 as the American Sugar Refining Company, a corporation chartered under the laws of New Jersey.

Meanwhile, the capacity of the independent sugar refineries had increased, and refining margins declined in 1890 and 1891. However, sugar consumption continued to increase; the gain in 1891 over the previous year amounted to 23 percent. This gain was generally attributed to cheaper sugar resulting from a reduction in the tariff. Increased volume doubtless helped to offset the adverse effect of lower margins on refiners' profits.

The organization under its new corporate name responded to the increased competition by buying as many of the competing plants as possible. And by 1892 it controlled about 90 percent of the sugar refining capacity of the United States. The principal competition that remained was with semirefined sugar produced in Louisiana. This was made in mills which processed sugarcane and, in place of selling raw sugar to the refineries, manufactured a product intermediate in quality between raw and refined sugar. Even though accurate data are not available, most of the sugar produced in Louisiana during this period appears to have been sold as raw sugar. Another developing source of competition was beet sugar. Beet sugar mills produced refined sugar from their earliest establishment in the United States, in contrast to the situation in Europe where many of the early mills made raw sugar for sale to refiners.

The margin between the prices of raw and refined sugar widened in 1892 and 1893, following the new acquisitions of the American Sugar Refining Company, much as had happened in 1888 and 1889. However, as in the earlier period, new refineries were built and the refining margin declined in 1894.

The most serious competition encountered by the American Sugar Refining Company at this time seems to have come from Arbuckle Brothers. This firm had developed a business in roasted coffee in New York. It held a patent on a machine for packing coffee in 1-pound paper bags or cartons. These packages became very popular, and the company then began selling sugar in the same type of package. The machine worked just as well with sugar as with coffee.

Originally the sugar was purchased from the American Sugar Refining Company and put in the new packages. The business became profitable, and the sugar company attempted to buy the Arbuckle patent. Arbuckle Brothers refused to sell and, being unable to continue the purchase of refined sugar, decided to

build a sugar refinery of their own. The American Sugar Refining Company responded by entering the coffee business through the purchase of a share in another company engaged in that trade. The Arbuckle sugar refinery began operating in 1898.

The next important event in the struggle for control of the sugar market occurred in 1900 when three independent firms united to form The National Sugar Refining Company. The new organization soon appeared to be working in harmony with the American Sugar Refining Company, leaving only Arbuckle Brothers as a real independent. This ended what was apparently the most severe period of competition in sugar refining. However, the American and National sugar refining companies still did not have the power to prevent the establishment of new refineries or to stop the growth of competition from semirefined sugar produced in Louisiana and from the expanding beet sugar industry. The significance of these and other factors can best be understood after consideration of other events at the start of the 20th century which affected not only sugar refining but all other aspects of the sugar industry.

European Sugar Bounties

Developments of the sugar industry in Europe during the last half of the 19th century were in certain ways more dramatic and of greater and more lasting influence on world sugar trade than anything that happened in the United States. The most important of these events concerned the growth of the beet sugar industry on the Continent. This production of sugar from beets, as already noted, began early in the 19th century. By 1866 world beet sugar production had reached 741,000 tons, and 33 years later in 1899 it reached to 5,965,000 tons. The 1899 output was 65 percent of the world's production of cane and beet sugar.

Continental Europe accounted for about 95 percent of world beet sugar production in 1899. Russia, Germany, France, Holland, and Belgium provided 57 percent of the world total. Sugar production in these countries, and to a lesser extent in some others, exceeded their own consumption and caused producers to seek export markets. This situation developed gradually, beginning for France as early as 1860 (28).

In general, the governments of these countries encouraged exports by establishing export subsidies of various sorts. In France such subsidies preceded the first production of beet sugar by more than 100 years. In 1684 Colbert instituted "primes d'exportation" which granted refined sugar exports a drawback of the duty paid on raw sugar when imported. The bounty arose as a result of the method of calculating the drawback received by the exporter. This was established on the basis that 100 pounds of raw sugar would yield 44.44 pounds of refined. By 1786 it appeared that the actual recovery was 56.56 pounds

of refined sugar per 100 pounds of raw sugar. But the official conversion factor was unchanged from that set 100 years earlier. Recovery rates had doubtless increased more or less gradually during this period and varied among refiners according to the quality of the raw sugar and the effectiveness of the refiners' operations. The rate of the export subsidy, therefore, cannot be calculated exactly for an individual refiner even for 1 year.

