

# **Sugar**

## **Background for 1990 Farm Legislation**

**Robert D. Barry  
Luigi Angelo  
Peter J. Buzzanell  
Fred Gray**

### **Introduction**

Sugar enters such a wide variety of food and beverage products that its price, denominated in one/one-hundredths of a cent, is constantly and very closely observed all over the globe. U.S. sales of sugar totaled about \$4.4 billion in 1987, while the value of corn and low-calorie sweeteners with which sugar competes in varying degrees, amounted to over \$2.5 billion.

The U.S. sugar program is the key determinant of the domestic sugar price the level of which directly affects producers and processors of sugarcane in 4 States and sugarbeets in 14 States. Various segments of the sugar market are continually at odds on the appropriate level and form of support. Moreover, over 110 countries produce sugar, in tropical as well as temperate climates. Many developing countries depend on sugar as a significant source of revenues and employment. Sugar has consequently long been involved in North-South, developed-developing country trade issues. The sugar program has strong foreign policy aspects and does not simply apply to an item of commerce.

U.S. Government involvement in the sugar market began 200 years ago. Comprehensive regulation of production, imports, and prices lasted 40 years, to 1974. Since then, sugar support programs have been re-established (although not as comprehensively) whenever the world price has been deemed so low as to threaten the viability of the U.S. sugar industry. Since 1974, Government support was absent only in 1975/76 and 1980/81 when world prices climbed to cyclical highs. In most years, the world market price is artificially low, reflecting the residual nature of sugar sold in that market. Sugar issues are not clear-cut, partly because most national governments intervene in the sugar market.

The 1990/91 crop of sugarcane and sugarbeets will be the last one produced under the price support program of the Food Security Act of 1985. As discussion continues on the next omnibus farm bill, accurate information on the U.S. sugar industry in the context of the world sweetener market and agricultural trade in general will be important to all sides in formulating decisions relating to U.S. policies and programs.

## Structure of the U.S. Sugar Industry

About 85 percent of the sugar deliveries for consumption in the United States was produced domestically during 1986-88 (about 45 percent from sugarbeets and 40 percent from sugarcane). The balance was imported. Farm value of the sugar crops produced in 1987/88 was \$1.9 billion or 3 percent of the total value of all principal crops. In 1987, the value of U.S. sugar deliveries equaled about \$4.4 billion.

The sugar industry consists of: (1) production and harvest of sugarcane and sugarbeets, (2) extraction of raw sugar from sugarcane, (3) refining of raw cane sugar and the processing of sugarbeets into commercial refined grades of sugar, and (4) distribution of refined sugar among consumers. This report focuses on the first three stages.

### Production Characteristics

#### Sugarcane Production

Sugarcane, a tall perennial grass, is grown in tropical and semitropical climates. After the planting of cane stalk cuttings, the plant matures in 12-24 months. Two to four crops (ratoon crops) are harvested from the original plantings, unless the plant is impaired or destroyed by frost, disease, or other causes. However, Hawaii has recently been experimenting with replanting after each harvest.

Most U.S. sugarcane production and harvesting operations are mechanized. In Florida, however, about two-thirds of the sugarcane is cut by hand.

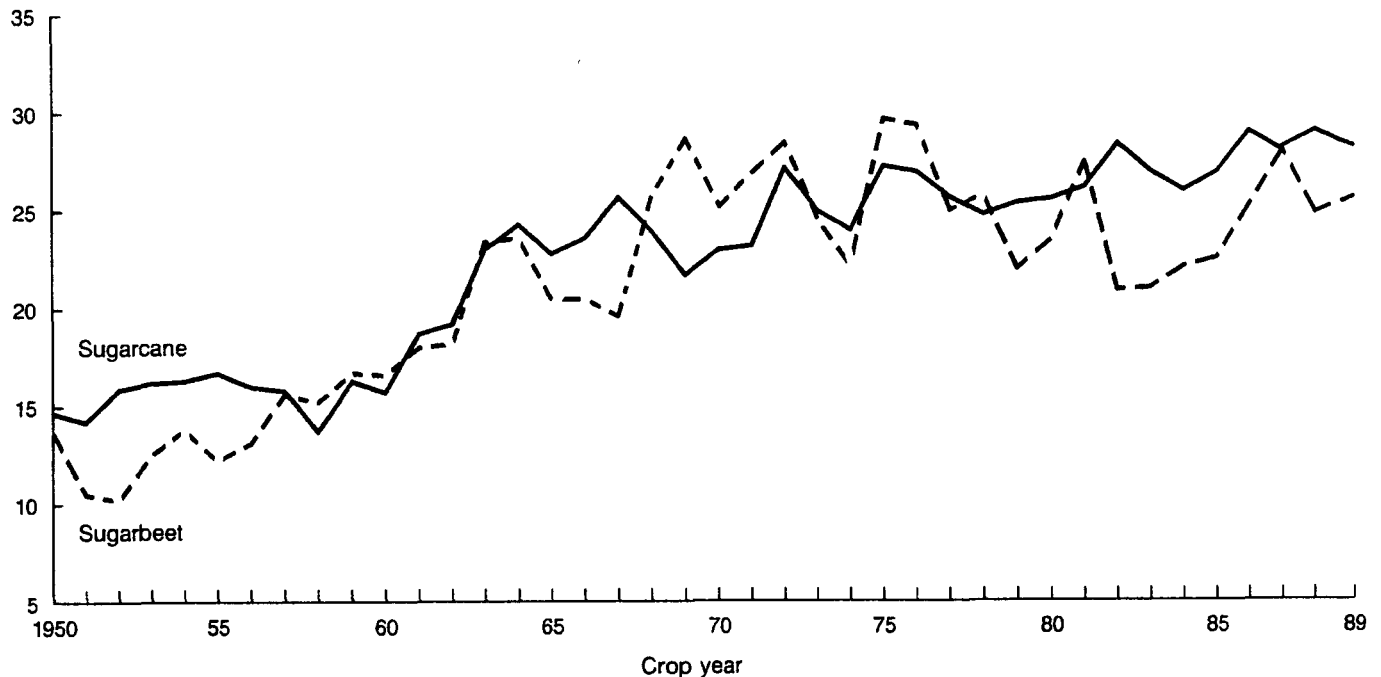
Production Areas. Florida, Hawaii, Louisiana, and Texas grow sugarcane. In 1987/88, the four States harvested 778,300 acres of sugarcane (except seed) that produced 28 million short tons of sugarcane for sugar, or 36 net short tons per harvested acre. Florida accounted for 52 percent, Louisiana 34 percent, and Hawaii 10 percent of the sugarcane acreage, producing 46, 21, and 29 percent of the sugarcane. The remainder was produced in Texas. Puerto Rico, also covered by the domestic sugar price support program, harvested 1.2 million short tons of sugarcane from 50,006 acres and produced 96,417 tons of raw sugar. Preliminary estimates for the 1988/89 sugarcane crop indicate that 793,600 acres will be harvested for sugar in the United States and will produce 28.5 million tons of sugarcane or 35.9 net tons per acre (tables 1-4).

