The Rise and Decline of Puerto Rico's Sugar Economy

Nydia R. Suarez[1]

Abstract: Puerto Rico's sugar industry has suffered from a history of major swings in production and trade. At its peak in 1952, Puerto Rico grew 12.5 million tons of sugarcane on more than 400,000 acres and processed over 1 million tons of raw sugar at 34 mills and seven refineries. Today, only two mills and one refinery are in operation. Puerto Rico has shifted from being a raw sugar supplier to the United States to importing sugar to meet domestic needs. The drastic decline in production to less than 20,000 tons in 1998 has probably gone too far to be reversed. High production costs, outdated equipment, lack of capital and collateral for investment in new technology, and the Sugar Corporation's lack of commitment to continue supporting the industry generates a very bleak outlook. The government completed privatization of the industry in mid-1998. However, many problems remain unresolved, leaving the future of the industry dependant on how the government and the "colonos" (the island's sugar farmers) work out their differences.

Keywords: Puerto Rico, sugarcane, sugar, colonos, production, Sugar Corporation.

Sugar Dominates Puerto Rico's Early Development

The Puerto Rico sugar industry is one of the oldest in the Western Hemisphere, having begun when Spanish colonizers brought sugarcane from the Dominican Republic and established the first sugar mill in the mid-1500s. Sugarcane cultivation and sugar production expanded during the rest of the 16th century but lost momentum and stagnated over the next two centuries. Growth was impeded by high costs of labor and freight, competition from other countries, and trade restrictions imposed by the Spanish Crown.

The sugar sector took off again in the 19th century due to growing external demand, principally from Europe and the United States. Sugar production dominated the country's economy as farmers dedicated an increasing amount of land to sugarcane cultivation. However, toward the end of the 1800s, sugarcane cultivation entered a period of decline due to competition from Brazil and Cuba and labor shortages.

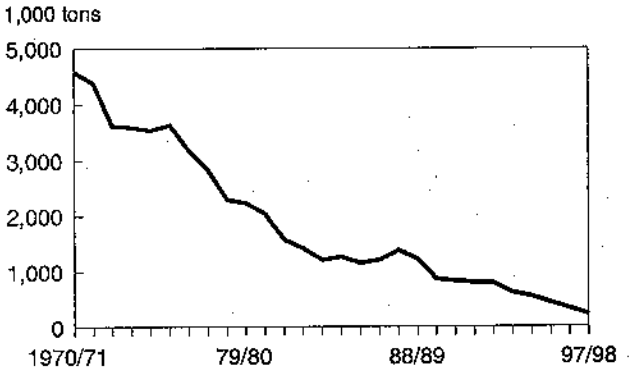
The Puerto Rico sugar industry was revived as a result of the Spanish-American War of 1898. Through a Presidential proclamation in 1901, Puerto Rico became part of a U.S. customs territory, thereby receiving the same tariff benefits that protected U.S. mainland sugar interests. Helped by this tariff and other economic policies, U.S. sugar companies invested heavily in the island's sugar industry. The area devoted to sugarcane tripled, and farm size increased. Puerto Rico's raw sugar production climbed to 661,000 tons by 1925 from an average of 440,000 tons in the early 1920s. Over 40 percent of production was controlled by three corporations. Sugar exports increased accordingly, totaling about 600,000 tons by the end of 1927 when sugar accounted for almost 60 percent of the island's exports.

In 1934, sugar's role was challenged by the enactment of the Jones-Costigan Act. The act established production quotas for the beet and cane producing areas of the United States and its possessions, as well as import quotas for foreign countries. The legislation also restricted the amount of refined sugar that Puerto Rico could ship to the United States. Even though this law discouraged investment in the island's refining capacity, production of raw sugar continued to increase. The vitality and impetus of the island's sugar industry was mainly a result of the relationship between the United States and Puerto Rico. Sugar from Puerto Rico enjoyed a guaranteed outlet in the U.S. market and brought a premium price that was maintained by U.S. import restrictions. The profitability of the sugar industry, bolstered by low labor costs, prompted high levels of investment which led to the creation of infrastructures and the multiplication of sugar mills. During this period, the sugar sector earned approximately two-thirds of the island's net income and employed more than one-third of its labor force.

[1]The author is an agricultural economist in the Specialty Crops Branch, Economic Research Service, USDA. The author wishes to thank the officials from the Puerto Rico Department of Agriculture, Office of Agricultural Statistics, the Economic Development Bank, and the staff from Central Roig and Central Coloso for their insights drawn from a recent trip to Puerto Rico to study the sugar industry. The author also wishes to thank William Kost and Michael Lopez, Asia/Western Hemisphere Branch for their editorial comments.

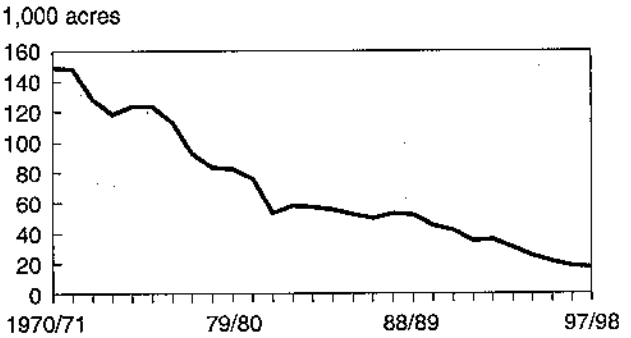
Puerto Rico Sugar Market at a Glance

Figure B-1
Puerto Rico: Sugarcane Production



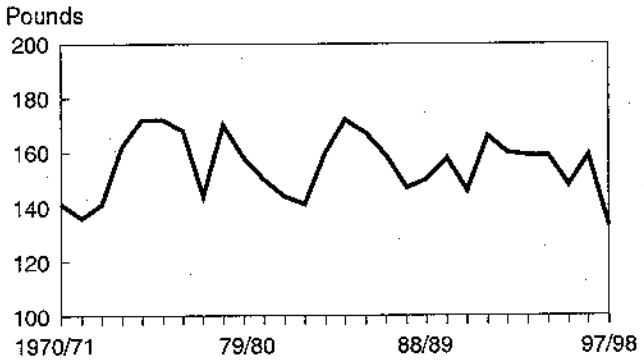
Source: Puerto Rico Department of Agriculture.