This type of export subsidy was discontinued by France in 1786 but reestablished in 1816 when the beet sugar industry was beginning to develop. The official conversion rate was established in 1816 at 100 pounds of refined sugar for 200 pounds of raw sugar. The French subsidy for the earlier period benefited only the refiners of cane sugar. However, beginning in 1816, producers of beet sugar who could sell their product in foreign countries gradually became the most important beneficiaries.

Sugar bounties developed somewhat more slowly in Germany than in France. In fact, opposition to the development of a beet sugar industry in Germany, on the grounds that it would interfere with foreign trade and increase the cost of sugar to consumers, was more or less active until about 1850.

The German bounty system started about 1885. A tax was established on sugarbeets which was refunded on all sugar exported. The refund was based on a recovery of 8.51 pounds of sugar per 100 pounds of beets. Actual recovery averaged 11.76 pounds in 1885 and 12.01 pounds in 1891. The subsidy gradually increased over time as the sugar content of the beets increased, largely a result of scientific research.

U.S. and English Imports of Beet Sugar

Most of the beet sugar exported from continental Europe in the last half of the 19th century went to England and the United States. The United States, as a measure of protection from what would now be called dumping, adopted countervailing duties starting in 1890. This did not completely stop the imports, and some shipments of beet sugar from Europe to the United States continued until the European nations took steps to abolish the export subsidies at the start of the 20th century. Most of the beet sugar going to the United States was in the form of raw sugar, primarily because the tariff was higher on refined sugar than on raw sugar. This protected U.S. refiners.

England took a different attitude toward the importation of subsidized sugar. England had imposed an import duty on sugar from 1651 to 1846. Starting in 1846, with the enactment of the corn laws, duties on sugar were generally reduced, the reductions being greater on sugar from foreign countries so that the preference to British colonies was reduced. Sugar became free of duty in England in 1874 and remained free until 1901.

The timing of England's movement to free trade in sugar corresponded rather closely with the rise of export bounties by the continental countries. Presumably this was accidental. In any event, by 1901 most of the sugar imported into England was beet sugar, and the price of sugar in London in 1899 was less than half that prevailing in 1872.

This produced several noteworthy results. First, British sugar producing colonies in the Caribbean and elsewhere, which had been highly prosperous in the 18th and early 19th centuries, were by 1900 reduced to a very impoverished condition. The price at which they could sell their sugar had declined drastically. Substitute crops which could be grown profitably were not generally available.

Also, the cane sugar refining industry in England suffered severely, and many refineries were closed because of the large imports of refined beet sugar.

The same cheap sugar that impoverished the British sugar colonies and damaged the refining industry was highly beneficial to English consumers. It was especially beneficial to persons engaged in manufacturing such sugar-containing items as jams, marmalade, confectionery items, and sweet baked goods. These industries developed rapidly using cheap sugar. And in some cases they were able to export some of their sugar-containing products to the countries from which they had obtained subsidized sugar.

Brussels Convention

As the volume of sugar exported with the aid of bounties increased, the cost to the bounty paying countries also rose, imposing an increasingly severe financial burden on them. As early as 1851 France began looking for ways of removing or at least reducing this burden. Beginning in 1863 a number of conferences were held among the nations concerned, including England. However, it was not until 1901 that effective action to suppress the subsidies was taken at the Brussels Convention.

The avowed intention of the Brussels Convention was to equalize competition between beet and cane sugar exported from various countries and to promote the consumption of sugar. To accomplish this the signatories agreed to abolish all direct and indirect bounties on the export of sugar and to limit surtaxes from the effective date (Sept. 1, 1903) of the convention. The surtax was defined as the difference between the rate of duty or taxation to which foreign sugars were subject and that imposed on the home product. It was not to exceed 6 francs per 100 kilograms on refined sugar or 5 francs 50 centimes per 100 kilograms on other sugar.

The contracting parties also agreed to either refuse entry to sugar from countries granting bounties on the production or export of sugar or to impose special duties on such imports. The special duty was to be not less than the bounty granted in the country of origin.

No preferences were to be granted to sugar produced in colonies. Each country which was party to the convention agreed to admit sugar from other member countries at the lowest rate of import duty imposed on sugar from any other country, and they agreed that cane and beet sugar would be subject to the same rates of duty.

