

The Bittersweet Tale of Sorghum Sugar

by Homer E. Socolofsky

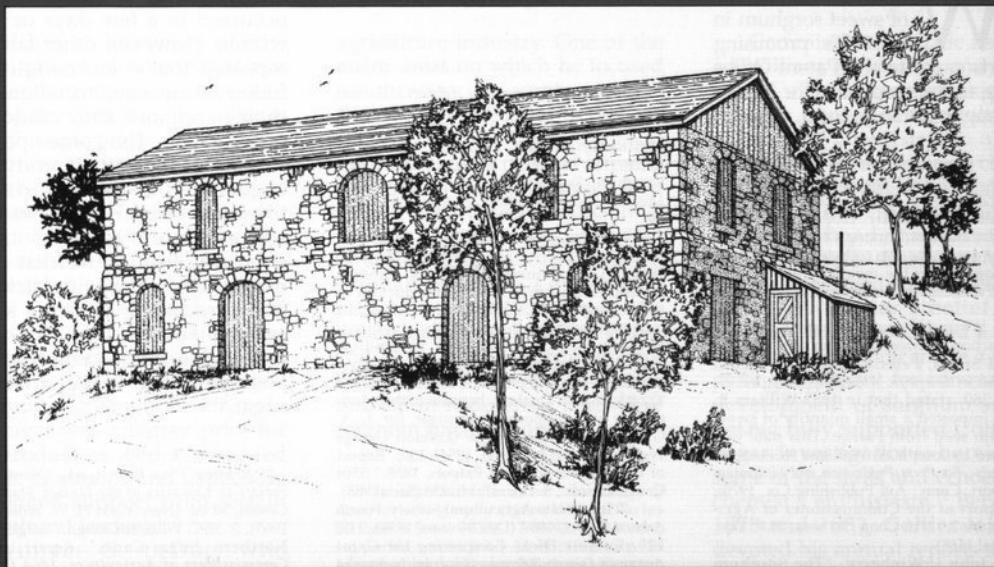
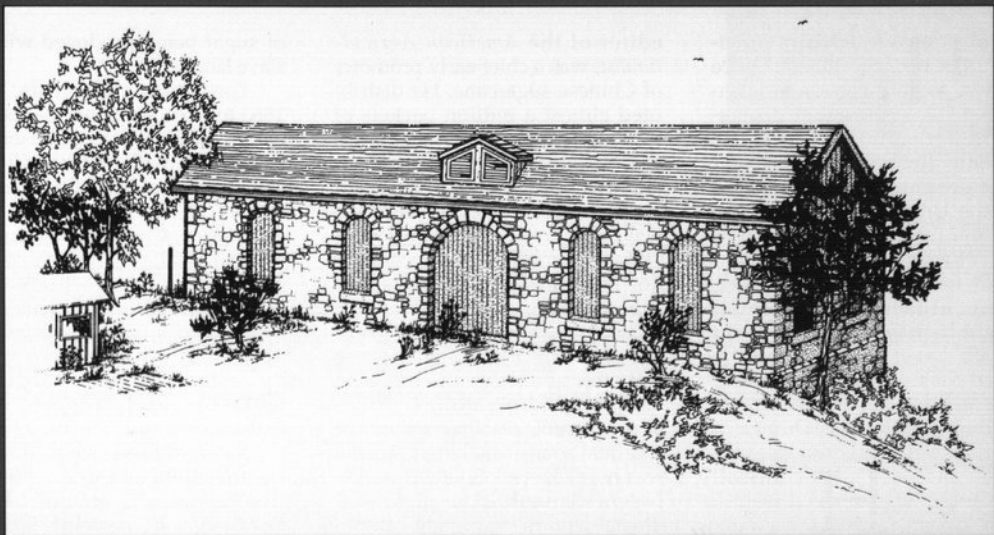
Historically, sweeteners have played a major role in the diets of the American people. In the first half of the nineteenth century, cane sugar production in the United States was limited by climate to small slaveholding areas just north of the Gulf of Mexico. Sugar was therefore an expensive product. As an alternative, syrups and sugar were widely produced in the home. Making maple syrup and maple sugar was a common late-winter household activity in northern states, and many families kept bees for honey. These products were relatively inexpensive compared with "store-bought" sugar, which was absent from most families' diets. Therefore, the development of a new sweetener, sorghum sugar, a product formerly obtained only by laborious work or by purchase, was viewed favorably in the antebellum "do-it-yourself" economy.

Major production of sugar from sorghum was not attempted in Kansas until the 1880s. By that time federal, state, and local governments were promoting the quest for sorghum sugar, which was reputed to supply both a new crop for farmers and a new product to fill an economic demand. It marked one of the first times, other than enactments of various land laws, that happenings in Washington strongly influenced economic outputs in Kansas. (After 1890 all of these state and federal governmental programs collapsed.)

However, before Kansas became an active player in sorghum sugar production, the new crop had already experienced a difficult history. Contemporary information about the first sweet sorghums in this country is confusing and contradictory. D. Jay Browne, agricultural agent for the U.S. Patent Office, provided the first notice of the crop in 1854 when he said that Chinese Amber sorghum had come from China by

Homer E. Socolofsky is an emeritus professor of history and university historian at Kansas State University. His interest in the Kansas sorghum sugar industry stems in part from his youth in Marion, Kansas, where, during the 1930s, he and neighboring children often played in the "old sugar mill." No one in the neighborhood gang questioned the identity of the sugar mill, and disclosure of its history came many years later.

The author would like to thank Robert M. Frame II, Minnesota Historical Society, who alerted him to Agriculture Commissioner William G. LeDuc's role in the sorghum sugar story. LeDuc's papers are at the Minnesota Historical Society.



Front (top) and back views of the Marion County Pioneer Sorgho Sugar Factory, the first sorghum sugar mill built in Kansas. Erected in 1880, it shut down in 1881 at the end of the sorghum season. Drawings by Elizabeth Socolofsky-Howe.

way of France four years previously.¹ Because the Patent Office released sorghum seeds to farmers in 1854, subsequent discussion in agricultural reports use that date almost exclusively for sweet sorghum's introduction into the United States. In addition, the fifteen or sixteen varieties of sweet sorghum imported in 1857 from Natal, South Africa, were confused with sorghum brought from France.² Until about 1880 all sweet sorghums in the United States came from either Chinese Amber or South African introductions. Kansas Orange, a strain of sweet sorghum released in 1881 and widely used in eastern Kansas, was derived from a South African variety.³

With the introduction of sweet sorghum in the 1850s, promising reports came to the Patent Office telling of the crop's use for fodder and sugar.⁴ Orange Judd, popular

editor of the *American Agriculturalist*, was a chief early promoter of Chinese sugarcane. He distributed almost a million packets of sorghum seeds to interested farmers. Beginning in 1854 Isaac A. Hedges of St. Louis also was a leading visionary on behalf of the new sugar crop.⁵ In 1858 the Patent Office claimed great success for northern growers.⁶ Encouraging reports came from Iowa and Nebraska, where farmers were able to produce raw sugar. These and other northern states provided bounties and premiums.⁷ However, favorable response to hints of sorghum's sugar-making potential was not universal. Southern newspapers were suspicious of governmental reports suggesting competition for southern cane sugar producers and especially the thought

of sugar being produced without slave labor.