Figure B-2
Puerto Rico: Sugarcane Area Harvested for Sugar



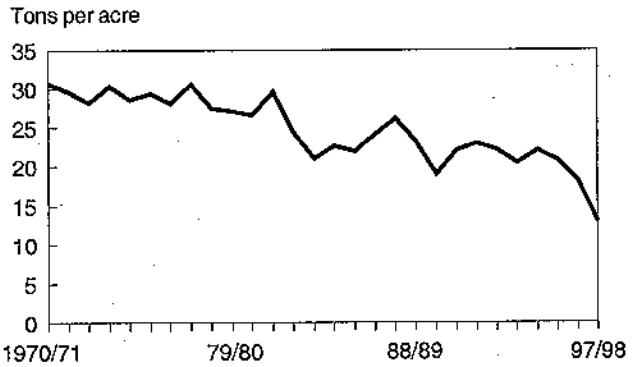
Source: Puerto Rico Department of Agriculture.

Figure B-3
Puerto Rico: Sugar Yields Per Ton of Cane Milled



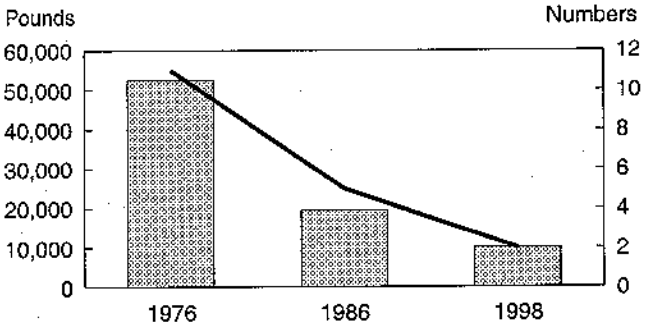
Source: Puerto Rico Department of Agriculture.

Figure B-4
Puerto Rico: Sugarcane Yields Per Acre



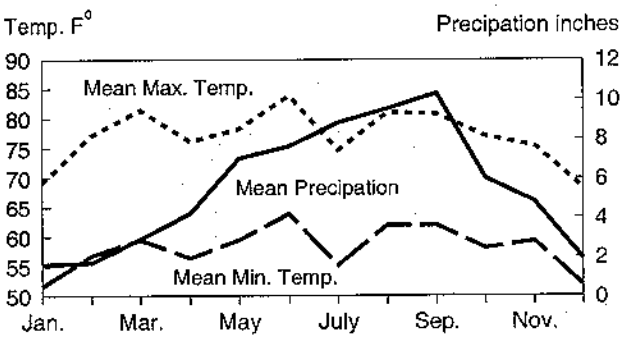
Source: Puerto Rico Department of Agriculture.

Figure B-5
Puerto Rico: Sugarcane Mill Capacity and Number of Mills in Operation



Source: Puerto Rico Department of Agriculture.

Figure B-6
Puerto Rico: Weather Normals in Sugarcane Growing Area (Mayaguez)



Source: Puerto Rico Department of Agriculture.

Emphasis Shifts from Agriculture To Manufacturing

Initially, the reformist political party of the 1940s thought that the economic well being of the island depended on agriculture. One of their first policy initiatives was to implement a land reform program through the newly created Land Authority, whose mandate was to enforce a 500-acre limitation on the size of corporate land holdings. The Land Authority was also responsible for purchasing, at a fair-market price, holdings in excess of 500 acres, and with using these lands to benefit landless peasants and small farmers. Since most corporate sugar holdings were in excess of 500 acres, they became prime targets. By 1947, the Land Authority had purchased 36 percent of the corporate sugar land holdings. By the end of the 1950s, the government had become the single largest landowner in the sugar industry.

Luis Munoz Marin, the island's first elected governor in 1948, introduced a series of policy measures to encourage industrialization. This economic plan, which came to be known as "Operation Bootstrap," gave direction to the Puerto Rico economy henceforth. By the end of the 1950s, the benefits of Munoz's pro-industrialization policies were evident as the gross domestic product (GDP) of the island almost doubled.

These economic policies, particularly those referring to the promotion of the private investment and the tax-exemption benefit, were not extended to the agricultural sector. Traditional agriculture was not a moneymaker and was unable to take advantage of the exemption even if it had been offered.

The Sugar Industry Declines as Puerto Rico Industrializes

Over the next 30 years, industrialization created jobs in the cities and an exodus of labor from the farm. The sugar harvested area declined by more than 50 percent between 1953 and the early 1980s, while the contribution of the agricultural sector to the GDP fell from 14 percent to 5 percent. Cash receipts from sugar averaged $13.5 million annually in 1989-98, accounting for only 2 percent of the agricultural sector receipts (table B-1).

