

Sparks Companies, Inc.

Study of the Sugar and Fuel Alcohol Markets in Brazil

for

**Sugar Research and Development Corporation
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Study of the Sugar and Fuel Alcohol Markets in Brazil

FOREWORD

This is a study of the world's largest sugar producer, Brazil. Its purpose is to describe the highly complex recent trends in sugar policies, investment and exports, and in the innovative fuel alcohol program. And, it is intended to raise relevant questions concerning future marketing and investment strategies across key regions.

The study was undertaken for the Sugar Research and Development Corporation, Brisbane, Australia.

Key Unit Conversion Factors

- 50 kg sacks x 50 ÷ 1,000 = metric tons
- tel quel x 1.0619 = raw value
- 1 barrel of oil = 42 gallons or 159 liters
- 1 US gallon = 3.785 liters
- 1 cubic meter = 1,000 liters
- M³ to liters ÷ 1,000
- 682.5 liters of Anhydrous Alcohol = 1 ton of crystal sugar
- 712.24 liters of hydrous alcohol = 1 ton of crystal sugar
- 1 kg of standard sugar = 1.04723 kgs of TRS
- 1 liter of anhydrous alcohol = 1.86222 kgs of TRS
- 1 liter of hydrous alcohol = 1.78563 kgs of TRS

Most Recent 5 Year Averages:

- 1 ton of cane to produce 77 liters of alcohol in Brazil (79 liters in Sao Paulo)
- 1 ton of cane to produce 113 kgs of sugar in Brazil (115 kgs in Sao Paulo)

TRS = total reduced sugar

Source: Brazil's Sugar and Fuel Alcohol Industry.

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Study of the Sugar and Fuel Alcohol Markets in Brazil

EXECUTIVE SUMMARY

Brazil is among the world leaders in the production of sugarcane, sugar, fuel alcohol (ethanol) and in sugar consumption and exports. In addition, its Center-South region is among the most efficient of all the world's major sugar producers and its export products are the most diverse. It currently uses about two-thirds of its annual sugarcane output of 300 million metric tons to produce fuel alcohol; the remaining one-third goes to produce sugar for domestic use and for export. The nation has the potential to expand sugar exports more rapidly than any other of the world's major exporters by diverting more cane into sugar production for export. However, this potential is constrained by several factors, most notably by the country's need to satisfy its large domestic sugar and fuel alcohol requirements. While the domestic sweetener requirements of the population and the food and beverage industry are expected to grow at a rapid pace, policies supporting fuel alcohol are in transition. These policy developments will have important implications for the world sugar market.

The study describes key trends throughout the sector, and offers the following observations:

- **More open markets and deregulation are rapidly changing the sugar and alcohol industry in Brazil.** Growers and processors, long accustomed to government guaranteed prices and market allocations are competing in the free market—and, many must become more efficient to survive. In fact, a number of firms have exited so that the industry has become smaller and more consolidated, with lower costs. New investments in infrastructure such as highways, railroads and port facilities, spurred in part by the sale and long term lease of government-owned companies and facilities, such as the state railroad in Sao Paulo and the port of Santos, are enhancing the competitive position of Brazil's sugar and alcohol producers. In the short-run the industry, which probably grew too rapidly in the recent past, will become smaller. In the long-run, it will expand. In the future, it will face a significantly different fuel alcohol market and will develop flexibility to respond to shifts in relative returns from sugar and fuel markets.
- **Brazil will remain competitive in world sugar markets** but annual increases in production could halt, at least temporarily, as growing numbers of marginal producers adjust to world market realities. Also, home market demand for both sugar and fuel alcohol likely will continue to grow and, compete increasingly for the available sugar, limiting export availability.
- **Fuel alcohol demand growth likely will cut availability of Brazilian sugar on world markets.** The most likely prospect for the next several years is for a rapid

downsizing and consolidation of the sugar and alcohol industry. Substantial subsidies for alcohol fuel, likely via a "green tax" on petroleum based fuels, are expected. This could result in smaller exports of sugar as Brazilian producers concentrate on supplying expanding domestic fuel markets.

Should the government significantly reduce its support for the alcohol program, even faster downsizing of the industry would follow. However, exports likely will respond to world prices and sugar production could increase at the expense of alcohol, especially as the fuel market moves from hydrous alcohol for pure alcohol vehicles to anhydrous alcohol for blending with gasoline. By reducing anhydrous alcohol content in gasohol from 22% to as low as 10%, sugar availability could be boosted. The maximum range of exports by 2005 is about 5 million tons of sugar.

- **There is a complementary relationship between sugar and alcohol production which results in lower costs for both products.** A mill not producing alcohol must extract all possible sucrose from sugarcane juice for crystallization into sugar. In contrast, a mill with an integrated distillery can use the sucrose easiest and cheapest to extract for sugar and send the remaining high test molasses to the distillery for alcohol production. The few mills without distilleries and the many independent distilleries have substantially higher costs than the integrated mills. As a result stand alone distilleries and sugar-only mills are closing or converting to integrated mills. Between 1992-98 the number of autonomous distilleries dropped by 40%, non-integrated mills decreased 42% while the number of integrated mills increased 20%.
- **The growing market orientation of Brazil's sugar and alcohol industry has limits.** The industry may never be completely free of government intervention because of its importance to the economy—2% of the GDP and over 1 million employees—and its political influence. The most important manifestation of government influence is the maintenance of the National Alcohol Program.
- **The sugar and alcohol economy of Northeast Brazil is distinct from the rest of country.** The Northeast accounts for about 20% of Brazil's sugarcane output and one-third of its sugar exports including almost all raw sugar exports. While the Northeast has the advantage of having its growing areas near to its ports, it has high production costs relative to the Center-South, and trades virtually no sugar or alcohol with the rest of the country. The Northeast industry's productivity is constrained by limitations imposed by its physical environment. This situation contrasts sharply with the excellent natural conditions for sugarcane agriculture in the Center-South. The region's sugar and fuel alcohol sector has been gradually contracting, in part, by the out-migration of potential investment capital and entrepreneurial activity to other parts of Brazil. Nonetheless, the sugar industry will remain a vital part of the economy of the Northeast and as such will continue to be supported by regional political forces both within the region and in their lobbying in Brasilia.

- **Brazil and Australia have a common interest in seeking improved market access for sugar** in major importing countries during the next round of negotiations at the World Trade Organization (WTO). Both countries have put in place policies that set examples for other countries to move toward to achieve free world trade in sugar. Given these common policies and trade goals, both countries would be strong potential allies in the coming negotiations.
- **Despite the common interests in seeking free trade for sugar, Brazil and Australia are now and will remain key competitors in the global sugar market.** The markets in the Middle East and Eastern Europe will be especially key areas for competition for market share between the countries. The potential future expansion of Brazilian sugar into Asian markets is also a high probability owing to the trend toward improved internal transport and port costs and greatly expanded port export facilities for sugar. Brazil's recent excursion into Australia's backyard market of Indonesia may be a precursor of the future. The year-to-year export availability of sugar by Brazil, which will be largely determined by their domestic alcohol policies, will influence the direction of world sugar prices and the level of competition encountered by Australia in world sugar markets.
- **What are the sugar/alcohol price trigger points which will cause a switch from alcohol to sugar for export and vice versa?** Research indicates that in the Center-South the break even point for sugar is currently about US \$190 per ton (VHP or plantation white sugar which translates into \$ 177.6 per ton, raw value or 8.1 cent per pound). Therefore, higher relative prices in the export market for sugar would draw out sugar for export if they were higher than the comparable prices in the domestic market for sugar or fuel alcohol. Nonetheless, the market outlook appears very fluid. For example, as of early November both alcohol and sugar prices are depressed—ex mill sugar prices in the Center-South are US\$ 143 per ton or 6.5 cents a pound, alcohol prices are 21 cents per liter, and sugar for export is US\$ 180 per ton fob stowed or 8.2 cents a pound with a fobbing discount running at \$33 to \$38 per ton. Sugar export contracts are being made at these prices reflecting such non-price factors as the need to utilize new export capacity at ports, the fact that exports generate commercially attractive large volume sales in contrast to the small size of common domestic sales, and export payments, based on letters of credit, are much quicker and in dollars in contrast to the domestic market—not an unimportant consideration for liquidity starved milling companies.

Study of the Sugar and Fuel Alcohol Markets in Brazil

I. INTRODUCTION

Overview

Brazil is among the world leaders in the production of sugarcane, sugar, fuel alcohol (ethanol) and in sugar consumption and exports (Chart 1). In addition, its Center-South region is among the most efficient of all the world's major sugar producers and its export products are the most diverse. It currently uses about two-thirds of its annual sugarcane output of 300 million metric tons to produce fuel alcohol; the remaining one-third goes to produce sugar for domestic use and for export (Table 1). The nation has the potential to expand sugar exports more rapidly than any other of the world's major exporters by diverting more cane into sugar production for export. However, this potential is constrained by several factors, most notably by the country's need to satisfy its large domestic sugar and fuel alcohol requirements. While the domestic sweetener requirements of the population and the food and beverage industry are expected to grow at a rapid pace, policies supporting fuel alcohol are in transition. These policy developments will have important implications for the world sugar market.

Chart 1. Brazil: Sugar and Fuel Alcohol Production

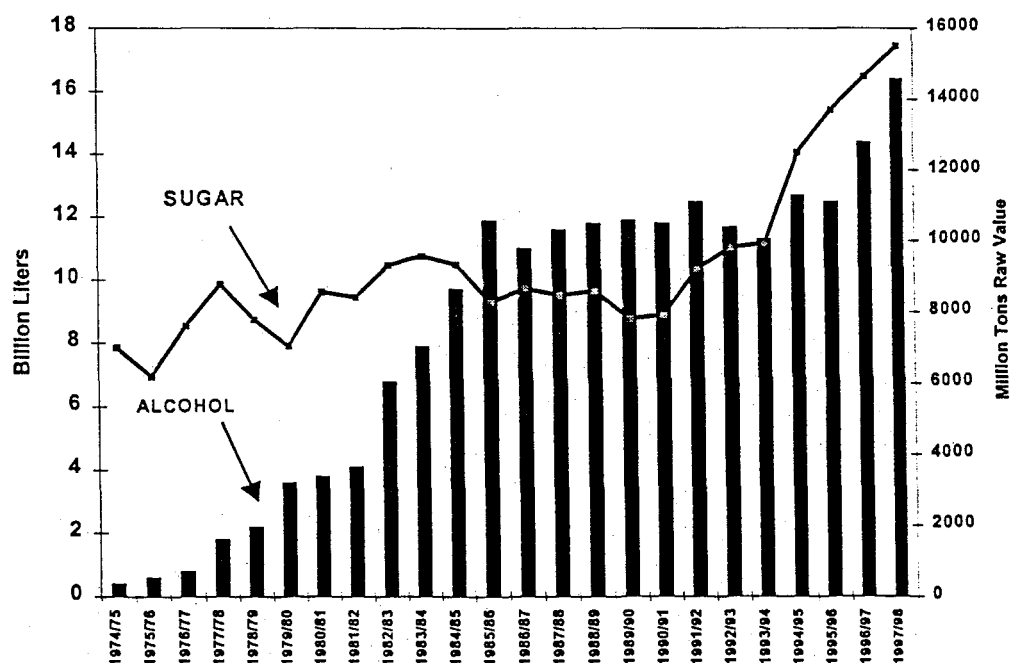


Table 1. Brazil: Regional Sugarcane, Sugar and Fuel Alcohol Supply and Utilization

Regions/Total	1996/97	1997/98	Forecast
			1998/99
North/Northeast			
Sugarcane (mmt)	48.0	49.4	43.5
Total Sugar (mmt)	3.1	3.2	2.8
Domestic market	1.6	1.3	1.3
Export	1.5	1.9	1.5
Total Alcohol (BL)	1.6	1.7	1.4
Anhydrous	0.6	0.7	0.8
Hydrous	1.0	1.0	0.6
Center/South			
Sugarcane (mmt)	231.6	248.8	256.3
Total Sugar (mmt)	10.5	11.4	12.2
Domestic market	6.4	6.6	6.7
Export	4.1	4.8	5.5
Total Alcohol (BL)	12.0	13.3	13.0
Anhydrous	3.8	4.8	5.1
Hydrous	8.2	8.5	7.9
Brazil			
Sugarcane (mmt)	279.6	298.2	299.8
Total Cane (mmt)	13.6	14.6	15.0
Domestic market	8.0	7.9	8.0
Export	5.7	6.7	7.0
Total Alcohol (BL)	13.6	15.0	14.4
Anhydrous	4.4	5.4	5.9
Hydrous	9.2	9.6	8.5

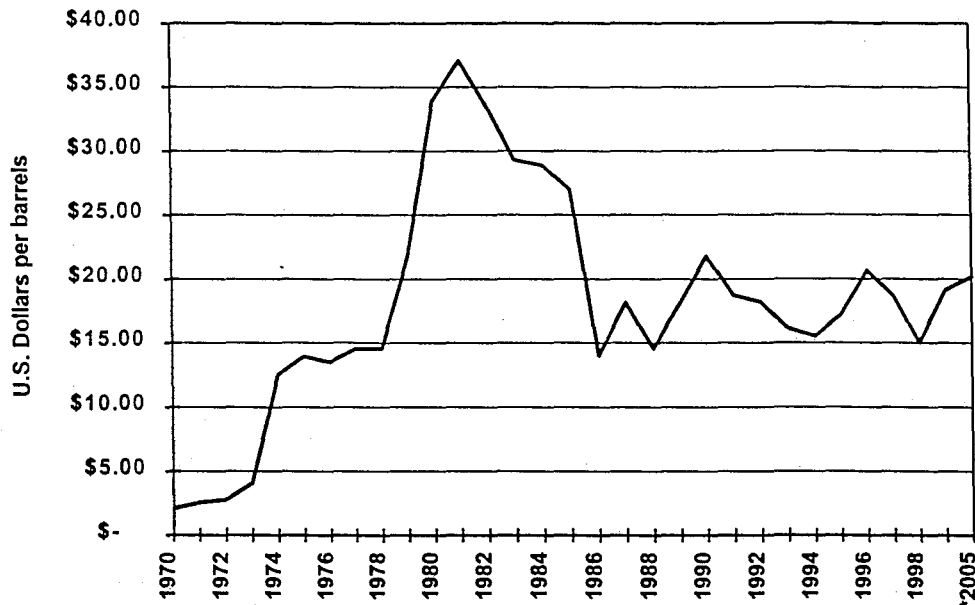
Source: Brazilian Sugar and Fuel alcohol Industry, SCI forecast

Sugar and Fuel Alcohol Policy Developments

Brazil's sugar and fuel alcohol policies have their roots in developments that began in the mid-1970s. In 1976/77, Brazilian sugarcane production was around 90 million tons which was processed into 7.2 million tons of sugar and 660 million liters of alcohol. Up until that time alcohol was regarded as a sugar byproduct obtained from the fermentation of molasses. As a result of the crises in the global oil market in 1973-74 and 1980-81, Brazil as a large oil importer found itself with a growing oil bill which reached a staggering \$11 billion in 1981 accounting for 50% of total imports, compared with \$700 million and 12% in 1973 (Chart 2). For this reason the government undertook the National Alcohol Program known as Proálcool. Its initial aim was to cut the energy import bill by adding anhydrous alcohol to gasoline. A second phase promoted the use of hydrous alcohol as a gasoline substitute. Anhydrous began to be produced in greater volume and mixed with gasoline at 22% levels following recommendations of technical studies.

Cars running exclusively on hydrous alcohol were introduced in 1979 and the first independent distilleries were built to supply the growing market.

Chart 2. World: Crude Oil Price Trends and Projections



Source: World Bank and US Energy Department.

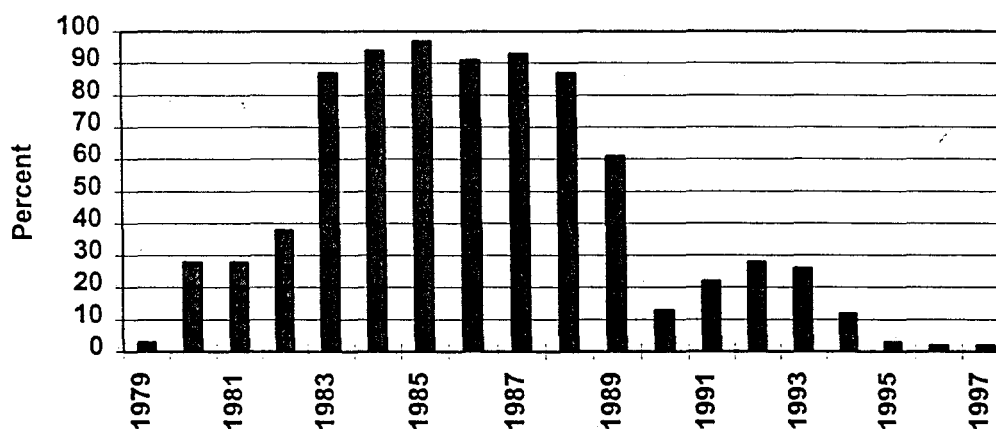
EVOLUTION OF BRAZILIAN SUGAR POLICY

1934	IAA - Sugar and Alcohol Institute - Established; government export monopoly; production and marketing quotas, administered prices
1975	National Alcohol Program - First phase, anhydrous ethanol for gasohol
1979	National Alcohol Program - Second phase, hydrous ethanol for pure ethanol vehicles
1985	National Alcohol Program - End of subsidies for new distillery investment
1990	IAA abolished - End of government export monopoly, sugar prices freed
1990	Government fails to provide sufficient hydrous alcohol for consumers
1990-97	Gradual elimination of sugar production, export and domestic market controls
1994 - July	Introduction of <i>Real</i> currency, end of hyperinflation
1995	Domestic market sugar futures contract
1995-99	Gradual freeing of retail fuel prices
1997	End of Petrobrás monopoly on petroleum product refining
1997 - May	Free market price for anhydrous alcohol
1998	End of export quotas
1998 - Oct	Free market price for hydrous alcohol (postponed for second time, new date Feb 1, 1999)
1998 - Oct	Free market price for sugarcane (postponed for second time, new date Feb 1, 1999)
Future	Tax or other mechanism to subsidize ethanol fuel in place of internal cross-subsidy by Petrobrás

Source: Brazilian government press releases, industry reports, and US embassy reporting.

Alcohol-fueled cars were well received by Brazilian consumers since tax incentives made their purchase attractive and fuel prices were subsidized as well. Alcohol-fueled cars accounted for more than 90% of total sales between 1983 and 1988 with the total alcohol-powered fleet reaching its peak in 1994 at 4.6 million vehicles. As oil prices declined in the late 1980s, the Brazilian government began to reduce subsidies, discouraging alcohol production. The decline eventually led to shortages for the alcohol-powered fleet. By the late 1990s, sales of alcohol cars had fallen to less than 1% of total annual car sales (Chart 3).

Chart 3. Brazil: Sales of Alcohol-Fueled Cars



Source: Copersucar.

Today, Brazil's sugar and alcohol sector operates within a nearly free market, a major transformation from a decade ago when the government administered every aspect of the sector. Liberalization has stimulated innovation and boosted efficiency. The parallel privatization of many public services, such as transportation, utilities and port facilities, are reducing costs for Brazil's sugar and alcohol producers. The market reforms appear to be the key factor assuring that Brazilian sugar exports will remain competitive in the opening decade of the new millennium.

The shift to more competitive fuel markets was supported by the 1990 abolition of the IAA, the Sugar and Alcohol Institute. Sugarcane and alcohol prices continued to be administered, production and marketing plans, though of less importance, continued to be executed, but the export market was opened to private enterprise and sugar price controls were terminated. In 1994, hyperinflation came to an end, and high real interest rates and a highly valued currency were introduced. This spelled trouble for less efficient, often indebted mills and sparked a wave of consolidations which is far from complete today. The establishment of a domestic sugar futures contract in 1995 signaled the growing importance of competition on the sugar sector. In September 1995, the government eliminated the value added tax (ICMS) on exports of raw material agricultural products, thus ending the tax treatment that favored exports of white sugar over raw sugar. Government-decreed prices for sugarcane were scheduled to disappear in May 1998, but a last minute reprieve kept them in place until November and recently were postponed again until February 1, 1999.

Freeing the alcohol market has been a slower process and is not yet complete. The first step, in November 1995, was Constitutional Amendment No. 9 which abolished the Petrobrás monopoly on petroleum exploration and refining in Brazil. Implementing legislation was passed in 1997. In the past, government-controlled Petrobrás facilitated the subsidy of alcohol prices via artificially high prices for gasoline. Now that fuel distributors can choose between gasoline and ethanol, subsidy mechanisms are understood to have potential market distorting impacts.

Prices for anhydrous alcohol were freed in May 1997, but the freeing of hydrous alcohol prices was postponed from May to November 1998 and now to February 1, 1999. Opponents of immediate price liberalization contend that market pricing will be chaotic until a permanent mechanism for balancing gasoline and ethanol prices is in place. The most frequently cited option is a "green tax" which would require a constitutional amendment before becoming law.

Political and Macro Economic Environment

The evolution of Brazil's domestic and international sugar and fuel alcohol policies depend heavily on the country's political and macro economic environment. Table 2 highlights key events from 1500 to 1998.

Brazil is a Federal Republic with 26 states and a Federal district (Chart 4). The national government is comprised of Executive, Legislative, and Judicial branches. The system is governed by the Constitution, created in 1988 following 20 years of military rule, which grants broad powers to the federal government. A popularly elected president holds office for four years and appoints his own cabinet. The Senate includes 81 members, three for each state and the Federal District. The Chamber of Deputies has 513 Deputies, with seats allocated on a complex system of proportional representation. Each state is eligible for a minimum of eight seats, and a maximum of 70 seats. The net result is a system heavily weighted in favor of the less populated states in the North and the many small fairly heavily populated states in the Northeast where the current population (nearly 168 million) remains heavily concentrated (Charts 5 and 6).

In October 1994, Fernando Henrique Cardoso won the presidential election with 54% of the vote, and this fall's election was a rerun of 1994. The Cardoso administration has made stabilization and reform of the economy and modernization of the state its highest priorities. The "Plano Real" has reduced high levels of inflation that had been the bane of the economy (2,491 in 1993) by linking the "real" to the US dollar (the exchange rate was 1.18 real to the US dollar in mid September 1998). In addition to price stability and tight credit (interest rates now exceeded 40%), the economy was opened to foreign competition beginning in 1990. The average tariff rate is now 14% compared with 80% in 1988/89. Also, the program to reduce the number of state companies begun earlier has been continued as has the general level of governmental intervention in the economy. However, major constitutional amendments needed to reform

social security, taxation, and public administration necessary to cut government deficits and lay the groundwork for future growth and development in Brazil have encountered significant Congressional opposition. To move forward Brazil needs to address myriad economic and social reforms to modernize the economy and reduce the so-called "custo Brasil"—the extra cost of doing business in Brazil that results from an inefficient state-managed infrastructure and rigid labor laws.

Table 2. Brazil: Chronological History

1500	Pedro Alvares Cabral, Portuguese navigator, claims Brazil for Portugal.
1531	Permanent colonization begins.
1580-	Spain governs Portugal and its colonies.
1640	
1646	Brazil is declared a principality by the Portuguese throne.
1695	Gold is discovered in Minas Gerais.
1750-	Marguis de Pombal, prime minister of Portugal, introduces economic reforms.
1777	
1763	Rio de Janerio becomes the capital of Brazil.
1808	Under British protection, the Portuguese royal family moves to Brazil following Napoleon's invasion of the Iberian peninsula.
1822	Brazil declares its independence from Portugal.
1831	Peter I, first emperor of Brazil, abdicates and returns to Portugal.
1840	Peter II is declared emperor of Brazil.
1865	The Triple Alliance of Brazil, Argentina, and Uruguay declares war on Paraguay, which lasts until 1870.
1888	Slavery is abolished in Brazil.
1889	The empire is overthrown in a military coup d'etat.
1889-	Brazil is governed by state oligarchies, with Sao Paulo and Minas Gerais as the most
1930	powerful actors.
1930	Getulio Vargas leads a bloodless movement to end the Republic.
1930-	Vargas governs Brazil, first as provisional and then constitutional president.
1937	
1937-	Vargas rules as dictator.
1945	
1946	A new constitution restores democracy.
1960	Brasilia is inaugurated as the new capital city.
1964	Military overthrows President Joao "Jango" Goulart.
1964-	Military governments rule Brazil.
1985	
1985	Constitutional democracy is restored with the selection of Tancredo Neves as president; Neves dies soon after and is succeeded by his vice president, Jose Sarney.
1986	The <i>Cruzado</i> Plan, a heterodox economic shock program, is attempted and fails.
1987	Brazil declares a unilateral moratorium on its foreign debt.
1988	A new constitution is promulgated.
1990	Fernando Collor de Mello is elected Brazilian president.
1992	Faced with impeachment on charges of corruption, Collor de Mello resigns and is succeeded by his vice president, Itamar Franco.
1993	Finance Minister Fernando Henrique Cardoso announces his government's new economic program.
1994	The <i>Real</i> Plan is implemented and inflation drops sharply; as a result of the success of the <i>Real</i> Plan, Cardoso is elected president in late 1994.
1995	Fernando Henrique Cardoso is inaugurated as constitutional president of Brazil for a four-year term.
1998	Oct. 4, Fernando Henrique Cardoso re-elected President of Brazil. Oct. 28, Cardoso government announces major economic reform plan.

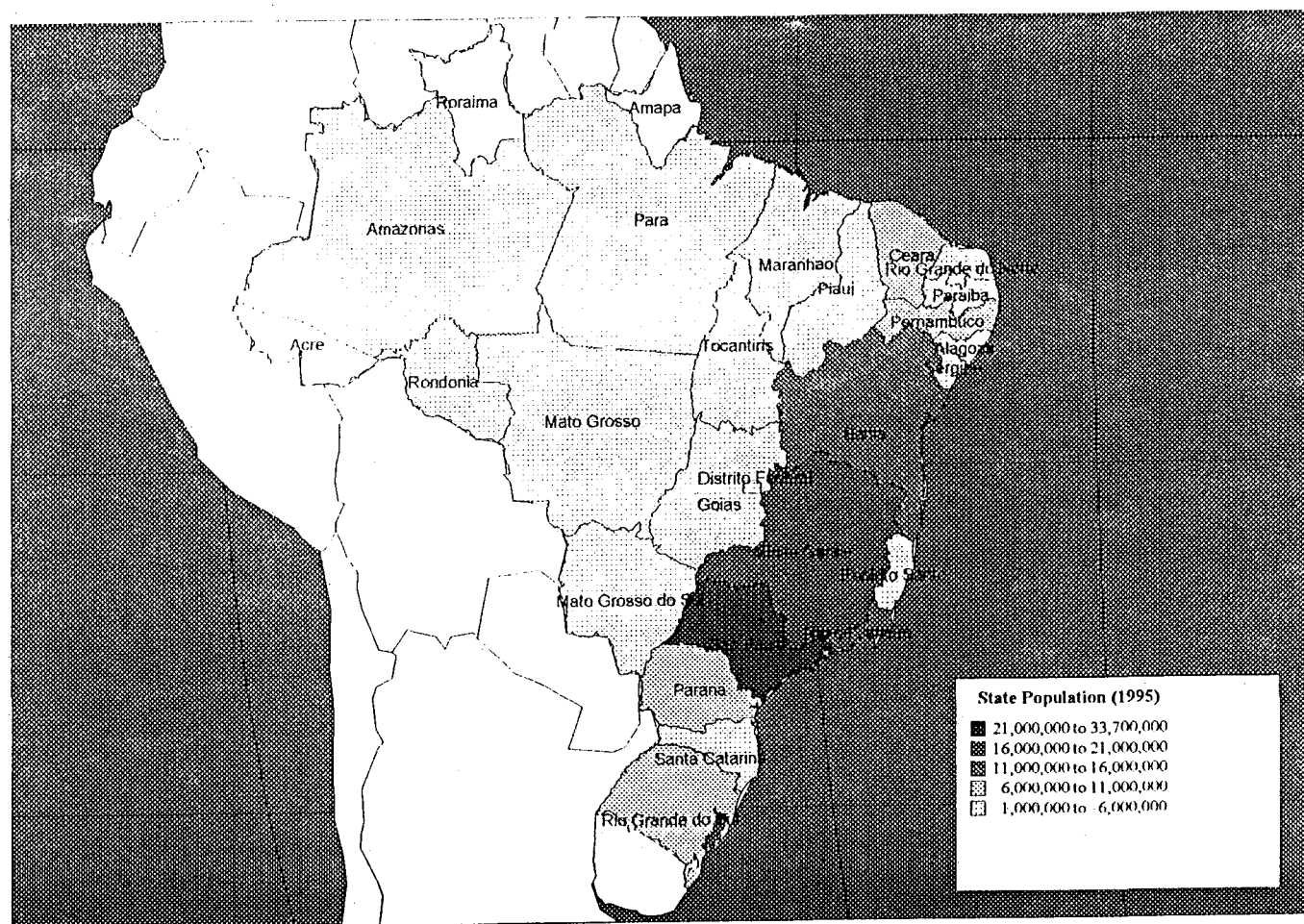
Source: Parcell and Roett (1997), SCI (1998) Brazilwatch

social security, taxation, and public administration necessary to cut government deficits and lay the groundwork for future growth and development in Brazil have encountered significant Congressional opposition. To move forward Brazil needs to address myriad economic and social reforms to modernize the economy and reduce the so-called "custo Brasil"—the extra cost of doing business in Brazil that results from an inefficient state-managed infrastructure and rigid labor laws.