For almost eight years, from 1863 to 1870, the *Sorgo Journal and Farm Machinist* was published at Cincinnati, with William Clough as editor. In the 1864 annual *Report of the Commissioner of Agriculture*, Clough wrote an article that dealt with sorghum origins, growing methods, and machinery needed to produce syrup and sugar. Because millions of dollars had been saved by using sorghum-sugar or molasses, early reports were enthusiastic.⁸

Much of this early confidence stemmed from the granulation of pale yellow or light brown, unrefined sugar by northern farmers. Often accidental sugaring of sorghum molasses in the barrel occurred in a few days or over winter.⁹ However, other farmers reported that even though they followed the same techniques as their neighbors, they could not obtain sugar. The contemporary, successful history of producing sugar from beets was used to illustrate similar problems that manufacturers had previously overcome to produce that commercial crop. The unpredictability of producing sorghum sugar caused editor Clough to acknowledge in 1865 that there "is absolutely no 'royal road' to sugar."¹⁰

1. "Report of the Commissioner of Patents, 1854," 33d Cong., 2d sess., S. Doc. 42, xxii, 220 (Serial 755). According to the *Yearbook of Agriculture*, 1936 (Washington, D.C.: Government Printing Office, 1936), 526, Chinese sugarcane was collected on the island of Tsungming in the mouth of the Yangtze River. Presumably Chinese seed originated in Africa.

2. While 1851 was Browne's date for introduction of sweet sorghum seed into the United States, Peter Collier, in a speech reported in *Scientific American* 52 (April 25, 1885): 260, stated that in 1853 William R. Prince imported a small quantity of sweet sorghum seed from France. This date was also used by Joseph W. Wall and William M. Ross, eds., *Sorghum Production and Utilization* (Westport, Conn.: Avi Publishing Co., 1970), 3; "Report of the Commissioner of Agriculture, 1862," 37th Cong., 3d sess., H.R. Doc. 78 (Serial 1168).

3. John J. Winberry, "The Sorghum Syrup Industry, 1854-1975," *Agricultural History* 54 (April 1980): 351.

4. The U.S. Bureau of Agriculture did not exist until 1863. Before that year the U.S. Patent Office dealt with agricultural matters and was primarily concerned with statistics.

5. George F. Lemmer, Norman J. Colman and Colman's *Rural World: A Study in Agricultural Leadership* (Columbia: University of Missouri Studies, 1953), 55; William M. Ledbetter, "Isaac A. Hedges' Vision of a Sorghum-Sugar Industry in Missouri," *Missouri Historical Review* 21 (April 1927): 361-69.

6. DeBow's *Review* (1857), in *Agriculture in the United States: A Documentary History*, ed. Wayne D. Rasmussen (New York: Random House, 1975), 1:577-78. The introduction of sweet sorghum at the height of abolitionist fervor naturally produced emotional responses about slave-produced sugar. See Andrew Van Hook, *Sugar: Its Production, Technology, and Uses* (New York: Ronald Press Co., 1949), 122-23; English Quakers, because of their anti-slavery bias, supported beet sugar. See L. A. G. Strong, *The Story of Sugar* (London: George Weidenfeld and Nicolson, 1954), 130; "Report of the Commissioner of Patents, 1858," 35th Cong., 2d sess., S. Doc. 47, vii, 233 (Serial 988).

7. Iowa State Agricultural Society, *Eighth Annual Report, 1857* (Des Moines: 1858), 118, 125. Everett Dick, *Conquering the Great American Desert: Nebraska* (Lincoln: Nebraska State Historical Society, 1975), 146; Iowa State Agricultural Society, *Eighth Annual Report, 1861-2* (1863), 8-9, and *Ninth Annual Report, 1863* (1863), 4. Reported sugar costs in Kansas Territory in 1856 were sixteen to twenty-two cents per pound.

8. Edna Titus Brown, ed., *Union List of Serials in Libraries of the United States and Canada*, 3d ed. (New York: H. W. Wilson Co., 1965), 5: 3997; William Clough, "Sorghum, or Northern Sugar-Cane," *Report of the Commissioner of Agriculture*, 1864 (Washington, D.C.: Government Printing Office, 1864), 11, 54-87.

9. *Scientific American* 41 (December 13, 1879): 385.

10. *Report of the Commissioner of Agriculture, 1865* (1865), 323-24.



The Tenth Biennial Report (1895-1896) of the Kansas State Board of Agriculture included this photo of a field of sorghum cane on a farm west of Medicine Lodge.

Although advocacy of sorghum cane as a potential source of merchantable sugar peaked during the Civil War, the collapse of high sugar prices with the end of the war reduced the economic incentive for producing sugar from northern sorghum. Interest in obtaining sugar at a low cost from northern crops almost disappeared. Memory of the potential of sugar from sorghum and its subsequent disillusionment retreated from the public mind. Crucial to the revival of interest in producing sorghum for making sugar was a higher price for the product as well as renewed public comment and especially prolonged support from certain agricultural leaders.

William G. LeDuc, who became commissioner of agriculture on July 1, 1877, carefully examined patterns and developments throughout the American

agriculture industry. One of the major areas on which he focused his attention was sorghum sugar. Later he wrote that he "found the sugar industry—one of the most important of our national interests connected with agriculture—in a greatly depressed condition."¹¹ LeDuc's support, along with that of agricultural editor Norman J. Colman of the St. Louis-based *Colman's Rural World*, and the timely experiments of H. A. Weber and M. A. Scovell, chemistry professors at the University of Illinois, resulted in widespread renewal of sorghum sugar activity.

11. Dumas Malone, ed., *Dictionary of American Biography* (New York: Charles Scribner's Sons, 1933), 11:92-93. LeDuc also supported research on American-grown tea and on animal diseases. More significant in the long run was a special appropriation to investigate animal diseases which led to the formation of the Bureau of Animal Industry. W. G. LeDuc, "Maize and Sorghum as Sugar Plants," *Report of the Commissioner of Agriculture*, 1877 (1878), 228-36.

Commissioner LeDuc assigned William McMurtrie and later Peter Collier, successive chiefs of the U.S. Bureau of Agriculture's division of chemistry, to apply the new analytic skills in chemistry to sorghum sugar experiments. When McMurtrie resigned to head the Bureau of Agriculture's Paris exhibit, Collier continued under LeDuc's directive. Collier's belief that sorghum stalks contained a high proportion of sugar made a compelling argument for commercial development of sorghum sugar. LeDuc fully supported Collier's sugar investigations; he visited some of the mills and echoed his chemist's enthusiasm.¹² Between 1878 and 1882, Collier largely devoted his annual reports to the new crop.