The convention, with modification and the admittance of some new members (the United States was never a member) remained in effect until the outbreak of World War I. During the time it was in effect, sugar consumption in continental Europe increased greatly, as domestic prices were reduced. Beet sugar production remained profitable in most countries where it had developed and production began to increase in the years immediately prior to World War I.

The Brussels Convention is generally regarded as the first effective international agreement regulating trade in sugar. Numerous attempts, some of them reasonably successful, have followed the effort at Brussels.

Developments in the Corn Wet Milling Industry

The small beginnings of the production of sweeteners from starch, which had been made in the United States prior to the Civil War, were gradually expanded after the end of the conflict, first by the establishment in 1873 of a plant in Buffalo, New York. Major outlets for the dextrose produced from cornstarch in this plant were to manufacturers of vinegar and to the brewing industry. Soon other plants producing sweeteners from cornstarch were established, and by 1879 sweeteners had become a major outlet for cornstarch, although the sugar being manufactured was quite crude (70 to 80 percent dextrose) by today's standards.

However, by 1880 a process had been developed for producing relatively pure anhydrous dextrose.⁴ Commercially successful methods of manufacturing dextrose hydrate were not developed until considerably later. Since this development, most of the commercial production of dextrose has been in the form of dextrose hydrate rather than anhydrous dextrose.

During the time when methods for producing dextrose were being developed, the industry was also developing improved ways of producing and marketing corn sirup. Sirup represents an intermediate state in conversion of starch into dextrose. It consists of a mixture of dextrose and other saccharides, exclusive of sucrose. The proportion of the various saccharides in the mixture can be controlled to a considerable

⁴Anhydrous dextrose contains no chemically combined water in contrast to the more commonly sold product in recent years—dextrose hydrate—which contains one molecule of water chemically combined with each molecule of dextrose.

extent by the manufacturer, so that various types of sirup have been produced and marketed for many years. Buyers' preferences vary according to the use they make of the sirup.

Most of the early plants built to produce sweeteners from starch in the United States were constructed in the Northeastern States. Since about 1880, however, production facilities have become concentrated in the Corn Belt with the largest number of plants in Illinois and Iowa. With one exception, all

plants producing sweeteners from starch have used corn as their raw material since 1873. A plant in Corpus Christi, Tex., built after World War II, sometimes uses grain sorghum.

Most of these plants have always produced starch for sale as well as converting starch into corn sirup or dextrose. The industry producing these products since late in the 19th century has been called the corn wet milling industry, since the corn is softened with water before being ground.

CHANGES IN U.S. SUGAR TRADE FOLLOWING THE SPANISH-AMERICAN WAR AND DURING 1900-15

At the end of the Spanish-American War in 1899, Cuba, Puerto Rico, and the Philippines were transferred to U.S. control, although Cuba's independence was recognized in the peace treaty and the United States promised eventual independence to the Philippines. U.S. policy toward these territories encouraged the development of the sugar industry in each of them (32).

Changes in Tariff Duties

Following the Spanish-American War, Puerto Rico became a possession of the United States. Since 1902 sugar produced there has been admitted to the United States free of duty, and the import duty on Philippine sugar was reduced to 75 percent of the general rate in 1902. The Philippine Islands were allowed to send as much as 300,000 tons a year to the United States free of duty beginning in 1902. In 1914 the limit was removed, and all Philippine sugar was admitted duty free, until after World War II. A treaty of reciprocity with Cuba became effective in December 1903. Under the treaty, the United States established the duty on sugar from Cuba at 80 percent of the general rate, thus granting Cuba a 20-percent preferential. The most important immediate effect of this preference was to make the duty on raw sugar (96-degree polarization) from Cuba 1.348 cents a pound, as compared with 1.685 cents for other countries (55).

Changes in Production

Sugar producers in the three areas responded to the changes in the U.S. tariff by increasing their output. Cuban production reached a million tons in 1891-95 and then declined to less than a third of that amount during the revolutionary struggle with Spain. But Cuba recovered its former level by 1901-5 (table 1). Production continued to increase and exceeded 2.5 million tons a year during 1911-15.

Puerto Rican production also declined during 1896-1900 but much more moderately than in Cuba. The increase in production in the next 15 years, however,

was sufficient to raise Puerto Rican sugar output substantially above previous levels.