Chart 4. Map – Brazil: States, Territories, and Regional Divisions

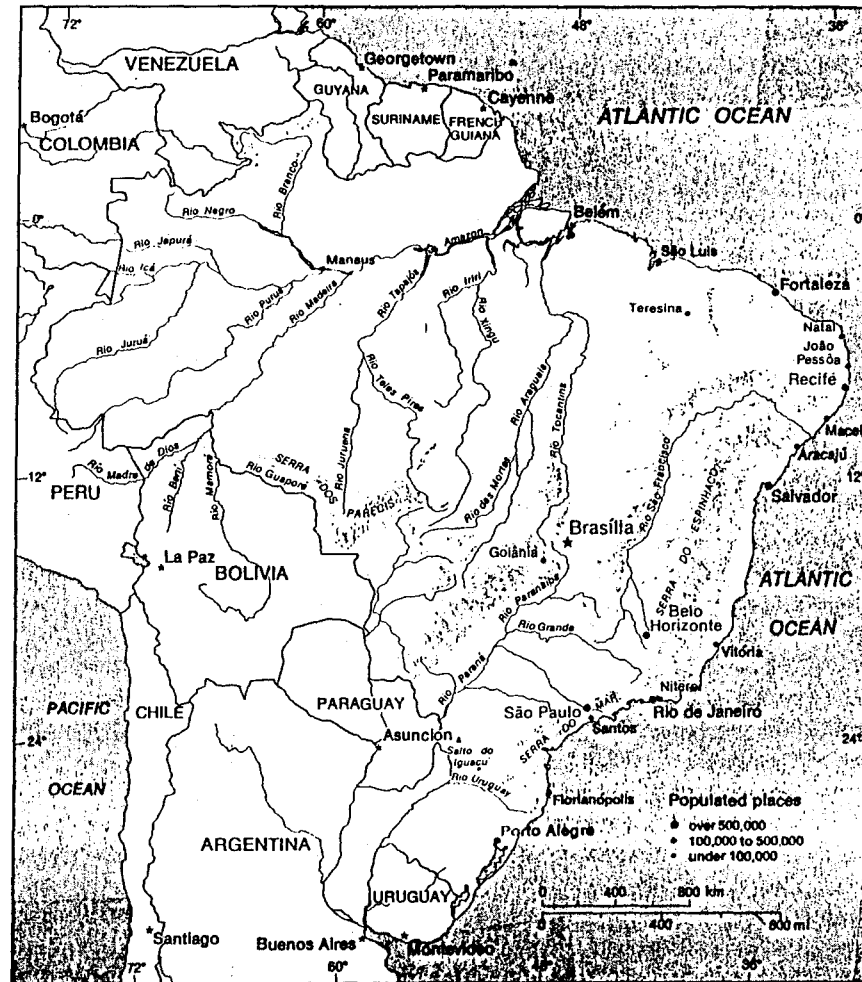


Source: Werner Baer, *The Brazilian Economy*.

Chart 5: Brazil: Population Distribution by State (1995)

Source: IBGE

Chart 6. Map – Brazil's Physical Geography



Source: Preston James, Latin America, 5th Edition.

For calendar year 1997, Brazil held inflation down to 4.8% and real GDP growth was 3.0% (Table 3). Its trade deficit was \$8.7 billion, the third year in a row of a trade deficit reflecting the opening of the economy and an overvalued currency. For the first five months of 1998 the trade deficit continued with exports totaling \$21.1 billion and imports at \$23.4 billion. For 1998 inflation is still down, but growth in the economy is forecast at about 1%, and GDP is expected to decline in 1999. The trade deficit in 1998 is forecast at \$7.0 billion. With these deficits some economists fear that Brazil is heading for a currency crisis similar to the kind that hit Mexico in December 1994, and more recently Thailand, Indonesia, and Russia. Brazilian officials, have rejected such comparisons because Brazil's foreign reserves remain high at nearly \$50 billion, and foreign direct investment, which accounted for one-half of all the foreign investments in Latin America in 1997 at \$15 billion, is still running high.

In November 1997, the government amended its economic package in reaction to stock market problems which began in Asia. The economic measures were loaded with various types of taxes as the administration sought to raise additional revenues to help reduce its deficit and reassure foreign investors. High interest rates are aimed at containing the trade deficit and slowing the economy and Brazilians' ability to borrow. High interest rates also help maintain foreign investment flows. This in turn helps Brazil's Central Bank maintain large reserves to defend the "real." The government has successfully maintained its current economic course without a large devaluation which they fear would send the country into another inflation spiral.

In September 1998, the government boosted interest rates again to squelch an outflow of foreign currency reserves provoked by the Russian economic crisis. The high interest rates are expected to halt the already sluggish growth in the economy.

In its first major post-election economic announcement, the Cardoso government on October 28 issued a three year \$80 billion economic reform package of spending cuts and tax increases. The program is designed to restore the country's flagging credibility in world markets and prepare the way for an economic rescue program led by the International Monetary Fund. For 1999, the impact of the program will be negative growth forecast at -1%, inflation is expected to be only 1.5%. The Cardoso government is expected to continue its gradual depreciation of the real to keep its exports competitive. In addition, the trade deficit is expected to be reduced to -\$2.0 billion as exports are expected to grow while imports are forecast to remain at 1998 levels. International reserves are forecast to remain at the \$50 billion level.

It should be emphasized that Brazil has followed a policy of gradual depreciation of the real over the last several years. The depreciation has averaged about 0.6% per month totaling about 7.5% per year. Informed sources in Brazil believe that the depreciation now will be accelerated to 0.8 to 1.2% per month or about 12% per year. However, a maxi devaluation is going to be avoided. These same sources believe that if there was an immediate 10% devaluation of the real, an additional 1 million tons of sugar could be exported.

For Brazil's large agricultural sector, including the sugar and fuel alcohol industry, years of government support and easy credit led to expansion, but resulted in high debts (Table 4). More recently the sector has had to carry a high debt burden while facing the new high cost of finance and problems in the transition to a more open market with greatly reduced government intervention.

Table 3. Brazil: Selected Economic Indicators

Item	1993	1994	1995	1996	1997	1998*	1999*
Inflation (CPI Dec/Dec)	2491	1173	23.2	10.0	4.8	2.5	1.5
Real GDP Growth (% Chg.)	4.2	6.0	4.2	2.9	3.0	1.0	-1.0
Fiscal Balance (% GDP)	-9.9	-8.0	-4.6	-4.4	-4.1	-4.3	-3.2
Exchange Rate (Real per \$US)	0.12	0.85	0.97	1.04	1.12	1.21	1.29
Domestic Interest Rate (% Annual Rate)	3085	1349	53.2	23.9	42.1	43	20
Current Account (\$US BLN)	-0.6	-1.7	-18.0	-24.3	-32.2	-30.5	-25.5
Trade Balance (\$US BLN)	13.3	10.4	-3.4	-5.6	-8.7	-7.0	-2.0
Exports (\$US BLN)	38.6	43.5	46.5	47.7	53.0	57.0	62.0
Imports (\$US BLN)	25.3	33.1	49.9	53.3	61.7	64.0	64.0
International Reserves (\$US BLN)	31	37	50	58	51	47	53

* Forecast

Source: PDE (Primark Decision Economics) Latin America Monitor, October 30, 1998.

Table 4. Brazil: Agriculture's Contribution to Gross Domestic Product

	1994	1995	1996	1/ 1997
GDP (US \$ Billion)	587	734	749	789
Per Capita GDP (US\$)	3,820	4,708	4,743	4,935
GDP Growth (%)				
Overall	6.0	4.3	2.9	3.5
Agriculture	7.0	2.1	2.3	3.8
Industry	9.3	5.1	3.1	5.5
Service	4.2	6.0	3.3	1.8
Gross Agri-Production (US \$ Billion)	70	95	97	102
Agri-Contribution to GDP (%)	12	13	13	13
Agricultural Trade				
Exports (US \$ Million)	13,899	15,617	16,883	18,596
Imports (US \$ Million)	4,308	6,798	7,604	6,985
Population (Million)				
Total	154	156	158	159
Number in Agri	43	42	41	40
Agri Share (%)	28	27	26	25
Consumer Price Index (%) 2/	1240.9	27.47	11.33	5.40

1/ Forecast according to the Government of Brazil (GOB).

2/ Consumer price index, compiled by FGV.

Sources: Central Bank, SECEX, Getulio Vargas Foundation (FGV), and Brazilian Institute of Geography and Statistics (IBGE)

II. SUGAR AND FUEL ALCOHOL MARKETS—RECENT TRENDS AND FUTURE PROSPECTS

Overview

Brazil's national sugar and fuel alcohol industry contributes 2% to GDP but accounts for 17% of the country's agricultural product and employs over 1 million nationwide. It has been growing for the last decade (Table 5). Sugarcane production totaled a record 332 million tons last year, up 26% from 1985 reflecting an expansion in area by 1.1 million hectares to 4.9 million hectares and some improvement in yields from the Center-South region, especially the state of São Paulo (Chart 7). A small share of this production is used annually for animal feed and the production of alcoholic beverages, but about one-third is ground for sugar and the remainder used to produce fuel alcohol (both hydrous or anhydrous) for auto fuel (Chart 8). No fuel alcohol is currently used as diesel fuel, but research is underway to evaluate use of alcohol blends in diesel engines.

Brazil's sugar production area is the world's largest, and has been growing in response to higher returns for sugarcane than for competing crops, the availability of underutilized land in Brazil, expansion programs by mills to increase output and ready access to credit, as well as attractive prices for both sugar and fuel alcohol. However, rapid growth has led to high debts, estimated at between 4.5-6.0 billion reais.

Over the past decade raw sugar production jumped from 8.3 million tons in 1985/86 to a record 15.7 million tons in 1997/98 (May-April marketing year). Domestic sugar consumption took about 57% of last season's production and has grown rapidly in recent years (Table 6). With the world's sixth largest population and a long tradition of high per capita sugar consumption (45.5 kg, refined compared with the world average of around 20 kilos), Brazil is one of the world's leading sugar-consuming nations, and requires more than 55% of use as direct consumption.

Per capita consumption of sugar was flat during the 1980s, but has grown recently with gains in sales of processed foods. Total soft drink consumption reached 10.6 billion liters in 1997, a gain of 89% since 1993.¹ Cookies and chocolate recorded similar rapid increases. In all cases, the biggest jump occurred in 1995, the first full year after the inflation decline. Since then, consumer growth has been healthy but less spectacular. For 1999 the rate of per capita consumption growth is expected to slow due to an expected slow-down in the economy.

Brazil exported 6.7 million tons in 1997/98, about 40% of production, and up sharply in recent years reflecting attractive export prices and strong international market demand. Brazil's exports totaled 6.59 million tons in 1997, up sharply from under 2.0 million tons in the early 1990s.²

¹ Brazilian Soft Drink Industry Association.

² International Sugar Organization (ISO).

Sugar exports consisted of raw sugar and both standard refined sugar and semi-refined "crystal" sugar exports.³ The Center-South of Brazil has become a growing export supplier for "very high polarity" sugar.

While refined and crystal sugar exports dominate Brazil's export portfolio, it remains a significant raw sugar exporter to markets that have refining capacity such as the United States and Canada. Brazil's refined sugar exports, second only to the EU in volume, go mainly to destinations in Africa, with Eastern European and Middle Eastern markets up strongly in the last several years.⁴ For example, exports to the Middle East for 1997 totaled a record 1.46 million tons, up 70% from the year before. Noteworthy were record shipments of 500,000 tons to Persian Gulf countries to service the new refineries in the region (Chart 9).

Russia is the single largest export market taking 1.5 million tons in 1997, 23% of the total (Table 7). While exports are reported to be up for the first half of 1998, Russia's lingering economic problems are expected to keep it out of the market for the rest of the year.

In July 1997, Brazil's Industry and Commerce Ministry raised its annual export quota because of the larger than expected sugar output. All exports beyond the quota level were taxed at a rate of 40%. This tax was meant to ensure the availability of sugar for domestic needs. In another policy change to remove government from the market, the tax on exports was abolished in 1998.

Brazil's sugar and fuel alcohol industry includes 324 facilities (15 sugar mills, 107 autonomous distilleries, and 202 integrated facilities) (Chart 10). It produces both sugar and fuel alcohol. A record 16.4 billion liters of fuel alcohol of which 9.7 billion liters or 59% was hydrous alcohol and the remaining 6.7 billion liters was anhydrous alcohol in 1997/98. This represents an increase of 14% from the previous year and more than fills the fuel needs of the nation's 4.3 million vehicles powered solely on hydrous alcohol and the 10.2 million vehicles fueled by a mixture of anhydrous alcohol and gasoline. The production growth coming after periods of shortages when imports were required has been spurred by high prices, but is resulting in surplus conditions and depressed prices. The government has moved to reduce the surplus and push up prices by increasing use of anhydrous alcohol in gasoline blends from 22% to 24%, buying 500 million liters of hydrous alcohol stocks in the Center-South, and providing financing for alcohol stocks. In addition, the Congress passed the "green fleet" law mandating that replacement vehicles for federal, state and municipal fleets be alcohol powered.

To put the current situation in perspective, fuel alcohol production was nearly 30% lower and totaled 12.7 billion liters in 1991/92 when hydrous alcohol production peaked at 10.8 billion liters or 85% of the total. The current market situation in large part reflects the decline in hydrous alcohol demand due to the declining number of hydrous alcohol fueled cars on the road. Consumers stopped purchasing these cars in 1990 when they lost confidence in the availability of the government to guarantee the availability of the fuel.

³ Brazil's Department of Foreign Trade.

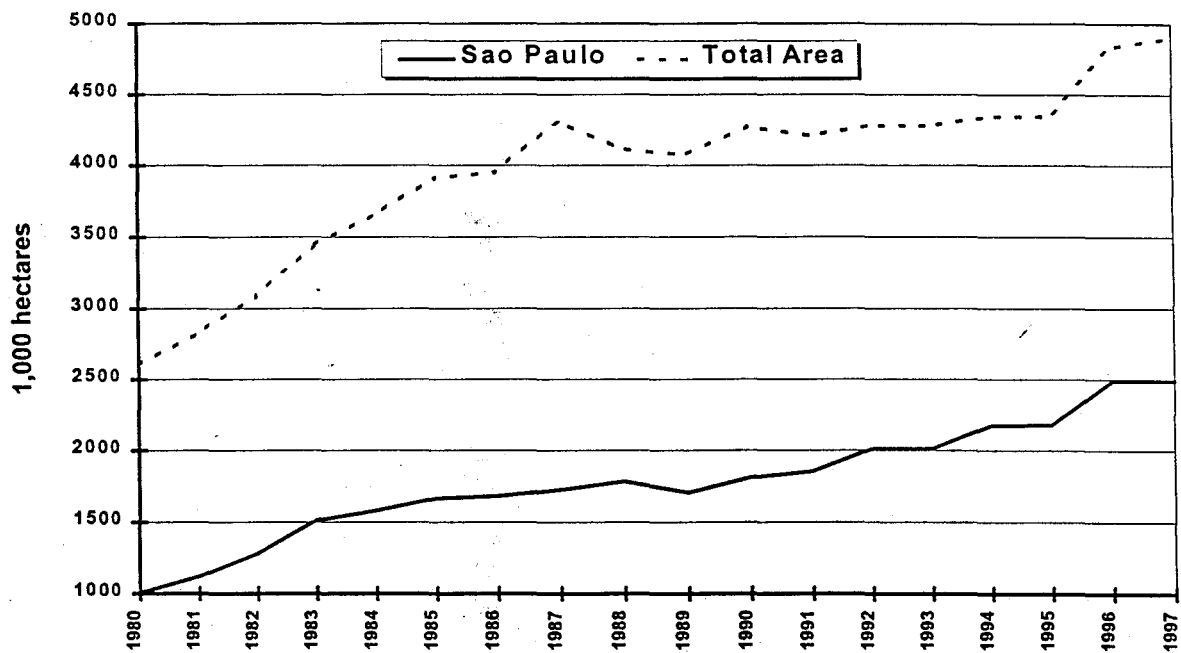
⁴ ISO.

Table 5. Brazil: Production of Sugarcane, Sugar, and Fuel Alcohol

Crop Year	Sugarcane	Sugar	Hydrous Alcohol	Anhydrous Alcohol	Fuel Alcohol Total
(May-April)	1,000 MT	1,000 MT (tel quel)		1,000 M ³	
1970/71	79,753	5,070	385	252	637
1971/72	79,595	5,081	223	390	613
1972/73	95,074	5,926	292	389	681
1973/74	91,994	6,680	260	306	566
1974/75	95,624	6,673	409	217	625
1975/76	91,525	6,017	323	233	556
1976/77	103,173	6,851	364	300	664
1977/78	120,082	8,306	293	1,177	1,470
1978/79	129,145	7,476	395	2,096	2,491
1979/80	138,899	6,980	671	2,712	3,384
1980/81	148,651	7,844	1,602	2,104	3,706
1981/82	153,858	7,912	2,750	1,413	4,163
1982/83	166,753	8,843	2,274	3,550	5,823
1983/84	197,995	9,086	5,392	2,469	7,861
1984/85	202,765	8,849	7,150	2,102	9,252
1985/86	224,364	7,819	8,612	3,208	11,820
1986/87	227,873	8,157	8,338	2,168	10,506
1987/88	224,495	7,985	9,474	1,983	11,459
1988/89	221,296	8,070	9,978	1,726	11,713
1989/90	223,812	7,246	10,557	1,341	11,929
1990/91	222,429	7,404	10,474	1,309	11,792
1991/92	229,083	8,658	10,768	1,984	12,684
1992/93	224,737	9,279	9,470	2,216	11,685
1993/94	217,598	9,372	8,787	2,620	11,307
1994/95	243,224	11,823	9,852	2,875	12,726
1995/96	256,073	12,726	9,628	2,999	12,626
1996/97	289,517	13,646	9,807	4,638	14,445
1997/98	302,693	14,896	9,721	6,688	16,409

Sources: IAA, MIR, MIC, MICR, DATAGRO

Chart 7. Brazil: Sugarcane Harvested Area, National Total and Sao Paulo State



Source: IBGE

Chart 8. Brazil: Fuel Alcohol Production Trends

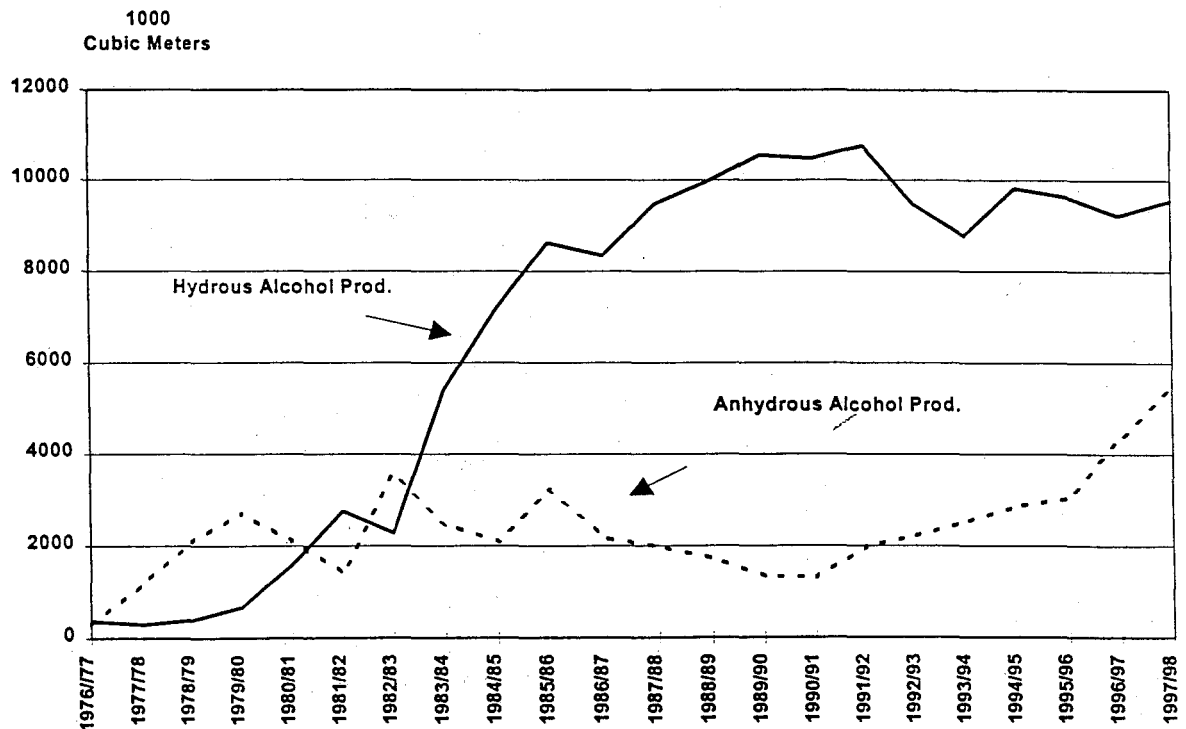


Table 6. Brazil: Sugar Supply, Consumption, and Trade Trends

Year	Beginning Stocks	Sugar Production	Imports	Exports	Domestic Consumption	Ending Stocks
1,000 metric tons, raw value						
(May/April)						
1974/75	555	6985	0	2418	4507	615
1975/76	615	6180	0	1244	5177	374
1976/77	374	7598	0	1798	5148	1026
1977/78	1026	8756	0	2391	5165	2226
1978/79	2226	7767	0	1877	5508	2608
1979/80	2608	7027	0	2333	6098	1204
1980/81	1204	8547	0	2305	6107	1339
1981/82	1339	8393	0	2615	5832	1285
1982/83	1285	9302	0	2984	6178	1425
1983/84	1425	9561	0	2700	6300	1986
1984/85	1986	9324	0	3439	6300	1571
1985/86	1571	8270	0	2560	6300	981
1986/87	981	8650	0	2086	6700	845
1987/88	845	8457	0	2131	6400	771
1988/89	771	8582	0	1371	6600	1382
1989/90	1382	7793	289	1500	6800	1164
1990/91	1164	7900	81	1300	7088	757
1991/92	757	9200	0	1607	7400	950
1992/93	950	9800	55	2425	7500	880
1993/94	880	9930	6	2861	7500	455
1994/95	455	12500	55	4300	8000	710
1995/96	710	13700	30	5800	8100	540
1996/97	510	14650	0	5800	8500	860
1997/98	860	15500	0	6700	8800	860
1998/99 1/	860	16300	0	7300	8900	960

1/ SCI Forecasts.

Source: US Department of Agriculture history, SCI Projections. Population data "World Population and Projections to 2050," International Data Base of the Bureau of Census, US Department of Commerce.

Chart 9. Brazil: Sugar Exports, Total and by Leading Region

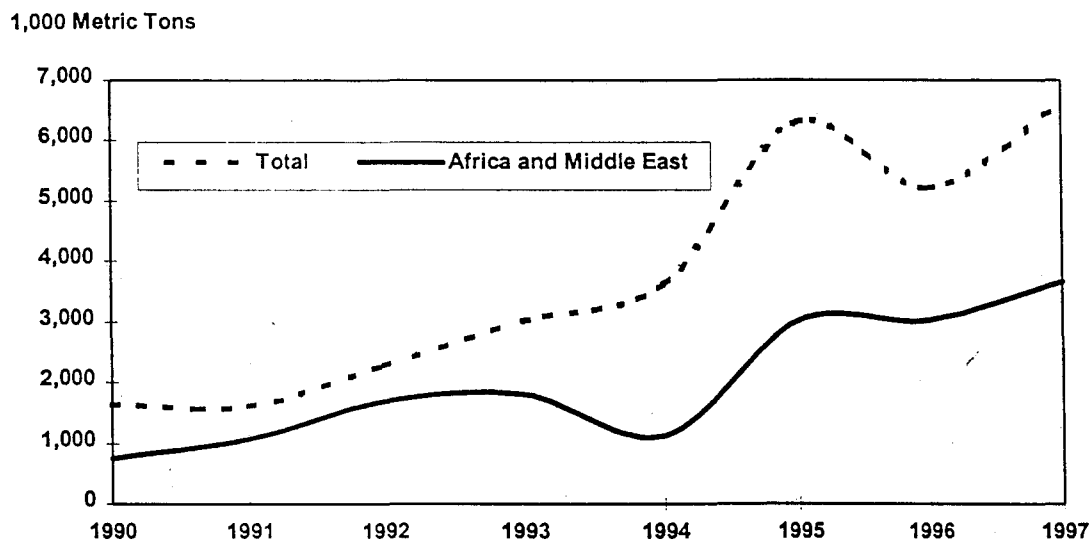


Chart 10. Brazil: Sugar and Fuel Alcohol Production Facilities, 1997/98

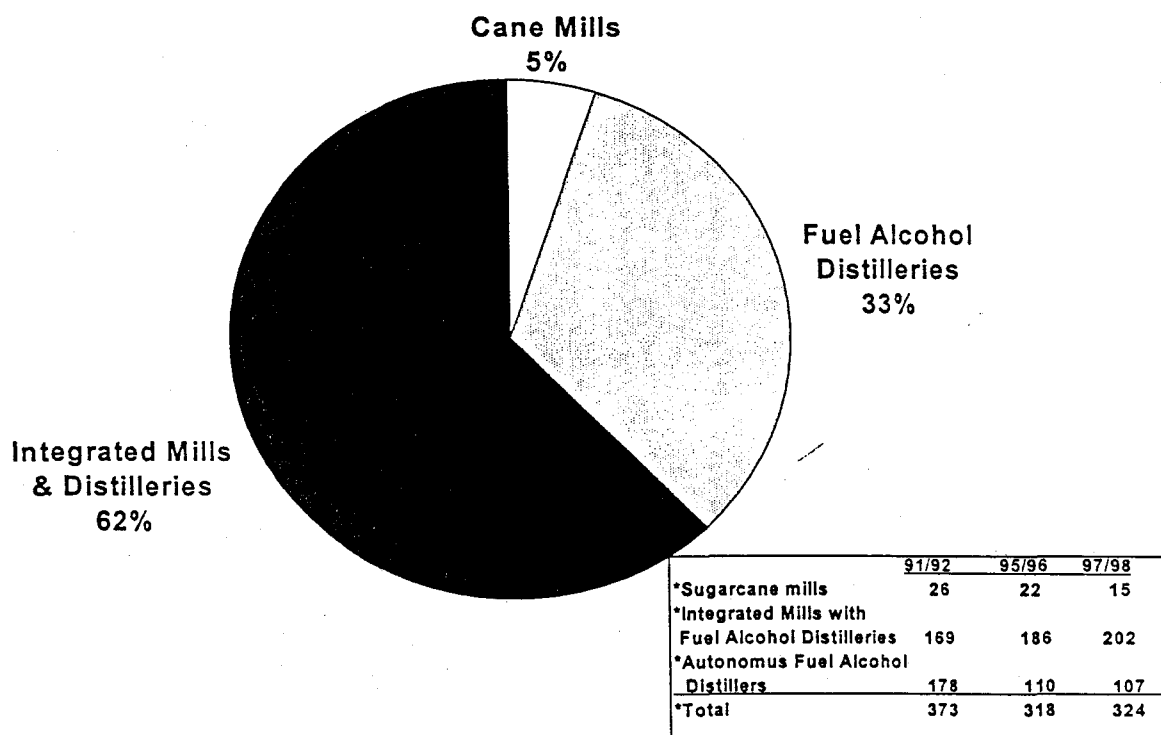


Table 7. Brazil: Sugar Exports by Region and Country of Destination

Region and Country	1990	1991	1992	1993	1994	1995	1996	1997
	metric tons							
North Africa								
Algeria	0	29,300	15,900	36,051	54,800	299,224	385,294	96,336
Egypt	176,500	232,200	197,300	218,823	100,300	709,679	335,148	520,164
Libya	29,000	28,500	16,700	54,900	28,600	63,098	117,944	59,946
Morocco	157,000	261,500	300,100	207,956	151,700	405,398	250,399	394,239
Tunisia	25,100	12,000	86,900	117,757	40,200	25,257	49,501	59,294
Subtotal	387,600	563,500	616,900	635,487	375,600	1,502,656	1,138,286	1,129,979
Sub-Saharan Africa								
Angola	31,500	57,800	41,800	51,077	16,800	29,022	36,906	60,698
Burkina Faso	0	0	0	0	0	0	3,261	-
Chad	0	0	0	0	0	0	0	6,300
Cape Verde	0	0	0	1,557	0	0	0	-
Congo	0	0	0	0	0	0	0	5,500
Djibouti	0	0	0	0	0	19,565	0	3,000
Ethiopia	0	0	0	0	0	870	15,217	-
Cote d'Ivoire	0	0	0	6,000	14,600	15,217	30,979	13,522
Gambia	0	0	0	2,500	3,300	22,500	18,505	27,870
Ghana	10,800	0	38,800	54,511	34,800	88,968	82,990	117,073
Guinea	0	0	0	0	0	163	0	-
Kenya	14,100	0	43,500	18,700	52,900	48,420	34,733	24,519
Liberia	0	0	0	0	0	0	327	-
Madagascar	0	0	0	0	4,000	0	16,196	1,750
Mali	0	0	0	0	0	4,348	9,783	-
Mauritania	0	0	0	0	0	7,174	7,174	-
Mozambique	0	0	0	12,602	22,000	0	28,519	14,000
Namibia	0	0	0	0	0	0	15,217	-
Nigeria	135,500	256,800	529,200	495,207	226,300	290,431	587,777	576,130
Niger	0	0	0	0	0	142,283	0	-
Senegal	0	0	0	0	0	52,862	26,228	18,044
Sierra Leone	0	0	0	2,500	0	0	0	-
Swaziland	0	0	14,900	13,000	73,900	28,913	55,045	89,583
South Africa	0	0	68,300	17,243	20,100	52,336	13,587	27,529
Tanzania	0	0	12,000	0	10,300	0	9,234	39,219
Togo	0	0	0	0	0	0	4,348	6,214
Zaire	0	0	0	0	0	0	7,500	-
Zimbabwe	0	0	11,700	0	0	0	14,000	4,064
Subtotal	191,900	314,600	760,200	674,897	479,000	803,072	1,017,526	1,035,015