12. *Scientific American* 41 (December 13, 1879): 385.

In an 1879 move that made his publication unique among agricultural journals, editor Colman created a "Sargo" department for *Colman's Rural World*. He placed Isaac Hedges, affectionately known as "Old Sorghum," in charge, and the special sorghum column occupied a front-page position. Colman had often warned farmers of agricultural manias or crazes, which he regarded as expensive and unfounded, but sorghum was different: it was no mania. He confidently "predicted that within ten years more sugar would be made north of Louisiana than south of its northern boundary." In 1880 farmers organized the Mississippi Valley Cane Growers' Association with Hedges as its first president.

In the late 1870s Professors Weber and Scovell experimented with the manufacture of sorghum sugar and were among a group that established the Champaign Sugar and Glucose Company to enter the field of commercial sugar manufacturing. Weber maintained that in the Illinois "experiments with making sugar from sorghum, we have no such extensive failures to chronicle as in the case of the sugar beet." It appears, he wrote, "that crystallized sugar can be obtained from sorghum of as good a quality as that of the ordinary brown sugars found in the market."¹³

Thus the stage for promoting sorghum sugar moved from the private, frequently accidental farmers' experiments, to the U.S. government chemical laboratory. Commissioner LeDuc's leadership on behalf of sorghum sugar and Weber and Scovell's experiments prompted the premature development of the undercapitalized Marion County Pioneer Sorgo Sugar Factory, and its construction was duly recorded in *Colman's Rural World*.

In 1880-1881 three sorghum sugar mills were built in Kansas. The Marion County Pioneer Sorgo Sugar Factory was erected in 1880 at a cost of \$3,000, and the local newspaper extolled the enterprise as "ANOTHER BOOM!"¹⁴ Frequent references to the sugar mill appeared during the construction phase, but a strange silence followed its completion. Owing to belated arrival of the machinery and the poorest local sorghum crop in years, the 1880 "sugar campaign" saw the production of only five thousand gallons of molasses and no sugar. No newspaper account about the crop appeared in the 1881 harvest season, and the factory's subsequent failure went unnoticed by national leaders in the field. An explanation, eventually published in 1883, merely stated, "Sugar-making did not succeed."¹⁵ The

Central Arkansas Valley Sorghum Sugar Association erected a much larger enterprise in 1880 at Larned—the Pioneer Sugar Mill. The \$20,000 plant was promoted by John Bennyworth who expected to employ seventy-five people to make ten thousand pounds of sugar per day and additional molasses. Like the mill in Marion, this one shut down at the end of the 1881 season and never re-opened in Larned. Far less was recorded about the Ellsworth Sugar Works Company, built in the west part of Ellsworth in 1881. Reputedly a \$25,000 investment that would employ seventy-five hands, it failed like the others.¹⁶

After George B. Loring replaced LeDuc as commissioner of agriculture on July 1, 1881, Collier lost the support he needed for government-sponsored sorghum sugar research. He was dismissed as chemist, creating the impression that Loring opposed, or at best was indifferent to, sorghum sugar prospects. Loring announced that Collier's Washington experiments for manufacturing sorghum sugar cost nearly \$52 per pound, a price "so expensive and unsatisfactory that the work can be conducted better elsewhere." The situation "savors of sarcasm," reported the *New York Times*.¹⁷

Although removed from his government job, Collier tried

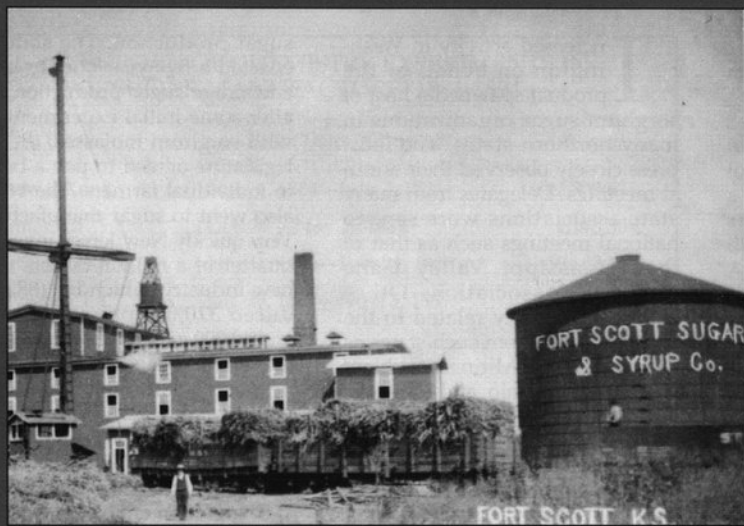
13. Lemmer, *Norman J. Colman*, 56-57, 81; H. A. Weber, "The Sorghum-Sugar Industry," in Illinois Department of Agriculture, *Annual Report*, 1881 (Springfield: H.W. Rokker, 1882), 493. See Harvey W. Wiley—*An Autobiography* (Indianapolis: Bobbs-Merrill Co., 1930), 176; H. A. Weber, "Sorghum," *Transactions of the Illinois Department of Agriculture* (1880), 417-32.

14. *Marion County Record*, Marion, March 26, 1880. "Sorgo" was used synonymously with sweet sorghum. It was a "name of convenience applied to the juiciest, sweetest stemmed variants" of sorghum. See John H. Martin, "Sorghum Improvement," *Yearbook of Agriculture*, 1936, 526.

15. *Marion County Record*, November 28, 1879-June 10, 1881; Alfred T. Andreas, *History of the State of Kansas*, 2 vols. (Chicago: A. T. Andreas, 1883), 2:1257.

16. Craig Miner, *West of Wichita: Settling the High Plains of Kansas, 1865-1890* (Lawrence: University Press of Kansas, 1986), 184-86; Francis L. Wilson, *A History of Ellsworth County* (N.p.: Ellsworth County Historical Society, 1979), 39-40; Andreas, *History of the State of Kansas*, 2:1278.

17. *New York Times*, June 2, 1882. Loring offered a \$1,200 reward for each of the ten best sorghum-sugar reports and the two best beet-sugar reports.