The low point of Philippine sugar production was reached about 5 years later than in the two other areas. Political instability continued for a longer time than in Cuba or Puerto Rico. Also, the recovery of production, while substantial, proceeded at a slower rate. Duty-free entry to the United States, limited to 300,000 tons of sugar a year from 1909 through 1914, helped to keep industry expansion in the Philippines from exceeding this figure, plus the amount needed for domestic consumption in the Islands. Production in the Philippines achieved its major expansion following World War I.

U.S. production of beet sugar, which reached 92,000 tons, raw value, for the first time in 1855, continued to increase rapidly. It reached a peak of 935,000 in 1915. At that time, helped by the outbreak of war in Europe, beet sugar produced in this country first became an important source of U.S. sugar (22). In 1900, beet sugar provided only 3.8 percent of the total supply; by 1915, it contributed 19.8 percent. After a long period of trial and error, people interested in the commercial production of beet sugar began to learn how and where sugarbeets could be grown prof-

Table 1—Sugar production in Cuba, Puerto Rico and the Philippines, prior to and following the Spanish-American War, 5-year averages, 1891-85 to 1911-15

5-year average	Cuba	Puerto Rico	Philippines
	----- 1,000 short tons -----		
1881-85	626	87	189
1886-90	733	70	186
1891-95	1,061	63	287
1896-1900	313	61	135
1901-05	1,065	141	110
1906-10	1,564	282	146
1911-15	2,548	390	358

Source: Puerto Rico and the Philippines, Yearbook of Agriculture 1924, U.S. Dept. of Agr. Cuba, the Agriculture of Cuba, by P. G. Minneman, U.S. Dept. of Agr. For. Agr., Bul. No. 2, 1942.

itably. In this they received substantial help from USDA plant scientists.

Sugar production in Hawaii also increased rapidly during this period, rising from 252,000 tons in 1900 to 640,000 in 1915. The rise continued the expansion that began in 1876 with the treaty of reciprocity between the United States and the Kingdom of Hawaii. The expansion after 1900 was further encouraged by the annexation of Hawaii as a U.S. territory.

In contrast to trends in other areas, Louisiana production, although fluctuating widely from year to year, tended somewhat downward (23). Annual production in 1900-4 averaged 348,000 tons; in 1911-15, only 242,000 tons. The decline appears to have been largely the result of production difficulties caused by adverse weather (mainly frost), diseases, and insect damage.

Sugar Consumption

Total U.S. sugar consumption expanded rapidly during this period. In 1911-15 it rose to more than three times the level in 1881-85 (table 2). Much of the increase resulted from the increase in population, but per capita consumption also grew substantially.

Table 2—Sources of supply for U.S. sugar consumption, 5-year averages, 1881-85 to 1911-15

5-year average	U.S. production		Net imports	Consumption ²	
	Mainland	Insular		Total	Per capita
	----- 1,000 tons -----			Pounds	
1881-85 ...	133	---	1,172	1,305	47.6
1886-90 ...	173	---	1,457	1,630	53.3
1891-95 ...	295	---	1,899	2,194	64.9
1896-1900 .	345	83 ¹	1,945	2,373	64.0
1901-05 ...	604	540	1,824	2,968	72.5
1906-10 ...	848	818	1,898	3,564	79.3
1911-15 ...	1,021	1,070	2,095	4,186	86.1

¹ Beginning in 1900 when production was 416,000 tons. ² No allowance has been made for changes in inventory.

Most of the sugar for the increased consumption came from domestic sources, particularly after 1900, when Hawaiian and Puerto Rican output became part of the domestic supply. Although imports had increased substantially up to 1900, they declined somewhat in the following years and did not exceed their 1896-1900 average until 1911-15. The percentage of consumption supplied by imports declined throughout the period. Before 1900, imports accounted for more than 80 percent of U.S. consumption. The inclusion of supplies from Hawaii and Puerto Rico resulted in a sharp drop in the import share to about 62 percent in 1901-5. The proportion imported declined further to 50 percent in 1911-15.

Changes in Sources of Imports

Not only did the relative importance of imports as a source of supply decline following the Spanish-American War, the comparative importance of different sources of sugar imports shifted greatly. These shifts were largely the result of preferential tariff rates, which the United States granted to Puerto Rico, the Philippines, and Cuba, and the removal of export bounties on sugar by European beet sugar producing countries, as provided by the Brussels Convention. During the 15 years prior to 1896, about 45 percent of U.S. sugar imports came from Cuba, some 7 or 8 percent from the Philippines, and the rest from other countries.