--continued

Table 7. Brazil: Sugar Exports by Region and Country of Destination--continued

Region and Country	1990	1991	1992	1993	1994	1995	1996	1997
	metric tons							
Europe								
Albania	0	0	0	0	0	0	14,130	0
Bulgaria	0	0	86,900	28,000	66,100	61,315	57,391	120,000
Czech Rep	0	0	0	0	0	0	0	85
EU	26,100	0	48,000	112,985	119,400	78,197	58,777	88,378
Estonia	0	0	0	0	0	0	0	14,000
Finland	0	13,000	0	44,300	38,000	19,701	0	12,000
Georgia	0	0	0	9,004	0	0	15,217	11,000
Latvia	0	0	0	21,600	0	0	0	19,000
Lithuania	0	0	0	0	0	0	59,243	14,000
Moldova	0	0	0	0	0	0	0	14,300
Romania	0	14,000	31,100	43,496	14,000	95,522	249,368	7,000
Russian Fed.	0	0	29,800	344,234	45,600	1,044,479	500,346	1,496,4
Slovenia	0	0	0	0	0	0	25	
Sweden	0	6,000	0	0	26,000	0	0	0
Switzerland	0	0	0	0	0	25,498	3,261	0
Ukraine	0	0	11,500	51,380	0	129,755	116,723	25,000
USSR/FSU	146,700	72,500	157,100	23,872	0	0	0	0
Uzbekistan	0	0	0	0	0	10,870	0	0
Yugoslavia	18,000	0	0	0	0	24,345	0	0
Subtotal	190,800	105,500	364,400	678,871	309,100	1,489,682	1,074,481	1,821,271
Middle East								
Iran	138,300	23,400	202,800	208,000	179,800	268,802	46,631	219,715
Iraq	0	0	0	12,658	0	0	0	111,173
Israel	0	0	0	0	0	100	20,952	0
Jordan	30,300	29,700	17,900	123,629	52,200	170,590	235,855	207,963
Lebanon	0	0	0	0	14,000	0	0	0
Persian Gulf	0	0	0	0	0	4,503	194,823	500,396
Saudi Arabia	0	28,900	0	0	0	32,064	17,522	17,391
Syria	0	28,300	41,600	14,309	14,000	75,739	87,651	13,999
Turkey	0	0	0	3,650	0	33,315	39	24
Yemen Rep	0	87,100	55,400	132,950	16,800	119,728	255,929	365,7
Subtotal	168,600	197,400	317,700	495,196	276,800	704,841	859,402	1,461,219

--continued

Table 7. Brazil: Sugar Exports by Region and Country of Destination--continued

Region and Country	1990	1991	1992	1993	1994	1995	1996	1997
	metric tons							
Asia								
Bangladesh	0	0	0	35,000	1,100	13,207	62,174	39,979
China	0	17,300	0	0	0	459,050	0	37,304
India	0	0	0	0	1,600,200	466,850	0	108,545
Indonesia	0	0	0	0	0	101,739	0	72,757
Japan	0	0	0	0	0	0	0	13,000
Korea, P.D.R.	0	5,500	0	0	0	0	0	15,000
Korea, Rep	0	13,500	0	0	0	25,000	0	-
Malaysia	0	12,000	0	0	0	0	0	-
Nepal	0	0	0	0	12,700	0	0	-
Pakistan	0	0	1,600	14,000	0	0	108,659	44,785
Philippines	0	0	0	0	0	0	219,139	14,000
Singapore	0	0	0	0	0	28	0	-
Sri Lanka	0	15,200	33,700	82,288	208,400	167,976	19,565	121,108
Vietnam	0	0	0	0	0	13,913	0	-
Subtotal	0	63,500	35,300	131,288	1,822,400	1,247,763	409,537	466,478
North America								
Canada	0	0	0	0	0	14,656	100,325	114,487
USA	501,400	198,500	140,900	187,894	80,500	241,500	374,303	241,308
Subtotal	501,400	198,500	140,900	187,894	80,500	256,156	474,628	355,795
Latin America								
Argentina	0	0	0	5,526	223,700	154,896	10,427	47,736
Bolivia	0	0	0	0	0	443	0	796
Chile	9,700	28,200	7,600	18,797	29,600	5,999	46,891	34,151
Colombia	0	0	2,200	0	0	0	0	-
Dominican Rep.	0	0	0	0	0	15,218	10,869	-
Ecuador	0	0	0	0	0	217	0	-
Guyana	3,300	0	0	0	0	0	0	-
Haiti	0	0	0	0	0	1,090	0	6,250
Jamaica	0	0	0	0	0	11,474	20,582	11,641
Mexico	159,500	101,200	900	0	0	0	82,412	51,631
Netherlands	0	0	0	0	0	0	462	4,568
Paraguay	0	0	0	0	4,400	18,479	3,586	-
Peru	26,600	13,600	14,100	55,175	0	10,870	32,013	15,461
Surinam	0	0	0	0	0	375	0	-
Trinidad & Tobago	0	0	6,500	2,500	0	47,501	29,729	14,000
Uruguay	0	16,000	900	48,662	12,900	28,176	98,069	117,192
Venezuela	0	0	5,700	0	0	0	0	-
Subtotal	199,100	159,000	37,900	130,660	270,600	294,738	335,040	303,426
Others	100	11,500	0	73,702	1,800	0	0	15,219
TOTAL	1,639,500	1,613,500	2,273,300	3,008,080	3,615,800	6,298,903	5,309,048	6,586,402

Source: International Sugar Organization

Regional Trends

North/Northeast Region

Brazil's Northeast region accounts for one quarter of the country's sugar output and 20% of the alcohol. In a sense, it is separate and distinct from the larger Center-South sugar sector (Chart 11). There is almost no transfer of sugar or alcohol between the two regions. Harvest seasons differ, and in the Northeast productivity tends to be lower and costs higher. Northeast growers and processors benefit from government subsidies and privileges not available in the Center-South, and 60% of sugar production is exported, compared to only 40% for the rest of the country. A major portion of Northeast exports are raw sugar, versus almost no raw sugar in the Center-South. And, in the Northeast there is little potential to expand production.

The Northeast sugar industry has a long history dating back to the 16th century. Currently, it employs over 250,000 workers directly, while the sugar and alcohol industry pays 35% to 40% of annual regional taxes. Traditionally the industry has enjoyed strong political influence with the central government that has resulted in special subsidies and trade preferences for the region. For example, all of the premium-priced US sugar quota must originate from the Northeast according to Brazilian law. However, these special considerations are increasingly being challenged by Center-South producer interests.

Field Production. The bulk of the sugarcane which goes into the production of sugar and fuel alcohol in the North/Northeast region is grown on a 30 to 40 mile strip of land near the coast called the "zona da mata" (literally the forest zone). Sugarcane production is largely concentrated in the portions of this zone encompassed by the states of Pernambuco and Alagoas which together account for two-thirds of regional land in sugarcane (Chart 12). The terrain in this area is plateau-like in southern Pernambuco and northern Alagoas and hilly in much of the rest of Pernambuco. Sandy soils characterize the plateau areas while red clay soils predominate on the hilly areas. The climate throughout the zone is hot and humid, and rainfall, which is concentrated in the months of April through July, is usually sufficient to grow a crop (Charts 13 and 14). Some supplemental irrigation facilities are available, but rainfall during the growing season is critical to the size of the crop.

Land owners in the sugarcane zone have found few options to compete with cane production and no large scale alternative crops or livestock operations are available. There are also few options for expansion as much of the remaining land in the zone is hilly and expansion outside into the interior is increasingly constrained by poor soils and low rainfall. This interior zone in the Northeast is known as the "sertão" (literally the back-lands zone) and is prone to recurrent droughts and very inhospitable living conditions.

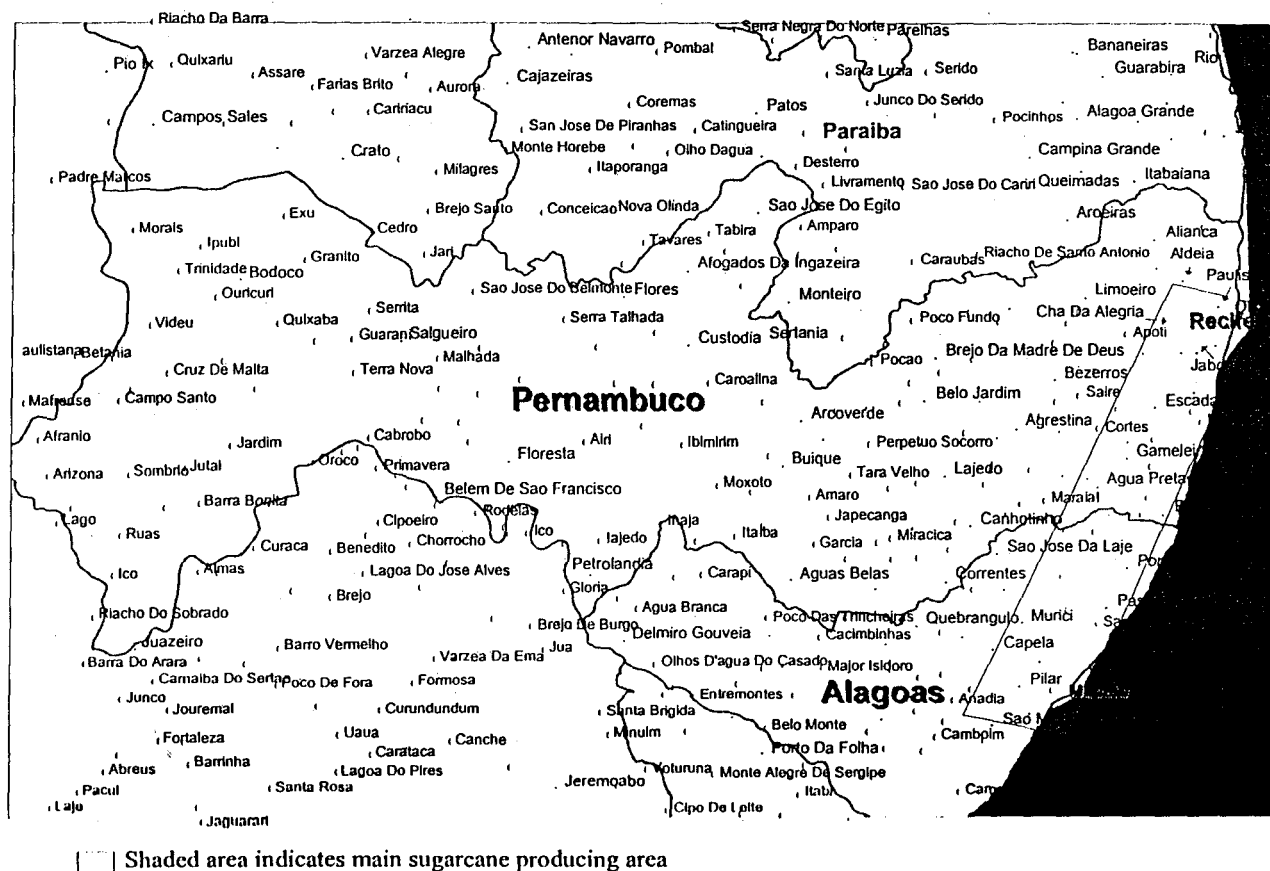
In the Northeast, cane is grown largely by independent growers whose farm size averages about 200 hectares. Most growers rent the land they farm, while a small number of land-wealthy families control large growing areas and own mills. Small growers usually depend on loans from neighboring mills to finance their crops. Currently both small holders and the landed class are experiencing a credit squeeze, high interest rates on loans, and considerable indebtedness.

Chart 11: Brazil: Leading Sugarcane Producing States



Source: SCI

Chart 12: Brazil: States of Alagoas and Pernambuco



Source: SCI

Chart 13. Brazil: Average Annual Monthly Precipitation for Typical Sugarcane Growing Area in Northeast

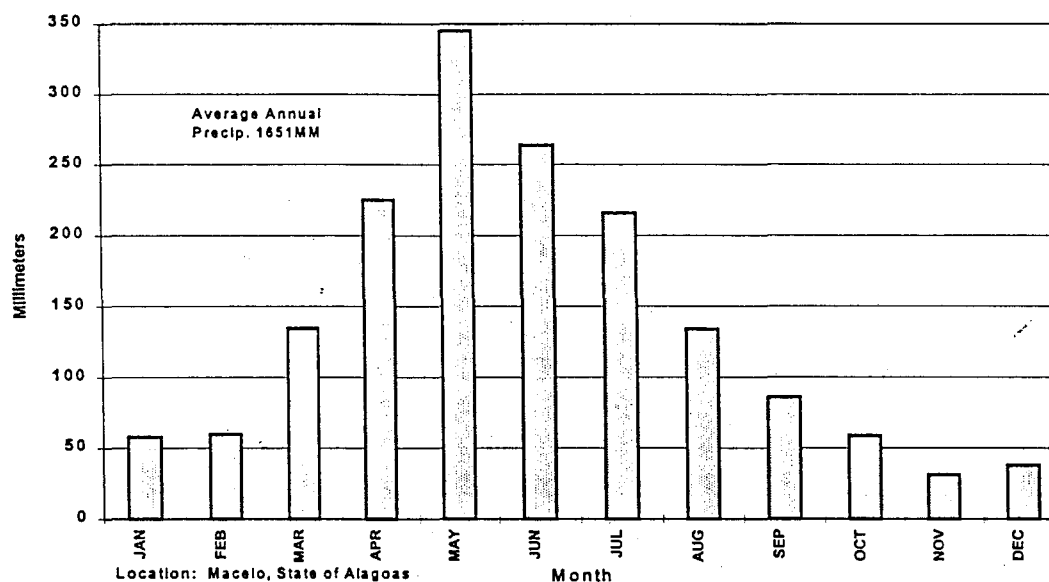
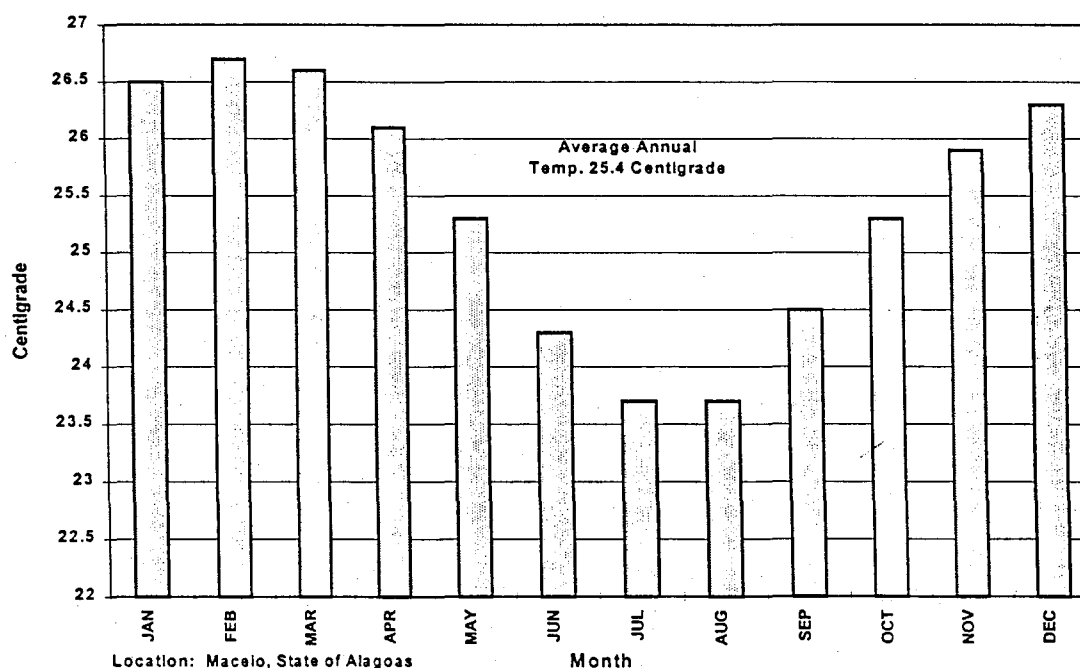


Chart 14. Brazil: Average Annual Temperature for Typical Sugarcane Growing Area in Northeast



Since the early 1990s, area in sugarcane in the region has trended slightly downward (Chart 15). The North/Northeast harvested 1.49 million hectares in 1990 and 1.25 million in 1997, a decline of 16%. Area in both Pernambuco and Alagoas have declined (Table 8). This trend, in large part, reflects the shift of investments of some of the more progressive regional grower mill groups to other states outside the region such as newer production areas in the states of Minas Gerais, Mato Grosso and Goiás where returns on investments appeared higher.

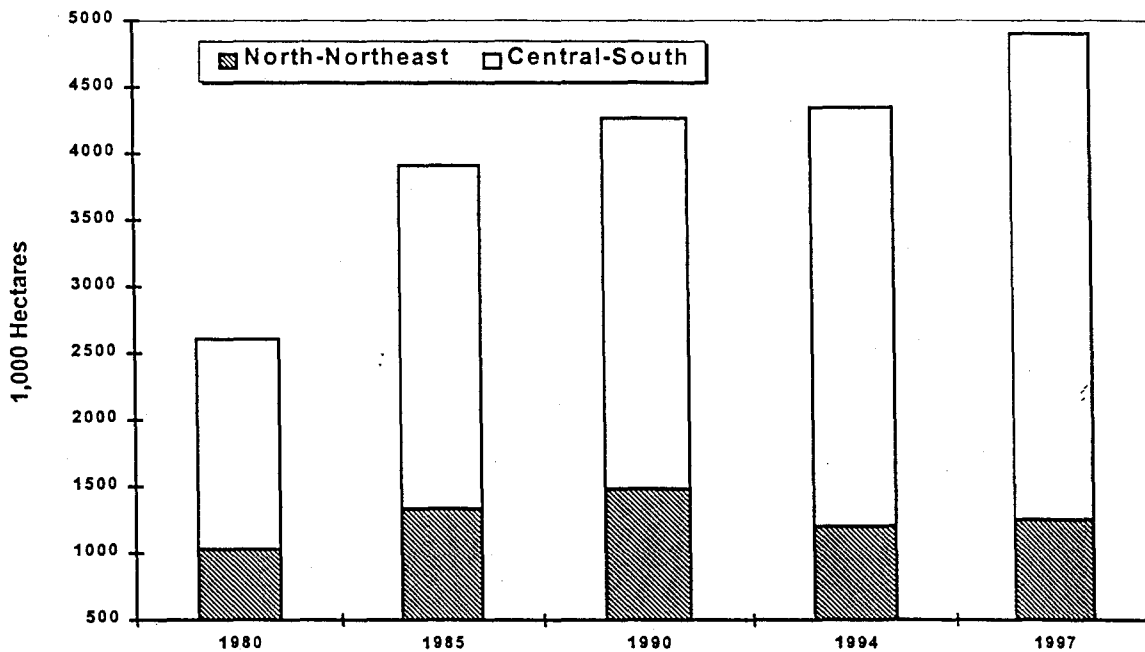
With the decline in harvested area in sugarcane, cane tonnage also declined. Total regional sugarcane tonnage for both sugar and fuel alcohol declined from 72.3 million tons to 63.1 million (Table 9). Yields in the Northeast have remained low compared to the Center-South reflecting the region's less productive soils, periodic droughts and use of traditional cane varieties and lower levels of use of yield improving inputs (Chart 16 and Table 10). While the region is characterized by generally poorer yields and higher production costs than the Center-South, there are some areas in the region, such as parts of Pernambuco and Alagoas, where yields are comparable to the Center-South and where good management, investment in supplemental irrigation and improving inputs has resulted in higher yields and lower overall costs.

Sugar and Fuel Alcohol Production Facilities. The Northeast region has 89 sugar processing and fuel alcohol facilities of which 8 are stand-alone cane mills, 32 are autonomous distilleries, and 49 are integrated facilities producing both sugar and fuel alcohol (Chart 17). The industry has experienced considerable contraction in recent years, the number of total facilities has declined by 25% since 1991/92 and the share of integrated facilities now accounts for 55% of the total. As expected, the states of Alagoas and Pernambuco combined have 48 facilities, about two-thirds of the regional total.

In general, the technology of the mills is comparable with those of the Center-South, but efficiency is constrained by the poor quality of the cane and the lack of sufficient capital of many mill companies to maintain properly or replace equipment needed to reduce operating costs.

Ownership of facilities is split between independently owned mills and those affiliated with groups. For example, in Pernambuco the Tavares de Melo Group has multiple mills and has reinvested in improving both its plant facilities and farm operations in the region as well as outside the region. The same is true of the Carlos Lyra and Joao Lyra Groups in Alagoas. One striking feature of the Northeast industry is the family nature of the management structure. However, this structure can potentially lead to rigidities in adopting modern forms of management and policies concerning succession. (See appendix Tables A-1 and A-2 for details on sugar and fuel alcohol facilities and production by state).

Chart 15. Brazil: Sugarcane Harvested Area by Major Regions



Source: IBGE

Chart 16. Brazil: Sugarcane Yields in Selected States

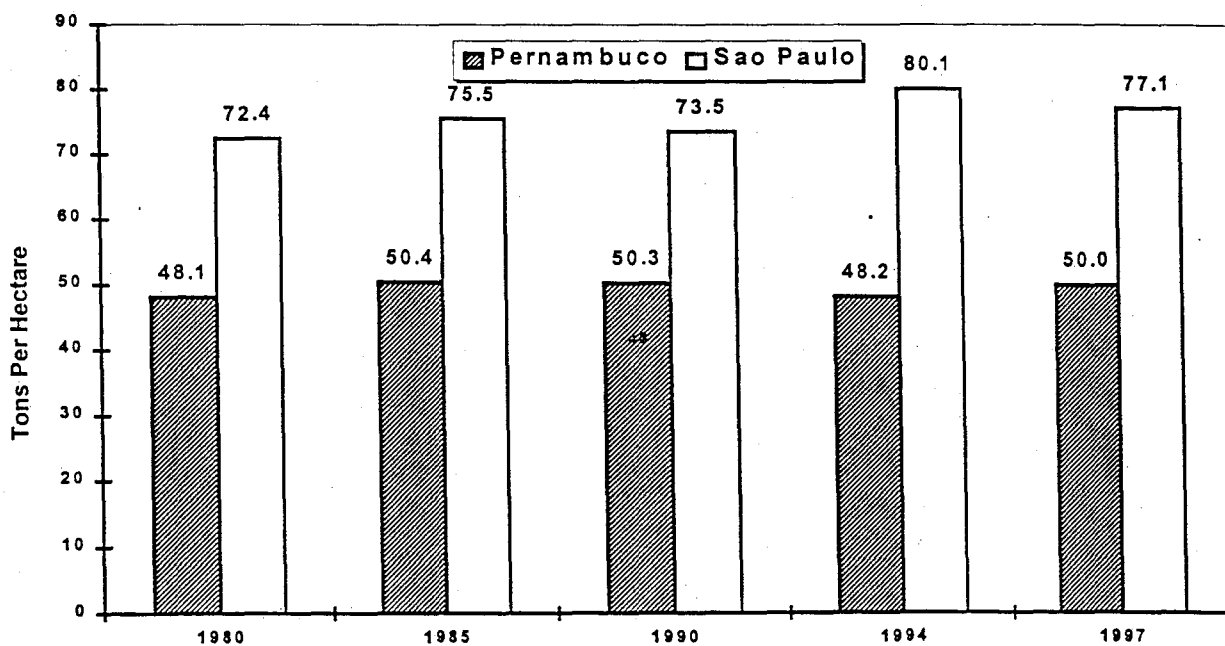


Table 8. Brazil: Sugarcane Harvested Area by Region and State

	1980	1985	1990	1994	1996	1997
	hectares					
Central-South						
Espirito Santo	24,873	45,485	42,244	35,470	43,847	42,587
Goiás	20,664	90,010	97,950	104,582	117,179	129,630
Mata Grosso	8,563	30,027	50,675	75,050	118,506	132,510
Mata Grosso do Sul	11,671	50,650	67,358	58,512	80,885	82,443
Minas Gerais	187,326	279,624	298,065	262,111	255,743	262,169
Parana	57,990	140,855	159,417	215,796	294,000	305,000
Rio de Janeiro	197,582	217,084	204,802	166,487	167,787	164,482
Rio Grande do Sul	32,193	32,087	31,175	33,912	27,752	28,490
Santa Catarina	22,632	22,833	16,388	14,664	7,486	7,679
Sao Paulo	1,008,184	1,666,176	1,811,980	2,173,200	2,493,180	2,493,180
Total Central-South	1,571,677	2,574,831	2,780,054	3,139,784	3,600,065	3,648,170
North-Northeast						
Alagoas	349,059	496,709	558,550	438,527	432,236	450,470
Bahia	76,300	84,841	79,739	70,322	75,532	77,570
Ceara	54,000	44,864	63,096	42,425	42,155	46,201
Maranhao	23,050	23,697	37,374	30,145	26,376	27,296
Para	7,473	3,753	7,084	8,417	7,192	8,383
Paraiba	107,376	176,201	156,449	114,390	129,578	133,264
Piaui	13,364	11,563	19,326	14,561	14,209	14,771
Pernambuco	344,801	413,361	467,276	399,865	417,660	410,000
Rio Grande do Norte	35,991	52,433	56,881	53,776	55,618	54,693
Sergipe	21,947	26,453	38,104	24,852	22,412	23,197
Tocantins	---	---	5,080	4,619	5,303	5,290
Total North-Northeast	1,033,361	1,333,875	1,488,959	1,201,899	1,228,271	1,251,135
Others 1/	2,590	3,036	18,612	2,860	1,541	1,634
Total Brazil	2,607,628	3,911,742	4,287,625	4,344,543	4,829,877	4,900,939

1/ Acre, Ampa, Amazonas, Rondonia, Roraima (Rondonia accounts for over 80% of growth in "Others" after 1990)

Source: IBGE (Instituto Brasileiro de Geografia E Estatística)