Between 1884 and 1894 the federal government conducted sugar manufacturing experiments at thirteen sites in Kansas including the sugar factory at Fort Scott.

through political influence to have Loring deposed and to regain his position as chief chemist. In 1884 he sought vindication by publishing his spirited views on sorghum in *Sorghum: Its Culture and Manufacture, Economically Considered as a Source of Sugar, Syrup and Fodder*. Collier, no longer restrained by the Bureau of Agriculture, gave unlimited endorsement to sorghum sugar, which he expected to cost only a few cents per pound. Collier wrote, "It may appear somewhat hazardous to venture any prediction; but I think such a result will be accomplished within the next decade, and that, by 1900, we shall export sugar produced from sorghum to Europe." For every detraction Collier had an answer; like earlier supporters he guessed at the possible cost, and he offered

unconditional optimism for the crop's future.¹⁸

In December 1882 Commissioner Loring addressed the annual meeting of the Mississippi Valley Cane Growers' Association in St. Louis. He assured his audience, "The foundation and development of a new industry in this country is entitled to all the respect and admiration which are won by great achievements and more prominent and conspicuous fields of action and thought."¹⁹ In St. Louis he met Purdue chemistry professor Harvey W. Wiley,

whom he named to the post of chief chemist for the Bureau of Agriculture in mid-June 1883. Wiley's appointment ushered in the most active period of government-sponsored research on sorghum sugar. During the next eleven years, Wiley's division of chemistry prepared forty booklets for publication. Fourteen of the nineteen bulletins that dealt with sugar had application, wholly or in part, to sorghum sugar. Wiley took a personal interest in these experiments and conducted many of them himself. At times, nearly the entire professional staff of the division was engaged in sorghum sugar research.

Wiley quickly mastered the art of expanding the bureaucracy in the division of chemistry through a continual "quest for problems to solve," wrote A. Hunter Dupree:

18. Peter Collier, *Sorghum: Its Culture and Manufacture, Economically Considered as a Source of Sugar, Syrup, and Fodder* (Cincinnati: Robert Clark and Co., 1884), 19, 417.

19. George B. Loring, "The Sorghum Sugar Industry," *United States Bureau of Agriculture, Special Report No. 54* (Washington, D.C.: Government Printing Office, 1883).

The dream of producing sugar in the temperate regions of the United States was as old as the dream of raising silk. Sorghum had beguiled the department from the Civil War days. When Wiley took over in 1883 he extended sugar research to the pilot-plant stage. After sorghum as a sugar producer . . . proved a pipe dream, Wiley vigorously pushed sugar beets and determined the belt where maximum results in raising them could be expected.²⁰

Wiley watched his division swell in size, and when sorghum sugar experiments ceased, he saw to it that other tasks continued to expand the number of employees in the division of chemistry.

Prompted by an 1882 resolution of the U.S. Senate, Commissioner Loring asked the National Academy of Sciences for a feasibility study of the sorghum sugar industry. The academy's response in 1883 cited conflicting opinions and "repeated failures in the cultivation of sorghum for crystallized sugar as a commercial undertaking." Nevertheless, that report placed no barriers in the path of further experiments, although it suggested that New Jersey's approach of paying a bounty for sorghum sugar production might be necessary.²¹

20. A. Hunter Dupree, *Science in the Federal Government: A History of Politics and Activities to 1940* (Cambridge: Belknap Press, 1957), 177.

21. National Academy of Sciences, *Investigation of the Scientific and Economic Relations of the Sorghum Sugar Industry* (Washington, D.C.: Government Printing Office, 1883), 29, 77; *Report of the National Academy of Sciences, 1883* (Washington: Government Printing Office, 1884).

Increased activity in Washington on behalf of the product spawned a host of sorghum sugar organizations in many northern states. The local press closely observed their annual meetings. Delegates from many state associations were sent to national meetings such as that of the Mississippi Valley Cane Growers' Association. Other reports of activity related to the industry came from such states as Massachusetts, Minnesota, New Jersey, Illinois, Ohio, and Kansas.²²

Harvey W. Wiley continued Collier's sorghum growing experiments near Washington and in his home state of Indiana. In 1883 Wiley made his first annual report to the commissioner of agriculture. Because he was completely unable to crystallize sugar from the sorghum grown near Washington but got sixty pounds of sugar per ton of sorghum raised in Indiana, he concluded, "The results of the experiment with the Indiana cane was in every way encouraging, and served in a manner to diminish the disappointment which attended the work in other directions."²³

New Jersey also witnessed substantial developments in sorghum

sugar production. The state had enacted a five-year bounty law to encourage sugar production, and, after some initial experimentation with sorghum molasses, the 1881 legislature agreed to pay a bounty to individual farmers. The bounty also went to sugar manufacturers. Very quickly New Jersey invested a quarter of a million dollars in the new industry, which by 1882 produced 320,000 pounds of sugar and 40,000 gallons of syrup. Output levels remained steady during the next four years, but low prices prevented expansion in New Jersey. With the end of the bounty period, sorghum sugar production ceased.²⁴

Between 1884 and 1894 the U.S. government spent \$509,000 on sugar manufacturing experiments. This enormous expenditure for sugar manufacturing came during a period that rarely saw an annual federal budget for all activities of more than \$500 million. Almost half of the amount for sugar experiments was spent on materials and machinery for activity conducted in twenty-two locations other than the laboratory in Washington, D.C. (see Table 1).²⁵

Thirteen of the twenty-three locations for this significant investment in federal sugar research were in Kansas, and these stations accounted for almost 75 percent of the total expended for materials and machinery. Three Louisiana cane sugar locations expended slightly more than 14 percent of the total,

22. *Topeka Daily Capital*, March 15, 1879, December 31, 1881, September 8, October 6, 20, December 8, 15, 1883, February 16, 1884; *Ohio Farmer*, Cleveland, March 4, 8, 1882, December 1, 8, 1883; *Scientific American* 39 (October 19, 1878): 240; 40 (March 15, 1879): 162; 42 (April 17, 1880): 245; 49 (September 8, 1883): 149; 49 (October 6, 1883): 210; 49 (October 20, 1883): 244; 49 (December 8, 1883): 357; 49 (December 15, 1883): 374; 50 (January 19, 1884): 40; 50 (February 16, 1884): 105; 52 (April 25, 1885): 260.

23. Harvey W. Wiley, "Experiments with Sorghum Cane, 1883," *Report of the Commissioner of Agriculture, 1882* (1884), 423-29.

24. New Jersey State Agricultural Experiment Station, *Second Annual Report, 1881* (1881), 42-43, *Fifth Annual Report, 1884* (1884), 86-87, *Ninth Annual Report, 1888* (1889), 133-34.

25. "Letter from the Secretary of Agriculture," 53d Cong., 3d sess., S. Doc. 69, 2-3 (Serial 3280).