Imports from Cuba declined greatly during the revolution which began in that country some years before the Spanish-American War. However, these imports recovered rapidly, and in 1901-5, about 60 percent of sugar imported into the United States came from Cuba. This percentage increased to 90 percent in 1911-15.

The trend of imports from the Philippines was similar to that of Cuba, on a much smaller scale. Imports from the Philippines, because of continuing civil disorder, reached a low point 5 years later than the low for Cuba.

Receipts of sugar from countries other than Cuba and the Philippines, which averaged about 48 percent of all U.S. imports of sugar prior to the Spanish-American War, rose to 80 percent during 1896-1900 and then declined rapidly, amounting to less than 40 percent in 1911-15. During this period, imports of beet sugar from Europe almost disappeared. Imports of cane sugar, most of which had come from other countries in the Western Hemisphere, declined more slowly but were reduced to a very low level prior to World War I.

Reciprocity with Cuba

The treaty of reciprocity with Cuba, which became effective on December 27, 1903, aroused considerable controversy among representatives of the U.S. sugar industry while under consideration by the Congress. In general, sugarbeet growers and processors were opposed to granting a preferential rate of duty on Cuban sugar. The main force of their arguments was that the proposed preferential would reduce the protection received by the domestic sugar industry, including the beet industry. The refiners, on the other hand, supported the granting of a preferential rate on sugar from Cuba. Cuba was a convenient place from which to obtain raw sugar for refining. It was relatively nearby and large supplies could, if needed, have been obtained in a short time (55,68). The proponents of reciprocity prevailed and Cuban sugar entered this country at a preferential rate of duty until 1960.

Economic Effects, 1904-9

The economic effects of reciprocity with Cuba appear to have differed somewhat from those anticipated by the opponents of the treaty, especially during the first years the treaty was in effect (68). During the first 5 years (1904-9) after the treaty became effective, practically all the sugar exported from Cuba came to the United States (table 3). Also, U.S. imports of sugar from countries other than Cuba and the Philippines continued in considerable volume during 1904-9. In the following period, 1910-14, the volume of Cuban sugar exports to the United States continued to increase, but total sugar exports from that country increased even faster. Consequently, about 8 percent of Cuban exports in 1910-14 went to countries other than the United States, compared with only 0.2 percent during the previous period.

When practically all Cuban sugar exports came to the United States, and the United States also imported substantial quantities of sugar from other countries at the full rate of duty, Cuban sugar producers apparently were receiving the full benefit of the U.S. tariff preferential. The price paid for Cuban sugar delivered in the United States was the same as that for sugar from other countries and the difference in rates of duty, 0.337 cent a pound on sugar polarizing at 96 degrees, accrued to producers in Cuba. With average annual exports to the United States of 1,324,000 tons during 1904-9 these benefits amounted to \$8,924,000 a year.

The principal effect in the United States of the Cuban preferential during this period was to reduce U.S. Treasury receipts by the amount gained by Cuban sugar producers. U.S. sugar prices were not affected by the preferential, since the full-duty rate applied to a sizable quantity of imports and remained the effective rate so far as internal prices in this country were concerned.

The effect of the Cuban preferential on other sugar exporting countries during 1904-9 was also minor. The volume of their exports to the United States was reduced, but supplies of Cuban sugar in their other

export markets were greatly reduced or disappeared. The principal result was that the relative importance of the United States and other countries as outlets for their sugar was altered. Trade patterns shifted.

Economic Effects after 1909

Beginning about 1910, Cuban sugar exports reached a level higher than could be exported to the United States at prices equal to those offered by other importing countries. When this point was reached, exports of Cuban sugar to countries other than the United States began growing in volume and U.S. imports of sugar from countries other than Cuba and the Philippines were reduced to very low levels.

With these shifts in trade, the preferential rate on Cuban sugar, rather than the full-duty rate, became the effective U.S. tariff level. If the general duty had been reduced by 0.337 cent a pound, the amount of the preference, the effect in the United States would have been similar. This reduction lowered the protection offered the domestic sugar industry and imports of duty-free sugar from the Philippines. Also, it presumably resulted in a slight increase in U.S. sugar consumption. The rise was restricted by the inelasticity of demand for sugar in this country.