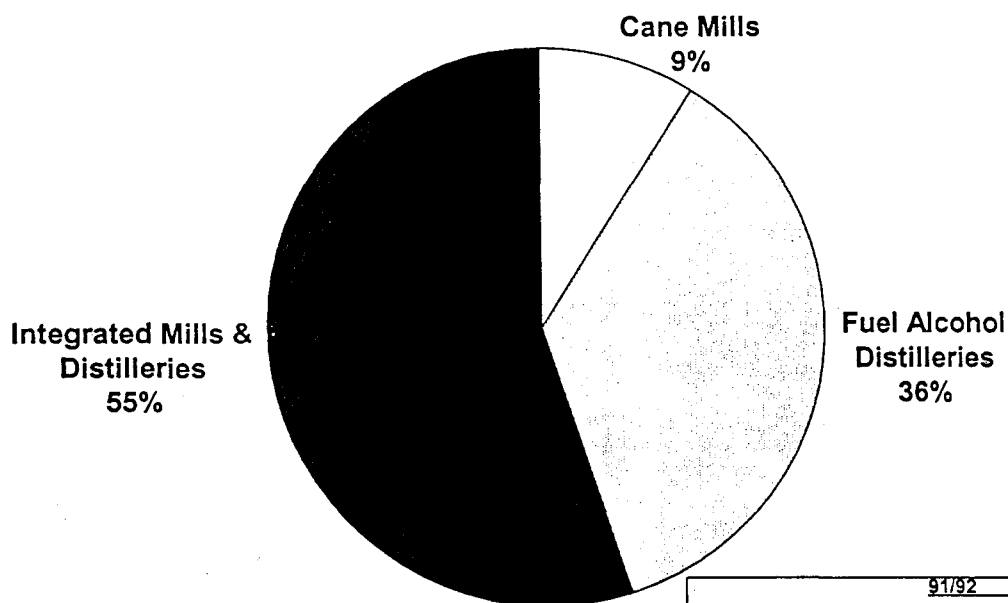
Table 9. Brazil: Sugarcane Production by Region and State

	1980	1985	1990	1994	1996	1997
	tons					
Central-South						
Espirito Santo	771,063	2,740,350	1,500,958	2,078,383	2,495,163	2,082,593
Goiás	1,218,325	6,025,090	6,896,320	7,818,187	8,767,380	10,222,459
Mata Grosso	420,140	1,740,129	3,036,690	5,229,692	8,462,490	9,217,215
Mata Grosso do Sul	606,743	3,170,806	4,193,288	3,840,391	5,562,943	5,556,620
Minas Gerais	8,175,781	16,171,698	17,533,368	16,211,999	15,487,265	16,327,350
Parana	4,451,480	10,423,985	11,738,412	15,945,937	22,500,000	24,400,000
Rio de Janeiro	9,526,699	10,946,510	5,574,698	6,891,054	7,562,734	7,444,641
Rio Grande do Sul	869,580	971,292	914,948	10,046,154	836,039	888,598
Santa Catarina	1,170,361	10,082,237	979,014	768,325	314,580	334,780
Sao Paulo	73,041,362	125,872,013	137,835,000	174,100,000	192,320,000	192,300,000
Total Central-South	100,251,534	188,144,110	190,202,696	242,930,122	264,308,594	268,774,256
North-Northeast						
Alagoas	17,103,907	25,004,471	26,150,998	21,744,387	20,754,266	23,070,114
Bahia	3,204,000	3,443,326	3,435,351	3,548,521	4,037,882	4,126,794
Ceara	1,350,000	1,886,775	2,723,911	1,923,411	1,989,377	2,205,499
Maranhao	1,127,527	1,108,747	2,041,956	1,590,806	1,510,993	1,588,938
Para	378,155	257,841	390,055	478,430	459,106	487,625
Paraiba	5,213,040	10,646,134	8,282,781	4,586,335	6,192,100	6,287,860
Piaui	331,300	551,876	1,562,485	875,226	759,766	797,804
Pernambuco	16,568,949	20,826,398	22,817,700	19,258,632	20,906,371	20,500,000
Rio Grande do Norte	1,778,096	2,575,486	2,492,024	2,350,347	2,425,265	2,378,285
Sergipe	1,258,660	1,601,846	2,182,172	1,454,026	1,314,958	1,394,374
Tocantins			238,100	226,383	249,268	249,200
Total North-Northeast	48,313,634	67,902,900	72,317,533	58,036,504	60,599,352	63,085,993
Others 1/	85,395	76,079	155,893	103,823	52,741	52,928
Total Brazil	148,650,563	256,123,089	262,676,122	301,070,449	324,960,687	331,913,177

Table 10. Brazil: Sugarcane Yield Per Hectare by Region and State

	1980	1985	1990	1994	1996	1997
	tons per hectare					
Central- South						
Espirito Santo	31.0	60.2	46.3	58.6	56.9	48.9
Goiás	59.0	66.9	70.0	74.8	74.8	78.9
Mata Grosso	49.1	58.0	60.6	69.7	71.4	69.6
Mata Grosso do Sul	52.0	62.6	60.2	65.6	68.8	67.4
Minas Gerais	43.6	57.8	63.8	61.9	60.6	62.3
Parana	76.8	74.0	70.9	73.9	76.5	80.0
Rio de Janerio	48.2	50.4	41.7	41.4	45.1	45.3
Rio Grande do Sul	27.0	30.3	26.7	30.8	30.1	31.2
Santa Catarina	51.7	47.4	51.9	52.4	42.0	43.6
Sao Paulo	72.4	75.5	73.5	80.1	77.1	77.1
Total Central-South	63.8	73.1	68.4	77.4	73.4	73.7
North-Northeast						
Alagoas	49.0	50.3	45.9	49.6	48.0	51.2
Bahia	42.0	40.6	44.7	50.5	53.5	53.2
Ceara	25.0	42.1	44.1	45.3	47.2	47.7
Maranhao	48.9	46.8	53.9	52.8	57.3	58.2
Para	50.6	68.7	55.1	56.8	63.8	58.2
Paraiba	48.5	60.4	52.4	40.1	47.8	47.2
Piaui	24.8	47.7	77.7	60.1	53.5	54.0
Pernambuco	48.1	50.4	50.3	48.2	50.1	50.0
Rio Grande do Norte	49.4	49.1	49.9	43.7	43.6	43.5
Sergipe	57.3	60.6	55.1	58.5	58.7	60.1
Tocantins	---	---	46.9	49.0	47.0	47.1
Total North-Northeast	46.8	50.9	48.6	48.3	49.3	50.4
Others 1/		NA	NA	NA	NA	NA
Total Brazil	57.0	63.2	61.5	67.2	67.3	67.7

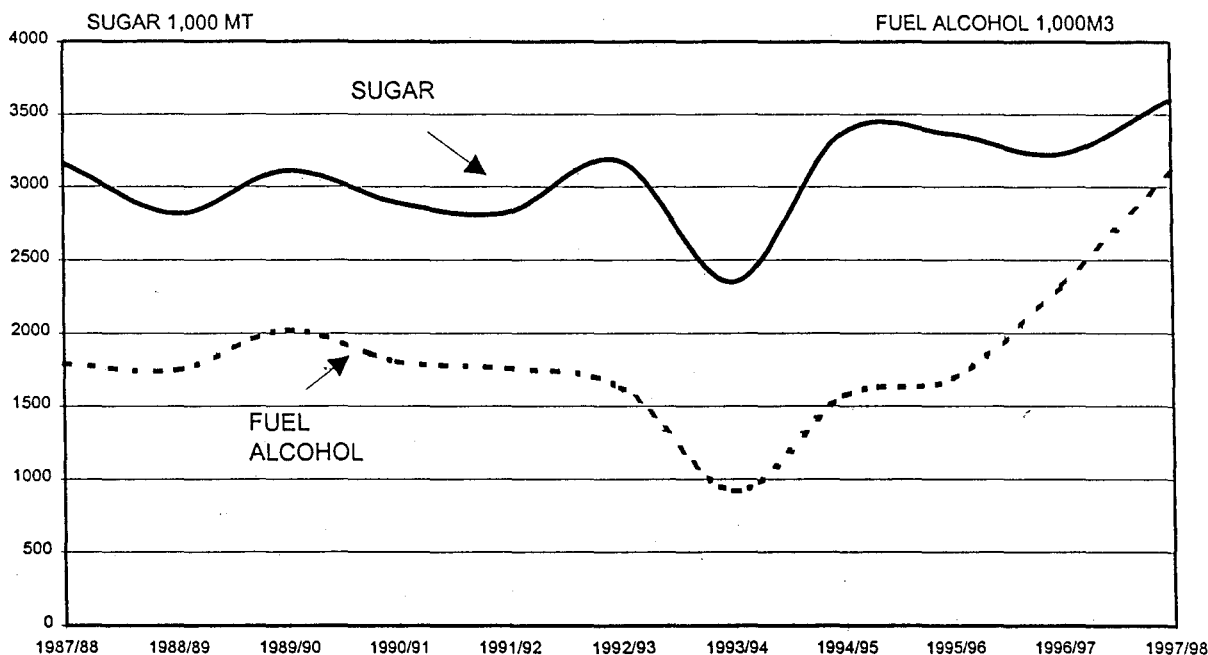
Chart 17. Brazil's Northeast Region: Sugar and Fuel Alcohol Production Facilities, 1997/98



	91/92	95/96	97/98
*Sugarcane mills	16	12	8
*Integrated Mills with Fuel Alcohol Distilleries	66	48	49
*Autonomous Fuel Alcohol Distillers	37	26	32
*Total	119	86	89

Marketing of Sugar and Fuel Alcohol. About one-third of regional sugar production, which averaged 3.4 million tons the last three years, went to domestic use for direct consumption and for food processing (Chart 18). About 75% of use went to the region's 56 million population in the form of direct consumption. The market for sugar containing product manufacturing remains relatively small in the Northeast and is expected to remain small as products manufactured in other parts of the country are marketed in the region. Northeast sugar for the domestic market rarely is shipped out of the region and Center-South sugar rarely is brought to the Northeast. Mill companies sell their output mainly in 50 kg bags for domestic use and prices are determined in the market place. Brazil's central government abolished national sugar retail price controls in 1990.

Chart 18. Brazil: Sugar and Fuel Alcohol Production Trends for Northeast



All of the fuel alcohol production is marketed within the region. The last three years production has averaged 2.1 billion liters of which two-thirds has been hydrous alcohol. This production is sold by sugar mills to fuel production and distribution companies usually on annual contracts. The companies that purchase the fuel alcohol include Esso, Texaco, Shell, Petrobrás—the state energy company—and the private Brazilian firm Ypiranga.

The bulk of the region's annual sugar production is exported. The region ships a mix of bagged and bulk sugar including raw, crystal, and refined sugar, but the dominant share of exports are raw sugar. The sector's coastal location means distance to ports is short and transportation costs much lower than for the Center-South region where growing areas are a considerable distance from the ports.

Exports from Pernambuco are shipped from the bulk-loading terminal at the port of Recife, the state's capital. Inaugurated in 1972, the terminal's construction was financed by the government's sugar authority the Institute of Sugar and Alcohol (IAA). It is, on the average, located about 70 kilometers from Pernambuco's sugar mills. In the past the government managed operations of the terminal, but now the private sector runs it. For Alagoas, the IAA built a similar facility in 1976 at the port of Maceió. On average the terminal is located about 60 kilometers from the state's mills. As in Pernambuco, the private sector has assumed from the government managerial responsibilities for the facility. Operating costs are shared by the exporting mills based on their use levels.

The bulk export terminal at Maceió has a capacity to load about 1,100 tons per hour and averages 700-800 tons. The average loading rate per day is 12,000 tons. At Recife, the average hourly loading capacity is 500 tons with daily capacity of about 8,000 tons. Both the Maceió and Recife bulk sugar terminals have storage cells. The one in Maceió has four cells of 50,000 tons each for a total capacity of 200,000 tons. Recife's cells are somewhat smaller, approximately 41,000 tons each, for storage capacity of about 164,000 tons.

Both terminals were state-of-the-art and are still in excellent condition, dedicated exclusively to sugar handling. The scarce rains during the September-April shipping season favor uninterrupted loading patterns and result in generally high levels of throughput. Average-sized cargoes are usually loaded in two to four days. Bagged cargoes are handled manually in a very traditional way, but the majority of the volume exported is bulk. It should also be noted that these ports tend to have little labor strife unlike the highly charged unionized labor situation at the Center-South's major ports of Santos and Paranaguá. Given these conditions, average fobbing costs at these ports are estimated at \$15 to \$20 per ton compared with \$50 to \$55 per ton at Santos and \$40 to \$45 per ton at Paranaguá.

Since 1990, the Brazilian export regime has been privatized so that Northeast millers can now negotiate their own contracts instead on being obliged to turn their sugar over to the government which in the past sold it for them at government established prices which were set to production costs. Millers must now sell at world prices. In Alagoas, some mills are joined in a export cooperative, Copertrading, and others market independently. Current high interest rates, tight credit and heavy indebtedness of the milling sector are leading millers to establish working relationships with international sugar trade houses which offer them, US dollar based, pre-export financing. Among the most active firms in the Northeast are Tate and Lyle, ED&F Man, Czarnikow-Rionda, and Dreyfus.

Special Policies for Northeast Industry. Brazil's North/Northeast region ranks among the poorest regions in the country. This factor, plus its dependence on sugar, its high population density, and a tradition of political clout have combined to foster policies to aid the region's sugar and alcohol industry. For example, under current law, all of the premium-priced US import quota sugar allocated to Brazil must come from the Northeast. For 1997/98, that allocation totals 221,000 tons and gleans for the industry about 10 cents a pound or \$220 per ton more than shipments to the world market. Some segments of the Center-South industry, specifically the Cosan Group, have brought challenges to this special advantage.

Because of its inherently lower productivity and high production costs, the region is given special tax breaks. For example, sugar producers in the region pay a lower percentage (1.8%) of the Industrial Products Tax (IPI) which in the Center-South is levied at 12%. (But, no one pays the IPI now because of a court challenge to its constitutionality.) Most importantly, the industry is given an official price for which it can sell hydrous alcohol to distributors 23% above the official price in the Center-South. (The government later reimburses these distributors). According to a recent report, the scheme is to be modified with the subsidy paid directly to cane growers. The rationale for this policy is the higher cost of production in the Northeast and the social argument that aims to distribute the wealth of the country more evenly.

Prospects for the Future. Despite the special support policies provided the industry, it likely will contract over the next decade. The biggest problem facing growers is low productivity caused by poor cane varieties, generally difficult soil and weather conditions, terrain that does not lend itself to mechanization, and field to mill logistical problems that result in delays and sucrose loss. Resistance to innovation represents another problem that differentiates many Northeastern growers from their counterparts in the Center-South. According to one observer, the government's historical protection of the Northeastern growers underlies much of this conservatism.

Millers also must cope with the high cost and generally low quality of cane, and their high debts have forced several bankruptcies. This has been a long-standing problem—in the early 1990s one government study put the industry debt at over \$1 billion and about this same time the state development bank of Alagoas went bankrupt, in large part due to large cane miller loans. In the late 1990s, the situation has not changed appreciably. The trend is for the milling sector to consolidate and the remaining units of production to seek greater economies of scale and thereby lower unit production costs.

While this trend is long-standing and is likely to continue, some regional funds and talent have shifted to states outside the region such as Minas Gerais. It is likely that over the next decade the number of regional facilities will decline while average size increases. The producing area will continue to contract as hilly land goes out of production and the better plateau areas in southern Pernambuco and Alagoas remain in production.

While Northeastern sugar interests will continue to petition the government for special treatment (they are well represented in the regulatory entities, and wield disproportionate political clout in Congress), it is hard to imagine large scale assistance coming from a central government with such a strong free market philosophy and severe budget constraints as the Cardoso government. The region could lose some of its remaining special treatment related to the US sugar import quota, tax breaks, and price subsidy on alcohol sales.

Center-South Region

In contrast to the Northeast, the Center-South region is one of the most dynamic and productive sugarcane producing areas in the world. It accounts for more than 80% of Brazil's sugar and 86% of its alcohol (Chart 19). The heart of the Center-South is São Paulo State with more than three-quarters of the area's sugar (Chart 20). Like the Northeast, the Center-South has a long history of sugar production, but with its highly productive natural resource base, long standing commitment to research by the state government of São Paulo and strong regional cooperatives such as COPERSUCAR, and its continuing capital investments in plants and equipment, the industry as a whole has been expanding. Over the last decade, for example, annual output of sugarcane has grown by 46% from 169.8 million metric tons for the 1987/88 season to a record 248.3 million tons for 1997/98. This impressive growth was accomplished by both area expansion and productivity gains. While productivity gains are expected to continue, a key question for the coming decade is the trend in sugarcane production area.

Chart 19. Brazil: Sugar and Fuel Alcohol Production Trends for Center- South

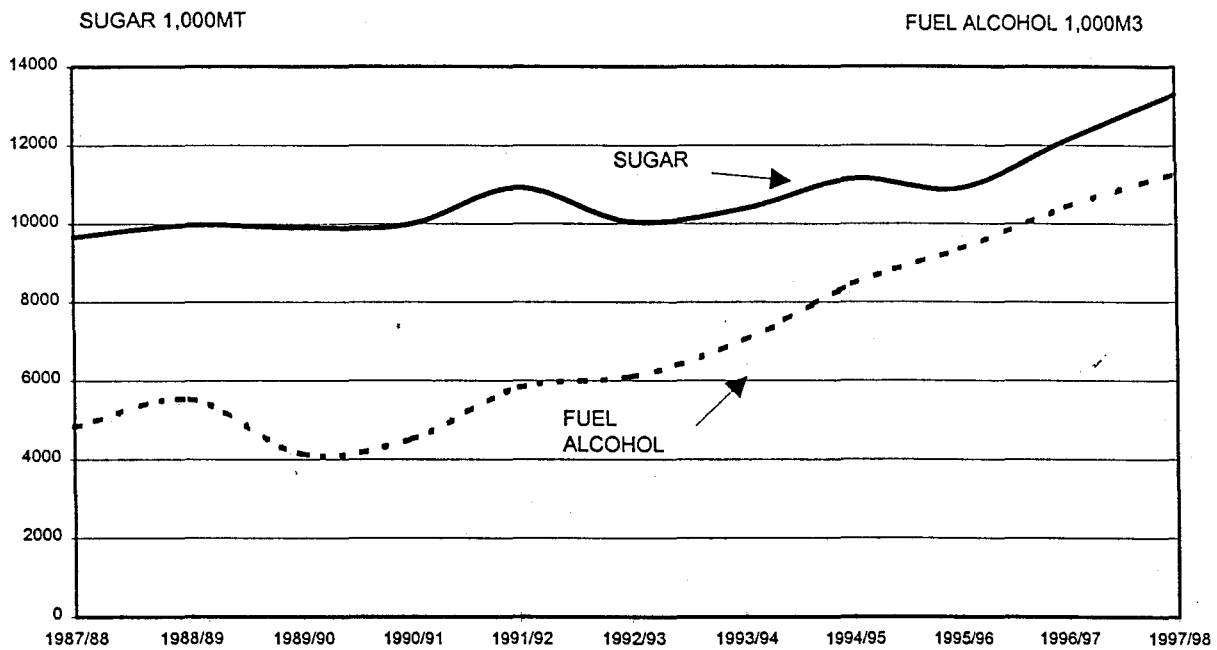


Chart 20: Brazil: State of Sao Paulo



Source: SCI

Chart 21: Brazil: State of Parana



Source: SCI

Sugarcane Production. Sugarcane area in the Center-South has been expanding strongly in the states of São Paulo, Paraná, Minas Gerais and Mato Grosso. The state of Rio de Janeiro, a traditionally important sugarcane producing state, went against this trend and area contracted largely due to its high costs relative to other center-south producing areas. By contrast, in São Paulo sugarcane replaced pastures as well as coffee, field crops and marginal citrus areas as government incentives to invest in the alcohol program, attractive guaranteed prices for sugarcane and alcohol, and the opening of the export market for sugar made sugarcane more profitable than cattle or alternative crops. In the state of Paraná, sugarcane was substituted for cotton and the potential expansion of sugar exports from the state spurred mills to lease more land in order to expand (Chart 21). In western Minas Gerais, Goiás, Mato Grosso and Mato Grosso do Sul tax benefits given by state governments as well as the lower price of the land encouraged expansion. According to published statistics from Brazil's Institute of Geography and Statistics (IBGE), taken together area in cane for the 10 Center-South growing states expanded from 2.6 million hectares in 1985 to 3.6 million in 1997. The state of São Paulo alone accounted for 800,000 hectares, 80% of the total increase.

The Center-South is considered one of the world's lowest cost producing regions, reflecting the productivity of its soils, its excellent growing conditions, and the long-standing research investments in development of high yielding cane varieties. Yields of cane have been trending upward and currently average around 74 tons per hectare. In the state of São Paulo cane yields average 75 to 80 tons per hectare compared with 50 tons for the Northeast state of Pernambuco. In São Paulo growers benefit from the highly fertile reddish clay soil, known as "massape" and on the Paraná Plateau growers have the rich "terra roxa" soils to cultivate. In addition, the entire region has a generally good growing climate for producing sugarcane with adequate rainfall during the growing season and dryer conditions prevailing during the May to November harvest season (Charts 22 and 23). Normally cane is grown on a 5 year cycle (up from 4 years in the recent past).

The Center-South growing region is generally characterized by gently rolling terrain. While the area is highly adaptable for mechanized agriculture, the harvest is still largely undertaken by hand labor. Currently the Center-South harvest is beginning to be mechanized with machines now cutting about one in 5 hectares in São Paulo. This will reduce costs 20 to 30% according to some experts, but will displace tens of thousands of workers who now have the highest-paying agricultural jobs in the state. The potential layoffs could aggravate the social problem associated with the Landless (Sem Terra) Movement. Landless farm workers—seeking to enforce the constitutional provision subjecting underutilized agricultural land to expropriation for land reform—have been occupying extensively managed farms throughout Brazil.

Chart 22. Brazil: Average Annual Monthly Precipitation for Typical Sugarcane Growing Area in Center-South

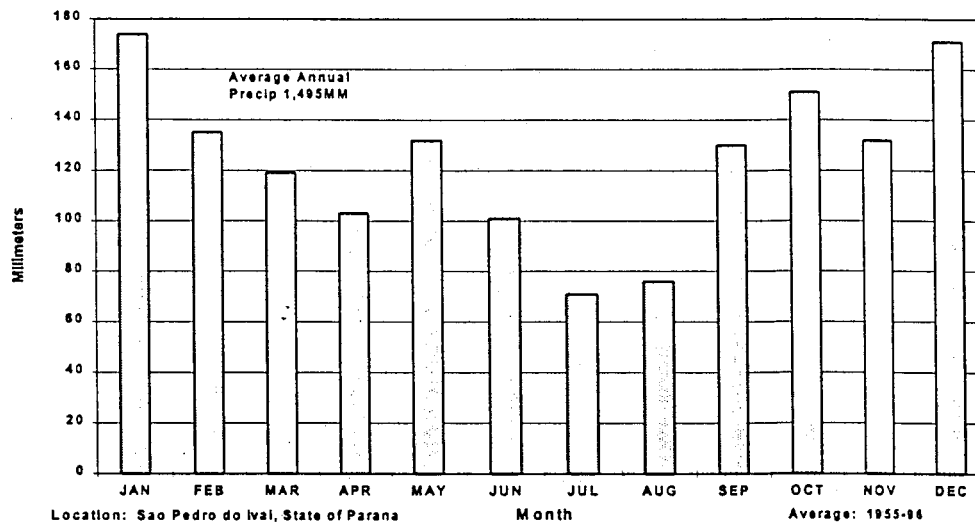
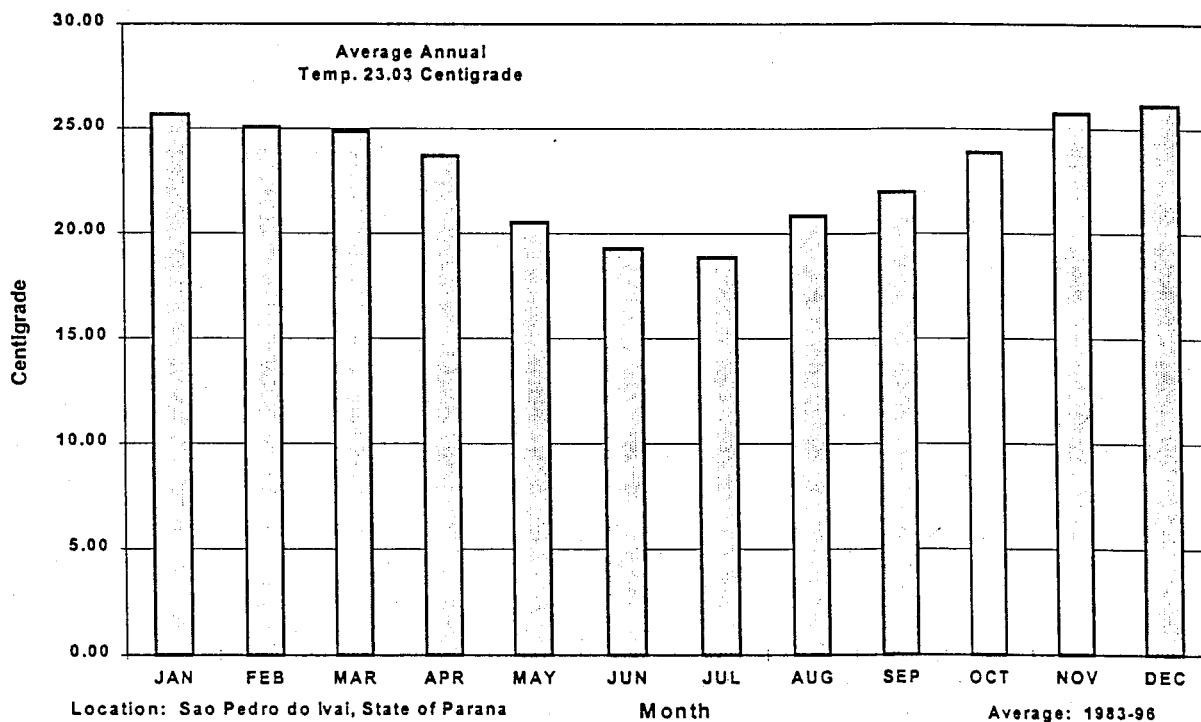


Chart 23. Brazil: Average Annual Monthly Temperature for Typical Sugarcane Growing Area in Center-South



Sugar and Fuel Alcohol Production Facilities. The Center-South region has 235 sugar processing and fuel alcohol facilities, including seven stand-alone cane mills, 75 autonomous distilleries, and 153 integrated facilities producing both sugar and fuel alcohol (Chart 24). Since the early 1990s, many companies have invested in sugar processing equipment and equipment to produce both hydrous and anhydrous alcohol (anhydrous production requires an additional distillation column). For example, the state of São Paulo had 67 integrated facilities in the early 1990s and now has 94, a 40% increase (Chart 25).

In the region, mills own about one-third of the cane-producing land and rent another one-third of cane land—with independent growers accounting for the remaining one-third. The region is characterized by a large number of mills and varying ownership patterns. In recent years, there has been numerous mill mergers, especially in the state of São Paulo. For example, this past year the privately held Cosan Group which operates some of the largest mills in São Paulo acquired two additional smaller mills in eastern São Paulo. This trend of mergers is expected to continue. A prime location is the Ribeirão Preto area in northeastern São Paulo which accounts for about one-half of the state's sugarcane. This area has 46 sugar and fuel alcohol facilities, many of which will either merge or close in the coming years. One of the strongest groups in the region is COPERSUCAR, a cooperative formed by 36 member mills. COPERSUCAR is powerful politically in the region and also funds one of the world's leading sugarcane and sugar/alcohol research centers at Piracicaba, located in eastern São Paulo.

Sugar and Fuel Alcohol Marketing. Sugar from the Center-South (a record of 11.3 million tons in 1997/98, up from the 9.4 million tons average the previous three seasons) accounts for three-quarters of the national total. It traditionally has gone to the domestic market to service the area's large population and food processing sector. The states of São Paulo, Rio de Janeiro, and Minas Gerais are Brazil's three largest states in terms of population with estimated combined population of about 65 million, 40% of the national total. Likewise, fuel alcohol production has been used by the more than two-thirds of Brazil's auto fleet registered in the region. The Center-South is also the industrial hub of the country where the bulk of fuel alcohol is consumed. For 1997/98, Center-South fuel alcohol production totaled 13.3 billion liters compared with an average of 11.4 billion liters the previous three years.

In recent years, however, an increasing volume of sugar produced in the region has gone to the export market. This contrasts sharply with the era of the IAA when the Center-South was largely self-sufficient and the government controlled export licenses which went largely to the Northeast to help achieve better income distribution for the country. For the 1997/98 shipping season, exports from the region were a record 5.5 million tons, up from 4.7 million the season before and under 1.0 million tons in the early 1990s.

