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Biofuels Annual

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Report Highlights:
This report provides a comprehensive study on the biofuels sector (ethanol and biodiesel) in Brazil, including policies and programs adopted by the government, as well as production, and supply and demand figures for 2010 and 2011.

Post:
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Executive Summary:

The present report includes the following sections: (1) Executive Summary; (2) Policy and Programs; (3) Conventional Bioethanol; (4) Conventional Biodiesel; (5) Advanced Biofuels; (6) Notes on Statistical Data; (7) Definitions and Conversion Rates.

Secton 2 describes major policies and programs for biofuels. Brazil has a longstanding history in the use of biofuels as part of the energy matrix. Bioethanol has been commercially produced in Brazil for over 75 years due to sugarcane's ability to divert its juice towards sugar and/or ethanol production. The sector is completely deregulated, but the government plays a key role in influencing how much ethanol is produced in order to guarantee the domestic supply for both products through the ethanol use mandate and tax incentive measures.

The introduction of biodiesel in the energy matrix fis a more recent occurrence. The biodiesel program was created in 2004 to partially replace fossil fuels use and to promote social inclusion. The market remains regulated by the Brazilian government through a public auction system which sets the volume of biodiesel that should be produced as well as the average sales price. The government has also set the biodiesel mandate and tax incentive measures to stimulate the sector.

Section 3, 4 and 5 provide a comprehensive study about the current situation and outlook for biofuels production, and supply and demand, whereas Sections 6 and 7 include statistical information, definitions and conversion rates.

1.1. Brazil's Political Division

The map below shows the Brazilian political division in regions and states.

Policy and Programs:

2.1. The introduction of Bioethanol in the Brazilian Energy Matrix - Historical Perspective

The systematic use of ethanol from sugarcane for fuel purposes can be divided into five distinct periods, as shown in the historical timeline below:

A. Ethanol as Additive to Gasoline (1934-1974)

From 1934 to 1975, hydrated ethanol was converted to anhydrous ethanol to be blended with gasoline. Then, President Getulio Vargas created the Sugar and Ethanol Institute (Instituto do Açucar e Alcool" – IAA) to regulate the activity and the ethanol mixture to gasoline became compulsory. IAA set production quotas and rigid norms to control production and marketing of the product in the domestic and international markets. During this first period, the promotion of the ethanol industry was more related to the fluctuations in the sugar market than to the need to replace energy imports.

B. Proalcool – Initial Phase (1975-1979) [1]

Following the oil shocks of the early 1970's, the Government of Brazil adopted a agressive plan to guarantee the country's energy independence. In 1975, Federal Decree # 76,593/1975 created the National Alcohol Program (Proalcool) to reduce dependence on oil imports by promoting the production of anhydrous ethanol as an additive to gasoline. Proalcool was the largest fossil fuel substitution program in the world, mandating the use of ethanol made from sugarcane to power automotive vehicles. The goal was to increase production from 0.5 to 3 billion liters by 1979. The first ethanol-use mandate in Brazil required a 4.5 percent mixture of ethanol to gas in 1977, but the goal was to increase the amount up to 20 percent. In 1980, Brazil surpassed the 3 billion liter production and the content of ethanol blended to gasoline was approximately 17 percent. In the early years, Proalcool was leveraged by the existing and under utilized industrial capacity from the sugar sector, mainly with the construction of several ethanol distilleries annexed to the sugar plant.

C. Proalcool – Growth and Maturity (1979-1989) [2]

The second phase of Proalcool started at the beginning of the eighties, and it was driven by the second oil crisis. The National Ethanol Commission (Cenal)/Ministry of Industry and Commerce set new goals for the program based on Federal Decree # 83,700/1979, which included the expansion of sugarcane fields and the industrial capacity to produce hydrated ethanol (E100) as fuel, i.e.; ethanol as substitute and not as additive to gasoline.

The Proalcool policy required passenger cars to be built to run on ethanol and led to the installation of a nationwide distribution network which would supply ethanol (E100) in all service stations. Supply was guaranteed via strict controls that regulated sugarcane acreage as well as sugar and ethanol production.

The automobile manufacturers had to adjust their engines to the new E100. Anhydrous ethanol remained as an additive to gasoline and in 1984, the Petroleum National Council set the ethanol/gasoline blend at 22 percent (Portaria CNP # 144/1984). This percentage was affirmed by the National Environment Council in 1986 (Conama Resolution # 18/1986).

The success of the program was related to several measures taken by the Brazilian government, such as: financial support, subsidies, and incentives to plant sugarcane, but more importantly support for the construction of distilleries; reduction of the Industrialized Products Tax (Imposto sobre Produtos Industrializados" – IPI) for ethanol powered cars; reduction of the Automobile Ownership Tax (Imposto sobre Propriedade de Veículos Automotores – IPVA); and tax exemption for ethanol fuel sales. In addition, the government set a 65 percent price ratio (later increased to 67 percent) between hydrated ethanol (E100) and gasoline prices at the pump based on the energy power for both fuels.