When the U.S. preferential rate for Cuban sugar became the effective rate, the advantage to Cuban sugar producers largely disappeared. Cuban sugar, f.o.b. Cuba, sold for the same price whether destined for the United States or some other country. Two advantages remained for Cuban producers. One was a secure market in the United States for a large quantity of sugar in case other markets declined in importance or disappeared. The other was slightly larger exports to the United States. Lower prices here encouraged consumers to buy more sugar and presumably slowed somewhat the expansion of the domestic sugar industry, resulting in slightly larger exports. Both these advantages were too slight to be measured statistically.

Similarly, the fact that the Cuban preferential rate

Table 3—Exports of Cuban raw sugar to the United States and other countries and U.S. imports from other countries, 1900-03 to 1910-14¹

Average ¹	Exports from Cuba			U.S. imports from countries other than Cuba and the Philippines
	Total	To United States	Share to United States, centage of total	
	----- 1,000 tons -----		Percent	1,000 tons
1900-1903	877	870	99.2	939
1904-1909	1,327	1,324	99.8	574
1910-1914	2,138	1,964	91.9	150

¹ Years ending June 30.

Source: U.S. Tariff Commission Report, "The Effects of the Cuban Reciprocity of 1902," 1929. Last column from Sugar Statistics and Related Data, Vol. 1, Bul. 293, Agr. Stabil. and Conser. Serv., U.S. Dept. of Agr.

became the effective U.S. rate of duty had only slight effect on exporting countries other than Cuba and the Philippines. It became necessary for them to sell their sugar in other than U.S. markets, but they could still sell it at the same price producers in Cuba were receiving for sugar sold in the United States and other countries, so long as tariffs were the only obstacle to exports.

The chief effect of the change in trade position occurring about 1910 may be summarized as being the transfer of the advantage obtained from the Cuban preferential from Cuban sugar producers to U.S. consumers.

The treaty of reciprocity with Cuba dealt with many commodities other than sugar. A discussion confined to sugar, even though it was the most important commodity concerned, obviously cannot evaluate the entire effects of the treaty. However, consideration of these other aspects is beyond the scope of this report.

New Capital Investments in Cuba

The stabilization of political and economic conditions in Cuba and other areas where Spain relinquished control was speedily followed by a sizable flow of capital to these areas from U.S. sources and, to a lesser extent, from other countries. Prior to the Spanish-American War, U.S. citizens had made certain investments in Cuba, estimated at \$50 million. The end of fighting in Cuba and the U.S. occupation for a few years resulted in the establishment of an independent government on democratic lines. And the acceptance by Cuba of the Platt Amendment as part of its constitution greatly encouraged additional investments in Cuba by U.S. citizens. The Platt Amendment, a law enacted by the U.S. Congress, was proposed to Cuba for inclusion in its constitution as a means of facilitating U.S. withdrawal from Cuba and the recognition of its new Government. The most important provision permitted the United States to intervene in Cuban affairs whenever necessary to maintain civil order in that country (25,46,58).

These assurances greatly encouraged further investments in Cuba, since they promised to contribute to continued political stability there (28). Also, the U.S. tariff preferential on Cuban sugar at first promised to increase the profitability of investments in the Cuban sugar industry. An additional attraction for firms engaged in sugar refining in the United States came from their ability to ship their own sugar to their U.S. refineries (6). This form of integration gave them added assurance of the availability of at least part of the supplies for their refining operations whenever needed and of greater control over the quality of the raw sugar they received.

The first rush of American investment in Cuban sugar properties occurred immediately after the end of the Spanish-American War. Large additional

investments were made during and shortly after World War I.

In 1915 U.S. interests owned 43 of the 170 mills then operating in Cuba; in 1940 the proportion was 67 of 174. However, the American mills in most cases were considerably larger than other mills, and American-owned mills produced half or more of the total Cuban sugar output. American investors also owned large areas of Cuban land that were used to produce sugarcane, but in most cases, they were not large enough to supply all of the sugarcane processed by their mills. Consequently, sugarcane was also purchased from independent Cuban growers known as colonos.

Capital Investments in Puerto Rico

The movement of U.S. capital into the Puerto Rican sugar industry occurred at about the same time as that in Cuba, but on a considerably smaller scale, as the area suitable for growing sugarcane is much smaller in Puerto Rico than in Cuba. As soon as sugar from Puerto Rico was admitted duty free to the United States, sugar producers there possessed the same economic advantage over those in Cuba as producers in the continental United States and Hawaii, and later, the Philippines.