Florida's sugarcane production has expanded significantly since 1960 when the United States ceased importing Cuban sugar. In the 1980's, Florida became the largest cane producer in the United States, accounting for 50 percent of the acreage and 43 percent of sugarcane production. Most of the sugarcane is produced on organic soils along the southern and southeastern shore of Lake Okeechobee in southern Florida. The majority of the sugarcane acreage is land brought into production after 1960. In addition

Figure 1

**U.S. sugarcane and sugarbeet production, 1950 - 89**

Million short tons



Source: U.S. Dept. Agr., Agricultural Stabilization and Conservation Service.

to having highly fertile soil, the area has a long growing season and generally warm winters.

Soil subsidence is a problem facing the Florida industry. Organic soils oxidize when exposed to the atmosphere and the rate of oxidization has been estimated at 1 foot every 10 years. Some say that much of the present sugarcane land may eventually have to revert to pasture or other crops that can adapt to the soil after it can no longer support sugarcane production.

In Louisiana, the northernmost cane-growing State, most sugarcane production has been confined to the Delta where the soils are fertile and the climate is warm. However, freezing weather makes the growing season shorter than in other States and yields are lower because the cane is generally harvested before maturing fully.

Texas sugarcane is produced in the lower Rio Grande Valley in the southern tip of the State. This area has a subtropical climate of long hot summers and short mild winters, but occasionally killing freezes. Production of sugarcane resumed with the 1973/74 crop after years of inactivity.

Sugarcane is produced on Hawaii's islands of Hawaii, Kauai, Maui, and Oahu under a wide variety of conditions. On the island of Hawaii, the leading production area, harvest occurs virtually year-round. The average age of the sugarcane crop at harvest is 2 years. In recent years, Hawaii has been outstripped by Florida as the largest U.S. producer of sugarcane, but Hawaii's average

Table 1--U.S. sugar: Harvested acreage, yield per acre, and production, 1970-88

Crop year	Cane sugar <u>1/</u>			Beet sugar <u>2/</u>			Total (cane and beet) <u>1/</u>		
	Harvested area	Yield	Production	Harvested area	Yield	Production	Harvested area	Yield	Production
	1,000 acres	Short tons, raw value	1,000 s.t., raw value	1,000 acres	Short tons, raw value	1,000 s.t., raw value	1,000 acres	Short tons, raw value	1,000 s.t., raw value
1970/71	549.5	4.39	2,416	1,367.0	2.43	3,322	1,916.5	2.99	5,738
1971/72	607.1	3.71	2,436	1,325.0	2.65	3,512	1,932.1	3.08	5,948
1972/73	663.7	4.13	2,740	1,335.0	2.72	3,632	1,998.7	3.19	6,372
1973/74	702.3	3.63	2,549	1,215.0	2.65	3,216	1,917.3	3.01	5,765
1974/75	689.9	3.63	2,512	1,213.0	2.40	2,916	1,902.9	2.85	5,428
1975/76	734.7	3.99	2,934	1,517.0	2.65	4,019	2,251.7	3.09	6,953
1976/77	704.0	3.87	2,724	1,479.0	2.63	3,895	2,183.0	3.03	6,619
1977/78	719.3	3.73	2,684	1,216.0	2.56	3,108	1,935.3	2.99	5,792
1978/79	699.8	3.74	2,612	1,269.0	2.59	3,289	1,968.8	3.00	5,901
1979/80	689.7	3.91	2,700	1,120.0	2.57	2,879	1,809.7	3.08	5,579
1980/81	683.6	3.99	2,728	1,190.0	2.65	3,149	1,873.6	3.14	5,877
1981/82	715.6	3.96	2,833	1,228.1	2.76	3,388	1,943.7	3.20	6,221
1982/83	700.4	4.37	3,063	1,026.8	2.67	2,737	1,727.2	3.36	5,800
1983/84	733.4	4.00	2,930	1,055.8	2.56	2,699	1,789.2	3.15	5,629
1984/85	700.7	4.29	3,007	1,096.3	2.65	2,905	1,797.0	3.29	5,912
1985/86	722.8	4.20	3,033	1,102.5	2.72	3,000	1,825.3	3.31	6,033
1986/87	750.7	4.37	3,281	1,191.2	2.87	3,416	1,941.9	3.45	6,697
1987/88	778.3	4.28	3,333	1,252.4	3.19	3,998	2,030.7	3.61	7,331
1988/89 <u>3/</u>	793.6	4.28	3,398	1,300.7	2.70	3,512	2,094.3	3.30	6,910

1/ Excludes Puerto Rico.

2/ ASCS data prior to 1975.

3/ Preliminary.

Source: U.S. Dept. Agr., National Agricultural Statistics Service.

Table 2--U.S. mainland sugarcane: Harvested acreage, yield per acre, and production, 1970-88

Crop year	Florida			Louisiana		
	Harvested area	Yield	Production	Harvested area	Yield	Production
	1,000 acres	Short tons, raw value	1,000 s.t., raw value	1,000 acres	Short tons, raw value	1,000 s.t., raw value
1970/71	170.0	3.83	652	265.7	2.26	602
1971/72	189.9	3.34	635	301.4	1.90	571
1972/73	243.8	3.94	961	311.4	2.12	660
1973/74	257.6	3.19	824	318.9	1.75	558
1974/75	258.4	3.07	803	308.0	1.93	594
1975/76	286.6	3.70	1,061	308.0	2.08	640
1976/77	286.0	3.25	930	291.0	2.23	650
1977/78	285.0	3.14	894	304.0	2.20	668
1978/79	300.0	3.24	972	268.0	2.05	550
1979/80	318.2	3.29	1,047	240.0	2.08	500
1980/81	320.7	3.50	1,121	232.0	2.12	491
1981/82	334.4	2.88	963	247.0	2.88	712
1982/83	341.4	3.83	1,307	234.0	2.88	675
1983/84	361.1	3.39	1,223	245.0	2.46	603
1984/85	371.9	3.80	1,412	205.0	2.20	452
1985/86	383.4	3.69	1,413	226.0	2.35	532
1986/87	390.0	3.78	1,476	248.0	2.71	671
1987/88	402.0	3.77	1,517	263.0	2.78	731
1988/89 1/	404.0	3.88	1,566	279.0	2.86	797

	Texas			Mainland		
	Harvested area	Yield	Production	Harvested area	Yield	Production
	1,000 acres	Short tons, raw value	1,000 s.t., raw value	1,000 acres	Short tons, raw value	1,000 s.t., raw value
1970/71	0	0	0	435.7	2.88	1,254
1971/72	0	0	0	491.3	2.45	1,206
1972/73	0	0	0	555.2	2.92	1,621
1973/74	18.0	2.11	38	594.5	2.39	1,420
1974/75	28.0	2.64	74	594.4	2.47	1,471
1975/76	35.0	3.60	126	629.6	2.90	1,827
1976/77	27.0	3.48	94	604.0	2.77	1,674
1977/78	34.0	2.59	88	623.0	2.65	1,650
1978/79	32.0	1.88	61	600.0	2.64	1,583
1979/80	30.9	3.01	93	589.1	2.78	1,640
1980/81	33.5	2.78	93	586.2	2.91	1,705
1981/82	36.6	3.01	110	618.0	2.89	1,785
1982/83	35.7	2.75	98	611.1	3.40	2,080
1983/84	34.5	1.74	60	640.6	2.94	1,886
1984/85	34.3	2.36	81	611.2	3.18	1,945
1985/86	30.4	2.50	76	639.8	3.16	2,021
1986/87	29.1	3.13	91	667.1	3.35	2,238
1987/88	33.8	3.14	106	698.8	3.37	2,354
1988/89 1/	31.7	3.38	107	714.7	3.46	2,470

1/ Preliminary.