The sugar industry was not immediately crippled by the industrialization strategy. According to Dr. Curet Cuevas in his book *El Desarrollo Economico De Puerto Rico*, agriculture in Puerto Rico remained profitable until the mid-1960s, 15 years after Operation Bootstrap was initiated. In 1949, sugarcane was produced on about 48 percent of all cultivated land, accounting for 50 percent of all agricultural employment and income. In 1952, the sugar industry peaked with the production of almost 1.3 million tons, raw value. As industrialization became the core of the economy, its effect on the sugar industry became more evident. Although sugar production averaged over 1 million tons from 1950 to 1956, it began to fall in 1957. Production briefly recovered,

Table B-1--Puerto Rico: Leading commodities for cash receipts

Items	Value of receipts										Average percent of total receipts
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1989-1998
	Million dollars										Percent
All Commodities	729.4	708.2	725.1	722.0	689.8	670.7	687.1	664.7	701.2	708.3	100.0
Livestock products	419.3	410.3	415.2	417.4	404.5	402.1	401.8	388.3	389.7	397.0	57.8
Traditional crops 1/	83.0	70.2	69.4	80.1	81.0	79.3	71.3	66.4	63.0	57.4	10.2
Other products	227.1	227.7	240.5	224.5	204.3	189.3	214.0	210.0	248.5	253.9	32.0
Milk	196.1	201.6	199.6	195.6	191.2	187.3	195.2	195.5	193.5	199.1	28.0
Poultry	80.6	77.4	85.3	87.6	90.3	93.1	94.2	91.7	92.6	88.9	12.6
Coffee	58.3	51.5	50.6	63.1	64.7	65.6	59.1	57.4	56.9	53.8	8.3
Starchy vegetables	67.7	59.9	70.8	56.7	45.9	44.3	57.9	52.6	52.5	62.5	8.1
Beef	46.9	49.5	45.4	48.7	44.2	42.0	37.1	27.5	29.5	35.4	5.8
Fruits	39.0	36.5	41.7	38.4	34.8	29.3	25.5	29.6	36.4	36.4	5.0
Pork	52.8	34.7	37.2	34.9	33.0	30.8	29.0	28.2	27.3	25.1	4.8
Eggs	22.4	18.6	22.5	24.0	23.9	21.8	22.7	21.0	19.4	21.7	3.1
Sugar	22.5	22.5	17.2	15.5	15.1	13.1	11.1	9.1	6.5	3.1	2.0
Goats and other meats	2.3	3.1	4.2	4.7	3.4	2.9	2.5	2.7	2.5	1.9	0.4
Legumes	2.8	2.5	3.1	2.1	1.8	1.2	0.9	0.7	0.7	0.5	0.2
Molasses	2.0	1.3	1.6	1.5	1.3	1.1	1.0	0.9	0.8	0.5	0.2
Tobacco	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Others	135.9	149.0	145.9	149.2	140.2	138.2	150.9	148.8	182.6	179.4	21.7
Total	593.5	559.2	579.2	572.8	549.6	532.5	536.2	515.9	518.6	528.9	100.2

1/ Includes Sugar, Molasses, Tobacco, and Coffee.

Source: Government of Puerto Rico, Department of Agriculture, Office of Agricultural Statistics.

exceeding 1 million tons in 1961, but since then the sugar industry has been in a period of prolonged decline.

Several factors underlie the sharp decline of the Puerto Rico sugar industry. As with agriculture in general, workers abandoned sugarcane fields to look for higher paying manufacturing jobs in urban areas of Puerto Rico. Sugar mills began to experience labor shortages at harvest time, and the area planted to sugarcane was reduced. Labor unions, which had gained power during this period, pressed for higher wages, which in turn raised production costs. As mills sought to accelerate mechanization, unions resisted. Increased competition from Cuba and the Dominican Republic, as well as mismanagement of the mills, exacerbated this decline. Business confidence plummeted and capital investment fell sharply.

The declining profitability of the sugar industry led to the bankruptcy of some mills, while many of the survivors reduced production. Under pressure from both labor and management, the Government of Puerto Rico began to assume ownership of the industry by buying out failing mills. Between 1968 and 1972, the government invested $100 million in an unsuccessful effort to rehabilitate the industry and bring sugar production levels back to a million tons per year. In 1973, with sugar production below 300,000 tons, the government nationalized the sugar industry by creating the Sugar Corporation to oversee the operations of the remaining 13 mills and one refinery. Nonetheless, sugar production continued to fall due mainly to high production costs and labor shortages. Between 1981 and 1989, sugar production ranged only between 90,000 to 151,000 tons per year, and production has declined every year thereafter.

Location and Structure of Production

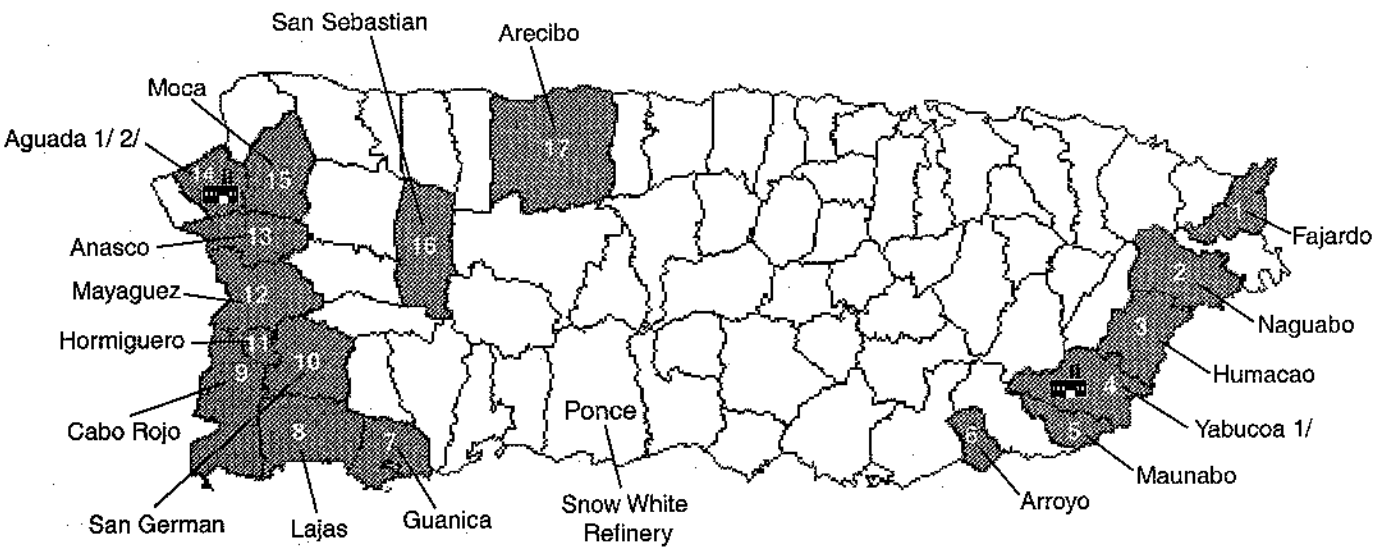
Sugarcane cultivation has been confined largely to the coastal fringes of the island. Historically, some production also occurred at higher elevations in the interior, but the central mountain ranges hamper sugar mechanization and increase labor costs in that region. The sugarcane area of Puerto Rico is customarily divided into five districts: the Interior, East, West, North, and South Coasts.