Investments to expand sugarcane area followed the prevailing agricultural policies. It is estimated that during the 1975-1989 period, the investment necessary to build 1m^3 of industrial capacity was US$ 213.88 and that total financing for ethanol distilleries was subsidized at 71 up to and 96 percent. Therefore, government expenses to cover investments in distilleries were over US$ 1.5 billion (US$ at 1987 basis). Tax reductions and exemptions were roughly US$ 7 billion.

The main factor that influenced the Proalcool policy was the high prices for oil in the international market, which favored the domestic production of ethanol vis-à-vis importing oil for gasoline production. Indeed, during the eighties, the domestic automobile industry sharply increased the manufacturing of ethanol-fueled cars to replace the gasoline fleet. Total sales of ethanol-fueled vehicles were over 4.5 million units during that decade compared to 1.9 million units powered by gasoline.

In 1984, ethanol powered cars represented over 94 percent of total automobile production. In 1989/90, total ethanol production increased to 12 billion liters, the ethanol powered fleet considerably replaced the gasoline vehicle fleet and ethanol fuel consumption represented approximately 50 percent of total light vehicle fuel consumption.

D. The decline of Proalcool and the Deregulation of the Ethanol Industry (1990-2002)

With the reduction of oil prices in 1986, the negative impact of the oil crisis and the recovery of sugar prices in the international market made ethanol production unappealing and created difficulties within the industry. In addition, GOB also reduced ethanol incentive policies and even encouraged sugar production for exports. In 1989, consumers began to face erratic supply shortages of ethanol at the pump which led to a loss of confidence in the product and a drastic drop in the sales of ethanol-fueled cars. The share of sales of ethanol powered vehicles dropped from over 94 percent during the mid-eighties to nearly zero in the late nineties.

In 1989, most of the incentives and benefits given to the ethanol industry during the previous 15 years were eliminated and Proalcool virtually ended. It is worth noting, however that Federal Bill #8,723/1993 sustained the ethanol blend to gasoline at 22 percent. The Sugar and Ethanol Institute was dismantled in 1990 and the control of ethanol related issues was transferred to the Interministerial Sugal and Alcohol Council (Conselho Interministerial de Acucar e Alcool – CIMA).

One of CIMAS's most important functions was to specify and revise the ethanol content in gasoline, within the 20 to 25 percent range, in order to guarantee the domestic supply of the product and reduce price fluctuations.

In 1997, Law #9,478 created the National Energy Policy Council (Conselho Nacional de Politica Energetica – CNPE) and the National Petroleum Agency (Agencia Nacional do Petroleo – ANP) which in 2005 was renamed as the National Agency for Petroleum, Natural Gas and Biofuels. CNPE issues directives for specific programs for biofuels use, whereas ANP oversees the regulation, contracting and inspection of biofuels activities. ANP also implements national biofuel policies, with an emphasis on ensuring supply throughout the country, and specifying quality and standards.

During the nineties, the Brazilian government took several measures to deregulate the sector with the abolishment of production and export quotas and the deregulation of anhydrous and hydrated ethanol prices. By the mid-1990's the program was nearly abandoned as ethanol shortages and low gasoline prices led to widespread popular rejection of ethanol-powered cars.

In spite of the downward trend in the ethanol industry, the legacy of Proalcool is conclusive. The Proalcool policy led to a well-established infrastructure to handling ethanol and the installation of a nationwide distribution newtwork which supplies ethanol (E100) in nearly all service stations. Indeed, over 32,000 gas stations in Brazil have ethanol pumps. The program also left an ethanol-powered automotive fleet and continued production of both gasoline and ethanol fueled automobiles. It also created the largest and most highly developed sugarcane industry worldwide, with sound and continuous research and development.

E. The resurgence of the Ethanol Industry (2003-present)

Despite the collapse of the program in the early nineties, ethanol has remained an integral part of the Brazilian fuels matrix. The resurgence of ethanol is due to private sector commitment to take advantage of ethanol's availability. The *flex-fuel* car was developed and put into production so that consumers would be able to freely choose between gasoline and hydrated ethanol (E100).

Unlike most countries, Brazilian gas stations offer both gasoline (actually a mixture of 75 percent gasoline and 25 percent ethanol) and ethanol (100 percent) as a legacy of Proalcool to promote ethanol use.

Following the launch of *flex* cars in March 2003, *s*ales increased to more than ninety percent of new car sales by the end of 2009. All major car companies have begun selling these vehicles, and they have proved a gain to automotive manufacturers as well; companies that previously produced two models of each car (one for gas, another for ethanol) have been able to consolidate production lines. For consumers, *flex* cars mean flexibility at the pump and increased re-sale value.

While market forces drive current demand growth for ethanol, government policy does have a significant influence on market dynamics. Policy supports for ethanol consumption include both an ethanol-use mandate and significant tax credits.

2.2. Government Support Programs for Bioethanol

The only direct subsidy paid by the Government of Brazil (GOB) refers to the "Regional Producer Subsidy". There are no longer any direct government controls over the amount of ethanol or sugar that can be produced or released onto the domestic market, nor are there any restrictions concerning the quantity of ethanol or sugar that can be exported. Furthermore, the GOB no longer fixes sugarcane, sugar or ethanol prices. These three prices are determined by market forces, and since the liberalization of ethanol prices in 1998, sugar and ethanol prices have traded at close to technical parity to each other. Not surprisingly, the prices of both derivatives have closely followed international sugar prices.