Source: U.S. Dept. Agr., National Agricultural Statistics Service.

Table 3--U.S. offshore sugarcane: Harvested acreage, yield per acre, and production 1970-88

Crop year	Hawaii			Puerto Rico		
	Harvested area	Yield	Production	Harvested area	Yield	Production
	1,000 acres	Short tons, raw value	1,000 s.t., raw value	1,000 acres	Short tons, raw value	1,000 s.t., raw value
1970/71	113.8	10.19	1,162	187.5	2.45	460
1971/72	115.8	7.41	1,230	157.3	2.06	324
1972/73	108.5	10.36	1,119	155.4	1.92	299
1973/74	108.2	10.45	1,129	137.6	1.85	255
1974/75	95.8	10.84	1,041	130.5	2.23	291
1975/76	105.1	10.54	1,107	127.7	2.34	299
1976/77	99.1	10.50	1,050	123.8	2.52	312
1977/78	96.8	10.66	1,034	114.8	2.33	267
1978/79	99.4	10.39	1,029	93.3	2.19	204
1979/80	100.6	10.54	1,060	86.8	2.24	194
1980/81	97.4	10.50	1,023	78.7	2.25	177
1981/82	97.6	10.74	1,048	74.6	2.05	153
1982/83	89.3	11.01	983	53.7	2.12	114
1983/84	92.8	11.25	1,044	54.9	1.82	100
1984/85	89.5	11.87	1,062	56.2	1.73	97
1985/86	83.0	12.19	1,012	55.7	1.96	109
1986/87	83.6	12.48	1,043	52.5	1.83	96
1987/88	79.5	12.31	979	50.0	1.92	96
1988/89 2/	78.9	11.76	928	56.6	1.80	102
	Total offshore			Total cane 1/		
	Harvested area	Yield	Production	Harvested area	Yield	Production
	1,000 acres	Short tons, raw value	1,000 s.t., raw value	1,000 acres	Short tons, raw value	1,000 s.t., raw value
1970/71	301.5	5.38	1,622	738.0	3.89	2,876
1971/72	323.3	4.81	1,554	760.0	3.63	2,760
1972/73	263.4	5.38	1,418	815.0	3.73	3,037
1973/74	245.6	5.64	1,384	835.0	3.35	2,794
1974/75	226.5	5.88	1,332	812.0	3.44	2,793
1975/76	232.7	6.04	1,406	867.0	3.73	3,233
1976/77	223.8	6.09	1,362	828.0	3.67	3,036
1977/78	211.8	6.14	1,301	836.0	3.53	2,952
1978/79	192.3	6.41	1,233	800.0	3.52	2,816
1979/80	187.4	6.69	1,254	773.0	3.74	2,893
1980/81	176.1	6.81	1,200	767.5	3.79	2,905
1981/82	172.2	6.97	1,201	790.5	3.78	2,986
1982/83	143.0	7.67	1,097	754.1	4.21	3,177
1983/84	147.7	7.75	1,144	788.3	3.84	3,030
1984/85	145.7	7.95	1,159	756.9	4.10	3,104
1985/86	138.7	8.08	1,121	778.5	4.04	3,142
1986/87	136.1	8.37	1,139	803.2	4.20	3,377
1987/88	129.5	8.27	1,075	828.3	4.15	3,429
1988/89 2/	135.5	7.60	1,030	850.2	4.12	3,500

1/ Includes Puerto Rico.

2/ Preliminary.

Source: U.S. Dept. Agr., National Agricultural Statistics Service.

Table 4--U.S. sugarcane: Number of mills, milling capacity, sugarcane ground, raw sugar production, and recovery, 1970-88

Crop year	Florida	Hawaii	Louisiana	Texas 1/	Total	Daily milling capacity	Net tons of cane ground for sugar	Sugar production, raw value	
								Total	Per ton of cane
	----- <u>Number of mills</u> -----					----- <u>1,000 short tons</u> -----		<u>Pounds</u>	
1970/71	9	23	43	---	75	273	23,058	2,416	210
1971/72	1	23	43	---	74	178	23,145	2,436	210
1972/73	8	21	43	---	72	282	27,239	2,740	201
1973/74	8	19	39	1	67	280	24,924	2,549	204
1974/75	8	18	37	1	64	277	24,031	2,512	209
1975/76	8	17	36	1	62	274	27,306	2,934	215
1976/77	8	16	35	1	60	282	26,919	2,724	202
1977/78	7	16	33	1	57	271	25,730	2,684	209
1978/79	7	15	28	1	51	256	24,821	2,612	210
1979/80	7	14	25	1	47	248	25,410	2,700	213
1980/81	7	14	24	1	46	260	25,582	2,728	213
1981/82	7	14	23	1	45	257	26,165	2,833	217
1982/83	7	14	21	1	43	254	28,449	3,063	215
1983/84	7	14	21	1	43	268	27,201	2,930	215
1984/85	7	14	21	1	43	268	26,008	3,007	231
1985/86	7	13	21	1	42	264	26,877	3,033	226
1986/87	7	13	21	1	42	270	28,936	3,281	227
1987/88	7	12	21	1	41	289	28,026	3,333	238
1988/89 2/	7	12	21	1	41	289	28,479	3,398	239

--- = Not applicable.

1/ Began operations in 1973.

2/ Preliminary.

Source: U.S. Dept. Agr., Economic Research Service.

yield of 96.4 net short tons of sugarcane per harvested acre in 1988/89 was over two times higher than the average yield in the other domestic sugarcane areas. Hawaii's was the highest yield in the world. The high sugarcane yields in Hawaii are due to its unique year-round growing season, ideal climate, and biennial harvest pattern.

Characteristics of Producing Units. Sugarcane growing is generally a monoculture type of farming in which only one crop is produced. About 50 percent of the sugarcane is produced from operations vertically integrated from the growing of sugarcane through processing into raw sugar. About 30 percent is produced by growers who have formed cooperatives and the remainder is produced by independent growers.

Sugarcane was grown on 1,038 U.S. farms in 1988/89, down 355 from 1983/84 (table 5). The largest absolute decline in sugarcane farms has been in Louisiana. Farm numbers are from cost of production surveys conducted in 1983/84 and 1988/89.

The average sugarcane farm size increased from 523 harvested acres in 1983/84 to 765 acres in 1988/89. The average farm size in 1988/89 ranged from 305 acres in Texas to 3,339 in Florida where several large sugarcane processors produce their own sugarcane. Florida and Hawaii have the highest concentration in

Table 5--United States: Number of sugarcane farms and average acreage harvested by area, 1983/84 and 1988/89 crop years

Area	1983/84		1988/89	
	Farms	Average area harvested per farm	Farms	Average area harvested per farm
	<u>Number</u>	<u>Acres</u>	<u>Number</u>	<u>Acres</u>
Florida	127	2,799	121	3,339
Hawaii	243	383	87	907
Louisiana	925	265	726	384
Texas	98	360	104	305
U.S. total	1,393	523	1,038	765

Source: U.S. Dept. Agr., Economic Research Service.

ownership of sugar production. For the 1987/88 crop, the three largest producers in Florida, which are also processors, accounted for about 50 percent of the sugarcane production. In Hawaii, more than 96 percent of the sugarcane acreage and production is accounted for by five companies. Alternative uses for land in sugarcane are relatively limited. In Florida, vegetables, beef cattle, rice, citrus, and sod are possible but generally poor competitors to sugarcane. Possible, but much less financially attractive crops in Hawaii are coffee, macadamia nuts, some fruits and vegetables, and flowers. Some areas can be developed for nonagricultural uses. Crops competing with sugarcane in Louisiana are soybeans in the north and cotton, rice, and kenaf. In Texas, the alternative crops are cotton, vegetables, corn, kenaf, citrus, and possibly soybeans.