Climatic conditions in Puerto Rico are generally ideal for sugarcane production. The Interior, East, and West Coast districts have a mean annual rainfall of almost 90 inches; the South Coast receives approximately half that amount; and the North Coast is intermediate. Average maximum temperatures do not vary sufficiently between districts to greatly influence sugarcane growth. Average minimum temperatures just prior to the grinding season (January-April) have a critical effect on the quality. In Puerto Rico lower temperatures are better. As mills have closed and the industry has shrunk, production is now primarily concentrated in the West and East Coasts (see map).

Cropping Schemes and Harvesting Methods

Historically, Puerto Rico has had three types of sugarcane cropping schemes: the primavera, gran cultura, and ratoon. The "primavera" crop or short growth, is seeded between January and June and harvested 10 to 12 months later. In recent years it has accounted for about 15 percent of the

Sugarcane Producing Municipalities and Active Sugarmills, 1998



1/ Central Roig is located in Yabucoa and Central Coloso is located in Aguada. 2/ The Central Agraso factory was previously known as Central Coloso. It was formerly owned and operated by the Corporacion Azucarera de Puerto Rico, an agency of the Government of Puerto Rico.

annual cane harvest. The "gran cultura" crop or long growth, is seeded in the second half of the year and harvested 14 to 18 months later. It represents about 5 percent of the annual cane harvest. The "ratoon" crop (a combination of primavera and gran cultura crops) now accounts for about 80 percent of total production.

Due to labor shortages and sharp increases in wage rates, about 85 to 90 percent of cane cutting and 90 percent of loading operations are now mechanized.

Once the cane is harvested, it is delivered to one of the mills with which the farmer has a contract. After mill technicians sample the cane to determine its sucrose content, it is processed into raw sugar, and the mills pay the farmer for his share. About 64 percent of the sugar obtained from the total cane delivered to the mill belongs to the farmer and the difference to the Sugar Corporation.

According to the most recent U.S. Census of Agriculture for Puerto Rico, the total area harvested for sugarcane in 1992 was 38,462 acres, down sharply from 124,595 acres in 1974, and 424,000 in 1945. The seven leading municipalities where sugarcane was grown—Cabo Rojo, Humacao, Mayaguez, Ponce, San German, San Sebastian, and Yabucoa—accounted for 52 percent of total area in 1992 (table B-2).

Table B-2 --Puerto Rico: Sugarcane area harvested by municipalities, 1992 rank

Municipality	1974	1978	1987	1992
		Acres 1/		
Humacao	2,708	2/	2,238	4,633
San Sebastian	7,578	7,045	4,365	3,186
Ponce	7,812	2/	3,416	3,118
Yabucoa	3,229	2/	2,029	2,957
Mayaguez	2,776	1,937	1,856	2,062
San German	6,136	4,195	2,108	2,006
Cabo Rojo	6,736	8,804	2,172	1,860
Lajas	6,497	5,261	3,221	1,730
Moca	4,903	4,473	2,198	1,689
Hormigueros	1,872	4,052	1,783	1,330
Anasco	4,286	3,835	2,167	1,257
Guayama	2/	2/	2,260	1,091
Aguada	4,419	2,453	1,678	1,086
Arroyo	1,181	1,364	1,255	1,015
Guayanilla	2,511	1,655	1,600	844
Juana Diaz	4,642	3,537	1,014	663
Guanica	2,115	2,728	2/	547
Others 3/	55,194	50,692	9,488	7,388
Total	124,595	102,031	44,848	38,462

1/ Original data in cuerdas. 1 cuerda=0.9712 acres.

2/ Withheld to avoid disclosing data for individual farms.

3/ Included farms in the following municipalities: Aguadilla, Arecibo, Barceloneta, Camuy, Fajardo, Gurabo, Isabela, Las Marias, Maunabo, Naguabo, Patillas, Penuelas, Quebradillas, Rincon, Sabana Grande, San German, San Sebastian, Santa Isabel, Toa Baja, and Yabucoa.

Source: Census of Agriculture, U.S. Department of Commerce, Bureau of the Census, various issues.

The number of sugarcane farms dropped from 1,932 in the 1974 Census to 435 in 1992. The average size of sugarcane farms was 182 acres in 1992, compared with 119 in 1974 (table B-3). Since the land reform of 1941 limited sugarcane farms to 500 acres, Puerto Rico's production has been dominated by small holders. This contrasts with the neighboring Dominican Republic, where sugarcane production has been characterized by large sugar estates (table B-4).

The number of sugarcane growers has fallen precipitously due to the low profitability of the sector. There were about 275 growers in 1996, compared with 5,000 in 1970. The growers who left sugarcane production were usually the smaller ones. Most sugar growers who quit the industry in the mid-1960s had only 25 to 50 acres in cane. Some of this land was eventually sold for residential or commercial development. The rest was left idle. This change in land use is still continuing.