Chart 24. Brazil's Center-South Region: Sugar and Fuel Alcohol Production Facilities, 1997/98

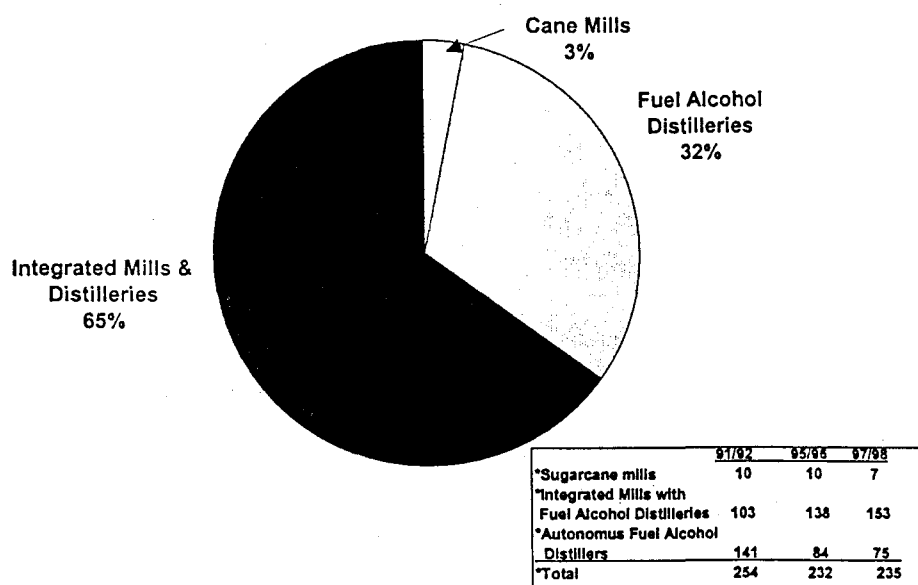
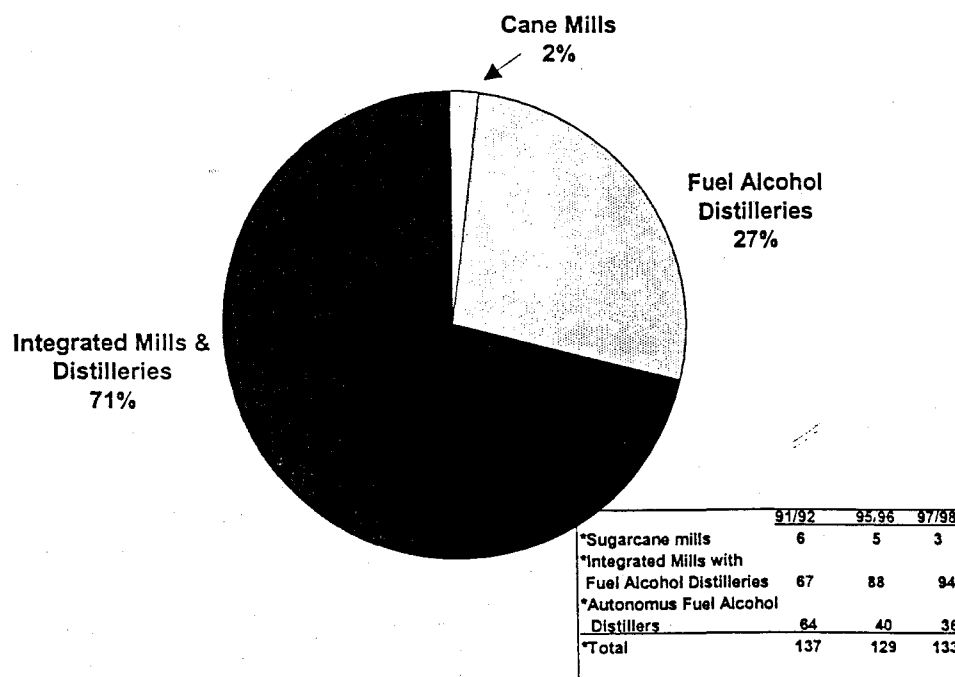


Chart 25. Brazil's State of Sao Paulo: Sugar and Fuel Alcohol Production Facilities, 1997/98



Sugar Transport and Ports. High transport and port costs comprise a major portion of what Brazilians call the "custo Brasil," but investments and reforms underway are reducing those costs. The distance from cane growing areas and sugar mills concentrated in the interior of the leading producing states of São Paulo and Paraná to the region's key sugar export terminals of Santos/Guarujá and Paranaguá is long and transportation costs high. Road and rail transportation networks leading to the ports are very congested and delays add to costs. Transportation networks descend major coastal escarpments leading to both ports. For many sugar producers in northern Paraná the distance to Paranaguá is 530 kilometers, 800 kilometers to Santos and 650 kilometers to Itajai, the region's third largest sugar port located in the state of Santa Catarina. Truck transportation costs for sugar shipments from mills in the interior of São Paulo to Paranaguá are reported to be 25 to 30% higher for the February-August period when trucks are in short supply due the soybean harvest, than in August-September.

Railways are currently used for only a small share of sugar shipments due to a lack of equipment, poor service by government-run railroads, and transshipment requirements due to different track gages between states. However, Brazil's railroad lines are being privatized and new owners are investing huge sums to modernize their acquisitions and to attract freight business. Within 10 years, probably sooner, revitalized railroads could handle at least one-third of the Center-South's sugar exports at a cost substantially below current truck transport costs. Another contribution to transport improvement is the new Tieté-Paraná Waterway which cleaves São Paulo state from the northwest to the city of São Paulo, and which could relieve the pressure on other transport facilities and may be used to barge sugar, alcohol and agricultural inputs between rural and urban areas of the state.

Fobbing costs at these ports also are traditionally high due to competition from other commodities and high labor costs among other factors. Fobbing costs are now \$50-\$55 per ton at Santos—down from \$65-\$70 2 years ago—and \$40-\$45 per ton at Paranaguá. Again, this contrasts sharply with the fobbing costs in the Northeast of \$15-\$20 per ton. However, the situation is changing rapidly and all indications point to a sharp drop in fobbing costs in the near future. Changes are being spurred by Brazilian Law No. 8.630 which calls for a nation-wide port modernization program.

In recent years, port congestion at Santos has frequently tied up general cargo as well as sugar shipments. The fact that climatic conditions are such that rainfall is more frequent during the May-December sugar shipping season than in the Northeast also adds to delays. On numerous occasions in recent years sugar cargoes took more than a month to load. Despite these shortcomings, Santos has remained Brazil's and South America's largest port. It can handle 30 ships per day and 38 million tons of cargo a year. The goal of port management is to increase tonnage to 52 million tons by 2000 and part of this increase is expected to be increased sugar shipments.

Modernization and privatization initiatives at Santos—funded in part by US\$1.65 billion from the federal government's "Brazil in Action" program and at least \$730 million in private investments—include:

- plans to improve access to the port via a tunnel under the port estuary and a new six-lane access road along the side the port;

- privatization of about 70% of the port via concessions to various consortia which pledge minimum investments of \$360 million;
- reduction in port dues from \$7.05 per ton in January 1996 to \$1.46 by May 1998;
- switching from an 18 hour day 5-days a week to a 7-days a week around the clock schedule; and
- dredging the channel from 14 to 17 meters.

Solutions to the labor situation at the port, a key part of the overall port efficiency improvement program, has encountered a storm of protests from unions and vested interests. Nonetheless, thousands of dock workers with high wages and restrictive work contracts have been fired. The port authority has used a program of early retirements as a means to lessen labor strife. There are now 17,000 unionized dock workers at Santos when a few years ago there were 22,000.

Sugar is a relatively new export commodity for the port of Santos. Sugar exports from the port started on a large scale in 1993. In 1996, sugar exports from Santos totaled 2.4 million tons, 47% of Brazil's total (Tables 11 and 12). Currently, the bulk of sugar arrives at Santos by truck and the port authority rents warehousing and equipment for loading. Private companies also have been active in investing in new facilities. The port now has several private sugar terminals with others expected to be operational in the next year:

- Cargill's bulk sugar terminal is used for either sugar or soybeans—warehouse no. 1 has a capacity of 80,000 tons and warehouse no. 2 has 40,000 tons. Nominal load rate is 1,000 tons per hour, average is 500 tons. Cargill has recently completed construction of its own sugar terminal with an estimated annual shipping capacity of 1.0 million tons.
- ADM rented an export terminal this season to load soybeans and bulk sugar. ADM is also building its own terminal which should be in operation next year.
- Glencore's new terminal has 65,000 tons of bulk sugar storage. The nominal load rate is 18,000 tons per day; the average load rate 12,000-14,000 tons.
- Cosan's new bulk sugar terminal has 5 warehouses each with a total capacity of 75,000 tons. The nominal load rate is 5,000-6,000 tons per day, the average is 3,500-4,500 tons.
- COPERSUCAR has a new mechanical spiral loading facility for bagged cargoes that is operational for the first time this season. The system is designed to load 3,000-4,000 tons of bagged sugar per day.

The port of Paranaguá historically has been a general cargo port focusing on coffee and lumber exports. In the 1970s with the growth of soybean production in Paraná, the port was equipped to handle large amounts of bulk soybeans and soybean products. Because of the importance of soybean trade that commodity gets preference at the port to the disadvantage of sugar shipments (soybeans are exported from February to August and products into November—overlapping much of the sugar shipping season). Soybeans are grown at distance much greater than sugar from the ports, but they are shipped in bulk in contrast to sugar which still has a large segment of its trade in bags which increases its transportation and fobbing costs. As the Center-South's sugar industry moves increasingly to bulk shipments, fobbing costs will decline.

Table 11. Brazil: Sugar Exports by Port, 1996

Port	Metric Tons	%
Santos/Guaruja	2,429,577	47.0
Paranagua	888,529	17.2
Maceió	679,305	13.1
Recife	534,789	10.3
Sao Francisco	155,870	3.0
Itajai	128,537	2.5
Imbituba	112,723	2.2
Uruguaina	71,475	1.4
Others	91,721	1.8
Total	5,171,752	100.0

Source: Williams, Servicos Martimos, Ltda.

Table 12. Brazil: Sugar Exported Through Port of Santos by Month and Terminal for 1996

Sugar Exported Through Santos Port	Bulk Sugar Shed 19	Bulk Sugar Cargill Terminal	Bulk Sugar Export Corridor	Bagged Cargo Loose Bags	Bagged Cargo Preslung	Total
	1,000 metric tons					
January	0	0	0	67,500	0	67,500
February	0	13,000	0	18,164	0	31,164
March	0	0	0	40,696	0	40,696
April	0	0	0	28,000	0	28,000
May	26,500	6,675	0	36,700	0	69,875
June	42,000	14,000	0	96,500	13,500	166,000
July	40,736	111,548	25,000	152,600	66,300	396,184
August	55,536	80,250	95,907	198,500	92,200	522,393
September	39,000	78,350	83,150	165,300	41,000	406,800
October	46,392	46,925	54,219	203,985	84,500	436,021
November	40,000	24,055	24,750	188,640	0	277,445
December	54,000	12,525	14,300	167,450	0	248,275
Total	344,164	387,328	297,326	1,364,035	297,500	2,690,353

Source: CODESP.

Like Santos, the port has only recently begun to handle sugar exports and most of these have been Very High Polarization (VHP) sugar.⁵ Exports from Paranaguá were 889,000 tons in 1996 and jumped to a record 1.4 million tons in 1997.

⁵ VHP sugar is much lighter in color and dryer than raw sugar and higher in polarity at 99.5, 600 ICUMSA color.

VHP sugar is the material product of the Center-South industry. This "plantation white" product obtained with no extra cost and traditionally was sold only in the domestic market. Now it is increasing by being sold on the world market and its pricing is very competitive.

Several private terminals operate under long term leases with the port authority. The companies EXIMCOOP and COIMBRA (Dreyfus) have been active in sugar trade at the port. Climatic conditions are similar to Santos and rain can cause considerable delays. However, throughput is high and, weather permitting, a 25,000 ton cargo gets loaded in approximately 4 days. Similar to Santos, there are several important infrastructure projects planned or underway at the port. The Galheta Channel leading to the port has a dredged depth of 10 meters which will be deepened to 11 meters which will allow handling of deeper draft vessels without dependence on tides.

The port is linked to the interior of Paraná and bordering São Paulo by a system of roads and railroads. Road traffic can become very congested owing to the major escarpment between the cities of Curitiba and Paranaguá. The port is also serviced by 2 privately operated railroads, Ferrovia Sul Atlantico (FSA) and Ferrovia Paraná (FERROPAR). The port authority now is designing a new railroad project to facilitate increased traffic at the port. Rail offers the opportunity to lower transportation costs well below those of truck service. In the long run, some experts envision that as much as 40% of the sugar moving to Paranaguá will move by rail.

Future Prospects. Sugarcane area could decline in the future in the Center-South as expansion levels-off in some states and contracts in the key state of São Paulo. Several factors could drive this change. The lingering precarious financial situation of the industry has become critical. Perhaps 10% of the industry is in good shape financially, another 20 to 40% are still acceptable credit risks, while the remaining 50% to 70% of the industry are thought to be poor credit risks. With high levels of indebtedness and high internal interest rates, many Center-South sugar companies have utilized pre-export financing for operating capital and to finance capital improvement programs and new acquisitions. With the recent sharp fall in world sugar prices these funds have begun to dry up. This new financial reality, coupled with declining internal prices and the expected full liberalization of the alcohol market is likely to cause less efficient mills to close or merge with those more financially viable. This also could result in a consolidation of land holdings as marginal sugarcane land goes out of production. This new trend is expected to be augmented by the ongoing shift to mechanized green cane harvest in the state of São Paulo where many hilly areas not suitable for mechanization could go out of production. As marginal growers as well as marginal mills go out of production, Brazil's productivity per hectare should increase (see next section for discussion of implications of mechanized green cane harvest).

Demand for sugar for internal use likely will continue to grow, especially to serve the needs of the region's rapidly expanding food and beverage processing industries. Exports also could grow as Brazil's long-run competitiveness increases as privatization and physical improvements in the internal transportation system and port facilities and in the processing sector continue. This year, however, export prices under \$0.08 per pound are expected to dampen exports. Nonetheless, exports are continuing. Current prices are US\$143 per ton, ex mill (6.5 cents a pound) (alcohol prices are 21 cents per liter) and US \$180 Fob stowed (8.2 cents) with a fobbing discount of \$33 to \$38 per ton. Sugar export contracts are being made at these prices reflecting such non-price factors as the need to utilize the new export capacity at ports, the fact that exports generate commercially attractive large volume sales in contrast to the smaller size of common domestic

sales, and export payments, based on letters of credit, are much quicker and in dollars in contrast to the domestic market—not an unimportant consideration for liquidity starved milling companies.

The fuel alcohol market is in transition, but the Brazilian government remains committed to fuel alcohol for the long run. This year the government has sought to boost the demand for anhydrous alcohol by increasing alcohol in the mix from 22% to 24% and is testing the feasibility of mixing alcohol in diesel fuel. Also, there likely is a future—albeit more modest than in the late 1980s—for vehicles powered by 100% hydrous alcohol thanks to new legislation mandating that government-owned automobiles be alcohol-powered, and plans by automobile manufacturers to introduce new alcohol models.

This year the government is trying to deal with excess fuel stocks which have resulted in market prices of hydrous alcohol well below the 41 centavos per liter official price—28 centavos in August. Impacts of current and expected future conditions are discussed in the following sections.

III. KEY ENVIRONMENTAL ISSUES AFFECTING THE INDUSTRY

The environmental benefits of ethanol fuel—reducing global warming and urban air pollution—reinforce the arguments of those favoring a strong alcohol fuel program and increase the odds their arguments will carry the day. Meeting environmental challenges, such as the disposal of factory wastes, elimination of cane burning, and—possibly in the near future—more efficient cogeneration of electricity, also results in lower costs of production for sugar and alcohol. And, while domestic oil production has expanded greatly in recent years, largely due to growth in offshore drilling in the Campos Basin off of Rio de Janeiro, the country continues to be a major crude oil importer (Chart 26 and Table 13).

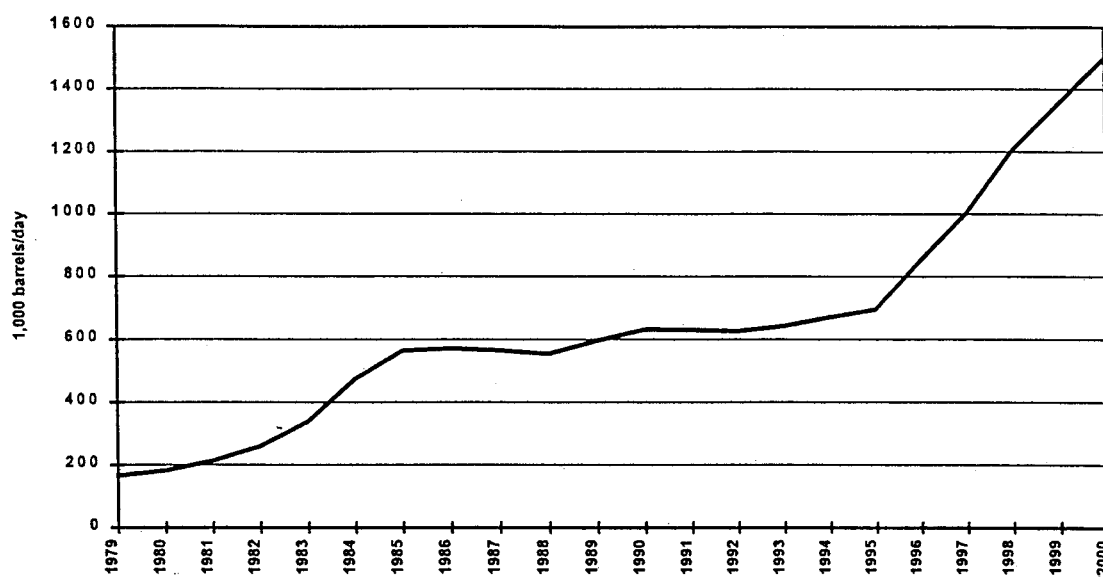
The National Alcohol Program and Global Warming

Brazil is a signatory of the United Nations Framework Convention on Climate Change. The Convention, adopted at the Rio de Janeiro Earth Summit in 1992 and entered into force in 1994, seeks to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous anthropogenic interference with the climate system. The Convention's principle of common but differentiated responsibilities assigns the lead in combating global climate change to developed (Annex I) countries. All parties to the Convention commit to prepare inventories of greenhouse gas emissions and greenhouse gas removals by "sinks," and to adopt strategies for mitigating climate change. In addition, Annex I countries agreed to enact measures to return their greenhouse gas emissions to 1990 levels by 2000. In the Kyoto Protocol of December 1997, the Annex I countries made a further commitment to reduce their emissions by 5% on average below 1990 levels in the period 2008 to 2012.

As an Annex II or developing country signatory, Brazil has made no commitment to reduce greenhouse gas emissions but is committed to preparing a "national communication" inventory of its emissions and removals by sinks of greenhouse gases, and to produce a general description of steps taken or envisioned to implement the Convention. However, Brazilian government officials have stated that steps already taken by Brazil on its own initiative constitute a substantial credit for Brazil since many tend to preclude the emission of greenhouse gases.

The Brazilian government lists the following as steps taken or envisioned to implement the Convention: National Alcohol Program (Proálcool), energy conservation, hydroelectric power generation, PRODEEM - the state and municipal energy development program, wind and solar energy development, increased use of natural gas (a pipeline to carry Bolivian natural gas to central and southern Brazil is under construction), PROCONVE - the program for vehicular pollution control, LBA - the large biosphere-atmosphere experiment in Amazônia, measures for avoiding deforestation, PREFOGO - the national system for forest fire prevention and suppression, and the establishment of national parks.

Chart 26. Brazil: Crude Oil Production Trends and Projections



Source: US International Energy Annual, various years

Table 13. Brazil: Petroleum Supply and Disposition

Year	Crude Oil Production	Primary Supply			Disposition		
		Oil Production 1/	Crude Oil Imports	Imports and Refined Petroleum Products	Crude Oil Exports	Total Exports of Refined Petroleum Products	Apparent Consumption (Including Bunkers)
thousand barrels per day							
1979	166	171	1,023	19	5	22	1,175
1980	182	227	869	39	1	24	1,164
1981	213	240	842	23	15	69	1,022
1982	260	331	798	60	22	90	1,082
1983	339	438	731	37	1	90	975
1984	475	601	648	10	0	176	1,070
1985	564	720	845	33	0	171	1,125
1986	572	726	584	44	0	112	1,297
1987	566	754	618	53	0	131	1,323
1988	554	731	637	98	4	156	1,300
1989	596	774	502	80	0	138	1,317
1990	631	803	571	70	0	98	1,339
1991	630	821	526	98	0	82	1,346
1992	626	806	526	107	0	93	1,369
1993	643	819	540	NA	0	NA	1,399
1994	671	871	550	307	0	194	1,451
1995	695	903	575	NA	0	NA	1,475
1996	795	1014	NA	NA	0	NA	1,530

1/ Includes crude oil, NGPL, and other liquids.

Source: Petrobras, US International Energy Annual, various years. US Energy Information Administration

Production of sugar and alcohol from sugarcane in Brazil is said to result in a net savings of greenhouse gas emissions because of the recycling of carbon in the sugarcane growing process, the substitution of bagasse for fossil fuels in alcohol distilleries and sugar mills, the substitution of ethanol for gasoline in vehicles, and, on a small scale, the use of surplus bagasse in other industries.

Total emissions of greenhouse gases from the production and processing of sugarcane in Brazil in 1996 were 1.58 million tons, carbon equivalent.⁶ Most of this was carbon from fossil fuels, but contributions also came from methane emissions from sugarcane burning (more than 90% of the area is burned before harvest) and dinitrogen oxide emissions from fertilizer. Carbon emissions from the burning of cane, bagasse and ethanol fuel were not considered because they are taken up by sugarcane plantations. On the other side of the ledger 14.33 million tons of emissions were avoided by the substitution of ethanol for gasoline (9.13 million tons) and of bagasse for fuel oil or coal (5.20 million tons). Thus the net greenhouse gas uptake by the sugar and alcohol industry was 12.74 million tons, carbon equivalent (Table 27).

The quantity of greenhouse gas emissions avoided by the alcohol fuels program compares favorably with other potential mitigation measures such as forest preservation and reforestation for charcoal. However, the cost is approximately \$200 per ton of carbon; far too high to justify the alcohol program on its carbon emissions mitigation effect alone.

Air Pollution Concerns

Gasohol (anhydrous alcohol mixed with gasoline) and pure ethanol (hydrous alcohol) powered automobiles burn cleaner because of the larger amounts of oxygen they contain and thus produce fewer pollutants than gasoline.⁷ A side benefit of alcohol fuels has been the introduction of catalytic converters. The heavy sulfur content of Brazilian gasoline not mixed with ethanol quickly contaminates catalyzers, but cleaner-burning ethanol produces virtually no sulfur emissions.

Tests with alcohol-diesel mixes for trucks and buses indicate significant reductions in carbon monoxide, hydrocarbons, and particulate matter.

⁶ L.C.C. Carvalho, cited by Moreira and Goldemberg.

⁷ A study by Alfred Szwarc, cited by Moreira and Goldemberg, comparing gasoline in 1980 with gasohol and ethanol in 1995, finds substantial reductions in emissions of carbon monoxide and hydrocarbons and moderate reductions in nitrogen oxides. A report by the Greenhouse Gas Technology Information Exchange shows that pure ethanol vehicle emissions, compared to gasoline vehicles, are substantially lower for sulfur dioxide and particulate matter, slightly lower for nitrogen oxides and carbon monoxide, and slightly higher for methane.

Table 14. Brazil: Net CO₂ (Equiv.) Emissions Due to Sugar cane Production and Utilization (measured as Carbon) In 1996 and Projected to 2010

Items	1996	2000	2005	2010
		(10 ⁶ tC (equiv.)/year)		
Fossil Fuel Utilization in the agro-industry	+1.28	+1.28	+1.34	+1.41
Methane Emissions (sugar cane burning)	+0.06	+0.06	+0.05	+0.03
N ₂ O emissions	+0.24	+0.24	+0.24	+0.24
Ethanol substitution for gasoline (diesel after 2000)	-9.13	-9.22	-10.58	-12.93
Bagasse substitution for fuel oil (average)	-5.20	-5.84	-6.43	-7.18
Leaves and tops not burned	0.00	0.00	-0.64 ⁽¹⁾	-1.44 ⁽²⁾
Net Contribution (Carbon Uptake)	-12.74	-13.48	-16.02	-19.87

(1) 10% of the amount saved by sugarcane bagasse

(2) 20% of the amount saved by sugarcane bagasse

Source: Luis Carvalho, Oct. 1998.

Stillage Disposal

In the past Brazilian alcohol distilleries routinely dumped stillage (vinasse) from their factories into rivers, causing serious contamination. For example, in the states of Mato Grosso and Mato Grosso do Sul processing wastes from distilleries were filtering into Brazil's Pantanal, the world's largest wetland ecosystem, and the state governments banned contraction of new fuel alcohol production facilities. More recently, the sugar and fuel alcohol industry throughout much of Brazil has utilized the nutrient-rich stillage as a fertilizer applied to ratoon cane fields resulting in substantial fertilizer cost savings while solving the serious pollution problem.

In addition, mill filter cake is used as fertilizer on plant cane fields. And, improvements have been made in the handling of cane washing water which either passes through closed circuits or through aeration lagoons. It no longer is dumped directly on the ground.

Burning of Sugarcane and Mechanized Harvesting

Pre-harvest sugarcane burning to eliminate pests and facilitate harvesting, and post-harvest burns to dispose of tops and remaining green leaves has been a universal practice in Brazil until recently. Today about 90% of sugarcane land is burned, but the percentage will drop sharply over the next several years. Cane burning releases carbon and methane into the atmosphere. Smoke and ash are nuisances for nearby urban areas and have provoked new regulations in the state of São Paulo. A series of decrees in 1997 mandates phasing out burning of cane in the state. The ban is immediate within one kilometer of urban areas. Other areas which are suitable for mechanized harvest have 8 years to eliminate burning, while those areas not suitable for machinery have 15 years to adapt.

The cost of manual cutting of green cane is more than twice as high as the expense for burned cane. Mechanized harvest of green cane, however, costs less than hand harvesting burned cane.

Harvesting green cane brings no greenhouse gas benefit because the emissions avoided by not burning are offset by increased fuel use for machinery.

Over time the annual sugarcane crop in Sao Paulo will be cut green by machinery. However, this shift is expected to be slow. Currently, the government is backing-off on the push to a mechanical green cane harvest, due to the implied unemployment it will create among labor. Moreover, with current low sugar and alcohol prices millers are not in a position to pay for mechanical chopper harvesters which cost over \$200,000 per unit.

The likely slow shift to green cane harvesting (already about 10% of the harvest is cut green by machine) will provide a long "learning curve" for the Brazilian industry. During this period marginal growers and marginal mills are expected to leave the industry or merge with more efficient mills. As a result, it is foreseen that Sao Paulo will be able to maintain its competitiveness as it moves slowly to a mechanized green cane harvest system.

Cogeneration of Electricity

Brazilian sugar mills and alcohol distilleries generate steam for their operations by burning bagasse. The steam plants cogenerate 15 to 20 kWh of electricity per ton of cane—sufficient to meet the factories' needs. A small amount of residual bagasse is sold as fuel to other industries. The amount of electric power produced could be increased to 80 or 100 kWh if higher pressure boilers and more efficient condensing extraction steam turbines (CEST) were used. With the elimination of cane burning, additional dry matter from tops and leaves would be available to produce even more electric power, enhancing the already significant environmental benefits—avoidance of greenhouse gas emissions—of the sugar/alcohol industry. If surplus electricity could be sold profitably, costs for producing sugar and alcohol would be lowered.

The principle stumbling block to enhanced cogeneration is the cost of electricity in Brazil. The price for bulk hydropower is approximately US\$40 per MWh, whereas the cost of cogeneration for sugar and alcohol producers is about \$50 per MWh. Despite the apparent problems some contracts have been signed for selling cogenerated electricity in the state of São Paulo.

IV. ECONOMIC AND TECHNOLOGICAL ISSUES

Cost of Production

Sugar production costs in Center-South Brazil fall generally in the US\$170 to \$190 per ton range for very high polarity (VHP) bulk sugar (Table 15). However, the cost in the Northeast is 30% to 35% higher. Costs for producing both sugar and alcohol have declined during the past 15 years. Curvalho estimate the annual cost of production rate for anhydrous alcohol at 3.7% per year.⁸ The liberalization of the markets for sugarcane, sugar and alcohol will quicken the pace of further efficiencies and cost reductions on both the agricultural and industrial sides.