### Sugarbeet Production

The sugarbeet is a cool-weather plant grown most successfully in northern latitudes. However, the plant adapts to many climatic conditions. In the United States, sugarbeets grow in the hot climate of the Imperial Valley of California as well as in the colder climates of Minnesota, Montana, and North Dakota.

Sugarbeets are grown in the United States on many soil types, but soils ranging from clay loam to the fine sandy loams are best. Beets respond to highly fertile soils better than many other crops. Sugarbeets require a well-drained, deep, and permeable seedbed of good moisture-holding capacity. The sugarbeet is a deep-rooted plant that often extends its roots to a depth of 6-8 feet. Most sugarbeet growers plant sugarbeets in a 3- to 5-year crop rotation with other crops.

Production Areas. Sugarbeets are grown in 14 States (table 6). The leading States, Minnesota, California, North Dakota, and Idaho, accounted for 68 percent of the acreage and 70 percent of the 1987/88 sugarbeet production of 28.1 million tons. Growers planted 1.27 million acres of sugarbeets for the 1987/88 crop and harvested 1.25 million acres, at an average yield of 22.4 tons of beets per harvested acre. The 1988/89 sugarbeet planted acreage



Table 6--U.S. sugarbeets: Area, yield per acre, and production, 1975/76, 1980/81, 1985/86, and 1988/89 crop years

Region and State	Area harvested				Yield				Production			
	1975	1980	1985	1988	1975	1980	1985	1988	1975	1980	1985	1988
	-----1,000 acres-----				-----Short tons-----				-----1,000 short tons-----			
<b>Far West:</b>												
Arizona	17.0	9.1	NA	NA	21.5	22.9	NA	NA	366	208	NA	NA
California	326.3	229.0	203.0	212.0	27.3	25.7	23.0	25.0	8,892	5,885	4,669	5,300
Idaho	158.3	137.9	152.0	166.0	18.6	23.9	23.0	24.5	2,942	3,296	3,496	4,084
Oregon	17.9	7.2	11.8	14.1	23.8	27.4	27.0	26.7	426	197	319	376
Washington	82.4	NA	NA	NA	26.0	NA	NA	NA	2,142	NA	NA	NA
Total	601.9	383.2	366.8	392.1	24.5	25.0	23.1	24.9	14,768	9,586	8,484	9,760
<b>Central:</b>												
Colorado	154.9	91.0	2.5	38.6	17.2	19.0	18.5	22.8	2,661	1,729	46	880
Kansas	43.0	14.5	NA	NA	15.5	13.8	NA	NA	667	200	NA	NA
Minnesota	196.0	243.0	276.0	334.0	14.2	14.9	18.4	14.2	2,783	3,621	5,088	4,743
Montana	48.5	43.3	42.7	48.9	17.1	20.3	19.0	21.1	829	879	811	1,032
Nebraska	96.0	85.0	53.2	62.2	18.5	20.9	23.1	21.2	1,776	1,777	1,229	1,319
New Mexico	.9	1.6	NA	.7	16.7	23.1	NA	12.9	15	37	NA	9
North Dakota	130.9	142.7	144.2	175.5	13.9	14.1	16.8	14.7	1,820	2,017	2,423	2,580
Texas	33.7	24.4	37.0	33.0	13.1	15.8	22.5	21.9	440	386	833	723
Utah	22.5	.7	NA	NA	15.7	21.4	NA	NA	353	15	NA	NA
Wyoming	57.7	45.3	49.4	56.0	18.4	22.6	20.9	20.3	1,060	1,024	1,032	1,137
Total	784.1	691.5	605.0	748.9	15.8	16.9	18.9	16.6	12,404	11,685	11,462	12,423
<b>Eastern:</b>												
Michigan	91.4	97.0	118.0	145.0	19.2	19.5	19.7	16.5	1,755	1,892	2,325	2,393
Ohio	39.2	17.8	12.7	14.7	19.8	19.1	20.3	15.9	777	339	258	234
Total	130.6	114.8	130.7	159.7	19.4	19.4	19.8	16.5	2,532	2,231	2,583	2,627
<b>U.S. total</b>	<b>1,516.6</b>	<b>1,189.5</b>	<b>1,102.5</b>	<b>1,300.7</b>	<b>19.6</b>	<b>19.8</b>	<b>20.4</b>	<b>19.1</b>	<b>29,704</b>	<b>23,502</b>	<b>22,529</b>	<b>24,810</b>

NA = Not available.

Source: U.S. Dept. Agr., Economic Research Service.

of 1.33 million acres was the highest recorded since the 1976/77 crop, but suffered from bad weather and disease.

Characteristics of Producing Units. Sugarbeets were grown on 9,893 farms in 1988/89, an increase of 118 from 1983/84 (table 7). Since 1983/84, sugarbeet production ceased in Kansas, due to the closing of a processing facility there. Sugarbeets compete with various other crops for resources in the farming operations of most sugarbeet producers. However, because of greater productivity in sugarbeet growing, more efficient processing, and the sugar support program, sugarbeet production has become relatively more profitable than other crops. Sugarbeet harvested area rose from 1.03 million acres in 1982/83 to 1.25 million in 1987/88. Harvested area in 1988/89 which was hit by drought was 1.3 million acres. The average area for sugarbeets harvested per farm increased from 108 acres in 1983/84 to 131 acres in 1988/89, ranging from 52 acres in Ohio to 214 acres in Oregon.

Typical sugarbeet producers in Ohio and Michigan are small relative to other regions as sugarbeet acreage per farm is about half the national average. In Ohio, the major competing crops are alfalfa, corn, oats, soybeans, and wheat. Dry beans, corn,

Table 7--United States: Number of sugarbeet farms and average acreage harvested, by area, 1983/84 and 1988/89 crop years

Area	1983/84		1988/89	
	Farms	Average area harvested per farm	Farms	Average area harvested per farm <sup>1/</sup>
	<u>Number</u>	<u>Acres</u>	<u>Number</u>	<u>Acres</u>
Far West:				
California	1,118	151	1,117	190
Idaho	1,402	102	1,308	127
Oregon	160	71	66	214
Washington	---	---	1	NA
Subtotal/average	2,680	121	2,492	157
Central:				
Colorado	565	66	463	83
Kansas	31	223	NA	NA
Minnesota	1,440	178	1,597	209
Montana	419	98	452	108
Nebraska	827	79	626	99
New Mexico	---	---	4	175
North Dakota	943	152	1,083	162
Texas	312	102	320	103
Wyoming	335	96	472	119
Subtotal/average	4,872	147	5,017	149
Eastern:				
Michigan	1,906	54	2,103	69
Ohio	317	39	281	52
Subtotal/average	2,223	52	2,384	67
<b>Total/average</b>	<b>9,775</b>	<b>108</b>	<b>9,893</b>	<b>131</b>

--- = Not applicable or zero.