Sugarcane Production

The sugarcane production available for processing is estimated at less than 300,000 tons in 1998, down from 6 million tons in 1970. Sugarcane yields are also declining (table B-5). In 1998, they were 13 tons per acre, down from 26 tons and 31 tons in 1988 and 1978, respectively. In comparison, yields in Florida, for example, rose from 31 tons per acre in 1978 to 36 tons in 1998. This decline in sugarcane yields suggests that some of the more productive land has gone out of production in addition to failure to develop more productive cane varieties, reduced use of yield-enhancing production inputs, and deficient farming practices.

Puerto Rico's sugar recovery rate per ton of cane milled is estimated at 6.64 percent in 1998, compared with 11.04 per-

Table B-3--Puerto Rico: Sugarcane for sugar, number of farms by municipalities, 1992 rank

Municipality	1974	1978	1987	1992
		Number		
San Sebastian	404	337	185	139
Moca	315	259	99	95
Lajas	141	67	26	20
Cabo Rojo	197	105	37	20
San German	136	87	31	18
Isabela	96	84	27	16
Yabucoa	5	2	7	12
Humacao	4	2	6	12
Aguada	32	23	11	11
Hormigueros	16	18	11	9
Others 1/	586	347	131	83
Total	1,932	1,331	571	435

1/ Included farms in the following municipalities: Aguadilla, Anasco, Arecibo, Arroyo, Barceloneta, Camuy, Fajardo, Guanica, Guayama, Guayanilla, Gurabo, Juana Diaz, Las Marias, Maunabo, Mayaguez, Moca, Naguabo, Patillas, Penuelas, Ponce, Quebradillas, Rincon, Sabana Grande, San German, San Sebastian, Santa Isabel, Toa Baja, Vega Baja, and Yabucoa.

Source: Census of Agriculture, U.S. Department of Commerce, Bureau of the Census, various issues.

Table B-4--Puerto Rico: Sugarcane for sugar, average size of farms, by municipalities, 1992 rank

Municipality	1974	1978	1987	1992
		Acres per farm 2/		
Mayaguez	231	387	464	687
Yabucoa	646	1/	290	541
Ponce	651	1/	285	520
Humacao	677	1/	373	386
Guayama	1/	1/	377	273
Juana Diaz	357	884	145	221
Guayanilla	100	207	320	211
Anasco	286	256	241	180
Hormigueros	117	225	162	148
Arroyo	84	341	179	145
Guanica	235	455	1/	137
Aguadilla	52	40	65	112
San German	45	48	68	111
Aguada	138	107	153	99
Cabo Rojo	34	84	59	93
Lajas	46	79	124	87
Isabela	21	30	15	28
San Sebastian	14	21	24	23
Moca	16	17	22	18
Toa Baja	565	1/	1/	1/
Santa Isabel	729	1,797	1/	1/
Rincon	114	1/	1/	1/
Vega Baja	318	1/	1/	1/
Arecibo	71	95	184	1/
Sabana Grande	81	85	75	1/
Penuelas	154	64	30	1/
Quebradillas	33	28	1/	1/
Barceloneta	79	193	1/	1/
Patillas	31	152	1/	1/
Naguabo	319	119	1/	1/
Maunabo	145	80	191	1/
Las Marias	19	1/	1/	1/
Camuy	17	37	1/	1/
Fajardo	434	367	1/	1/
Gurabo	201	101	1/	1/
Others	205	441	214	432
Total	64	77	79	88

1/ Withheld to avoid disclosing data for individual farms.
2/ Original data in cuerdas. 1 cuerda=0.9712 acres.

Source: Census of Agriculture, U.S. Department of Commerce, Bureau of the Census, various issues.

cent in the early 1950s, and well below other U.S. producing areas. Sugar farmers claim that recovery levels have declined over time mainly because of delays in receiving financial support from the government, in addition to malicious fires that occurred in sugarcane fields. Other reasons are the high levels of trash, inadequate and old equipment, and deterioration of sugarcane between cutting and milling.

Production Support

Puerto Rico's Sugar Corporation supported sugarcane farmers primarily through a price support program guaranteeing the price of the farmer's share of sugar produced at the mills. According to the contract terms, 64 percent of the sugar and 66 percent of the molasses belongs to the farmer who delivered the cane. The remaining sugar was owned by the Sugar Corporation, and was valued at the U.S. No. 14 nearby futures contract price for accounting purposes. Although Puerto Rico is eligible to participate in the Federal sugar program, for which the island's loan rate for raw sugar for fiscal 1999 has been set at 18.14 cents per pound, Puerto Rico has elected to use its own funds. However, Puerto Rico continues to benefit from the U.S. price, which is considerably above the world price.

The Sugar Corporation also helped sugarcane farmers in Puerto Rico obtain loans at below-market interest rates. The amount of money that a farmer could borrow, with the cane crop as collateral, depended on the size of the farm and estimated production costs. The total loan amount was not given to the farmer immediately, but released in installments based on how much of the money borrowed had been used for the farm. If the farmer could not repay the entire loan, the unpaid balance was carried into the next crop year.

From 1910 until 1991, sugarcane farmers also benefitted from varietal breeding research at the Agricultural Experimental Station of the University of Puerto Rico (AES-UPR). The program had a long and dedicated history of highly regarded sugarcane improvement. But in 1991, the government's diminished interest in Puerto Rico's fast shrinking sugar sector caused it to cease funding breeding research.

Milling Industry Structure And Performance

Puerto Rico's cane milling industry has shrunk drastically since the 1950s as sugarcane production fell (table B-6). Analyzing the state of the industry in the late 1960s, Dudley Smith, then vice president of the Association of Sugar Producers of Puerto Rico, found that of the eight factories that closed between 1962 and 1967, only one had made a profit in the years immediately proceeding the end of operations. Profits shrank because of high production costs and an inadequate cane supply resulting in an inability to maintain operations close to full capacity. These fundamental problems, which emerged in the 1960s, have not significantly changed in the last 30 years.