The combined production of all duty-free areas did not equal U.S. sugar consumption, and imports of Cuban sugar continued in volume. Consequently, producers in areas such as Puerto Rico with duty-free entry into the United States continued to receive protection from the tariff on sugar from Cuba.

Capital Investments in the Philippines

Extensive investments by U.S. citizens in the Philippine sugar industry developed more slowly than in Cuba and Puerto Rico and remained less important relative to the total size of the industry there. Sugar was less important in the economy of the Philippines than in that of Cuba or Puerto Rico. Also, the limit on duty-free imports may have combined with uncertainties about the islands' future political status to slow investment in the Philippines, since they were promised eventual freedom.

Distance was another factor that was especially important before the Panama Canal opened in 1914. Hawaiian cane and California beet sugar amply supplied the sugar needs of the western United States, and the route from the Philippines to northeastern U.S. ports, the primary market for imported sugar, was even longer than at present.

The Sugar Trust after 1902

The sugar trust, which developed late in the 19th century and was incorporated as The American Sugar Refining Company in 1891, continued to expand its

sugar interests until checked by Government suit brought in November 1910 (37). The acquisition of sizable blocks of stock (in some cases a controlling interest) in several sugarbeet processing companies was among the more important of its later expansionist moves. Beet sugar companies in which The American Sugar Refining Co. purchased stock included The American Beet Sugar Co., Spreckles Sugar Co., Michigan Sugar Co., The Great Western Sugar Co., Utah-Idaho Sugar Co., and The Amalgamated Sugar Co. (39). According to Vogt (62),

"The best information available is that in 1905, out of a total of fifty-seven active factories, The American Sugar Refining Co. was supposed to hold one-half or a controlling interest in thirty-five factories, representing a capacity of 28,700 tons of beets daily while the independent companies had twenty-two plants with a capacity of 13,150 tons." "This placed the Trust in virtual control of 68.7 percent of the beet sugar produced in this country. For the campaign of 1906, twelve new plants were building, with a daily capacity of 9,250 tons, and of these The American Sugar Refining Co. had an interest in at least five with 3,000 tons capacity, or about 39 percent of the total. If all investments of the Trust, as such, or if the holdings in beet sugar by prominent Trust stockholders were known, the probabilities are that this percent would be greater still."

The Company also had an indirect interest in the Hawaiian sugar industry through its one-half ownership of the Spreckles Sugar Company of California. The remaining share of the ownership was controlled by interests which also owned large sugar properties in Hawaii (37).

The suit instituted by the Government in November 1910 was finally settled by a consent decree dated December 29, 1921. In a statement issued to its stockholders by The American Sugar Refining Co. at the time the settlement was recommended to the Court, the U.S. Attorney General was quoted as saying that—

"It is believed that The American Sugar Refining Company is no longer a trust or monopoly. At the time the suit was commenced the American and its allied interests controlled about 75 percent of the refined sugar industry of the United States. At the present time, the control of the American has decreased to the point where it now controls about 24 percent of the industry. Under the change of management of the Company which took place

about the time of the beginning of this suit the Company has since endeavored to comply with the law and the Government's requirements. It has during recent years entirely discontinued the practices which were the cause of the chief complaints against it in the suit. It is believed that the consumer of sugar can now rest assured that competitive conditions in the industry have been entirely restored and that the price he pays for his sugar in the future will be the result of natural unrestrained competition. The consequence of this decree, which finally disposes of such long pending litigation, will doubtless prove beneficial to all branches of the sugar industry in this country, including both cane and beet sugar industries in the United States, and it is hoped that it will be of some benefit to the world-wide raw sugar situation, including that of Cuba."

Corn Sweeteners

By 1900 several efforts had been made to combine large segments of what was then commonly called the glucose or starch industry in the United States into a single ownership or control for the purpose of increasing profits (63). These culminated in 1902 in an amalgamation called the Corn Products Company (59). This company obtained control of about 71 percent of the production capacity of the industry in the United States. In addition, the Corn Products Company acquired 49.7 percent of the stock of another company with 9 percent of the industry's capacity. Later, still other acquisitions were made. The 50.3 percent of the stock in the company in which the Corn Products Refining Company held a minority interest was owned by persons having financial interests in the Standard Oil Company. These persons placed their stocks in a holding company so that the Corn Products Company was unable to acquire any of it.