NA = Not available.

<sup>1/</sup> Preliminary.

Source: U.S. Dept. Agr., Economic Research Service.

soybeans, and wheat compete for sugarbeet acreage in Michigan. Sugarbeet acreage is nonirrigated in both States.

Sugarbeet production in the Red River Valley is concentrated near the North Dakota-Minnesota border with some production in southern Minnesota. The far northern latitude limits the number of feasible alternative crops to such major competitors as feed grains, wheat, sunflowers, and potatoes. Almost all beets are nonirrigated.

Northern Plains States producing sugarbeets include eastern Wyoming, Nebraska, and northeastern Colorado. Elevations are high and rainfall low, so all beets must be irrigated. Major competing crops are corn, wheat, soybeans, and alfalfa. The Southern Plains sugarbeet area consists of the Texas High Plains and eastern New Mexico. Major competing crops are feed grains, wheat, alfalfa, and cotton in Texas. Sugarbeets are irrigated in this region.

Sugarbeet production in eastern Idaho occurs in the high-elevation, low-rainfall area between the Rocky Mountain and Cascade-Sierra ranges. All sugarbeet acreage in the region is irrigated. Competitive crops include hay, grain, and potatoes.

Sugarbeet production in Montana and north-central Wyoming competes with feed grains and alfalfa, reflecting the importance of cattle feeding in the region. All acreage in the region is irrigated. A diverse set of crops competes with sugarbeets in the Northwest, which includes western Idaho, eastern Oregon, and the Columbia Basin and Yakima Valley areas of Washington (although not now in sugarbeet production). Wheat, feed grains, and potatoes are the main crops in western Idaho and eastern Oregon while alfalfa, soybeans, potatoes, corn, wheat, and mint compete in Washington and northern Oregon. All beets in these areas are irrigated.

California has four distinct production regions: the north central (Sacramento Valley), the south central (San Joaquin Valley), the Coastal region, and the Imperial Valley. The climate of California is highly beneficial to crop production, and more than 30 different crops are grown on farms producing beets. The major competing crops are feed grains, wheat, cotton, alfalfa, and vegetables. About 70 percent of the sugarbeets are planted in the spring and harvested in the fall or overwintered for harvest in the spring. Another 15 percent is produced in the Imperial Valley where planting is in the fall and harvesting in the spring. In other areas, such as the lower San Joaquin Valley, planting is in the fall and harvesting in the late summer and early fall.

## **Processing Characteristics**

### Sugarcane Processing

Sugarcane must be processed into raw sugar before it can be refined. Processing must be done within hours after the cane is

cut because the sucrose starts breaking down, resulting in lower yields. This breakdown is accelerated when the sugarcane is burned to remove the leaves prior to harvest.

Sugarcane mills are located near the cane fields to minimize transportation costs and the loss of sucrose once the cane is cut. Many sugarcane processors grow their own sugarcane (producer/processor) and supplement their production with sugarcane purchased from independent growers. Others are either cooperatives that process members' cane or producer/processors that process only their own production.

In order to convert sugarcane into raw sugar, the juice from the sugarcane stalk is extracted, clarified, boiled, and crystallized. The raw sugar, usually 96- to 99-percent pure, is then shipped to a refinery for further processing into refined sugar.

Byproducts of sugarcane milling include blackstrap molasses and bagasse. Molasses is used mainly for cattle feed, while bagasse, the fibrous residue from milling, is used principally as fuel in the raw sugar mill. Some bagasse is also used as raw material in the manufacture of building materials and certain chemicals.

Production. U.S. production of raw cane sugar totaled 3.3 million tons, raw value, for the 1987/88 crop year, the highest ever (table 1 and fig. 1). The preliminary estimate for 1988/89 is 3.4 million tons. Sugar recovery in 1987/88 was a record 238 pounds, raw value, per net ton of sugarcane (table 4). Sugar recovery averaged 11.9 percent, ranging from 10.1 percent in Texas to 12.25 percent in Louisiana.

Characteristics of Processing Mills. Forty-one raw sugar mills owned by 39 companies processed the 1987/88 U.S. sugarcane crop. The mills ground about 28 million net tons of sugarcane. The number of mills has declined from 45 in 1980/81, but the daily grinding capacity for U.S. sugarcane processors has increased from 260,000 tons to 288,800 tons (app. table 1). Five sugarcane mills operated in Puerto Rico.

In Florida, the three largest processing companies accounted for about 75 percent of the 1.5 million tons of raw sugar produced in 1987/88. Five companies that wholly own 11 of the 12 processing facilities in Hawaii accounted for 92 percent of Hawaii's raw sugar production. The Louisiana sugarcane processing industry consists of 10 cooperative and 11 independent mills. The five largest processors (one cooperative and four independent) accounted for 33 percent of the 1987/88 crop raw sugar production in Louisiana.

Milling Capacity. The domestic sugarcane industry, operating under normal conditions and assuming average recovery rates, presently has milling capacity to produce about 3.5 million tons of raw sugar a year. If the operating season were extended where practical, output could be increased to 3.7 million tons. These estimates take into account restrictions imposed by land and climatic conditions.

Cane Sugar Refining. Cane sugar refineries buy raw sugar from both domestic and foreign sources and process it into a usable product. Refiners receive, refine, and distribute sugar throughout the year and are not restricted to any seasonal production patterns.

Most U.S. refining facilities are located at ports of entry near densely populated areas. This gives refiners easy access to offshore raw sugar (including Hawaii), from which about one-fourth of the sugar consumed is produced.

Cane sugar refining is a complex process that involves transforming raw sugar into refined sugar. Prior to refining, raw sugar crystals are surrounded by a film of molasses along with a number of impurities, all of which must be removed during the refining process. Refining consists of washing the raw sugar, melting it into syrup, filtering the syrup, and drying and packaging the sugar.

During 1988, 11 cane sugar refineries operated in the continental United States and one operated in Hawaii (app. table 2). These 12 refineries were owned and operated by eight companies. The four largest companies accounted for 78 percent of the total refining capacity. All but two of the refineries are located on or near the east and gulf coasts. In 1988, cane refiners melted 4.32 million tons of raw sugar (plus about 400,000 tons of sugar for export), or 53 percent of the sugar consumed in the U.S. sugar market.

Cane sugar refineries are the principal importers of raw sugar. In 1988, domestic refiners obtained about 32 percent of their raw sugar supplies from foreign sources. Under optimal conditions for efficient plant operations of 260 days per year, the industry could refine 5.5 million tons of raw sugar. This is substantially down from 1981 when 21 cane refining plants operated in the United States, with an annual capacity of over 8.5 million tons.

### Sugarbeet Processing

Sugarbeet processors transform sugarbeets into refined sucrose and byproducts such as molasses and beet pulp. All sugarbeet processors rely on independent growers or members of grower cooperatives for their supply of sugarbeets. Because yields are higher and diseases reduced if sugarbeets are rotated with other crops, it is economically impractical for a processor to raise its own beets. Sugarbeet processors locate their factories near large farming communities where beets can be successfully grown. The beets are grown under contract, which requires growers to deliver beets to the processor from a specified acreage. The beets are processed into refined sugar and the growers are paid a percentage share of the returns the processor receives.

After harvest, beets are prepared for processing. This usually includes receiving beets at the factory site, removing dirt and trash, storing for a short time, removing trash and cleaning for the final time, and conveying to the factory slicers.