In 1998, total grinding capacity is 10,000 tons per day, down from almost 53,000 tons in the mid-1970s (table B-7). However, the average size of the mills has remained relatively unchanged at 5,000 tons per day. While some of the island's smaller mills have closed in recent years, so too have some of the largest. The Aguirre Sugar Company's mill in Salinas with a capacity of 7,500 tons per day and Central Plata in San Sebastian with a capacity of 4,000 tons per day closed in 1990 and 1996, respectively, due to lack of sugarcane resulting from irrigation problems. In addition to the lack of sugarcane for processing, the island's largest mill located in Ensenada closed in 1981 due to labor problems.

Table B-5-- Puerto Rico: Sugarcane acreage, production, and yield

Crop year	Acreage harvested	Cane yield per harvested acre	Sugarcane production for sugar	Raw sugar production	Recovery rate	Sugar yield
	1,000 acres	tons/acre	1,000 tons	1,000 tons	Percent	tons/acre
1955/56	342.7	30.07	10,306	1,138	11.04	3.32
1956/57	351.1	24.81	8,711	979	11.24	2.79
1957/58	318.3	28.51	9,074	923	10.17	2.90
1958/59	334.8	30.41	10,182	1,073	10.54	3.21
1959/60	318.5	31.40	10,001	1,006	10.06	3.16
1960/61	318.7	33.74	10,754	1,096	10.19	3.44
1961/62	299.8	32.23	9,663	997	10.32	3.33
1962/63	294.3	34.40	10,123	978	9.66	3.32
1963/64	294.4	33.29	9,802	978	9.98	3.32
1964/65	279.4	31.52	8,807	887	10.07	3.18
1965/66	265.0	35.72	9,465	873	9.22	3.29
1966/67	255.8	31.90	8,160	806	9.90	3.16
1967/68	230.3	28.61	6,590	637	9.67	2.77
1968/69	174.9	33.72	5,897	478	6.93	2.73
1969/70	183.3	32.14	5,891	455	7.72	2.48
1970/71	149.0	30.75	4,582	321	7.01	2.15
1971/72	148.0	29.61	4,382	295	6.73	1.99
1972/73	128.3	28.22	3,621	252	6.96	1.96
1973/74	118.1	30.36	3,585	287	8.01	2.43
1974/75	123.4	28.63	3,533	299	8.46	2.42
1975/76	123.2	29.46	3,630	308	8.48	2.50
1976/77	112.9	28.14	3,177	264	8.31	2.34
1977/78	92.7	30.58	2,835	201	7.09	2.17
1978/79	83.2	27.50	2,288	191	8.35	2.30
1979/80	82.5	27.10	2,236	175	7.83	2.12
1980/81	76.4	26.68	2,038	151	7.41	1.98
1981/82	53.4	29.57	1,579	112	7.09	2.10
1982/83	58.2	24.38	1,419	99	6.98	1.70
1983/84	57.5	21.04	1,210	96	7.93	1.67
1984/85	55.9	22.72	1,270	108	8.50	1.93
1985/86	52.5	21.96	1,153	96	8.33	1.83
1986/87	50.1	24.13	1,209	96	7.94	1.92
1987/88	53.1	26.18	1,390	102	7.34	1.92
1988/89	52.4	23.21	1,216	91	7.48	1.74
1989/90	45.3	19.05	863	68	7.88	1.50
1990/91	42.0	22.12	829	74	7.97	1.77
1991/92	35.1	22.99	807	67	8.30	1.91
1992/93	36.0	22.19	799	64	8.01	1.78
1993/94	30.6	20.52	628	50	7.99	1.63
1994/95	25.1	22.15	556	45	8.09	1.79
1995/96	21.4	20.84	446	33	7.40	1.54
1996/97	18.5	18.32	339	27	7.96	1.46
1997/98	17.5	12.91	226	15	6.64	0.86

Source: Government of Puerto Rico, Department of Agriculture, Office of Agricultural Statistics.

By 1998, the Sugar Corporation managed the two remaining mills as well as the Snow White refinery—the only refinery on the island. Central Coloso is the biggest mill, with a grinding capacity of 6,000 tons per day, while Central Roig has a capacity of 4,000 tons per day. A lack of agricultural labor, the shift from sugarcane to other agricultural products, increased demand for land, and lack of planning for housing and roads has contributed to inadequate cane supplies.

During the 1998 milling season (January-April), Puerto Rico produced an estimated 16,000 tons of sugar from about 227,000 tons of cane processed (table B-8). In the 1980s, the industry produced an annual average of 103,000 tons of sugar and that in turn was less than half of the 263,000-ton average over the 1970s. While overall production has declined, sugar yield per ton of cane processed remained relatively unchanged, averaging 154 pounds per ton of cane during the 1990s, 155 pounds during the 1980s, and 156 pounds during the 1970s, reflecting a lack of quality