**BUREAU OF CHEMISTRY EXPERIMENTS IN
SUGAR MANUFACTURE, 1884-1894**

<i>Place</i>	<i>Inclusive Dates of Expenditures</i>	<i>Total Spent</i>
Ottawa, Kans.	Nov. 1, 1884—July 7, 1886	\$ 22,803.63
Kenner, La.	Oct. 24 —Nov. 6, 1885	2,143.30
Fort Scott, Kans.	Jan. 21, 1886—Feb. 21, 1888	59,143.81
Lawrence, La.	Jan. 25, 1887—Nov. 3, 1889	21,254.90
Meade, Liberal, Arkalon, Minneola, and Ness City, Kans.	Sept. 4 —Oct. 22, 1889	16,976.60
Douglass, Conway Springs, Attica, and Topeka, Kans.	Aug. 27, 1888—Sept. 23, 1890	23,522.80
Rio Grande, N.J.	Dec. 20, 1886—Oct. 28, 1889	11,467.90
Cedar Rapids, Iowa	July 19 —Sept. 4, 1889	2,835.71
Sterling, Kans.	Oct. 2, 1888—Nov. 21, 1889	729.53
Audubon Park, La.	Nov. 16, 1888—Nov. 21, 1889	8,231.49
Medicine Lodge, Kans.	July 31, 1889—Nov. 7, 1892	44,271.05
Runnymede, Fla.	Jan. 31, 1891—May 10, 1894	7,094.06
Schuyler, Nebr.	May 11, 1891—Nov. 7, 1892	169.28
Washington, D.C. laboratory	Sept. 12, 1888—Nov. 18, 1892	575.90
Morrisville, Va.	Aug. 30, 1889	2,500.00
Union Island, Calif.	Aug. 16, 1894	<u>17.55</u>
	GRAND TOTAL	\$223,737.51

Table 1

and six other states and the District of Columbia divided the remainder.

Three reasons probably account for directing the non-salary federal research funds toward Kansas. First, Kansas Sen. Preston B. Plumb, more than any other member of Congress, was active in securing the needed legislation. Second, the Kansas leg-

islature developed an aggressive program of cash bounties to assist the infant sugar industry, and it granted authority to local government units to issue bonds to build sugar mills. Third, Harvey W. Wiley, a central figure in the federal sorghum sugar program, concluded that Kansas or possibly Indian Territory (later Oklahoma) offered more afford-

able climate and soil conditions for sorghum production.

Before he arrived in the U.S. Senate in 1877, Preston B. Plumb had supported sorghum as a crop for his adopted state of Kansas. As a pioneer in this field, he wrote articles on its value and urged production of sugar from sorghum. After serving in Congress only a short time, he advocated federal appropriations supporting additional sorghum research. Finally in 1884, the legislature appropriated \$50,000, but it was too late in the season for the money to be used entirely within the fiscal year. In 1885 the figure was reduced to \$20,000, which Plumb successfully amended to \$50,000. So encouraged was he with positive results of early federal experiments that he told the press in 1887, "I shall not be surprised if within five years Kansas is able to manufacture from sorghum all the sugar necessary to supply her own citizens, and I have little doubt but that within ten years the United States will manufacture from this source all the sugar necessary for home consumption."²⁶

Following the unsung collapses of the Marion, Larned, and Ellsworth sugar companies in 1881, other sugar factories were erected in Kansas. At least twenty-one additional communities eventually claimed distinction as the sugar mill site:²⁷ Hutchinson, Sterling (two mills), Dundee, Kinsley (which had been moved from Larned), Liberty, Ottawa, El Dorado,

26. William Elsey Connelley, *The Life of Preston B. Plumb, 1837-1891* (Chicago: Browne and Howell Co., 1913), 380.

27. Based on county histories, local newspapers, state and federal reports, and the Kansas State Historical Society's "Sugar Clippings," v. 1.

Conway Springs, Pratt, Medicine Lodge, Topeka, Ness City, Fort Scott, Bavaria, Douglass, Attica, Meade, Liberal, Arkalon, Minneola, and Garden City. Mills were mentioned but apparently not built for Ellis, Clements, Dodge City, Leavenworth, Logan, Spivey, Winfield, and other locales. The most significant mills, because of their use in the federal research program, were those at Ottawa, Fort Scott, Medicine Lodge, and Sterling.

Prices for traditional farm products declined in the early 1880s, and Kansas farmers were "eager to discover new crops and new methods to maintain their incomes."²⁸ The 1880s witnessed many questionable economic ventures in Kansas. Local pride, boosterism, and some speculative chicanery produced enthusiasm to gain the necessary financing for the new sugar mills. To increase interest in sorghum sugar, the Kansas State Board of Agriculture appointed E. B. Cowgill as sorghum commissioner. He quickly extolled sorghum sugar's merits, stating, "from small beginnings, sorghum-sugarmaking has finally been placed where there is no longer any room for doubt about its profitable expansion to the extent of the efforts put forth on the line of what is already known."²⁹ Local opposition to a growing "sugar trust"

monopoly gave additional support to the sorghum sugar industry. Parochial and nationalist fervor in support of local or home industry added to the antimonopoly feeling, always strong in rural areas.

John Bennyworth, promoter of the Larned sugar mill, had been elected to the state legislature in 1880. Upon his arrival, he introduced a bill, which failed to pass, for a bounty to sugar producers and manufacturers. After the first Kansas sorghum sugar mills closed due to their inability to compete in the open market, the Kansas legislature revived the issue in 1887 by encouraging the "manufacture of sugar in this state from beets, sorghum, or other sugar yielding canes or plants grown in Kansas, [with] a bounty of two cents per pound upon each and every pound."³⁰ The 1887 law set a bounty limit of \$15,000 per year for five years to expire June 20, 1892. It was amended in 1889 permitting a maximum of \$40,000 per year for two years to expire in 1894. In 1891 the legislature reduced the bounty to three-fourths cent per pound. The legislature, meeting biennially, made appropriations to pay a bounty in 1889 of \$18,658.30; in 1891 of \$53,304.08; in 1893 of \$15,303.83; and in 1895 of \$5,331 directly to cane growers

and \$7,339.29 to sugar makers. Gov. Lyman U. Humphrey reported to the legislature on January 16, 1889, that four of Kansas' sorghum sugar plants had produced 701,941 pounds "of superior sugar, and 300,000 gallons of molasses."³¹ With encouragement coming from both the state and federal governments, speculators descended on Kansas, and the sorghum sugar industry blossomed with new plants built wherever sufficient local incentive could be found to construct a mill.

The lack of expertise in these sorghum sugar enterprises was readily apparent. As one commentator later wrote, "a lawyer, a professor, a politician, a man of no business essays Sorghum sugar manufacturing undaunted by difficulties which they do not comprehend. Energy and pluck are assumed by them to be all-sufficient."³² Late in 1889 the *New York Times* headlined a story, "Kansas Gets a Black Eye." Sorghum sugar was a "favorite topic last summer," said the *Times*:

Five or six sugar mills were being erected in as many towns, and visions of wealth danced before the eyes of farmers who had suffered three successive crop

28. Richard Sheridan, *Economic Development in South Central Kansas, Part Ia, An Economic History, 1500-1900* (Lawrence: School of Business, University of Kansas, 1956), 216.