The beet-sugar manufacturing process consists of six stages: (1) diffusion, (2) juice purification, (3) evaporation, (4) crystallization, (5) pulp drying, and (6) recovery of sugar from the molasses. After crystallization, the mass of crystals known as "massecuite" is fed into centrifuges which spin off the liquid surrounding the crystals. The crystals are then moved by conveyor to the drier or granulator to be dried and subsequently prepared for marketing as refined beet sugar.

Production. U.S. sugarbeet processors produced 4 million tons of beet sugar, raw value, from 27.6 million tons of beets sliced in 1987/88 (table 8). The output was just marginally below the record in 1975/76. The 1987/88 average recovery per ton of beets sliced was 271 pounds of refined sugar and the extraction rate was 83.54 percent. Average sucrose content was 16.89 percent.

Characteristics of Processing Factories. Thirty-six factories processed the 1987/88 sugarbeet crop. These factories were owned and operated by 12 companies, three of which were grower cooperatives (app. table 3). The four largest companies operated 24 facilities and accounted for 70 percent of the 4 million tons of beet sugar produced in 1987/88. The number of factories has declined from 43 in 1980/81, but the average daily slicing capacity per factory has risen 16.4 percent from 4,033 tons to 4,694. The sugar extraction rate (sugar recovered as percentage of sucrose in the beets) has also increased, from an average 81.4 percent in 1979/80-1981/82 to 83.4 percent in 1985/86-1987/88.

Slicing Capacity. U.S. beet sugar production is limited by the industry's capacity to slice sugarbeets. Daily slicing capacity totaled 168,700 tons for the 1988/89 sugarbeet crop (app. table 3). Based on this slicing capacity and assuming optimal conditions for efficient plant operations and average recovery rates, annual sugar output would approximate 4 million tons, raw value, or 3.7 million tons refined. Capacity of current facilities can be stretched about 10 percent, at higher operating costs.

## **Production and Processing Costs and Returns**

### Sugarcane

The cost of producing the 1987/88 sugarcane crop averaged 12.07 cents a pound of 96-degree raw sugar (degree of polarization indicates sucrose purity) (app. table 6). Production costs ranged from 10.71 cents in Louisiana to 13.21 cents in Florida. Total production costs averaged \$28.33 a net ton of sugarcane and ranged from \$22.99 in Texas to \$30.31 in Florida. The average cost was \$1,020 on a per acre basis. A net ton is gross weight less dirt, leaves, trash, debris, and other extraneous materials.

The total cost of processing the 1987/88 crop averaged 7.88 cents a pound of 96-degree raw sugar and \$18.50 a net ton of sugarcane (app. table 6). Processing costs were lowest in Florida at 6.29 cents a pound and highest in Hawaii at 10.59 cents.

Table 8--U.S. sugarbeets: Number of factories, slicing capacity, beets received, beets sliced, production, and sugar extracted, 1950/51, 1955/56, 1960/61, 1965/66, and 1970/71-88/89

Crop year	Factories <sup>1/</sup>	Daily slicing capacity		Beets received	Beets sliced		Production				Extraction rate <sup>3/</sup>
		Total	Average per factory <sup>2/</sup>		Total	Average per factory <sup>2/</sup>	Refined sugar		Sugar, raw value		
							Total	Per ton of beets sliced	Total	Per ton of beets sliced	
	Number	1,000 short tons		-----1,000 short tons-----		Pounds	1,000 s.tons	Pounds	Percent		
1950/51	72	138	1,944	13,582	13,306	187	1,883	283	2,015	303	89.33
1955/56	64	134	2,127	12,237	12,061	191	1,617	268	1,730	287	87.70
1960/61	62	143	2,344	16,617	16,657	273	2,313	278	2,475	297	88.25
1965/66	61	172	2,867	20,470	20,583	343	2,632	256	2,816	274	85.05
1970/71	58	193	3,386	25,320	25,392	445	3,105	245	3,322	262	82.44
1971/72	55	187	3,463	26,865	26,677	494	3,282	246	3,512	263	82.11
1972/73	54	185	3,491	28,463	28,176	532	3,395	241	3,632	258	81.64
1973/74	53	183	3,519	24,569	24,514	471	3,005	245	3,216	262	81.50
1974/75	55	202	3,741	22,123	22,197	411	2,725	246	2,916	263	78.95
1975/76	56	208	3,782	29,704	29,616	538	3,756	254	4,019	272	81.88
1976/77	56	215	3,909	29,386	28,889	525	3,640	252	3,895	270	82.68
1977/78	51	203	3,980	25,007	24,120	473	2,905	241	3,108	258	80.17
1978/79	49	200	4,082	25,788	24,929	509	3,074	247	3,289	264	80.04
1979/80	43	173	4,023	21,996	21,572	502	2,691	249	2,879	267	80.74
1980/81	43	173	4,023	23,502	23,328	543	2,943	252	3,149	270	82.41
1981/82	43	173	4,023	27,538	26,528	617	3,166	239	3,388	255	81.02
1982/83	38	155	4,079	20,894	20,539	541	2,558	249	2,737	267	81.91
1983/84	41	166	4,049	20,992	20,548	501	2,522	245	2,699	263	82.21
1984/85	41	166	4,049	22,134	21,606	527	2,715	251	2,905	269	82.21
1985/86	34	139	4,088	22,693	21,960	646	2,804	255	3,000	273	83.18
1986/87	36	166	4,611	25,097	24,657	685	3,193	259	3,416	277	83.33
1987/88	36	169	4,694	28,049	27,601	767	3,736	271	3,998	290	83.54
1988/89 <sup>4/</sup>	36	169	4,694	24,716	24,213	673	3,282	271	3,512	290	82.65

<sup>1/</sup> Data for 1950-76 include one factory that produced sugar from molasses, but not directly from sugarbeets.

<sup>2/</sup> Calculations for 1950-76 exclude molasses plant.

<sup>3/</sup> Sugar recovered as percentage of sugar in beets.

<sup>4/</sup> Preliminary data.

Source: U.S. Dept. Agr., Economic Research Service; prior to 1975, Agricultural Stabilization and Conservation Service.

Combining the production and processing costs provides the cost of producing raw sugar, 96-degree basis, in the United States. For the 1987/88 crop, the combined cost (net of byproduct credits of 1.07 cents) was 18.88 cents a pound.

Preliminary average production costs for the 1988/89 crop averaged \$1,046 a harvested acre and ranged from \$602 in Louisiana to \$2,822 in Hawaii.

Prices paid for sugarcane are based on the returns that processors receive from the sale of raw sugar and molasses. The grower generally receives about 60 percent and the processor 40 percent of the total income received from the sale of raw sugar. In addition, the grower receives a share of the value of the molasses in the sugarcane.

Prices paid for sugarcane generally relate directly to the domestic price of raw sugar. Independent growers are paid for their share of the sugar in the cane, based upon the season's average price a processor receives for raw sugar. To this value is added the grower's share of molasses. Grower returns for the 1987/88 crop averaged \$29.30 a net ton of sugarcane and ranged from \$27.20 in Hawaii to \$30.90 in Florida (app. table 4).

The market value per acre and the gross value of production for sugarcane are shown in appendix table 8 for the 1970/71-1987/88 crop years. In 1987/88, sugarcane growers received an estimated \$1,055 per acre for their sugarcane or \$35 an acre more than the total cost of production.