Table B-6--Puerto Rico: Sugarcane manufacturing data

Crop year	Operating mills	Sugarcane ground for sugar	Sugar produced	
			Total	Per ton of cane
	Number	---1,000 tons---		Pounds
1949/50	34	10,615	1,299	245
1950/51	34	10,501	1,238	236
1951/52	34	12,537	1,372	219
1952/53	33	10,171	1,182	232
1953/54	33	10,880	1,204	221
1954/55	32	9,873	1,166	236
1955/56	32	10,306	1,138	221
1956/57	32	8,711	979	225
1957/58	30	9,074	923	203
1958/59	29	10,182	1,073	211
1959/60	29	10,001	1,006	201
1960/61	29	10,754	1,096	204
1961/62	28	9,663	997	206
1962/63	27	10,123	978	193
1963/64	24	9,802	978	200
1964/65	24	8,807	887	201
1965/66	23	8,465	873	206
1966/67	22	8,160	806	198
1967/68	18	6,590	637	193
1968/69	17	6,897	478	139
1969/70	16	5,891	455	154
1970/71	15	4,582	321	141
1971/72	15	4,382	295	136
1972/73	13	3,621	252	141
1973/74	11	3,585	287	162
1974/75	11	3,533	299	172
1975/76	11	3,630	308	172
1976/77	11	3,177	264	168
1977/78	7	2,835	201	144
1978/79	7	2,288	191	170
1979/80	7	2,236	175	158
1980/81	7	2,038	151	150
1981/82	5	1,579	112	144
1982/83	5	1,419	99	141
1983/84	5	1,210	96	160
1984/85	5	1,270	108	172
1985/86	5	1,153	96	167
1986/87	5	1,209	96	159
1987/88	5	1,390	102	147
1988/89	5	1,216	91	150
1989/90	5	863	68	158
1990/91	4	929	74	146
1991/92	4	807	67	166
1992/93	4	799	64	160
1993/94	4	628	50	159
1994/95	4	556	45	159
1995/96	3	446	33	148
1996/97	2	339	27	159
1997/98	2	226	15	133

Source: Government of Puerto Rico, Department of Agriculture, Office of Agricultural Statistics.

Table B-7--Puerto Rico: Sugarcane mill capacity

Name of factory	Location	1976	1986	1993	1994	1995	1996	1997	1998
				Capacity cane grind per 24 hours					
				Tons					
Aguirre Sugar Co.	Salinas	7,500	--	--	--	--	--	--	--
Central Cambalache	Arecibo	5,000	--	--	--	--	--	--	--
Central Coloso	Aguadilla	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Central Eureka	Hormigueros	4,000	--	--	--	--	--	--	--
Central Fajardo	Fajardo	3,500	--	--	--	--	--	--	--
Central Guanica	Ensenada	8,000	--	--	--	--	--	--	--
Central Igualdad, Inc	Mayaguez	4,000	--	--	--	--	--	--	--
Central Mercedita	Ponce	4,500	4,500	5,000	5,000	5,000	--	--	--
Central Plata	San Sebastian	5,000	5,000	4,000	4,000	4,000	4,000	--	--
Central Roig	Yabucoa	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Central San Francisco	Yauco	1,000	--	--	--	--	--	--	--
Total		52,500	19,500	19,000	19,000	19,000	14,000	10,000	10,000
Average		4,773	4,875	4,750	4,750	4,750	4,667	5,000	5,000

Source: Gilmore Sugar Manual, various issues and Puerto Rico Department of Agriculture, Office of Agricultural Statistics.

Table B-8--Puerto Rico: Sugarcane milling production and molasses production, by mill

Name of factory	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
					1,000 tons of cane milled					
Central Coloso	324	256	302	243	256	201	246	245	218	170
Central Plata	193	155	141	112	103	101	117	73	0	0
Central Mercedita	287	220	275	197	211	138	0	0	0	0
Central Roig	194	127	211	255	229	188	193	127	121	57
Total	998	758	929	807	799	628	556	445	339	227
					1,000 tons of sugar produced 96°					
Central Coloso	22.6	21.2	24.3	20.5	20.1	15.9	21.0	18.9	17.3	11.9
Central Plata	15.1	12.3	9.7	9.7	8.1	7.5	8.3	4.7	0.0	0.0
Central Mercedita	21.3	18.5	23.3	16.7	16.6	10.3	0.0	0.0	0.0	0.0
Central Roig	15.4	8.6	16.7	20.5	19.3	16.1	16.2	10.0	9.8	3.9
Total	74.4	60.6	74.0	67.4	64.1	49.8	45.5	33.6	27.1	15.8
					1,000 gallons of molasses produced					
Central Coloso	1,586	1,241	1,584	1,311	1,139	955	1,200	1,164	1,105	n/a
Central Plata	1,242	985	1,006	751	587	599	527	366	0	n/a
Central Mercedita	1,514	1,176	1,452	1,242	1,519	1,163	0	328	245	n/a
Central Roig	950	680	1,196	1,408	1,330	1,070	1,035	635	620	n/a
Total	5,292	4,082	5,238	4,712	4,575	3,787	2,762	2,493	1,970	n/a

n/a = Not available.

Source: Puerto Rico Department of Agriculture, Office of Agricultural Statistics.

improvement. In contrast, Florida crushing yields grew 212 pounds to 239 pounds per ton over the same 25-year-period.

The milling sector's output of molasses also has dropped precipitously. The contraction in molasses production has had a major impact on Puerto Rico's well-known rum industry. Puerto Rico imports most of the molasses from the Dominican Republic.

Cost of Production

As the industry has shrunk, the fixed cost per unit of sugar produced has risen rapidly. The two remaining mills would need to produce at least 100,000 tons of sugar to approach efficient output levels. However, in 1997/98, raw sugar production from the two mills reached about 16,000 tons.

High input costs, relatively high labor content in a high-wage economy, increased transportation costs now that farms are located farther from mills, and low productivity place Puerto Rico among the highest cost sugar producers in the world. Field costs averaged 17.08 cents a pound from 1980/81-1984/85 and 20.95 cents a pound from 1990/91-1994/95. For the most recent period, labor accounted for 53 percent of total field costs, capital 33 percent, and fuel, fertilizer, and chemicals the balance.

Milling labor costs also are high. Total mill costs averaged 12.44 cents a pound from 1980/81-1984/85 and 19.10 cents a pound from 1990/91-1994/95. Total sugar production costs (field and factory and administration) averaged 33.87 cents a pound and 47.18 cents a pound, respectively, for the two periods. In the Landell Mills study, Puerto Rico had the second highest rank out of 62 cane producing countries surveyed for the 1980/81-1990/95 period, versus mainland U.S. cane producers ranking 28th. Hawaii field and factory costs, the highest of the four cane producing States, averaged 20.64 cents a pound during the 1980/81-1994/95 period, 36 percent below Puerto Rico's (tables B-9-B-11).