The complementary relationship for sugar and alcohol lowers costs for both products. A mill not producing alcohol must extract all possible sucrose from sugarcane juice for crystallization into sugar, while one with an annexed or integrated distillery can use the sucrose easiest (and cheapest) to extract for sugar and send the remaining high test molasses to the distillery for alcohol production. Thus, the few remaining mills without a distillery and the many remaining independent distilleries have substantially higher costs than the integrated mills. As a result stand alone distilleries and sugar-only mills are closing or converting to integrated mills. Between 1992 and 1998 the number of autonomous distilleries dropped from 178 to 107, non-integrated mills went from 26 to 15, and integrated mills producing both sugar and alcohol increased from 169 to 202.

This is the last year of administered sugarcane prices in Brazil. Based on annual cost of production surveys, the official price reflected average costs, well above those of most efficient producers. In São Paulo, US dollar equivalent prices received by growers during the 1990s ranged from \$9.50 to \$15 per ton of sugarcane delivered to mills. The planned freeing of sugarcane prices prompted independent growers and millers in São Paulo to negotiate a new arrangement for price determination. They agreed upon a "self management" system which spreads the risk of marketing sugar and alcohol to growers. Final prices will be based on the total recoverable sucrose (TRS) of cane delivered and on market prices for sugar and alcohol.⁹ Incentives for delivering high sucrose cane and the reverberation of market signals to growers should enhance productivity. However, no more than one-third of the cane milled in Brazil is grown by independent growers.

The cost of production for sugarcane on a well run mill-operated farm in 1997 averaged \$11 per ton over a 7 year (6 cuts) production cycle. For the plant crop inputs, such as the estimated costs of seed cane, represented 46% of total costs. For subsequent ratoon crops manual operations were the largest costs representing 26% of total costs with harvest costs accounting for 75% of manual costs. According to various estimates the shift to a largely mechanized harvest system in the state of São Paulo will save 20% to 30% over manual harvesting. One machine is expected to displace 80 workers

⁸ Luis Curvalho, Oct. 1998

⁹ This mechanism apparently is being used this season by most mills in São Paulo despite the government decree maintaining administered prices until February 1999.

**Table 15. Center-South Brazil: Sugarcane Cost of Production, 1997,
Best Practice Farms (US\$ per Hectare)**

Description	Specification	Unit Value	Planting		1st Cut 140 t/ha		2nd Cut 120 t/ha		3rd Cut 100 t/ha		4th Cut 90 t/ha		5th cut 75 t/ha		6th Cut 60 t/ha	
			Qty	Value	Qty	Value	Value	Qty	Value	Qty	Value	Qty	Value	Qty	Value	Qty
1. Depreciation of Planting						271.6		232.8		194.0		174.6		145.5		116.4
2. Mechanized Operations																
Soil mounding	MH 126 hp 4x4 + terr. 20x26	25.60	2.1	53.2												
Terrace containment	MH 126 hp 4x4 + terr. 20x26	25.60	0.4	10.2												
Subsoiling	MH 126 hp 4x4 + subs	21.44	3.3	71.4												
Lime application	MH 61 hp 4x2 + spreader	10.85	0.3	2.7												
Filter cake application	MH 61 hp 4x2 + spreader	10.85	0.3	2.7												
Grading	MH 137 hp + gr pe 24x32	32.55	2.0	65.1												
Leveling	MH 126 hp 4x4 + leveler 52x22	21.07	1.0	21.1												
Furrow for vinasse	MH 126 hp 4x4 + plow	20.78	0.2	4.2												
Liquid fertilizer application	MH 61 hp 4x2 + tank 2,000 l	10.44	1.3	13.6												
Dry fertilizer application	MH 126 hp 4x4 + 2 line fert-furrow	21.59	1.7	35.8												
Load plant cane	MH 84 hp 4x2 + loader	23.06	0.3	7.6												
Transport plant cane	Truck hire (\$/t)	1.64	14.0	22.9												
Transport of workers	\$/km	0.61	12.0	7.3												
Collect/trans water	MH 61 hp 4x2 + tank 2,000 l	10.44	0.3	3.1												
Covering furrows	MH 61 hp 4x2 + impl	8.79	0.6	5.5												
Transport of inputs	MH 61 hp 4x2 + 4 t wagon	10.21	0.4	4.1	0.4	4.1	0.4	4.1	0.4	4.1	0.4	3.6	0.4	3.6	0.3	3.1
Herbicide application	MH 61 hp 4x2 + spray bars	15.28	0.2	3.1	0.4	6.1	0.2	3.4	0.2	3.4	0.2	3.4	0.2	3.4	0.2	3.4
Cultivate/fertilize	MH 61 hp 4x2 + cult/ fert appl	11.38			0.9	10.2	0.9	10.2	0.9	9.7	0.9	9.7	0.9	9.7	0.9	9.7
Spreading mulch	MH 126 hp 4x4 + spreader	20.82			1.0	19.8	0.8	16.7	0.8	16.7	0.8	16.7	0.8	16.7	0.8	16.7
Triplex operation	MH 126 hp 4x4 + impl	23.83			1.5	35.5	1.5	35.5	1.5	35.5	1.5	35.5	1.5	35.5	1.5	35.5
Loading cane	MH 84 hp 4x2 + loader	23.06			1.4	32.5	3.2	73.8	3.0	69.2	2.7	62.3	2.5	57.7	2.1	48.4
Transporting cane	Truck hire (\$/t/km)	0.10			140.0	196.0	120.0	168.0	100.0	140.0	90.0	126.0	80.0	112.0	70.0	98.0
Subtotal 2				333.6		304.2		311.6		278.5		257.0		238.4		7
3. Manual Operations																
Terrace construction	Hours - land prep crew	76.45	0.5	40.5												
Lime application	Person-days	9.14	0.2	1.8												
Setting plant cane	Person-days	9.14	4.8	43.4												
corte en toletes	Person-days	9.14	1.8	16.5												
repasse	Person-days	9.14	3.0	27.4												
Triplex cultivation	Person-days	9.14	0.2	1.8	0.2	1.8	0.2	1.8	0.2	1.8	0.2	1.8	0.2	1.8	0.2	1.8
Fertilizer application	Person-days	9.14	0.2	1.8	0.2	1.8	0.2	1.8	0.2	1.8	0.2	1.8	0.2	1.8	0.2	1.8
Transport of inputs	Person-days	9.14	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.2
Aceiro	Person-days	9.14	1.0	9.1	0.3	2.3	0.3	2.3	0.3	2.3	0.3	2.3	0.3	2.3	0.3	2.3
Burning for harvest	Person-days	9.14	1.0	9.1	0.5	4.6	0.1	1.2	0.1	1.2	0.1	1.2	0.1	1.2	0.1	1.2
Harvest	\$/t	1.85	1.0	1.8	140.0	258.4	120.0	221.5	100.0	184.6	90.0	166.1	80.0	147.7	70.0	129.2
Inspectors	Person-days	9.14	1.0	9.1	0.4	3.7	0.4	3.7	0.4	3.7	0.4	3.7	0.4	3.7	0.4	3.7
Herbicide application	Person-days	9.14	0.2	1.8	0.1	0.5	0.2	1.8	0.2	1.8	0.2	1.8	0.2	1.8	0.2	1.8
Hand hoeing	Person-days	9.14	2.0	18.3	7.5	68.6	4.5	41.1	4.5	41.1	4.5	41.1	4.5	41.1	4.5	41.1
Ant control	Person-days	9.14			0.5	4.6	0.5	4.6	0.5	4.6	0.5	4.6	0.5	4.6	0.5	4.6
Subtotal 3				182.8		346.4		280.0		243.1		224.6		206.2		187.7

Table 15. Center-South Brazil: Sugarcane Cost of Production, 1997, Best Practice Farms (US\$ per Hectare)--continued

Description	Specification	Unit Value	Planting		1st Cut 140 t/ha		2nd Cut 120 t/ha		3rd Cut 100 t/ha		4th Cut 90 t/ha		5th cut 75 t/ha		6th Cut 60 t/ha	
			Qty	Value	Qty	Value	Value	Qty	Value	Qty	Value	Qty	Value	Qty	Value	Qty
4. Inputs																
Lime	\$/t	6.79	2.0	13.6												
Plant cane	\$/t	22.50	14.0	315.1												
Insecticide	\$/kg	2.64	2.0	5.3	2.0	5.3	2.0	5.3	2.0	5.3	2.0	5.3	2.0	5.3	2.0	5.3
Herbicide	\$/l	19.77	1.5	29.7	3.5	69.2	3.5	69.2	3.5	69.2	3.5	69.2	3.5	69.2	3.5	69.2
Fertilizer 04-20-20	\$/t	262.70	0.6	157.6	0.4	91.9										
Fertilizer 15-00-15	\$/l	272.70					0.5	136.4	0.5	136.4	0.5	130.9	0.5	125.5	0.4	120.0
Subtotal 4				521.1		166.4		210.8		210.8		205.4		199.9		194.5
5. Administration																
Administrative labor	% (subtotal 1+2+3+4)	2.0%	1.0	20.4	1.0	21.7	1.0	20.6	1.0	18.5	1.0	17.2	1.0	15.8	1.0	14.2
Technical assistance	% (subtotal 1+2+3+4)	1.0%	1.0	10.2	1.0	10.8	1.0	10.3	1.0	9.2	1.0	8.6	1.0	7.9	1.0	7.1
Accounting/office management	% (subtotal 1+2+3+4)	1.5%	1.0	15.3	1.0	16.3	1.0	15.5	1.0	13.9	1.0	12.9	1.0	11.8	1.0	10.7
Deprec/benefits	% (subtotal 1+2+3+4)	2.0%	1.0	20.4	1.0	21.7	1.0	20.6	1.0	18.5	1.0	17.2	1.0	15.8	1.0	14.2
Travel	% (subtotal 1+2+3+4)	3.0%	1.0	30.6	1.0	32.5	1.0	31.0	1.0	27.7	1.0	25.8	1.0	23.6	1.0	21.3
Taxes	% of revenues	7.8%			1.0	164.3	1.0	140.9	1.0	117.4	1.0	105.6	1.0	88.0	1.0	70.4
Subtotal 5				97.0		267.4		238.9		205.1		187.2		162.9		138.0
Total Cost per ha (1+2+3+4+5)				1,135		1,356		1,274		1,132		1,049		953		852
Cost per ton (\$/t)						9.69		10.62		11.32		11.66		12.71		14.20
Revenues (\$/ha) (1 ton cane delivered to mill = \$15.01)			0			2,101		1,801		1,501		1,351		1,126		901

Notes - Avg annual return over 7 years: \$11.31/t or \$309/ha. MH = machine hour for tractor. Costs do not include financing costs for investment or operations.

Source: FNP Consultoria & Comercio, São Paulo.

Returns from sugarcane compare favorably with competing crops (Table 16). Costs exceed those for corn and soybeans, they are less than cotton and sharply lower than coffee or citrus growing expenses. In recent years cane growing costs have been brought down by the introduction of improved varieties which produced more sucrose and allowed the profitable growing cycle to be extended from 4 to 5 cuts of cane. Researchers anticipate that the average cycle soon will be extended to 6 cuts. Other major cost cutting factors have been improved transport from field to mill with larger capacity trucks, and more rational utilization of industrial residues (e.g., trash, stillage and filter cake). Signs of increased efficiency in farm and factory include increased production of sugar per hectare in the Center-South (but not in the Northeast), higher sucrose recovery from cane in São Paulo (up to 83% in 1994 from 76% in 1983), and lower fuel consumption.

During the past decade the trend of prices received by farmers for sugarcane has been more favorable than the trend for competing crops (Table 17). Since 1994 sugarcane prices have been exceptionally generous (Table 18). Prices for anhydrous alcohol also have been attractive during this period (Table 19). The favorable price situation is likely to change in the liberalized market now being introduced. Prices will be more volatile, more akin to the price oscillations of competing crops such as coffee, cotton, corn, citrus and soybeans. The end of stable to increasing prices will make cane growing more risky and a less desirable option for independent growers.

**Table 16. Center-South Brazil: Costs and Returns for Selected Crops
Best Practice Farms, 1997**

Item	Time Frame	Cost	Gross Receipts	Net Receipts	Return on Investment
		US\$/ha	US\$/ha	US\$/ha	%
Coffee, high density	6 yrs	3,215	6,238	3,023	94%
Corn, high yield		602	761	159	26%
Corn, no-till		406	609	203	50%
Cotton, good practice		1,188	1,174	-14	-1%
Cotton, best practice		1,121	1,434	313	28%
Oranges, 8 years	8 yrs	1,548	1,433	-115	-7%
Oranges, 18 years	18 yrs	2,200	2,721	521	24%
Soybeans, high yield		473	551	0	0%
Soybeans, no-till		408	572	164	40%
Sugarcane, 5 cuts	6 yrs	977	1,313	336	34%
Sugarcane, 6 cuts	7 yrs	945	1,254	309	33%

Notes - Avg annual costs for perennial crops including planting.
Finance costs not included.

Source: FNP Consultoria & Comercio, São Paulo

**Table 17. Annual Average Prices Received by Producers
Index - 1988-90 = 100**

Year	Green Coffee S Paulo	Corn S Paulo	Seed Cotton S Paulo	Oranges S Paulo	Soybeans Paraná	Sugarcane S Paulo
1988	83.3	93.6	92.0	67.7	117.2	88.5
1989	108.7	94.7	104.3	119.5	99.1	97.2
1990	108.1	111.7	103.7	112.8	83.7	114.3
1991	80.8	98.1	88.7	35.5	87.0	103.8
1992	68.6	95.8	77.4	68.1	92.3	102.7
1993	92.2	103.5	95.7	10.9	97.3	102.7
1994	201.1	104.7	116.4	22.4	103.5	126.8
1995	207.7	99.9	115.9	35.1	88.8	144.6
1996	174.0	102.8	120.1	59.1	122.1	160.1

Source: Calculated from data supplied by FNP Consultoria & Comercio, São Paulo

Table 18. Brazil: Prices of Sugarcane, State of Sao Paulo

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
US\$ per metric ton													
1988	8.23	8.13	7.83	7.63	8.01	8.8	8.21	8.54	8.58	8.1	8.06	7.98	8.18
1989	8.83	8.96	8.96	8.87	8.62	8.04	7.53	8.34	9.53	9.35	10.09	10.63	8.98
1990	11.26	10.58	13.15	11.9	10.93	9.99	8.56	9.69	10.97	10.04	10.31	9.37	10.56
1991	9.36	11.3	10.89	9.93	9.17	9.15	9.2	9.3	9.62	8.9	8.98	9.33	9.59
1992	9.7	9.45	9.19	9.2	9.42	9.75	10.01	9.99	10.13	9.73	8.45	8.82	9.49
1993	8.66	9.16	8.8	8.76	8.67	9.34	9.62	10.67	9.97	9.98	10.16	10.14	9.49
1994	10.16	11.26	11.25	11.26	10.42	10.92	11.68	12.14	12.62	12.90	12.97	13.08	11.72
1995	13.16	13.25	12.49	12.74	12.91	13.44	12.99	13.03	14.19	14.08	14.03	13.96	13.36
1996	13.87	13.77	13.71	15.47	15.39	15.30	15.21	15.12	15.03	14.94	14.87	14.77	14.79
1997	14.69	14.60	14.49	14.44	15.45	15.36	15.27	15.17	15.09	15.01	14.91	14.82	14.94
1998	14.73	14.64	14.55	14.46	14.37	14.29	14.21						14.46
Ave.	11.44	11.70	11.55	11.70	11.54	11.56	11.43	11.49	11.91	11.66	11.64	11.66	11.74

Note: Average annual dollars deflated according to CPI obtained from The Economist.

Source: Brazil: Agriannual '98, update September 1998.

Table 19. Brazil: Prices of Anhydrous Alcohol, State of Sao Paulo

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
US\$ per Cubic Meter													
1988	240.5	237.74	229.02	223.33	234.44	257.45	240.26	249.91	251.05	236.54	290.79	285.63	248.06
1989	211.11	218.33	240	237.62	237.27	220.15	206.11	231.05	293.58	261.47	280.21	296.1	244.42
1990	313.42	294.59	366.22	331.6	304.5	278.39	238.39	269.86	309.88	281.22	277.3	249.79	292.93
1991	210.21	301.18	290.21	264.77	244.4	243.83	245.38	247.99	256.59	237.25	239.41	248.69	252.49
1992	309.01	251.87	245.01	245.25	251.26	263.64	267.01	266.43	270.09	259.36	225.18	395.54	270.80
1993	230.88	244.23	234.59	253.86	231.18	249.15	256.49	261.44	265.72	265.90	270.76	270.13	252.86
1994	270.63	275.76	299.87	300.06	277.55	290.98	311.38	323.63	336.24	343.76	345.67	348.54	310.34
1995	350.6	353.11	332.9	339.55	344.1	357.97	350.79	344.2	355.73	350.44	355.65	381.89	351.41
1996	442.43	439.38	437.25	474.62	472.12	469.31	466.65	463.75	461.08	458.27	456.17	453.09	457.84
1997	450.62	523.69	519.074	517.9	518.94	562.00	558.83	555.04	552.21	549.07			530.74
Ave.	302.941	313.988	319.4144	318.856	311.576	319.29	314.13	321.33	335.22	324.33	304.57	325.49	321.19

Note: Average annual dollars deflated according to CPI obtained from The Economist.

1) Prices paid to producers, FOB Mill.

Source: Brazil: Agriannual '98, update September 1998.

Cost of Transportation and Port Operations

The costs for sugar transportation and port operations differ between those in the Northeast and Center-South. The average distance from mill to ports in the Northeast is 60 kilometers and fobbing costs are \$15 to \$20 per ton. In the Center-South the situation is radically different, but for the highly progressive Center-South major efforts are underway within the industry to lower costs and become more efficient. For example, reports from São Paulo indicate that field to mill transportation costs are down due to the recent switch to multi-trailer trucks carrying 50 tons compared to 20 tons previously.

The Center-South sugar industry also appears to be headed for a partial shift from heavy dependence on truck transportation to increased use of rail. A bellwether of this change is the privatization in early September 1998 of the last and most important railroad in the country, the State Railroad of São Paulo (FEPASA). Recent research completed by a major international sugar exporter shows a \$4.00 to \$4.50 per ton savings by using rail, where available, in the Center-South compared with truck transportation. And, current truck freight rates vary considerably depending on distance from the ports of Santos/Guaruja and Paranágua (Table 20). For example, for the mills concentrated around Ribeirao Preto in the state of São Paulo the average freight costs by truck to Santos 380 kilometers away is \$24 per ton and for Paranágua over 600 kilometers distance it is \$31 per ton. Given the lack of rail linkages to many growing areas in the region, truck transportation will continue to be used to transport the bulk of sugar moving to export. However, with privatization of the railroads the sugar industry expects to get better service and better rates from both the rail and truck companies. Overtime a greater share of the transportation needs of the industry are expected to be met by rail.

At the ports, privatization coupled with the federal port improvement program is leading to significant investments which should translate into greater efficiencies in port operations and lower costs. Typical of this trend is Cargill's new sugar terminal with an estimated capacity of 1.0 million tons of bulk and bagged sugar which was dedicated in early September 1998. Tables 21 and 22 provide a detailed breakdown of current port costs at Brazil's four major sugar ports. The current high costs at both Santos and Paranágua are expected to decline. Union labor problems at the ports continue to be a major concern. Mechanization of operations will help reduce this problem over time. Also, port shipping officials foresee some increased support from the federal government after the national elections to solve some lingering labor issues. Overtime as costs and port congestion decline at Santos, officials foresee much of the sugar now marketed through Paranágua going instead to Santos.

Fuel Alcohol and Diesel Engines—The Outlook

Currently in Brazil there is considerable research underway and policy discussions concerning the use of anhydrous alcohol in diesel powered vehicles. Owing to the country's large fleet of buses and trucks powered by diesel engines this could be a significant new area for alcohol demand, and alcohol use in diesel fuel could begin as early as January 1999. The future demand

growing from this new use is an additional 2 to 3 billion liters per year. One key attraction of a mix of alcohol and diesel is the reported 50% reduction in smoke emissions.

The expected mixture levels being discussed range from 3% to 18%. However, many experts are not optimistic about the potential for diesel. Not all the tests have been completed. Moreover, research results discussed at a meeting held in Rio de Janeiro on August 12, 1998 indicated problems with engine performance. As a result key industry leaders believe Brazil should proceed with caution. In the early 1990s, the Brazilian public's confidence in the use of alcohol was shaken when there were shortages of hydrous alcohol for hydrous powered cars. The result was a sharp drop in the purchase of alcohol powered cars and the resulting shifts in fuel demand that have impacted the sector to this day. Given that experience, the precipitous use of alcohol in diesel engines could prove highly damaging to the industry.

Table 20. Brazil: Freight Rates From Selected Mills in the Center-South to the Ports of Santos/Guaruja and Paranagua

Mill Name	State	Region	Distance to Santos/ Guaruja (km)	Truck Freight Rate (US\$ per ton)	Distance to Paranagua (km)	Truck Freight Rate (US\$ per ton)
Sta. Elisa	Sao Paulo	Sertozinho	407	23.79	656	31.44
Galo Bravo	Sao Paulo	Ribeirao Preto	381	23.79	649	31.44
Cosan	Sao Paulo	Piracicaba	225	16.14	449	22.09
Vale do Ivaí	Parana	Sao Pedro do Ivaí	683	25.49	476	33.98
Sabaralcool	Parana	Eng. Beltrao	721	25.49	514	33.98
Sta. Terezina	Parana	Maringa	671	25.49	498	33.98
Luciana	Minas Gerais	Lagoada Prata	560	31.44	880	39.93
Rio Grande	Minas Gerais	Passos	440	28.89	715	38.23
Jatiboca	Minas Gerais	Urucania	704	31.44	1,062	40.78
Jales Machado	Goiás	Goianesia	1,139	47.58	1,393	57.77
Itamarati	Mato Grosso	Nova Olimpia	1,851	51.83	1,992	55.23

Source: Cargill and other sources

Table 21. Brazil: Costs of Loading Bulk Sugar at Key Ports

Cost Item	Recife (Sugar Terminal)	Maceió (Sugar Terminal)	Santos (Wharf 19)	Paranagua (Sanbra/Export Corridor)
US dollars				
Light Dues	1,500	1,500	1,500	1,500
Vessel's Clearance	280	280	280	280
Municipal Dues	220	220	280	830
Federal Police Tax	460	460	460	460
Launch for Authorities/Agency	470	370	-	700
Pilotage In/Out (Lumpsum)	2,550	1,541	2,930	3,700
Tugs In/Out (Lumpsum)	7,200	8,430	6,400	6,990
Berthing Tax	912	821	10,426	3,800
Chamber Shipping	-	-	100	-
Mooring/Unmooring	800	400	-	-
Watchmen	1,120	590	1,120	1,520
Communications	400	400	400	400
Transportation	400	400	400	400
Agency Fee	2,850	2,850	3,000	2,550
Xerox, Mail, Courier	280	280	290	280
Sundries	218	218	274	250
Total Estimated	19,660	18,760	27,860	23,660
Number of Days	4 days	2 days	4 days	4 days

Notes: Standard estimated port d/a comparison among main Brazilian sugar ports basis a 15/19.999 dwt carrier and 144.0 m load, loading 14.000 ton bulk sugar and the number of days mentioned after total of each proforma loading by mechanical means.

In case cargo suppliers failed to supply enough cargo and vessel's stay exceed the number of days alongside berth as above costs such as watchmen, berthing tax, agency fee, communications transportation will increase substantially daily basis.

In case vessel performing entering/berthing/shifting/sailing at night or during weekend the cost with launch/pilotage/tugs will increase basis 30% to 70% except where costs are lumpsum.

Source: Williams (Servicos Maritimos, Ltda.)

Table 22. Brazil: Costs of Loading Bagged Sugar at Key Ports

Cost Items	Recife	Maceió 1/	Santos	Itajai 1/	Rio de Janeiro 1/	Paranagua 1/
	US dollars					
Light Dues	1,500	1,500	1,500	1,500	1,500	1,500
Vessel's Clearance	280	280	280	280	280	280
Federal Police Tax	460	460	460	460	460	460
Municipal dues	250	250	300	250	250	250
Chamber Shipping	-	-	-	-	-	-
Launch	750	470	-	953	1,570	700
Pilotage In, Shifting and Out	3,460	1,870	3,830	3,210	2,824	3,700
Tugs In, Shifting Out	11,800	8,400	11,200	4,970	8,360	7,000
Berthing Tax	4,980	4,992	28,770	7,700	34,100	4,656
Linesmen	1,400	400	-	-	1,100	-
Kraft Paper 2/	4,000	4,000	4,000	3,500	4,000	4,000
Laying of the Holds 3/	4,200	4,200	16,000	4,200	13,000	13,000
Watchmen	7,941	4,100	4,600	4,200	7,941	2,400
Communications	500	600	500	500	500	500
Transportation	450	450	500	400	550	450
Agency Fee First 10 Days 4/	3,460	3,460	4,500	3,327	3,000	3,650
Xerox, Mail, Courier	280	280	280	280	289	250
Sundries	289	288	280	270	276	204
Ttl Estimated	46,000	36,000	77,000	36,000	80,600	43,000
Total Number of Days 5/	22 days	12 days	14 days	10 days	14 days	8 days

Notes:

Ref. loading of 14,000 metric ton bagged sugar (loose bags)

General (rough) standard estimated port d/a comparison among main Brazilian sugar ports basis a freedom or sd-14 type vessel to load 14,000 metric ton bagged sugar and the number of days mentioned (after total of each proforma) I app US dollars.

Paranagua: Port administration applies a coefficient of productivity and estimated a load rate of 2,500 tons per day. In case shippers do not attend this load rate the coefficient of productivity increases the overall berthing tax substantially. In case vessel loads cargo in 14 days, as an example the cost with berthing tax will be triplicated.

Load rates mentioned above basis on the number of days above provide full cargo available, no strikes, weather permitting.

In case vessel performing entering/berthing/shifting/unberthing/sailing at night or during weekend the cost with launch/pilotage/tugs will increase basis 30 to 70%. The ports of Maceio, Santos and Paranagua tug-boats cost is lumpsum.

Berthing tax basis on vessel's load x number of days in port is: Recife US\$1.60, Maceio US\$2.88, Santos US\$14.92, Itajai US\$4.40, Rio de Janeiro US\$2.50 and Paranagua US\$3.60.

1/ Above costs do not include shifting of berth (basis only one berth) at Maceio, Itajai, Rio de Janeiro and Paranagua.

2/ Kraft paper is included above only for reference considering it is not allowed to purchase material and include on disbursements account as per Central Bank rules in force since 1992. Owners shall contact shiphandlers and ask them to supply material and then settle their invoices directly.

3/ Laying of the holds can be performed by vessel's crew at Recife/Maceió and Itajai port only. Service is compulsorily performed by shore laborers at other Brazilian ports.

4/ Agency fee above applied only for the first 10 days in port. After 10 days additional agency fee varying between US \$200/US \$300 is charged each port as per tariff. Agency fees could be discussed for mutual benefit.

5/ Paranagua has been calculated basis pre slung sugar cargo considering that vessels fixed to load loose bags have no facilities/priority by Port Administration.

Source: Williams (Servicos Maritimos, Ltda.)

V. SUGAR AND FUEL ALCOHOL MARKETS TO 2010

Economic Liberalization

Economic liberalization and deregulation both are key factors driving the development of the sugar and alcohol industry, forcing growers and processors to become more efficient. Those farmers and processors unable to increase productivity are falling by the wayside. The exit of marginal producers could halt the growth of sugar and alcohol production in Brazil, at least temporarily.

The following sections describe three scenarios for the sugar and fuel alcohol sectors in Brazil.

Political and Macro Economic Environment

The scenarios are underpinned by the assumption that President Cardoso will achieve passage of his economic reform program. The Cardoso government, while being severely tested by current world economic events, appears strong, relatively popular, and is getting high marks from the general population and business community for competency and honesty. The Government appear committed to following policies of holding down inflation and reducing government involvement in the economy while seeking to attract foreign investment. It is also assumed that the government will prove successful in achieving these goals.

The sugar and fuel alcohol industry is expected to continue to receive considerable attention. On October 16, the Cardoso government's Inter-ministerial Council on Alcohol (CIMA) announced that it will now be February 1, 1999 when the price of cane and hydrous alcohol will be freed ending the era of one of the country's most highly regulated economic sectors. CIMA also announced that alcohol subsidies will be cut to 1.1 billion reais in 1999, down from 1.3 billion in 1998 owing to the drop in demand for hydrous alcohol. In addition, CIMA announced the government plans to freeze subsidies to all sugar cane growers in the Northeast at 1998 levels and to subsidize only those growers throughout Brazil whose production is destined for fuel alcohol and not for sugar.