29. *Kansas Farmer*, Topeka, November 22, 1888. By 1891 the position was known as the state sugar inspector and was occupied by George F. Kellogg. Kansas State Board of Agriculture, *Eighth Biennial Report* (Topeka: State Printer, 1891-1892), pt. 2, 242-47.

30. Miner, *West of Wichita*, 186; *Kansas Statutes*, 1889, 2 vols. (Topeka: Geo. W. Crane and Co., 1889), 2: 2075-78. Legislation at the same time permitted local units of government to issue bonds to build sugar mills.

According to William McMurtrie, *Report on the Culture of the Sugar Beet and the Manufacture of Sugar Therefrom in France and the United States*, USDA Special Report No. 28 (Washington, D.C.: Government Printing Office, 1880), bounties to promote sugar beet culture had passed in 1838-1839 in Massachusetts, 1869 in California, and 1878 in Maine.

31. *Kansas Statutes*, 1897, 2 vols. (Topeka: W. C. Webb, 1897), 2: 832. Mills built under the 1889 law authorizing stock purchases by townships and second and third class cities were exempt from taxation until 1895. A law in 1901 provided of a further amendment permitting bounties of \$1 per ton for sugar beets up to \$5,000. *Kansas Senate Journal* (Topeka: Kansas Publishing House, 1889), 132.

32. Dan Gutleben, "Kansas: Garden City: Sorghum Sugar" (Typed manuscript, Library and Archives Division, Kansas State Historical Society). Gutleben was a resident of Walnut Creek, California, when he prepared this material about 1960.



Dr. Harvey W. Wiley was named chief chemist for the U.S. Bureau of Agriculture in 1883. His appointment ushered in the most active period of government-sponsored research on sorghum sugar.

failures. "Sorghum sugar will be our salvation," was the burden of their cry. . . . Utter disregard of the experience of men who have experimented for years with sorghums in Kansas has characterized the operation of those who have sunk upward of half a million dollars this year in an attempt to secure a profitable output of sugar. They have proceeded with as much confidence as if the problem of converting cane into cash had long since been solved.³³

The cash-conversion technique operated another way as disclosed in December 1889 by Martin Mohler, secretary of the

State Board of Agriculture. He "finally became convinced that fraud has had much to do with the alleged business of sugar making in Kansas in the past." Among other things, two men were discovered in western Kansas developing township schemes "to build 100 sugar mills by townships, at a cost of \$16,000 to \$20,000 each," and their fraud was quickly uncovered. Investigations elsewhere resulted in cancellations of sugar bonds in several counties and efforts to retrieve lost investments.³⁴

34. Ibid., December 10, 12, 13, 1889. According to Gutleben, "Kansas: Garden City: Sorghum Sugar," a promoter in 1890, claiming the backing of a German syndicate with \$5 million, lived on the hospitality of several "towns without any financial backing" of his own. His intemperate and outrageous habits so disgusted certain faculty at Kansas State Agricultural College that they investigated his background and were able to discredit him.

During this same period, the *Kansas Farmer* responded to the impact of the sorghum sugar industry with forty articles printed between 1887 and 1889. Generally supportive, the newspaper published a detailed, four-page supplement on "Kansas Sugar. Kansas To Be the Future Sugar State" in the last issue of 1887. But the *Farmer* was taken in by the dreams of wealth for Kansas agriculture, and it too quickly latched onto a new process that according to the inventor would vastly reduce the cost of extracting sugar from sorghum. When neither the new process nor federal experiments produced the expected benefits of easily refined sorghum sugar, the newspaper's tone became more skeptical. Finally the *Farmer* urged local communities to avoid issuing sugar bonds. In the mid-1890s the *Kansas Farmer* summed up its editorial frustrations:

At one time it was hoped that Kansas would supply this [sugar] want, and vigorous efforts were put forth to develop the sugar industry in this State. But every factory, of the seventeen which were started in Kansas, is now silent. The reason of this failure is to be found in the decline in the price of sugar.

In an 1897 article containing a long discussion of "Sorghum in Kansas," the *Farmer* mentioned sorghum sugar only in passing with a speculative "if," and after that the paper ignored the topic.³⁵

35. *Kansas Farmer*, September 27, 1896, May 27, 1897. The 1897 mention of sorghum sugar read, "If it ever became possible to manufacture sugar profitably from sorghum."

33. *New York Times*, November 2, 1889.

The sequence of pro-sorghum sugar federal administrators also aided the development of its prospects. In 1885, with a change in presidential administrations, Norman A. Colman, a long-time player in the sorghum sugar industry, became commissioner of agriculture. Harvey W. Wiley continued his research with stronger support from the Bureau of Agriculture. Four years later Colman was followed by Jeremiah Rusk, former governor of Wisconsin, and strong backing for Wiley continued. During these years Wiley determined that "efficiency of the machinery" for extracting sugar was of utmost importance. He believed sweet sorghums were "uniquely adapted to the semi-arid regions, such as the area from central Kansas and Nebraska to the foothills of the Rocky Mountains." To this Commissioner Colman added that farmers should be "paying more attention to saving the seed."³⁶ Because heavy rollers that crushed the cane left at least half of the juice in the crushed stalks, or *bagasse*, Wiley turned to the diffusion process invented almost twenty years earlier by the Frenchman M. Jules Robert.

After preliminary investigations in 1884, the primary experimentation in 1885 concentrated on "diffusion and carbonation" at the Franklin Sugar Works in Ottawa, Kansas, where M. A. Scovell acted as Wiley's agent

during construction. Delays occurred in obtaining specialized equipment to employ the diffusion process that took advantage of osmosis, which permitted extraction of 98 percent of the sugar in the sorghum.³⁷

In 1886 the Parkinson Sugar Company at Fort Scott became the site of experiments initiated the previous year at Ottawa. Prof. Magnus Swenson, formerly with the Wisconsin Agricultural Experiment Station, worked at both the Ottawa and Fort Scott plants and offered suggestions for process efficiency. In spite of achieving similar results at Fort Scott, another year passed and Wiley saw no improvement. He believed, "in the general review of the work, the most important point suggested is that absolute failure of the experiments to demonstrate the commercial practicability of manufacturing sorghum sugar."³⁸

37. Harvey W. Wiley, 163-64; Magnus Swenson, "The Northern Sugar Industry and Experiment Stations," in Kansas State Board of Agriculture, *Fifth Biennial Report* (Topeka: State Printer, 1886), 194; E. B. Cowgill, "The Sorghum Sugar Industry in Kansas," *Record of Experiments Conducted by the Commissioner of Agriculture in the Manufacture of Sugar from Sorghum and Sugar Canes*, Division of Chemistry, USDA, Bulletin No. 17, 26; Harvey W. Wiley, *Experiments with Diffusion and Carbonation at Ottawa, Kansas, Campaign of 1885*, Division of Chemistry, USDA, Bulletin No. 6 (Washington, D.C.: Government Printing Office, 1885), 3-6, 13, 20. Judge W. L. Parkinson was an early promoter of the Ottawa mill and subsequently the one at Fort Scott. According to the June 14, 1907, entry in Kirke Mechem, ed., *Annals of Kansas, 1886-1925*, 2 vols. (Topeka: Kansas State Historical Society, 1954), 1:457, Parkinson also was a promoter of sugar factories in Topeka, Arkalon, Meade, and Liberal.