Meanwhile, persons connected with the Standard Oil Company, some of whom apparently also had interests in the glucose industry, had acquired large blocks of stock in The American Sugar Refining Company, providing a link in ownership between the dominant companies in the sugar and corn sweeteners industries.

In 1916 the courts held the Corn Products Refining Company an unlawful combination in restraint of trade and ordered the sale of certain properties and imposed certain other restraints designed to eliminate the company's monopoly power. The Corn Products Refining Company was allowed to continue its operations but retained only three plants, two in Illinois and one in New Jersey (61).

Saccharin

The commercial production of saccharin began in 1901. Saccharin is a chemical made from non-agricultural materials which is about 300 times as sweet as sugar. It has no nutritive value. In addition to tasting sweet it also tastes bitter to some, but not all, consumers.

The principal use of saccharin for many years was by people who for health reasons could not consume sugar. Consequently, it did not compete seriously with sugar in the marketplace during its early history. Later there were changes in this situation and the importance of saccharin as a sweetener increased.

Tariff Changes Before World War I

Except for the preferential reduction in the duty on sugar from Cuba in 1903, the general or full duty rate on raw sugar remained unchanged from 1897 to March 1, 1914. At that time the full duty rate on raw sugar (96-degree polarization) was reduced to 1.256 cents per pound and on sugar from Cuba to 1.0048 cents. The law as enacted provided that all sugar should be placed on the free list on May 1, 1916. This provision was repealed April 27, 1916.

The reduction in the tariff rate on sugar in 1914 was part of a movement toward freer international trade initiated by President Wilson and embodied in the Underwood-Simmons Tariff. It marked the low point in the duty on sugar since the Civil War.

SUGAR DURING WORLD WAR I

Before war broke out in Europe in August 1914, world sugar production had been increasing rapidly, rising 60 percent in crop years from 1902/3 to 1913/14. Europe was the largest producer by a substantial margin, accounting for about 42 percent of total world output in 1909-13 (table 4). Nearly all European production took place on the Continent and about 99.8 percent was beet sugar; the rest was cane sugar produced in Spain.

Europe as a whole, exclusive of England, was also a large exporter of sugar, providing about 35 percent of total world exports during 1909-13. The only other countries with sizable exports were Cuba, with 27 percent of the total, and the Dutch East Indies, with 19 percent.

U.S. imports of sugar during this period amounted to about 30 percent of the world total and those of the United Kingdom, 26 percent. Most of Britain's sugar imports during this period consisted of beet sugar produced in continental Europe. More than 50 percent of Britain's imports in the immediate prewar years came from Germany and Austria-Hungary.

Shifts in Production

Much of the European beet sugar industry was destroyed during World War I. European production declined from 1909/10 to 1913/14 about 58 percent to 8,134,000 tons. The greatest decline, 95 percent, occurred in Russia, where revolution added to the destruction resulting from the war with Germany and Austria-Hungary. French production declined 78 percent, and German, 65 percent.

Sugar production in most non-European countries tended to increase during World War I, although not enough to offset declines in Europe. Thus, total world output in 1919/20 to 17,867,000 tons was about 3 percent below the prewar average. The largest

increase in production was in Cuba, where output rose 82 percent to 4,184,000 tons in 1919/20. The 1919/20 Cuban crop amounted to 23 percent of

Table 4—World sugar production and trade yearly average 1909-13¹

Area	Production	Imports	Exports
--- 1,000 tons ---			
Europe: ²			
Germany	2,304	3	873
Russia	1,557	4	294
Czechoslovakia	1,221	4 ³	848 ³
France	808	186	207
Poland	702	---	---
United Kingdom	---	1,854	33
Other	1,542	355	378
Total	8,134	2,406	2,633
Asia:			
India	2,649	716	24
Java	1,485	4	1,413
Other	563	632	257
Total	4,697	1,352	1,694
North America:			
United States	1,893	2,123	40
Cuba	2,287	1	2,010
Other	526	300	178
Total	4,706	2,424	2,228
South America	856	144	294
Africa	457	186	235
Oceania	301	140	93
Other countries	---	473	297
World	19,151	7,125	7,472

¹ Crop years for production, calendar years for trade.
² Estimates for boundaries established after World War I. ³ Prewar Austria-Hungary. ⁴ Included in German, Russia, and Austria-Hungary.

Source: U.S. Dept. of Agr., Agriculture Yearbook 1924.