President Cardoso is expected to continue his support of the country's alternative fuels program which he highlighted in June 1997 at the United Nations, but spending cuts will be made in the sector to help rein in the country's bloated fiscal deficit. In the economic reform package announced on October 28 there are also important new changes related to subsidies for fuel alcohol. The new proposal calls for a tax of R\$0.08 per liter on gasoline. Revenues collected will be paid directly to fuel alcohol distilleries. Under the current system a subsidy was given to fuel distributors via a discount on the state value added tax (ICMS). The new direct fuels tax will require a constitutional amendment, but with President Cardoso's new mandate passage is expected.

Sugar Consumption

Availability of plentiful, reasonably priced sugar is expected to continue in Brazil (Table 23). Sugar demand in Brazil is price inelastic and is largely driven by changes in population and income. Alternative caloric sweeteners such as high fructose corn syrup (HFCS) have little incentive to be used. A small growth market is likely to expand for diet or "light" products using high intensity sweeteners such as aspartame, but this development is not expected to adversely affect sugar demand.

In the mid-1990s, the industrial sector absorbed about 45% of Brazil's domestic sugar demand, with the remainder headed for households and institutional users. Brazilian sugar industry analysts expect industrial use to expand over the next several years at near the rate of GDP growth. With the contraction in the economy expected in 1999, consumption growth is expected to be relatively flat. Moreover, the big gains of the mid-1990s, largely the result of structural changes in the economy, are not likely to be repeated. Household use is likely to grow at less than the rate of population growth as consumers substitute processed foods for home prepared items. By the end of the first decade of the new century industrial use will exceed 60% of the total.

If economic growth averages 4% during the next decade—a likely scenario—and population expands at 0.9% per year, Brazil's total domestic sugar use could climb from 8.8 million tons, raw value in 1998 to about 10.2 million 2005 and 11.5 million in 2010 (Table 24). The overall average annual growth rate for sugar use in the next decade is projected at 2.4%. Growth in 1999 and 2000 will be lower because of a short term lull in economic growth.

Sugar Export

Sugar exports could total 7.3 million tons for 1998/99, an increase of 9% from the record achieved last season. Brazil's sugar exports likely will fall to 4.3 million tons by 2005 and 4.2 million in 2010 assuming continued declines in producer returns and government support for the alcohol program. However, flexibility in the government's administration of the alcohol fuel program could allow sugar production and exports to increase substantially, at the expense of anhydrous alcohol, in years of high sugar prices. By contrast, substantial reduction in government support for the alcohol program would lock in a higher level of exports and reduce processor flexibility.

Exports could continue to grow if government policies supporting economic liberalization were altered (Scenario 3). The policy shift would stimulate greater sugar production and sugar export availability in the coming decade. If this additional export market sugar became available it would be competitive given projected prices and increased internal efficiencies as Brazil deregulates its industry, modernizes its ports, and reduces its mill to port transportation costs.

Projections assume relatively favorable world prices for sugar. World Bank economists foresee world raw sugar prices (current dollars) averaging from 9.5 to 12.5 cents per pound between 2000 and 2005 and climbing to about 13.5 cents in 2010 (Table 25) (Crude oil prices are expected to range between \$15.5 to \$17 per barrel in 1999 and 2000, moving up to \$ 19 per barrel in 2005 and \$21 per barrel in 2010).

Fuel Alcohol Production

The Government of Brazil is in the process of deregulating the marketing of fuel alcohol but it remains committed to the program's continuation. For 1998/99, fuel alcohol output could total 14.4 billion liters, down from 15.3 billion produced last season. The downturn reflects the overhang on the market from large carry over stocks which has reduced prices and is forcing more cane to be used for sugar production or left unharvested. Within the fuel alcohol sector, anhydrous alcohol production is expected to total 6.4 billion liters compared to 5.6 billion last year. The 14% expansion reflects the growth in the demand for anhydrous alcohol due to the increase in the number of cars on the road and the increase from 22% to 24% of alcohol in the mix with gasoline. In contrast, hydrous alcohol is expected to total 8.0 billion liters, down from 9.7 billion liters last season due to excess stocks, low prices, and the continued decline of hydrous alcohol fueled cars on the road.

Anhydrous alcohol production and use is projected to continue to expand and represent a greater share of Brazil's total alcohol mix over time. There will be an increased focus on its attributes as an oxygen-enriched additive to raise the octane level of gasoline and lower emissions of pollutants. Hydrous alcohol will continue to benefit from economic incentives applied by means of fiscal policy (e.g., government purchasing of excess stocks). Nonetheless, the market share is expected to fall. Sales of alcohol fueled cars are not expected to rebound to the levels of the 1980s. But this could be offset somewhat by an expanded "green fleet" program aimed at achieving 5% of total car sales for alcohol cars. This is seen as a strategy to preserve the environmental benefits of the long standing Proálcool program as well as to maintain Brazil's capacity as a global leader in alternative fuels technology and to avoid scrapping the fuel alcohol distribution infrastructure which Brazil has invested in over the last 20 years. Lastly, while world oil prices are expected to remain low over the next decade, Brazil's alternative fuels program gives it some insurance against another unexpected sharp upturn in world oil prices.

Taking these assumptions together, fuel alcohol production and use likely will total 18.0 billion liters in 2010, up 18% from the record production achieved in 1997/98. In sharp contrast to the current situation anhydrous alcohol is foreseen accounting for 78% of the total market while hydrous falls to 4.0 billion liters or less than one-quarter of the total. Use of large quantities of alcohol in diesel fuel is not included in this projection. While there are many advocates of its use, even this season—3% use in Brazil's existing truck fleet would use 500 million liters—test results, as noted, have been mixed. At this critical point in the history of the country's alternative fuels program, pre-mature use in diesel could have a very serious long term negative impact.

If the government lessened its support for the alcohol program (Scenario 2), production and use of the alternative fuel would reach only about 15 billion liters in 2010. This implies that the mix of anhydrous alcohol with gasoline would be reduced from the 22% or 24% used in recent years. The demand for hydrous alcohol is less flexible.

Table 23. Brazil: Prices of Sugar, State of Sao Paulo

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1989	123.46	120.83	120.83	119.64	122.32	113.32	104.76	116.03	131.94	130.17	139.63	147.46	124.21
1990	155.96	146.44	182.87	164.82	151.35	138.37	118.49	133.91	151.87	139.36	137.29	123.62	145.36
1991	111.91	148.98	143.55	130.97	120.89	120.61	121.54	122.92	126.92	117.51	118.42	123.27	125.62
1992	122.48	124.50	121.31	121.31	124.47	128.58	131.36	131.87	133.60	128.46	111.39	115.12	124.54
1993	114.58	120.57	116.36	115.49	115.10	123.24	127.52	131.15	131.43	132.32	132.92	134.49	124.68
1994	135.00	146.14	149.51	148.42	144.03	142.79	154.07	160.07	166.36	170.10	170.90	169.10	154.71
1995	170.11	171.28	161.55	158.56	160.52	157.56	155.00	152.84	156.85	185.32	223.56	228.89	173.50
1996	246.61	258.03	259.98	256.44	234.82	214.03	202.73	186.92	179.41	179.88	185.99	197.73	216.88
1997	220.63	228.08	226.89	206.86	176.73	164.04	160.85	162.26	172.15	182.18	189.10	188.98	189.90
Ave.	155.64	162.76	164.76	158.06	150.03	144.75	141.81	144.22	150.06	151.70	156.69	158.74	153.27

Note: Average annual dollars deflated according to CPI obtained from The Economist.

1) Prices paid to producers for standard sugar, FOB Mill.

Source: Brazil: Agriannual '98, update September 1998.

Table 24. Brazil: Sugar and Fuel Alcohol Projections

Year	Harvested Area	Yield	Sugarcane Production			Sugar Prod	Sugar Consump	Sugar Exports	Fuel Alcohol Use		
			Total	for Sugar	for Alcohol				Anhydrous	Hydrous	Total
	mha	t/ha	mt	mt	mt	mtrv	mtrv	mtrv	bl	bl	bl
1997/98	4.40	68.8	302.6	109.0	193.6	15.5	8.8	6.7	5.6	9.7	15.3
1998/99	4.30	69.8	295.0	113.5	181.5	16.2	8.9	7.3	6.4	8.0	14.4
Scenario 1											
2004/05	3.82	78.5	300.0	100.0	200.0	14.5	10.4	4.1	10.0	6.0	16.0
2009/10	4.06	81.3	330.0	107.0	223.0	15.7	11.7	4.0	14.0	4.0	18.0
Scenario 2											
2004/05	3.82	78.5	300.0	130.0	170.0	18.9	10.2	9.0	7.6	6.0	13.6
2009/10	4.06	81.3	330.0	141.0	189.0	20.7	11.5	9.2	11.2	4.0	15.2
Scenario 3											
2004/05	4.44	74.3	330.0	130.0	200.0	18.9	10.2	9.2	10.0	6.0	16.0
2009/10	4.65	78.3	364.0	141.0	223.0	20.7	11.3	9.4	14.0	4.0	18.0

UNITS: mha = million hectares, t/ha = metric tons per ha, mt = million tons, mtrv = million tons raw value, bl = billion liters

Scenario 1: Liberal economic policies encourage rationalization in sugar/alcohol industry and/or unfavorable world sugar price with high subsidies for alcohol fuel.

Scenario 2: Liberal economic policies encourage rationalization in sugar/alcohol industry, favorable world sugar price (in line with World Bank projections; government subsidies for alcohol fuel reduced resulting in lower mixture of alcohol with gasoline (<22%).

Scenario 3: Slower rationalization of sugar/alcohol industry, and/or unusually favorable world sugar price.

Table 25. World Raw Sugar Prices: History and Projections
Current Dollars

Year	Cents per kg	Cents per Pound	US\$ per Metric Ton
1970	8.22	9.24	203.71
1975	44.91	20.37	449.07
1980	63.16	28.65	631.62
1985	8.95	4.06	89.51
1990	27.67	12.55	276.68
1995	29.28	13.28	292.77
1996	26.36	11.96	263.67
1997	25.06	11.37	250.66
1998	19.40	8.80	194.00
1999	19.84	9.00	198.41
2000	20.94	9.50	209.44
2005	27.00	12.28	270.72
2010	30.00	13.61	300.05

Source: History No. 11 World Raw Sugar Price. FOB Caribbean Ports (2,2046 kg = 1 pound). Projections World Bank as of August 21, 1998

SCENARIO 1

The most likely prospects for the next several years (Scenarios 1 and 2) include fairly rapid downsizing and consolidation of the sugar and alcohol industry. Scenario 1 assumes the maintenance of substantial subsidies for alcohol fuels, likely via a "green tax" on petroleum based fuels. The government demonstrated its continued, strong support for alcohol fuels with the series of policy initiatives taken in 1998 to shore up the program in the face of surplus alcohol supplies. Scenario 1 would result in smaller exports of sugar as Brazilian producers concentrate on supplying an expanding domestic market. Similar results would occur with slower industry cutbacks but lower than anticipated world sugar prices. Domestic sugar demand in Brazil largely reflects by population and income growth, but with lower domestic prices, sugar use likely will increase marginally.

SCENARIO 2

The outlook would change dramatically if the government significantly reduced its support for the alcohol program (Scenario 2). In that situation, with smaller production and favorable world sugar prices (as projected by the World Bank), sugar production could increase, alcohol production decline, and sugar exports would swell to about 9 million tons.

Scenarios 1 and 2 are different primarily in that scenario 1 projects less sugar production and exports and more alcohol production while scenario 2 projects more sugar production and

exports and less alcohol production. These sharply different outcomes illustrate the increased competition that Brazilian sugar producers will face in the near future. As the fuel market moves increasingly from hydrous alcohol for pure alcohol vehicles to anhydrous alcohol for blending with gasoline, the demand for alcohol will become more elastic. For example, if the government maintained support for the alcohol program, but relaxed the regulation mandating a 22% mixture of anhydrous alcohol in gasoline, additional sugarcane could be freed for sugar production. Thus Brazil easily fluctuate reflecting returns from sugar versus fuel alcohol use. This scenario could also reflect changes in world oil prices and domestic oil production.

SCENARIO 3

The third and least likely scenario would occur if production is increased and downsizing of the sugar and alcohol industry slowed. Productivity would advance less rapidly, but sugarcane harvested area would be higher. Sugarcane production could be sufficient to boost exports and also maintain high levels of domestic alcohol fuel use.

VI. GLOBAL TRADING ENVIRONMENT OUTLOOK

Structure and Outlook for the Global Sugar Market

Sugar by far is the world's dominant sweetener, although significant production and consumption has emerged around the world for starch based caloric sweeteners such as high fructose corn syrup and high intensity sweeteners such as aspartame. Global sugar production, consisting of about two-thirds of world supplies from sugarcane and one-third from sugar beets, has been trending up over the last decade largely due to increases in area harvested for sugarcane (Chart 27). For 1998/99, global sugar production likely will be 128.3 million metric tons, up about 20 million tons over the past decade (Table 26). Sugar production has been trending up sharply in recent years in several countries especially Brazil, Australia, Thailand, India, and Mexico. In contrast, production has contracted significantly in Cuba, Russia, and Ukraine.

Global sugar consumption has been steadily trending upward reflecting population and income growth and the increasing manufacture and use of sugar containing products, especially in developing countries. About two-thirds of sugar produced annually around the world is consumed in the country where it is produced. For 1998/99, global consumption likely will be 124.9 million tons, up 17% or 18 million tons over the last decade with the growth underpinned by strong advances in demand in Asia (Table 27). Other areas of significant growth have included the Middle East and Latin America. In contrast, sugar consumption levels have shown little growth in mature markets in Western Europe and Japan and have declined in some of the formerly centrally planned economies where internal sugar prices are no longer subsidized.

About one third of annual production is traded consisting of a combination of raw and refined or white sugar. Over the last decade global sugar trade has seen several significant changes. With the breakup of the former Soviet Union has come the demise of the old trading blocks. Russian and Cuban trade now occurs at world prices. Government to government trade agreements are now inconsequential in the world market. The privatization of sugar industries and trade operations as well as the de-regulation of sugar markets in many nations have exposed more industries directly to world prices and markets.

Another development is the addition of significant white sugar capacity by traditional raw sugar exporters in Central America and South America as well as Thailand and Australia. Center-South Brazil and Mexico have become regular exporters and large crops in the EU have also contributed the increased exportable white supplies. In recent years the world sugar market also has seen refineries being built by traditional white sugar importers such as in Dubai and Saudi Arabia. The result is an increased flow of raw sugar into the Middle East market, displacing traditional shipments of EU whites.

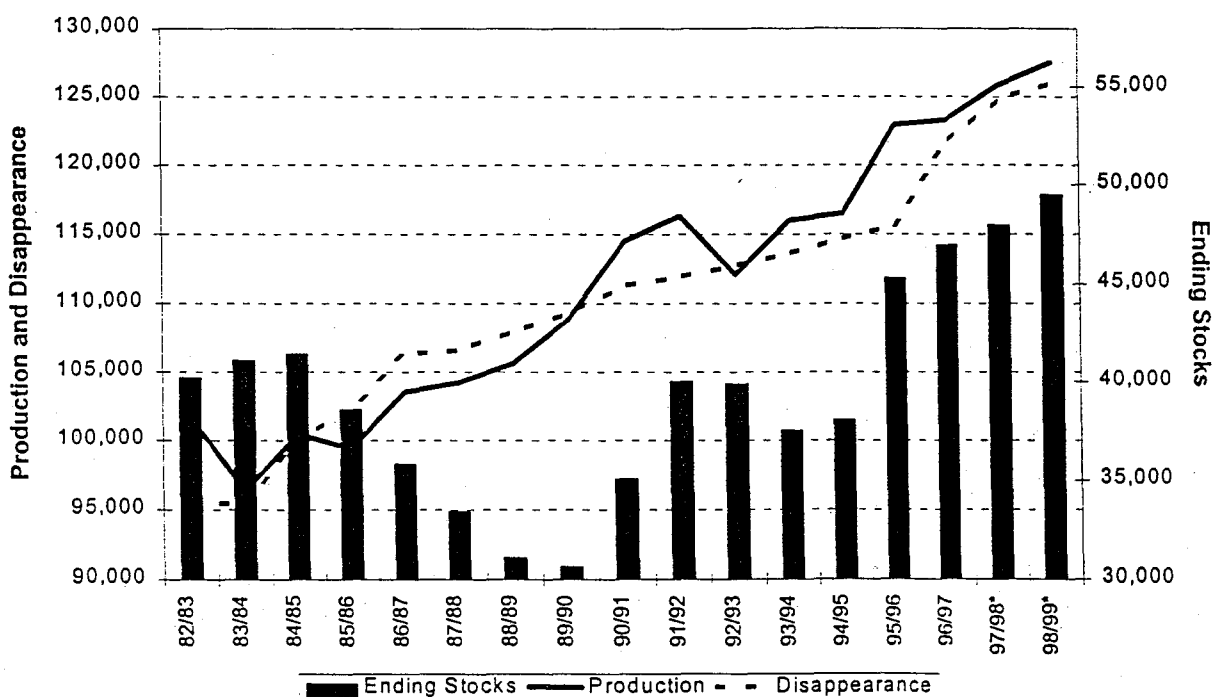
Since 1988 world prices have traded broadly though a 9 cent per pound range with most of the price action occurring between 8 and 15 cents per pound for raw sugar (Chart 28). It is estimated that the cost of production for highly efficient exporters is between 8.5 and 10.0 cents. Higher

prices have allowed more nations to compete for world price trade. Currently the world market is at the low end of the price structure (Chart 29).

In September, raw prices dipped to average 7.2 cents a pound, a 10 year low and down nearly 40% from September 1997. The fall-off in prices is attributed to a combination of large supplies and weak demand. Other factors such as the weak East Asian currencies and policy changes in several countries also have contributed to the decline. For example, in Russia, traditionally the world's largest importing country, the government has decided to increase tariffs on imported raw and refined sugar and this has largely halted imports. The duties are designed to protect domestic beet growers against a flood of cheap world sugar. These duties are expected to remain in place through the end of calendar 1998, but Russia is expected to need to import sugar in the second quarter of 1999.

These reduced prices likely will discourage production. Moreover, it is unlikely that prices will remain this low for more than a crop year without experiencing some upward pressure. Nevertheless world raw sugar prices are likely to average only 7.6 cents per pound for the period January-June 1999 (Table 28).¹⁰

Chart 27. World Sugar Supply and Demand



¹⁰ The World Bank in its price projections released August 21, 1998, forecasts world raw sugar prices at 9.0 cents for calendar 1999 and 9.5 cents per pound for 2000. Its long term projections, in current dollars, are 12.3 cents a pound for 2005 and 13.6 cents a pound for 2010.

Chart 28. World Futures Average Price (Jan-Jun) and Stocks to Use

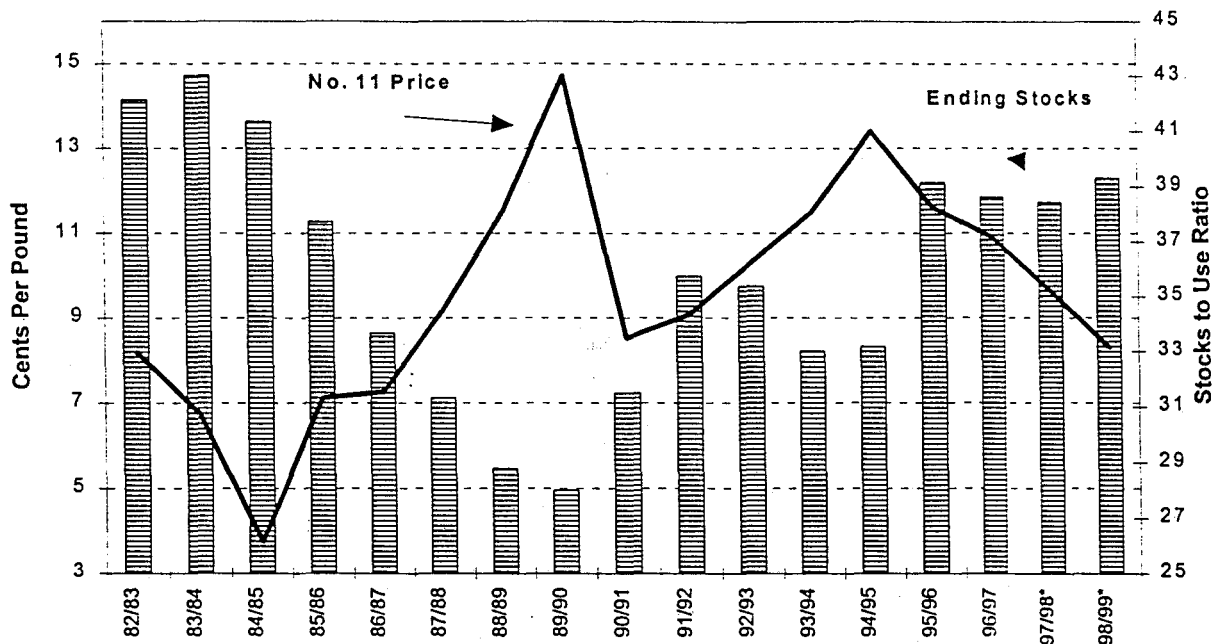


Chart 29. Monthly Nearby World Sugar No. 11 Futures

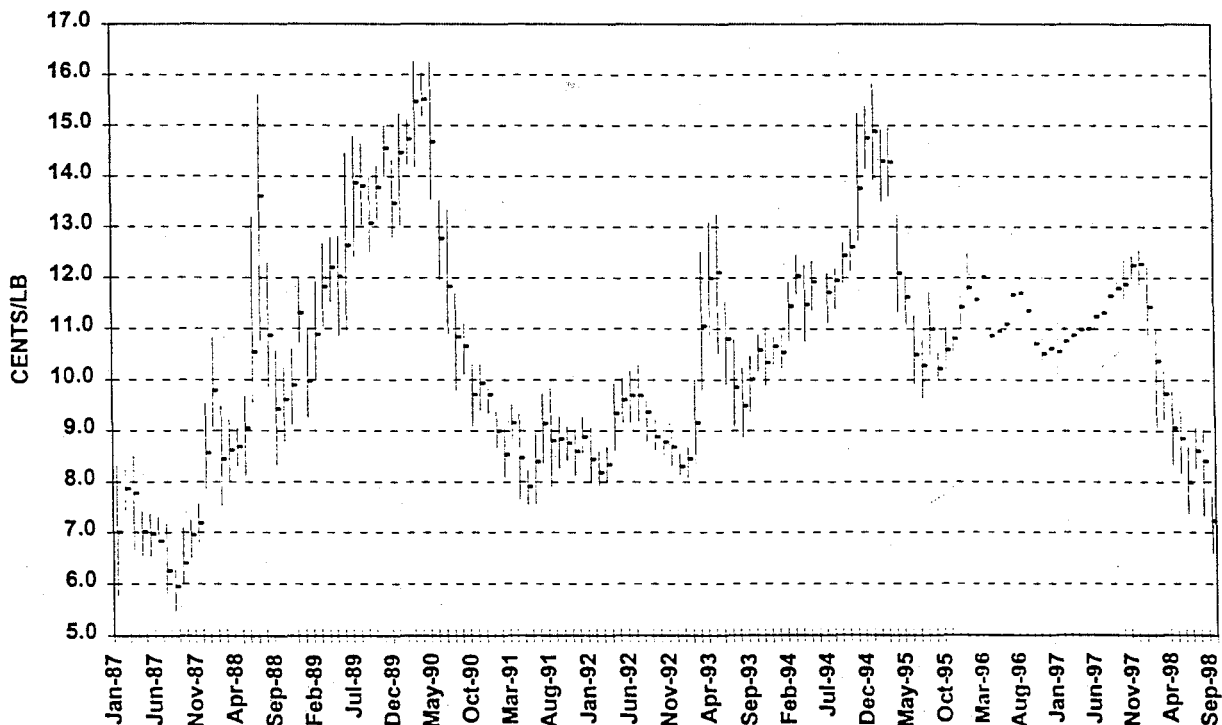


Table 26. World Sugar Production, Leading Producing Countries
Campaign Years

Region/Country	90/91	91/92	92/93	93/94	94/95	95/96	96/97	F.O. Licht 97/98	SCI 98/99*
1,000 metric tons									
Western Hemisphere									
Argentina	1,351	1,560	1,379	1,093	1,202	1,612	1,394	1,779	1,700
Brazil	7,932	9,300	9,979	10,112	12,598	13,661	14,734	16,000	17,500
Colombia	1,633	1,813	1,834	1,964	2,069	2,149	2,136	2,286	2,050
Cuba	7,729	7,104	4,365	4,024	3,419	4,460	4,320	3,100	3,250
Guatemala	1,011	1,118	1,104	1,238	1,345	1,256	1,566	1,722	1,750
Mexico	3,943	3,577	4,431	4,010	4,650	4,685	4,858	5,457	5,100
United States	5,601	5,838	6,455	6,278	6,699	6,240	6,201	6,800	6,940
Europe									
EU-15	18,021	16,605	18,064	18,448	16,533	16,970	17,997	19,062	17,950
Poland	2,214	1,640	1,567	2,170	1,492	1,714	2,435	2,333	2,100
Russia	2,859	2,230	2,538	2,714	1,798	2,237	1,863	1,360	1,380
Ukraine	5,856	4,178	3,758	4,196	3,598	3,804	2,935	2,170	2,150
Africa & Middle East									
Egypt	1,064	1,077	1,093	1,195	1,230	1,222	1,230	1,151	1,200
South Africa	2,142	2,524	1,654	1,266	1,791	1,790	2,437	2,573	2,800
Turkey	1,946	2,052	2,124	2,192	1,679	1,495	2,024	2,527	2,800
Oceania & Asia									
Australia	3,612	3,195	4,366	4,493	5,209	5,122	5,621	5,897	5,700
China	6,880	8,578	8,402	6,547	5,901	6,770	7,339	8,299	8,700
India	13,093	14,575	11,535	16,052	15,930	17,883	14,031	13,950	16,200
Indonesia	2,311	2,257	2,471	2,490	2,467	2,287	2,096	2,190	1,700
Pakistan	2,100	2,528	2,604	3,177	3,263	2,685	2,601	3,900	3,950
Philippines	1,799	2,061	2,131	1,873	1,705	1,853	1,905	1,750	1,700
Thailand	4,055	5,106	3,792	4,009	5,513	6,323	6,098	4,314	4,200
Subtotal	97,152	98,916	95,646	99,541	100,091	106,218	105,821	108,620	110,820
Others	17,331	17,417	16,456	16,455	16,304	16,684	17,448	17,357	17,480
World	114,483	116,333	112,101	115,996	116,395	122,902	123,269	125,977	128,300
Leading Producers as % of World	84.9%	85.0%	85.3%	85.8%	86.0%	86.4%	85.8%	86.2%	86.4%

*SCI Forecast

Source: F.O. Licht history

**Table 27. World Consumption, Leading Consuming Countries
Marketing Years**

Region/Country	90/91	91/92	92/93	93/94	94/95	95/96	96/97	F.O. Licht 97/98	SCI 98/99*
	1,000 metric tons								
Western Hemisphere									
Argentina	1,089	1,218	1,258	1,217	1,310	1,359	1,405	1,470	1,500
Brazil	6,924	7,400	7,459	7,760	8,033	8,385	8,945	9,246	9,450
Canada	1,097	1,153	1,201	1,321	1,158	1,202	1,227	1,239	1,270
Colombia	1,286	1,309	1,154	1,170	1,116	1,188	1,179	1,271	1,430
Cuba	882	960	869	716	562	582	609	608	640
Mexico	4,566	4,329	4,459	4,404	4,397	4,443	4,100	4,274	4,100
Peru	717	697	689	751	801	817	865	929	950
United States	7,926	7,993	8,219	8,394	8,506	8,682	8,809	9,040	9,050
Venezuela	735	721	779	744	760	758	761	771	820
Europe	14,028	14,049	14,027	13,856	13,912	13,776	14,003	14,270	14,470
Poland	1,614	1,650	1,565	1,639	1,652	1,762	1,804	1,840	1,860
Russia	6,661	5,678	5,600	5,650	5,550	5,435	5,550	5,450	5,000
Ukraine	2,963	2,717	2,540	2,283	2,375	2,228	2,196	1,942	1,825
Africa & Middle East									
Algeria	883	876	887	904	891	911	916	923	935
Egypt	1,697	1,712	1,683	1,700	1,766	1,836	1,916	1,952	1,980
Iran	1,560	1,625	1,680	1,670	1,745	1,777	1,843	1,938	1,960
Morocco	869	850	892	913	973	1,004	1,035	1,041	1,100
Nigeria	526	561	615	462	415	641	649	650	670
South Africa	1,390	1,405	1,303	1,443	1,360	1,399	1,408	1,412	1,425
Turkey	1,784	1,718	1,799	1,797	1,856	1,965	2,069	2,124	2,155
Oceania & Asia									
Australia	884	854	829	897	948	903	1,198	822	1,050
China	7,450	7,550	7,717	7,541	7,984	8,186	8,268	8,650	8,780
India	11,496	12,316	13,025	12,795	13,318	14,175	15,318	15,606	16,300
Indonesia	2,581	2,582	2,615	2,748	3,016	3,291	3,317	3,237	3,000
Japan	2,816	2,793	2,572	2,634	2,677	2,622	2,493	2,497	2,350
Korea Rep.	844	859	890	939	1,039	1,098	1,153	1,108	1,030
Malaysia	746	735	787	853	976	1,070	1,130	1,157	1,100
Pakistan	2,348	2,559	2,607	2,763	2,944	3,045	3,125	3,205	3,320
Philippines	1,528	1,619	1,716	1,801	1,816	2,040	1,848	1,870	1,890
Thailand	1,171	1,252	1,320	1,432	1,612	1,688	1,757	1,938	1,800
Subtotal	91,060	91,739	92,755	93,196	95,465	98,265	100,896	102,479	103,185
Others	19,315	19,322	19,097	19,297	19,435	19,836	20,412	20,977	21,715
World	110,375	111,060	111,852	112,492	114,901	118,101	121,308	123,455	124,900
Leading Consumers as % of World	82.5%	82.6%	82.9%	82.8%	83.1%	83.2%	83.2%	83.0%	82.6%

*SCI Forecast

Source: F.O. Licht history.