38. Harvey W. Wiley, *Record of Experiments at Fort Scott, Kansas, in the Manufacture of Sugar from Sorghum and Sugar Canes*, in 1886, Division of Chemistry, USDA, Bulletin No. 14 (Washington, D.C.: Government Printing Office, 1887), 41.

Defective machinery, overripe and frost-damaged cane, sugar's inversion in filtration tanks or cells, and unmarketable molasses from the carbonation process were continuing problems. Further improvement of sorghum seed was needed and emphasized.

The following year Swenson, who also directed experiments for the Bureau of Agriculture, gave a more optimistic report on the work at Fort Scott. To prevent sugar's inversion in a series of tanks called the battery, Swenson added precipitated carbonate of lime to the freshly cut sorghum chips, and later he patented the process. Swenson claimed:

Processes whereby sugar can be made at a profit from sorghum have been worked out. These are far from perfect, but present developments give promise of others in the near future, and will enable us to produce our own sugar on our soil, with the labor of our people. Those who invest in the new industry will be cautious about experimenting with unknown conditions. Kansas is therefore likely to lead in the development, and become the first Northern sugar State.³⁹

As work continued at Fort Scott, a large sugar mill, costing \$100,000, was built at Medicine Lodge in south-central Kansas. There Wiley experimented using

36. Harvey W. Wiley, 169-70; *Record of Experiments Conducted by the Commissioner of Agriculture in the Manufacture of Sugar from Sorghum and Sugar Canes at Fort Scott, Kansas, Rio Grande, New Jersey, and Lawrence, Louisiana, 1887-1888*, Division of Chemistry, USDA, Bulletin No. 17 (Washington, D.C.: Government Printing Office, 1888), 60.

39. *Record of Experiments Conducted by the Commissioner of Agriculture in the Manufacture of Sugar from Sorghum and Sugar Canes at Fort Scott, Kansas, Rio Grande, New Jersey, and Lawrence, Louisiana, 1887-1888*, Division of Chemistry, USDA, Bulletin No. 17, 60.



In the late nineteenth century, at least twenty-four sugar mills were constructed in Kansas. This 1890s photo is of the Southern Kansas Sugar Works in Conway Springs.

alcohol in the manufacture of sorghum sugar. In this process the cane juice, after extraction in the diffusion battery, was clarified and concentrated in a syrup containing about 55 percent solid matter. This syrup was placed in tall cylindrical tanks, each "being filled to a little less than half its depth. An equal volume of 90 percent alcohol" was added and the whole stirred by air bubbles. Impurities in the molasses precipitated, leaving a clear alcoholic syrup that was sent to a still for separation of the alcohol and syrup. Such syrup was easily concentrated in the vacuum pan and purged in the centrifuge to make high quality merchantable sugar.⁴⁰ However, under existing

revenue laws, this method was expensive and unpromising because of the alcohol loss through evaporation.

At Sterling, Kansas, the Bureau of Agriculture's primary experiment sought to find better sorghum seed. A. A. Denton, whom Wiley described as "a Luther Burbank without a college education," was in charge of seed improvement.⁴¹ Denton organized this work so that thousands of cane seed heads were numbered, stalks from each head squeezed separately, and the juice analyzed in a number of ways including the all-important sugar content. The next year he

planted seed from the better individual heads and very soon found yields as high as 13 percent sucrose. Over a four-year period the sucrose content of some varieties of sorghum was higher than 19 percent, an encouraging sign to Wiley and his co-workers.⁴²

Then multiple disasters hit the industry. Virtually the entire sugar program of the newly upgraded U.S. Department of Agriculture, including the investigations on sorghums, was scuttled. When Grover Cleveland became president for a second time in 1893, he appointed J. Sterling Morton of Nebraska City as his secretary of agriculture. A fiscal conservative confronted by economic depression, Morton later

iments with Sorghum in 1891, Division of Chemistry, USDA, Bulletin No. 34 (Washington, D.C.: Government Printing Office, 1892), 10-11; Charles C. Howes, *This Place Called Kansas* (Norman: University of Oklahoma Press, 1952), 154-55.

41. Harvey W. Wiley, 181.

42. Robert Edson, *Sugar: From Scarcity to Surplus* (New York: Chemical Publishing Co., 1958), 41; Wiley, *Record of Experiments with Sorghum*, 83.

40. Nellie Snyder Yost, *Medicine Lodge: The Story of a Kansas Frontier Town* (Chicago: Swallow Press, 1970), 118. Descriptions of this "mammoth" sugar mill tells of 700,000 bricks and 250,000 board feet of lumber used in construction. Harvey W. Wiley, *Record of Exper-*

expressed pride in his efficient administration that returned to the U.S. Treasury 18 percent of his department's appropriations within four years. Morton believed that the federal government should not conduct experiments for the benefit of any single industry, such as sugar. All federal sugar experimentation, whether with sorghums, beets or sugarcanes, came to an end. By 1893 H. W. Wiley admitted, "The investment of money during the last 15 years in sorghum sugar factories has proved almost uniformly disastrous."⁴³

By the end of the 1880s, before major federal experiments were completed, most northern sugar societies, including the Mississippi Valley Cane Growers' Association, were dying a natural death. *Colman's Rural World* downgraded its "Sargo" department, moving it off page one, and eventually dropped it completely. The sorghum sugar industry also lost its outstanding congressional spokesman when Preston B. Plumb died suddenly in Washington on December 20, 1891. While the McKinley Act of April 1891 provided encouragement for the domestic sugar industry with a bounty of two cents per pound for sugar testing over 90 percent purity, the Congress on August 28, 1894, abolished the bounty and admitted cheap foreign sugar.⁴⁴

Sugar prices in the twenty years after 1877 were halved while consumption per American almost doubled.⁴⁵ Lower prices for sugar largely contributed to the declining interest in sorghum sugar, but the advance of beet sugar and inherent technical problems with sorghum sugar production were also major determinants. The secretary of the Kansas State Board of Agriculture earlier had shown an impediment for sorghum sugar when he stated that it "was of good quality but not quite white, and that it retained some of the flavor of the cane from which it was derived."⁴⁶ In 1900 an incisive commentary stated:

Nearly fifty years ago the agricultural interests of this country became greatly interested in the prospects of a new sugar-producing plant, and since then much time and money have been spent in efforts to obtain sugar from sorghum cane on a profitable commercial scale. Containing a large per cent of sucrose and a small per cent of glucose, it would seem to be a more valuable sugar producer than either sugar cane or sugar beets. But this theory has failed of demonstration, owing to the fact that the juice of the sorghum

cane, as extracted at the mill, contains in addition to sugar and water, a large proportion of starch dextrin, and kindred elements which operate against its being successfully worked for sugar. From the results, obtained by the process of diffusion it was discovered that a foreign substance is extracted from the leaves and sheaths of unstripped cane which renders the product almost unsaleable.⁴⁷

"A resume of all the ventures in the field of sugar manufacturing in Kansas makes dismal reading from a commercial standpoint," reported the *Topeka Daily Capital* in 1897:

The first faint suspicion of a sugar-raising craze was perceptible in Kansas in the year 1880. The fever grew worse and the end of that decade saw factories in Kansas which had sprung up as if by magic. These factories were not built in a slipshod manner, but most of them, as in the case of the one at Topeka, were made of the most substantial material, and contained the very finest of machinery.

The *Capital* reported that neither the sugar-making machinery nor the withdrawal of federal bounty caused interest in sorghum sugar to wane, but that farmers could profit more from feeding sor-

43. James C. Olson, *J. Sterling Morton* (Lincoln: University of Nebraska Press, 1942), 358-62; Paul F. Long, "Sorghum for Sugar—Kansas Sugar Mills," *The Territorialist* 8 (March-April 1988): 18.

44. Lemmer, Norman J. Colman, 57, 82; George M. Rolph, *Something About Sugar: Its History, Growth, Manufacture and Distribution* (San Francisco: John J. Newbegin, 1917), 155.

45. *Yearbook of the United States Department of Agriculture, 1897* (Washington, D.C.: Government Printing Office, 1898), 754. Standard "A" sugar in New York in 1878 was 8.94 cents per pound and 9.84 cents in 1881. Consumption per person in these years was 34.3 and 44.2 pounds. In 1894 the price was 4 cents per pound and consumption was 66.14 pounds.

46. Connelley, *Life of Preston B. Plumb*, 378.

47. *Twelfth Census of the United States, 1900, Agriculture Part II, Crops and Irrigation* (Washington, D.C.: United States Census Office, 1902), 464-65.

ghum to cattle than they could by raising it for a potential sugar market.⁴⁸

Also lost with the decline of sorghum sugar possibilities was the earlier vision that farmers could make their own sugar, gain independence from foreign sugar, and at the same time fight the "sugar trust." Sugar mills proved to be expensive undertakings, more so because their machinery sat idle most of the year.

Through the twentieth century, research on sweet sorghums concentrated on increasing the qualities needed in producing molasses, not sugar. The principles of applied genetics superseded older plant breeders' tactics; a fresh attack on the sorghum sugar problem came during World War II, but interest waned in the 1950s. An ongoing Department of Agriculture-sponsored project in Mississippi and Texas solved many of the technical problems that previously had kept sorghum from gaining recognition as a sugar source, but still it was not economically viable with other sugars. By that time prospects were slim for a sorghum sugar industry separate from the already established, heavily capitalized beet or cane sugar mills. Harvesting and processing time for sorghum was "far too short to justify the required large investment" of a separate factory, but the timing of sorghum harvest

would complement other sugar crops and make more effective use of a sugar factory already in existence.⁴⁹

After 1965 Department of Agriculture experimentation was concentrated at Weslaco, Texas, and Meridian, Mississippi, although the sorghum crop was adapted to most of the United States. Reports described sweet sorghum as competitive with beets and sugarcane "assuming the processing costs are approximately the same for the three crops."⁵⁰ A text specializing in sugar beets pointed out the latent rivalry with sorghum sugar:

The potential for making sugar from sweet sorghums opens the possibility that the crop may become one of these. . . . The sweet character of these varieties was identified in the 1500s. Throughout the world at different periods, efforts were made to extract sugar from sorghums. . . . The day may be closer than we imagine.⁵¹

49. E. W. Brandes, "Progress with Sugar Sorgho," *The Yearbook of Agriculture, 1943-1947: Science in Farming* (Washington, D.C.: Government Printing Office, 1947), 345.

50. Wall and Ross, eds., *Sorghum Production and Utilization*, 437-38.

51. Russell T. Johnson, et al., eds., *Advances in Sugarbeet Production: Principles and Practices* (Ames: Iowa State University Press, 1971), 15. Low imported sugar prices were the primary reason for not producing sorghum sugar. Many domestic beet and cane sugar factories closed because of foreign competition. However, forecasts of energy demands point to sweet sorghum and sugarcane as economical sources of alcohol for fuel.

The ebb and flow of the sorghum sugar saga through the years reminds us that agriculture, in the words of Colman's *Rural World*, has been plagued by crazes and manias. Sorghum sugar's plight also calls to mind editor Clough's observation that there is "no royal road" to sugar. Bankruptcy sales were particularly disheartening in the failure of sorghum sugar mills in Kansas. Also, two large mills at Topeka and Ness City burned under mysterious circumstances.⁵² Only a few of the old sugar mills were transformed into other businesses. Most participants preferred to forget their ties to sorghum sugar and considered them the result of misplaced energies. The beleaguered sorghum sugar story for Kansas and the nation proved to be an elusive and eventually shattered dream. [KH]

B. A. Smith, research chemist, Good Crops Utilization Research Laboratory, USDA, Weslaco, Texas, to author, June 22, 1979, and Dempsey M. Broadhead, research agronomist, Delta States Area, U.S. Sugar Crops Field Station, Meridian, Mississippi, to author, June 30, 1979. "Another Step Forward: Sugar from Sorghum," *Agricultural Research* 24 (August 1976): 3-4, described the eight-step procedure for producing twenty-two tons of raw sugar at the Rio Grande Valley Sugar-growers plant in Santa Rosa, Texas. The production season for the three varieties ran from two to three months. *Bibliography of Agriculture* (November 1990), v. 54, no. 11, item 786124, notes that in Louisiana experiments continue on using sweet sorghum for biomass and sugar production.

52. Gutleben, "Kansas: Garden City: Sorghum Sugar," 6, states that the Fort Scott factory with its machinery, which cost \$105,000, sold for \$9,000. Sheridan, *Economic Development in South Central Kansas*, 219; Mary Davis Sander, "Sweet and Sours," *Bulletin of the Shawnee County Historical Society* 33 (December 1959), 44-47; Miner, *West of Wichita*, 228.

48. *Topeka Daily Capital*, December 26, 1897; Miner, *West of Wichita*, 227, estimated that sugar mills paid half as much for sorghum as it was worth as cattle feed. Farmers received from \$1 to \$2 per ton.