### Sugarbeets

The total cost of producing 1987/88 crop sugarbeets averaged \$27.82 a net ton (10.44 cents a pound refined sugar) and \$623 a planted acre (app. table 7). Production costs per net ton of sugarbeets were lowest in Michigan-Ohio at \$21.19 and highest in Texas-New Mexico at \$34.05.

The cost of processing 1987/88 crop sugarbeets, before byproduct credits, averaged 10.6 cents a pound of refined beet sugar and \$28.24 a net ton of sugarbeets. Primarily due to the higher sugar recovery rates, processing costs were lower in the West (eastern part of North Dakota and all other areas west of the Mississippi River).

Combining production and processing costs provides the cost of producing refined beet sugar in the United States. For the 1987/88 crop, the total cost (net of byproduct credits totaling 2.87 cents per pound) was 18.18 cents a pound.

Sugarbeets are grown by farmers under contract to sugarbeet processors. The contracts generally call for growers to deliver beets to processors from a given acreage and for processors to pay the growers a percentage of the returns processors receive from the sale of the refined sugar. With the exception of growers in Michigan and Ohio and cooperative growers in the Red



River Valley of Minnesota and North Dakota, growers do not generally share in processor returns from sales of dried beet pulp and molasses, the two principal byproducts of sugarbeet processing.

For the 1987/88 crop, sugarbeet farmers received an average of \$38.20 a net ton of sugarbeets, ranging from \$35.70 in the Far West to \$40.60 in the East (app. table 5). Estimated per acre receipts were \$857. The market value of the sugarbeets sold exceeded the estimated average production cost by about \$234 an acre.

Preliminary 1988/89 crop data show total production costs averaged \$735 a planted acre and ranged from \$557 in Minnesota and eastern North Dakota to \$1,097 in western Idaho and Oregon.

Based on an analysis by Landell Mills Commodities Studies of costs of production of world sugar and high fructose corn syrup (HFCS) for the 8-year period 1979/80-1986/87, the United States ranked 33rd of 61 regions in raw cane sugar, 7th of 31 regions in beet sugar, and was the lowest cost producer of HFCS in 12 major producing countries.

### **Structural Changes in the U.S. Sugar Market**

The structure of the U.S. market for sugar changed significantly in the 1980's in both supply and demand. Production of sugar and caloric sweeteners increased under the protection of the sugar program. A new technology to produce high fructose corn syrup (HFCS) simultaneously caused a reduction in and changed the composition of sugar demand.

#### **Production Trends**

U.S. sugar production reached a record 7.331 million tons, raw value, in crop year 1987/88, up 24 percent from the 1979/80-1981/82 average (table 1). Cultivated area and yield increased for both beet and cane crops. After a near-record beet sugar output of 4 million tons, raw value, in 1987/88, drought and disease struck the 1988/89 crop, and output did not fully recover in 1989/90. Cane sugar output reached a record 3.4 million tons in 1988/89 but may be down slightly in 1989/90. Florida and Louisiana output levels have advanced 50 percent and 40 percent from their 1979/80-1981/82 averages, while Hawaii has dropped about 10 percent. Florida now supplies about 45 percent of domestic cane sugar output and Hawaii about 25 percent, compared with equal shares of 38 percent a decade ago. Louisiana's output is up, and its share has risen to 25 percent of the total, from 21 percent.

The rise in U.S. sugar output in the 1980's reflects both higher productivity achieved by the industry and assurance of relatively high prices through the support program in the 1981 and 1985 farm acts (table 9). Sugar price support was provided through a purchase agreement price of 16.75 cents a pound, raw sugar, for

Table 9--U.S. and world raw sugar prices, 1960-89

Calendar year	United States <u>1/</u>		World <u>2/</u>		GNP deflator 1982 = 100
	Nominal	Real <u>3/</u>	Nominal	Real <u>3/</u>	
	-----Cents per pound-----				Index
1960	6.30	20.39	3.14	10.16	30.9
1961	6.30	20.19	2.91	9.33	31.2
1962	6.45	20.22	2.98	9.34	31.9
1963	8.18	25.25	8.50	26.23	32.4
1964	6.90	20.97	5.87	17.84	32.9
1965	6.75	19.97	2.12	6.27	33.8
1966	6.99	19.97	1.86	5.31	35.0
1967	7.28	20.28	1.99	5.54	35.9
1968	7.52	19.95	1.98	5.25	37.7
1969	7.75	19.47	3.37	8.47	39.8
1970	8.07	18.18	3.75	8.93	42.0
1971	8.52	18.32	4.52	10.18	44.4
1972	9.09	18.36	7.43	15.98	46.5
1973	10.29	19.06	9.61	19.41	49.5
1974	29.50	49.75	29.99	55.54	54.0
1975	22.47	35.61	20.49	34.55	59.3
1976	13.31	19.78	11.98	18.99	63.1
1977	11.00	15.24	8.11	12.05	67.3
1978	13.93	17.72	7.81	10.82	72.2
1979	15.56	18.16	9.66	12.29	78.6
1980	30.11	35.13	29.02	33.86	85.7
1981	19.73	20.99	16.93	18.01	94.0
1982	19.92	19.92	8.42	8.42	100.0
1983	22.04	21.21	8.49	8.17	103.9
1984	21.74	20.19	5.18	4.81	107.7
1985	20.34	18.34	4.04	3.64	110.9
1986	20.95	18.39	6.05	5.31	113.9
1987	21.82	18.59	6.71	5.72	117.4
1988	22.12	18.24	10.18	8.39	121.3
1989 <u>4/</u>	22.67	17.92	14.03	11.09	126.5

1/ C.i.f., duty/fee-paid. Contract No. 14. since January 1986.

2/ F.o.b. Caribbean, Contract No. 11.

3/ Deflated with gross national product deflator (1982=100).

4/ January-September.

Source: Coffee, Sugar & Cocoa Exchange, Inc.

part of the 1981/82 crop, and then through loan rates increasing from 17 cents a pound for the 1982/83 crop to 18 cents for the 1989/90 crop.

Market prices for raw cane sugar ranged from 18.84 cents a pound in fiscal 1981/82 to 22.49 cents in 1988/89 (c.i.f., duty/fee-paid, Contract No. 14). At the same time, costs of production were declining so that net cash returns for sugar crops improved in relation to alternative crops (including Government deficiency and diversion payments for corn, cotton, rice, and wheat). Despite somewhat lower prices in real (inflation-adjusted) terms for domestic raw sugar in the last half of the 1980's, most of the production gains in the past decade occurred after 1984. If the 1985 U.S. sugar program were continued, production would likely rise further, although some incremental expansion of sugarbeet processing capacity might be needed.

## Price Trends

Price support programs for the U.S. sugar industry have historically been mandated to protect domestic sugar producers from unstable world sugar prices which tend to be low for long periods of time. U.S. sugar prices were administratively determined by the Government through comprehensive regulation of domestic sugar production and imports for 40 years until 1974. Prices were allowed to reflect world levels in 1975-76 and 1980-81 when prices were high enough not to threaten the domestic industry (tables 9 and 16). But for most years, given low world prices, sugar support programs were implemented. U.S. sugar prices averaged 21.28 cents a pound between 1982 and 1988 compared with the world price average of 7.01 cents. Annual average prices in the U.S. market ranged between 19.92 cents and 22.12 cents a pound compared with a world price range of 4.04 to 10.18 cents a pound. The U.S.-world price differential narrowed to about 9 cents in September 1989 as the world market strengthened. Without a U.S. sugar program, the U.S. price would move in tandem with the world price but about 1.5 cents higher because of shipping and handling charges between the Caribbean (world market) and U.S. ports.