Table 28. World Sugar: Production, Disappearance and Stocks

Sep/ Aug	Begin Stocks	Campaign Prod.	Supply	Disap. 1/	Change in Disap.	End Stocks	Change in ES	End Stocks/ Disap.	Nearby Futures Price 2/
	1,000 metric tons								
70/71	21,124	71,030	92,154	73,403	2,389	18,751	-2,373	25.5	4.6
71/72	18,751	72,176	90,927	73,074	-329	17,853	-898	24.4	7.9
72/73	17,853	75,550	93,403	76,992	3,918	16,411	-1,442	21.3	9.2
73/74	16,411	78,200	94,611	78,231	1,239	16,380	-31	20.9	20.1
74/75	16,380	77,208	93,588	75,839	-2,392	17,749	1,369	23.4	25.3
75/76	17,749	79,855	97,604	76,965	1,126	20,639	2,890	26.8	14.0
76/77	20,639	85,235	105,874	80,825	3,860	25,049	4,410	31.0	9.1
77/78	25,049	91,857	116,906	86,306	5,481	30,600	5,551	35.5	8.2
78/79	30,600	90,552	121,152	89,226	2,920	31,926	1,326	35.8	8.4
79/80	31,926	84,324	116,250	90,194	968	26,056	-5,870	28.9	25.8
80/81	26,056	88,034	114,090	88,196	-1,998	25,894	-162	29.4	21.3
81/82	25,894	100,704	126,598	92,703	4,507	33,895	8,001	36.6	10.7
82/83	33,895	101,672	135,567	95,378	2,675	40,189	6,294	42.1	8.2
83/84	40,189	96,366	136,555	95,474	96	41,081	892	43.0	6.7
84/85	41,081	100,437	141,518	100,112	4,638	41,406	325	41.4	3.8
85/86	41,406	99,401	140,807	102,238	2,126	38,569	-2,837	37.7	7.1
86/87	38,569	103,535	142,104	106,303	4,065	35,801	-2,768	33.7	7.3
87/88	35,801	104,220	140,021	106,616	313	33,405	-2,396	31.3	9.2
88/89	33,405	105,624	139,029	107,936	1,320	31,093	-2,312	28.8	11.6
89/90	31,093	108,833	139,926	109,295	1,359	30,631	-462	28.0	14.7
90/91	30,631	114,491	145,122	111,291	1,996	35,054	4,423	31.5	8.5
91/92	35,054	116,346	151,400	111,906	615	40,001	4,947	35.7	9.1
92/93	40,001	112,098	152,099	112,757	851	39,876	-125	35.4	10.3
93/94	39,876	115,993	155,869	113,636	879	37,499	-2,377	33.0	11.5
94/95	37,499	116,496	153,995	114,659	1,023	38,030	531	33.2	13.4
95/96	38,030	122,921	160,951	115,674	1,015	45,277	7,247	39.1	11.6
96/97	45,277	123,308	168,585	121,629	5,955	46,956	1,679	38.6	10.9
97/98*	46,956	126,217	173,173	124,800	3,171	48,373	1,417	38.8	9.6
98/99*	48,373	128,300	176,673	125,300	500	51,373	3,000	41.0	7.6

1/ Disappearance based on September-August year stocks and campaign production utilizing F. O. Licht history and 1997/98 estimates.

2/ Price is average of nearby futures for Jan-June for second year shown in cts/lb.

*SCI Forecast

Brazil's Emerging Trade Position

The significant expansion of trade in the years ahead is a key component of Brazil's long-term economic development strategy. In recent years Brazil has run a trade deficit overall, but has maintained a large trade surplus in agriculture. For example, in 1997 total agricultural exports were a record \$18.6 billion and accounted for 35.2% of total exports. This contrasts with agricultural imports of \$7.0 billion which represented 11.4% of imports (Table 29). While sugar exports have been well below those export earnings from soybeans and products and coffee, sugar usually ranks among Brazil's top five export commodities (Chart 30). According to public statements by Foreign Minister Luiz Felipe Lampreia, sugar is a product that has increased its exports more than any other in recent years. But it is also a product that is highly protected around the world with both tariff and non-tariff barriers. As such, sugar trade reform is considered an "absolute priority" in the Brazilian government's foreign trade action strategy.

Minister Lampreia is on record that Brazil needs to combat high levels of protection around the globe that limit his country's sugar exports. In a recent article in one of Brazil's leading newspapers, Jose Reinaldo del Bianco, chief economist for COPERSUCAR, stated the Brazilian sugar industry's concern about the continuing high level of tariffs in countries such as Japan where the current tariff equivalent for refined sugar is 408% and 337% on raw sugar. The EU tariff equivalent according to Mr. Bianco is 320% and is scheduled to be reduced to 256%. In the United States, Brazil's imports on refined sugar currently pay a duty of 17.2 cents a pound which declines to 16.2 cents after 1999. Raw sugar imports to the United States are limited by a tariff-rate import quota system with country allocations based on historical shares of the market. The over-quota tariff on raw sugar is currently 16.3 cents a pound and is scheduled to decline modestly to 15.4 cents after 1999. The potential for developing a fuel alcohol market is also constrained by high import duties in countries such as the United States where the current duty is 54 cents per US gallon (14.3 cents per liter).

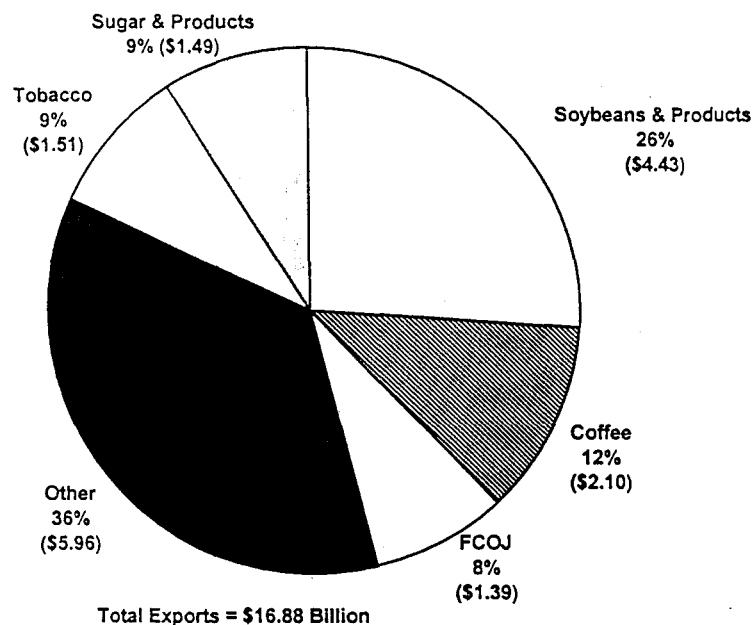
These statements and recent discussions with government, trade and industry officials all point to Brazil making sugar and alcohol key items for negotiation during the upcoming WTO trade talks. Even before WTO talks begin, Brazil hopes to solve a significant sugar trade problem they have within the regional trade agreement known as MERCOSUR (trade pact between Brazil, Argentina, Uruguay, and Paraguay). Argentina has placed a 20% import duty on sugar from Brazil in an attempt to protect its sugar industry (Argentina's cost of production is reported to be \$364 per ton compared with \$190 per ton in Brazil's Center-South). Brazil is currently seeking to have the tariff gradually lowered until it reaches zero by the year 2001. According to Minister Lampreia, Brazil foresees the negotiations with Argentina as a strategy to lever a round of negotiations with the EU. In addition, the Minister also has put the United States on notice that there will be no Free Trade Area of the Americas (FTAA) agreement if there are no better terms for the entry of Brazilian products into the US market. "Our country's trade relationship with the United States is a two-way street," Lampreia asserted on August 5 in response to a US Government document summarizing the FTAA negotiating requests of 71 US companies.

Table 29. Brazil: Value of Total Foreign Trade Compared With Agricultural Sector

Year	Total Exports	Total Imports	Balance	Total Agri-Exports	Total Agri-Imports	Total Agri-Balance	Agri-Exports % of Total Exports	Agri-Imports % of Total Imports
	millions US\$						percent	
1970	2,739	2,507	232	1,946	295	1,651	71.0	11.8
1971	2,904	3,247	-343	1,916	317	1,599	66.0	9.8
1972	3,991	4,232	-241	2,727	382	2,345	68.3	9.0
1973	6,199	6,192	7	4,153	760	3,393	67.0	12.3
1974	7,951	12,642	-4,691	4,834	1,118	3,716	60.8	8.8
1975	8,670	12,210	-3,540	4,837	853	3,984	55.8	7.0
1976	10,128	12,383	-2,255	6,078	1,112	4,966	60.0	9.0
1977	12,120	12,023	97	7,919	925	6,994	65.3	7.7
1978	12,659	13,683	-1,024	6,630	1,546	5,084	52.4	11.3
1979	15,244	18,084	-2,840	7,053	2,361	4,692	46.3	13.1
1980	20,132	22,955	-2,823	9,320	2,471	6,849	46.3	10.8
1981	23,293	22,091	1,202	9,622	2,187	7,435	41.3	9.9
1982	20,175	19,395	780	8,036	1,796	6,240	39.8	9.3
1983	21,899	15,429	6,470	8,992	1,465	7,527	41.1	9.5
1984	27,005	13,916	13,089	10,434	1,503	8,931	38.6	10.8
1985	25,639	13,153	12,486	9,422	1,366	8,056	36.7	10.4
1986	22,349	14,044	8,305	7,653	2,469	5,184	34.2	17.6
1987	26,224	15,052	11,172	8,540	1,440	7,100	32.6	9.6
1988	33,494	14,605	18,889	9,886	1,055	8,831	29.5	7.2
1989	34,383	18,263	16,120	9,526	2,228	7,298	27.7	12.2
1990	31,414	20,661	10,753	8,764	2,269	6,495	27.9	11.0
1991	31,620	21,041	10,579	7,962	2,764	5,198	25.2	13.1
1992	35,793	20,554	15,239	9,096	2,405	6,691	25.4	11.7
1993	38,597	25,480	13,117	9,697	3,183	6,514	25.1	12.5
1994	43,558	33,167	10,391	13,899	4,308	9,591	31.9	13.0
1995	46,506	49,663	-3,157	15,617	6,798	8,819	33.6	13.7
1996	47,762	53,288	-5,526	16,883	7,604	9,279	35.3	14.3
1997	52,986	61,358	-8,372	18,596	6,985	11,611	35.1	11.4

Source: International Monetary Fund, US Agricultural Counselor, SECEX.

**Chart 30. Brazil: Agricultural Trade Profile, 1996 Agri-Exports
(Billion US\$)**



Areas of Common Interests Between Brazil and Australia

There are striking similarities between the sugar industries of Brazil and Australia. Both industries have been largely de-regulated over the past decade. Both countries are among the world's lowest cost cane sugar producers. Both industries have expanded greatly since 1990 in terms of area in sugarcane, milling capacity, cane grind and sugar production. Both industries have greatly expanded sugar exports and are largely dependent on the world free market price. Both industries advocate free trade in sugar and both have removed their own import tariffs on sugar. Moreover, both countries face market access barriers around the world that restrict trade. Lastly, both countries are unique in the world in that they have significant additional good land available to continue expansion of sugarcane agriculture. Taken together these areas of similarity appear to set-the-stage for mutual cooperation to achieve a common goal—global free trade in sugar.

The main forum for this cooperation is the upcoming WTO negotiations on agriculture. Despite the historic achievements during the Uruguay Round of multilateral trade negotiations to bring agriculture trade under strengthened disciplines, market access barriers and other trade-distorting policies still limit the opportunities for agricultural exports. The Uruguay Round Agreement on Agriculture recognized the limited progress of reform and contained a "continuation" clause that called for a resumption of negotiations to begin in the year before the end of the transition period for Uruguay Round reforms. The Second Session of the WTO Ministerial Conference held in Geneva in May 1998 directed the General Council to meet in special session in September 1998 and to make recommendations and submit work plans for the negotiations on agricultural reforms.

Negotiations are to be launched during the fourth quarter of 1999 at the Third WTO Trade Ministerial to be held in the United States.

For countries such as Brazil and Australia with major concerns related to sugar trade, key countries to monitor during the coming WTO trade round will be the United States and the EU. US negotiators are expected to push for substantial tariff reductions and to eliminate the tariff-rate quotas that proliferated due to tariffication (the change of different border protection measures into customs tariffs) resulting from the Uruguay Round. The negotiators see no other way to address multilaterally the tariff discrepancy between the United States and most of the rest of the world (the United States currently has on average one of the lowest tariffs in the world about 3%—the world average for agriculture tariffs is 56% and many tariffs on agricultural products are much higher). In return, US negotiators will be under pressure from countries such as Brazil and Australia to reduce US tariffs and to eliminate US tariff-rate quotas on such items as dairy products, peanuts, beef, and sugar and sugar containing products. The US sweetener user community, which has been advocating trade liberalization for sugar, are natural allies of Brazil and Australia in these discussions.

For the EU the key to increased market access for sugar centers on reform of the EU's Common Agricultural Policy (CAP—its official objectives set down in Article 39 of the Treaty of Rome have been to increase productivity, ensure a fair standard of living for European farmers, to stabilize commodity markets, and to assure adequate food supplies at reasonable prices to consumers). All indications point to the CAP being the focus of scrutiny in the upcoming WTO on continuing agricultural reform. Within the EU, CAP reform such as reduced support levels began in the early 1990s due to the enormous cost of the program relative to the entire EU budget. Despite reforms, costs remain high. According to USDA research the cost of the EU agricultural policy in 1997 as measured by producer subsidy equivalents (PSE) was \$72.7 billion versus \$22.7 billion for US agricultural programs. According to one keen observer, the remaining high costs of the CAP and the likelihood of future cost crises—such as the planned enlargement of the EU to include countries in Central and Eastern Europe—will mandate further adjustments in policies with less focus on price support and more on direct income support and on rural development and environmental policy.

The EU's obligations under the Uruguay Round Agreement on Agriculture also have stimulated CAP reform. Under this agreement the EU, over a six-year period which started in January 1995, is obligated to a 20% reduction on domestic support for agriculture, a 36% reduction in budgetary expenditures on export subsidies, and a 21% reduction in the quantity of subsidized exports. The upcoming WTO negotiations are likely to require further reductions of export subsidies as well as tariffs on imports prompting further CAP reforms.

The EU has also recently embarked on initiatives to negotiate trade agreements on a bilateral and regional basis with Mexico, Chile, the MERCOSUR countries and the United States (Transatlantic Economic Partnership). Any significant trade concessions on agriculture in these negotiations will require further reforms of the CAP. As Brazilian officials have stated, sugar will be a priority in these negotiations.

VII. Appendix

**Table A-1. Brazil: Profile of Sugar and Fuel Alcohol Industry,
Based on 1996/97 Season Data**

Region/State	Sugar Mills	Fuel Alcohol Distilleries	Integrated Sugar & Fuel Alcohol Distillers	Total Sugar and Alcohol Facilities
	number			
North/Northeast				
Alagoas	5	5	19	28
Bahia	-	3	2	6
Ceara	-	3	1	4
Marnahao	-	2	1	3
Para	-	1	1	2
Paraiba	1	7	1	9
Pernambuco	2	6	21	31
Piaui	-	2	-	1
Rio Grade do N.	-	2	2	4
Sergipe	-	1	1	2
Tocantins	-	1	-	1
Region	8	32	49	91
Central/South				
Espirito Santos	-	4	2	6
Goiias	-	8	6	14
Mato Grosso	-	5	5	10
Mato Grosso do Sol	-	2	5	7
Minas Gerais	4	11	9	24
Parana	-	5	23	28
Rio de Janeiro	1	1	8	10
Santa Caterina	1	-	-	1
Sao Paulo	3	33	96	132
Region	9	69	154	232

--continued

**Table A-1. Brazil: Profile of Sugar and Fuel Alcohol Industry,
Based on 1996/97 Season Data--continued**

Region/State	Cultivated Cane Area	Cane Yield	Sucrose Content	Efficiency of Mill Extraction	Efficiency of Distillery	Prominent Cane Variety
	hectares	tons/ha	%	%	%	name
North/Northeast						
Alagoas	224,368	63.3	13.0	93.3	88.0	RB72-454
Bahia	37,93	75.7	13.8	93.7	90.6	SP71-1406
Ceara	1,500	78.8	10.5	90.0	87.4	CB45-3
Maranhao	7,182	66.7	12.0	93.6	87.4	RB72-454
Para	4,050	60.7	10.9	89.2	83.1	SP70-1143
Paraiba	51,932	56.6	12.1	89.1	87.4	CB45-3
Pernambuco	197,678	60.0	12.0	92.4	84.8	CB45-3
Piaui	5,527	56.7	10.3	93.0	92.2	RB72-454
Rio Gradedo N.	23,000	44.9	12.7	92.4	85.4	NA
Sergipe	15,700	66.9	13.0	94.2	86.6	RB72-454
Tocantins	2,500	70.0	16.7	96.1	88.5	NA
Region	571,367	63.7	12.5	92.5	87.4	RB72-454
Central/South						
Espirito Santos	41,406	47.8	14.2	94.9	90.2	RB73-9735
Goiias	96,993	84.6	15.7	93.9	89.4	RB73-454
Mato Grosso	114,225	74.4	13.6	93.0	88.4	SP71-1406
Mato Grosso do Sol	70,346	68.6	12.7	92.1	87.9	SP71-1143
Minas Gerais	113,043	66.9	15.1	94.7	90.2	SP71-6163
Parana	218,088	83.9	13.3	94.6	89.2	RB72-454
Rio de Janeiro	63,709	58.6	12.2	87.8	88.0	CB45-3
Santa Caterina	-	-	-	-	-	-
Sao Paulo	2,074,892	80.9	15.3	94.8	90.1	SP70-1143
Region	2,792,702	70.7	14.0	93.2	89.2	RB72-454

--continued

**Table A-2. Brazil: Profile of Sugar and Fuel Alcohol Industry,
Based on 1996/97 Season Data--continued**

Region/State	Cane Harvested	Sugar Production	Hydrous Alcohol Produced	Anhydrous Alcohol Prod.	Total Alcohol
	tons	50 kg sacks	liters	liters	liters
Alagoas	23,063,832	30,494,888	424,359,587	399,677,779	824,037,366
Bahia	2,428,164	2,772,155	90,963,182	5,925,450	96,888,632
Ceara	373,885	450,000	15,292,000	-	15,292,000
Maranhao	638,745	507,337	30,456,526	2,695,711	33,152,237
Para	243,256	72,507	16,564,167	-	16,564,167
Paraiba	4,406,117	1,057,633	300,271,721	34,822,000	335,093,721
Pernambuco	21,149,553	25,480,128	427,493,197	247,913,257	675,406,454
Piaui	319,365	-	21,795,500	-	21,795,500
Rio Grandedo N.	2,719,578	2,568,397	88,298,039	47,859,758	136,157,797
Sergipe	996,725	967,640	54,279,843	16,835,000	71,114,843
Tocantins	127,085	-	10,673,100	-	10,673,100
Region	56,466,305	64,370,685	1,480,446,862	755,728,955	2,236,175,817
Central/South					
Espirito Santos	1,828,660	1,058,494	86,245,661	22,495,013	108,740,672
Goiias	7,933,380	6,182,151	337,468,970	91,464,082	428,933,052
Mato Grosso	8,137,951	6,017,905	282,247,312	164,924,621	449,171,933
Mato Grosso do Sol	5,337,466	3,833,476	212,111,899	69,976,262	282,088,161
Minas Gerais	9,505,147	9,286,021	353,631,076	117,983,008	471,614,084
Parana	21,815,470	15,548,616	995,928,133	201,099,747	1,197,022,880
Rio de Janeiro	5,395,365	8,369,522	103,296,992	1,734,000	105,030,992
Santa Caterina	-	-	-	-	-
Sao Paulo	169,349,999	161,565,013	5,760,954,225	3,111,458,163	8,872,412,388
Region	229,303,440	211,862,198	8,133,884,268	3,781,134,896	11,915,019,164

Source: Jounal Cana (based on industry survey)

Table A-2. Brazil: Combined Sugar, Fuel Alcohol and Sugarcane Production by State and Region

	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98
North-Northeast											
Alagoas											
Sugar (1,000 MT)	1,244	1,090	1,281	1,235	12,243	1,436	1,061	1,561	1,543	1,539	1,843
Alcohol (1,000 M3)	730	686	883	778	735	719	412	630	615	881	839
Cane (1,000 MT)	21,799	21,317	26,395	22,617	21,483	21,112	15,827	20,121	19,918	23,937	24,340
Bahia											
Sugar (1,000 MT)	85	96	88	80	109	115	140	171	153	138	151
Alcohol (1,000 M3)	22	22	27	18	39	36	24	46	75	97	102
Cane (1,000 MT)	1,186	1,224	1,212	1,053	1,487	1,465	1,622	1,922	2,107	2,362	2,581
Ceara											
Sugar (1,000 MT)	54	41	38	35	31	25	16	16	30	23	19
Alcohol (1,000 M3)	27	24	21	16	13	5	3	7	17	17	13
Cane (1,000 MT)	795	655	579	506	420	286	184	222	467	405	326
Maranhao											
Sugar (1,000 MT)	41	30	27	25	20	13	12	25	64	25	9
Alcohol (1,000 M3)	25	24	30	32	27	20	10	18	32	41	64
Cane (1,000 MT)	727	624	733	595	540	359	136	260	568	734	899
Para											
Sugar (1,000 MT)	0	3	4	3	3	2	3	2	3	4	5
Alcohol (1,000 M3)	17	12	12	10	8	8	9	11	15	17	16
Cane (1,000 MT)	264	249	241	184	169	127	168	259	238	243	247
Paraiba											
Sugar (1,000 MT)	120	108	110	106	87	85	42	54	46	79	105
Alcohol (1,000 M3)	285	276	282	265	281	251	117	263	278	335	310
Cane (1,000 MT)	4,774	4,677	4,983	4,570	4,416	3,890	2,139	3,407	3,411	4,743	4,645

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Table A-2. Brazil: Combined Sugar, Fuel Alcohol and Sugarcane Production by State and Region--continued

	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98
North-Northeast											
Pernambuco											
Sugar (1,000 MT)	1,366	1,259	1,351	1,215	1,163	1,310	955	1,345	1,353	1,227	1,232
Alcohol (1,000 M3)	481	529	583	517	507	420	226	403	470	707	550
Cane (1,000 MT)	20,185	20,499	21,886	18,679	18,328	17,273	12,056	16,955	17,087	20,752	16,971
Piaul											
Sugar (1,000 MT)	0	0	0	0	0	0	0	0	0	0	0
Alcohol (1,000 M3)	19	21	33	33	31	24	18	25	31	22	25
Cane (1,000 MT)	241	287	459	464	384	306	243	328	414	319	337
Rio Grande do Norte											
Sugar (1,000 MT)	131	104	114	92	103	125	75	137	126	128	155
Alcohol (1,000 M3)	138	120	117	106	85	101	59	117	119	128	132
Cane (1,000 MT)	2,998	2,650	2,530	2,169	1,908	2,324	1,503	2,411	2,414	2,558	2,645
Sergipe											
Sugar (1,000 MT)	117	86	94	103	61	68	45	57	46	60	73
Alcohol (1,000 M3)	46	33	30	30	24	38	29	39	50	71	82
Cane (1,000 MT)	1,731	1,414	1,415	1,395	772	720	590	696	729	1,044	1,101
Tocantins											
Sugar (1,000 MT)	0	0	0	0	0	0	0	0	0	0	0
Alcohol (1,000 M3)	0	0	0	0	8	6	12	15	19	11	17
Cane (1,000 MT)	0	0	0	0	110	85	138	180	221	127	185
Sub-Total 1/											
Sugar (1,000 MT)	3,158	2,817	3,107	2,894	2,823	3,179	2,351	3,368	3,364	3,225	3,591
Alcohol (1,000 M3)	1,791	1,749	2,018	1,805	1,757	1,628	917	1,572	1,691	2,325	3,151
Cane (1,000 MT)	54,700	53,617	60,454	52,235	50,052	47,928	34,606	46,577	47,575	57,224	54,277

1/ Includes small volume of production from the states of Acre and Amazonas

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Table A-2. Brazil: Combined Sugar, Fuel Alcohol and Sugarcane Production by State and Region--continued

	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98
<u>Rio de Janeiro</u>											
Sugar (1,000 MT)	408	458	400	281	416	316	352	390	425	421	351
Alcohol (1,000 M3)	235	278	241	102	154	105	98	109	109	105	135
Cane (1,000 MT)	7,666	8,902	7,318	4,522	6,564	5,162	4,873	5,480	5,217	5,372	4,926
<u>Parana</u>											
Sugar (1,000 MT)	180	217	178	221	236	233	305	431	556	784	937
Alcohol (1,000 M3)	647	649	670	636	730	732	731	887	1,076	1,234	1,316
Cane (1,000 MT)	10,876	10,273	10,568	10,751	11,182	12,137	12,475	15,531	20,265	22,809	24,588
<u>Rio Grande do Sul</u>											
Sugar (1,000 MT)	4	2	1	0	0	0	0	0	0	0	0
Alcohol (1,000 M3)	2	3	4	3	2	3	4	3	2	3	3
Cane (1,000 MT)	76	68	70	38	38	53	57	46	31	44	45
<u>Santa Catarina</u>											
Sugar (1,000 MT)	42	30	31	29	26	30	29	20	0	0	0
Alcohol (1,000 M3)	11	3	6	9	4	5	4	0	0	0	0
Cane (1,000 MT)	527	373	377	163	322	350	343	235	0	0	0
<u>Sao Paulo</u>											
Sugar (1,000 MT)	3,638	4,001	3,032	3,473	4,567	4,920	5,551	6,645	7,261	7,897	8,655
Alcohol (1,000 M3)	7,329	7,724	7,781	7,959	8,580	7,926	8,290	8,706	8,127	8,974	9,495
Cane (1,000 MT)	125,457	125,689	123,477	131,815	137,281	136,933	143,173	148,953	154,341	170,600	180,413

--continued

Table A-2. Brazil: Combined Sugar, Fuel Alcohol and Sugarcane Production by State and Region--continued

	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98
Sub-Total											
Sugar (1,000 MT)	4,827	5,523	4,140	4,511	5,835	6,100	7,022	8,454	9,363	10,421	11,304
Alcohol (1,000 M3)	9,668	9,966	9,911	9,988	10,927	10,058	10,381	11,147	10,908	12,113	13,258
Cane (1,000 MT)	169,795	167,678	163,358	170,195	179,031	176,810	182,840	196,153	208,452	232,284	248,316
Brazil Total											
Sugar (1,000 MT)	7,985	8,070	7,246	7,404	8,658	9,279	9,372	11,883	12,726	13,646	14,896
Alcohol (1,000 M3)	11,459	11,713	11,929	11,792	12,684	11,685	11,298	12,719	12,599	14,445	16,409
Cane (1,000 MT)	224,495	221,296	223,812	222,429	229,083	224,737	217,445	242,730	256,027	289,517	302,593

Source: ASSUCAL (Associacao Dos Produtores Independentes de Acucar e Alcool do Estado de Alagoas)

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