These extremely high costs show up in the losses—close to $20 million per year since 1995—sustained by the government's Sugar Corporation. The Sugar Corporation has sustained losses every year since fiscal 1974, losing an accumulated total of more than $1 billion. The Sugar Corporation's inefficiency, obsolete machinery, and high labor costs have been widely publicized. Until recently, more than 2,000 people worked for the Sugar Corporation as pressure from unions hampered its ability to reduce its labor force.

Marketing Sugar and Molasses

Raw sugar produced in Puerto Rico is processed into refined sugar at the Snow White refinery located adjacent to the closed Mercedita cane mill in Ponce. The refinery is owned by the Land Authority and operated by the Sugar Corporation. The Sugar Corporation is the local producer and supplier for the Puerto Rico market for direct consumption or table grade refined sugar.

Table B-9--Puerto Rico: Sugar production (field costs) 1/

Year	Labor	Capital	Other Inputs	Total
		Cents per pound		
Average 1980/81-82/83	8.61	5.28	2.78	16.67
Average 1983/84-85/86	9.57	5.57	2.75	17.89
Average 1986/87-88/89	9.11	5.40	2.17	16.69
Average 1989/90-91/92	10.43	6.33	2.69	19.45
Average 1992/93-94/95	11.51	7.08	3.10	21.69

1/ These production costs have been estimated after allowing fully for the fixed costs attributable to the capital equipment installed in mills and in use in agriculture. As sugar output has fallen, capacity utilization has also fallen, thereby raising the unit fixed costs of capital and labor by a substantial amount.

Source: LMC International

Table B-10--Puerto Rico: Sugar processing (factory costs) 1/

Year	Labor	Capital	Other Inputs, net of byproduct credits 2/	Total
		Cents per pound		
Average 1980/81-82/83	2.67	13.36	-1.98	14.05
Average 1983/84-85/86	2.11	9.53	-0.75	10.89
Average 1986/87-88/89	4.01	9.97	-0.88	13.10
Average 1989/90-91/92	6.35	10.51	-0.59	16.28
Average 1992/93-94/95	9.64	11.35	-0.57	20.42

1/ These production costs have been estimated after allowing fully for the fixed costs attributable to the capital equipment installed in mills and in use in agriculture. As sugar output has fallen, capacity utilization has also fallen, thereby raising the unit fixed costs of capital and labor by a substantial amount.
2/ The byproduct credits do not allow for the value added from processing molasses into high value products, such as rum.

Source: LMC International

Table B-11 --Puerto Rico: Sugar production and processing costs 1/

Year	Production (Field)	Processing (Factory)	Administration 2/	Total
		Cents per pound		
Average 1980/81-82/83	16.67	14.32	4.65	35.64
Average 1983/84-85/86	17.89	10.89	4.32	33.10
Average 1986/87-88/89	16.69	13.11	4.47	34.26
Average 1989/90-91/92	19.45	16.28	5.36	41.09
Average 1992/93-94/95	21.68	22.03	6.56	50.28

1/ These production costs have been estimated after allowing fully for the fixed costs attributable to the capital equipment installed in mills and in use in agriculture. As sugar output has fallen, capacity utilization has also fallen, thereby raising the unit fixed costs of capital and labor by a substantial amount.
2/ The Administration expenses relate to both field and factory operations.

The wholesale price of refined sugar is determined by the government through its Department of Consumer Affairs (DACO). The price is presently set at 43 cents per pound. To complete the marketing chain, distributors sell their sugar to supermarkets and other retail outlets at a price which is also set by DACO. The current retail price is 52 cents per pound.

While the Sugar Corporation fills Puerto Rico's domestic food needs, most of the demand for industrial uses is met by shipments from the mainland United States. These shipments are regulated and subject to licenses issued by the Government of Puerto Rico. Currently there are about seven license holders.

When Puerto Rico produced sugar well in excess of the needs of the island, the surplus was exported to the United States. As the sugar industry declined, exports diminished as well. Puerto Rico has shifted from a historically significant exporter to an importer. Exports during the 1980s averaged about 30,000 tons; over the last 4 years they have dipped well below this mark. Exports are essentially raw sugar which cannot be processed with Puerto Rico's limited refining capacity. Most is sold to the United States, although occasionally some is shipped to Caribbean neighbors.

Puerto Rico is also a transshipment point for refined sugar from Florida and Louisiana. This refined sugar is typically reloaded onto smaller vessels and shipped to Haiti, Barbados, and other Caribbean destinations.

Over the years, some U.S. import quota sugar from foreign countries have entered the island. Non-quota sugar imports for consumption must pay the high duty (16.27 cents in 1998) as elsewhere in the United States.

Prospects for the Future

The Puerto Rico sugar industry has become a financial drain for the government and an ordeal for the colonos. The government has agreed to privatize the industry and transfer Sugar Corporation assets to sugar farmers and the two existing mills (92 sugar farmers from Coloso and 26 from Roig). The refinery asset transfer will occur in 2000.

Problems were aggravated further in September 1998 by Hurricane Georges, which inflicted over $12 million in damages to the sugar industry. The Central Roig mill decided not to harvest in 1998/99 and instead is preparing for the 2000 crop. The Central Coloso mill is expected to harvest no more than 130,000 tons of sugarcane and 9,000 tons of sugar in 1998/99. At this point, the government and the colonos have not reached an agreement on financing loans for the 1998/99 harvest, making it very difficult for the colonos to accomplish their dream of being able to at least satisfy the internal demand of the island.

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