## Consumption Trends<sup>1</sup>

Deliveries of refined sugar for U.S. consumption peaked in 1977 at 10.4 million tons (11.1 million tons, raw value). Thereafter, consumption steadily declined for a decade as HFCS displaced sugar (table 10). As losses to HFCS slowed, population and income growth were able to lift aggregate consumption up again, to 7.5 million tons in 1987 from the low of 7.2 million in 1986. Consumption in 1989 is estimated at 7.6 million tons, and is expected to continue to rise slowly. Per capita consumption reached a record 102.3 pounds in 1972, then declined to 60.8 pounds in 1986. After an increase in 1987, per capita consumption has again started to decline slowly (app. table 11 and fig. 2).

Between 1977 and 1989, HFCS consumption grew from 1 million tons, dry basis, to an estimated 6 million. Mostly because of sugar's loss to HFCS, the distribution of sugar among its various uses in the United States changed greatly (app. table 13). Sugar use in beverages fell nearly 90 percent, from 2 million tons in 1975 to about 237,000 tons in 1988. Use in canned, bottled, and frozen foods fell more than 43 percent to 354,000 tons. Beverages now constitute only 3 percent of U.S. sugar consumption, down from 22 percent in 1975. Industrial uses of sugar have declined by 1.4 million tons, and now account for 56.5 percent compared with 61.8 percent in 1975. Retail sales of sugar have declined from 1.2

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<sup>1</sup> "Consumption" data are U.S. sugar deliveries and do not deduct waste and losses in transportation and packaging. Some deliveries, such as for pharmaceuticals, tobacco products, and feedstock for yeast, are not designated for human consumption and are excluded from these data.

Table 10--U.S. domestic deliveries of cane sugar, beet sugar, and HFCS, 1975-89 1/

Calendar year	Total sugar and HFCS deliveries							Share of total sugar and HFCS deliveries		
	Beet sugar	Cane sugar			Total sugar	HFCS	Total sugar and HFCS	Beet sugar	Cane sugar	HFCS
		Domestic	Imported	Total						
	-----1,000 short tons, refined dry basis-----							-----Percent-----		
1975	3,250	2,659	3,719	6,378	9,628	525	10,153	32	63	5
1976	3,489	2,441	4,251	6,692	10,181	750	10,931	32	61	7
1977	3,281	2,522	4,570	7,092	10,373	1,000	11,373	29	62	9
1978	3,050	2,546	4,581	7,127	10,177	1,250	11,427	27	62	11
1979	2,982	2,375	4,695	7,070	10,052	1,625	11,677	25	61	14
1980	3,064	2,170	4,289	6,459	9,523	2,050	11,573	26	56	18
1981	2,946	2,472	3,713	6,185	9,131	2,550	11,681	25	53	22
1982	2,941	2,731	2,882	5,613	8,554	3,100	11,654	25	48	27
1983	2,712	2,920	2,603	5,523	8,235	3,650	11,885	23	46	31
1984	2,548	2,511	2,818	5,329	7,877	4,425	12,302	21	43	36
1985	2,860	2,403	2,211	4,614	7,474	5,275	12,749	23	36	41
1986	2,911	2,690	1,605	4,295	7,206	5,550	12,756	23	34	43
1987	3,415	3,157	939	4,096	7,511	5,740	13,251	26	31	43
1988	3,581	3,031	919	3,950	7,531	5,914	13,445	27	29	44
1989 3/	3,364	3,154	1,071	4,225	7,589	5,936	13,525	25	31	44

Note: To convert refined sugar to raw value, multiply by 1.07.

1/ Deliveries for domestic food and beverage use. Includes Hawaii.

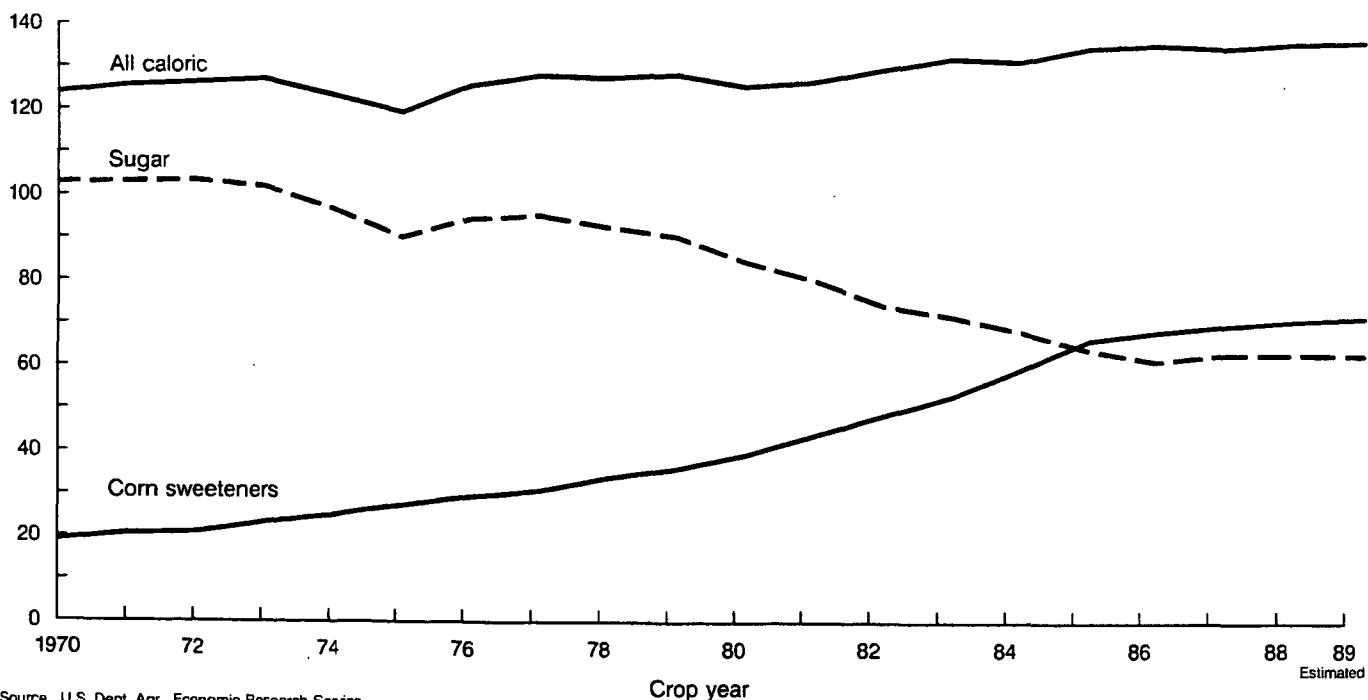
2/ Includes negligible quantities of imported beet sugar.

3/ Forecast.

Source: U.S. Dept. Agr., Economic Research Service.

Figure 2  
U.S. per capita consumption of sugar and sweeteners

Pounds, dry weight



Source: U.S. Dept. Agr., Economic Research Service.