The government can, however, exert influence over the commercial environment in which prices are determined. It also plays a key role in influencing how much sugar and ethanol is produced in order to guarantee the domestic supply for both products, through the ethanol use mandate and tax incentive measures.

2.2.1. "Regional Producer Subsidy"

The North-Northeast is comprised of many of Brazil's poorest states, and small growers in this region receive a direct subsidy for sugarcane production. Federal Law 12,249 from June 2010 sets the value of $ 5.00 per metric ton of sugarcane up to 10,000 metric tons per grower for sugarcane produced during the 2009/2010 crop. The subsidy is given to balance the cost of the production differential between the Central South and the Northeast mills.

2.2.2. Ethanol use mandate

The first ethanol-use mandate in Brazil required a 4.5 percent mixture of ethanol to gas in 1977. Since that time the mix of ethanol in gasoline has risen as high as twenty-five percent. Federal Law 8,723/1993 sets the ethanol blend to gasoline at 22 percent and establishes that the ethanol content can be changed within the 20-25 percent band. Federal Decree #3,966 of October 2001 determines that the Interministerial Sugar and Alcohol Council (Conselho Interministerial de Acucar e Alcool – CIMA) has the authority to adjust the ethanol content between the aforementioned band.

The admixture stood at 25 percent from 2003 until March 1, 2006, when ethanol shortages and rising prices prompted the government to reduce the rate to twenty percent. The government monitored the supply and demand of ethanol and increased the percentage to 23 percent on November 21, 2006, and, then to 25 percent on June 1, 2007, as a consequence of higher expected availability of the product.

Excessive rainfall during the 2009 harvest season has negatively impacted the crushing of sugarcane, thus reducing ethanol availability. In order to avoid sharp price escalation during the off-season months (January-April), CIMA decreased the ethanol content to 20 percent on February 1, 2010 (CIMA Resolution # 01 from January 2010). The blend was reestablished again at 25 percent on May 1, with the beginning of the current crop season. The graph below shows the variations in the percentage of ethanol blended to gasoline since 2003.

2.2.3. Tax incentives for ethanol

A. Tax incentives for ethanol-flex fuel vehicles

Hydrated ethanol (E100) directly competes with gasoline C - 75 percent of gasoline A (pure) + 25 percent anhydrous ethanol, depending on the mandate - and with natural gas for Otto cycle vehicles (spark ignition engines), which includes the Brazilian light fleet (automobiles, light commercial and motorcycles). Tax incentives play an important role in supporting ethanol consumption since the introduction of flex cars.

The table below shows the value of IPI, PIS/COFINS (Contribution to the Social Integration Program/Contribution for Financing Social Security) and ICMS (State tax for services and good circulation) for different categories of vehicles as reported by the National Association of Motor Vehicle Manufacturers (ANFAVEA). Note that taxes on flex cars are lower than taxes on gasoline powered cars, especially with regard to the Tax on Industrialized Products (IPI).

ANFAVEA also reports that the tax burden on light vehicles as a share of the total price for retail (price for final consumers) are usually lower for ethanol/flex-fuel vehicles compared to gasoline vehicles. The tax burden for 1,001 to 2,000 cylinder ethanol/flex-fuel vehicles are 29.2 percent, whereas it is ts 30.4 percent for gasoline units. The differential for more powerful cars, e.g., over 2,001 cylinders, is even higher: 33.1 percent for ethanol/flex engines as opposed to 36.4 percent for gasoline engines.

Taxes Applied to Ethanol, Flex-Fuel and Gasoline Vehicles						
Year	**Taxes**	**1000 cc**	**1001 cc to 2000 cc**		**More than 2000 cc**	
		Gas/Eth/Flex	**Gasoline**	**Eth/Flex**	**Gasoline**	**Eth/Flex**
2004 to 2008	**IPI**	7.0	13.0	11.0	25.0	18.0
	ICMS	12.0	12.0	12.0	12.0	12.0
	PIS/COFINS	11.6	11.6	11.6	11.6	11.6
As of Dec, 12, 2008 thru 2009	**IPI**	0.0	6.5	5.5	25.0	18.0
	ICMS	12.0	12.0	12.0	12.0	12.0
	PIS/COFINS	11.6	11.6	11.6	11.6	11.6
	% Share	22.2	26.4	25.8	36.4	33.1
Source: National Association of Motor Vehicle Manufacturers (ANFAVEA)						

In an attempt to encourage sales of vehicles after the world financial crisis that began in October 2008, Federal Decree #6,687/2008, later replaced by Federal Decree #6,809/2009 from March 2009 reduced IPI values as of December 12, 2008. The measure was successful in sustaining sales in a difficult market environment. IPI values progressively returned to 2008 levels in April 2010, as shown in the tables below. Note that even during this difficult period, renewable fuel vehicles were charged lower IPI values compared to gasoline engines.

IPI tax values for Ethanol/Flex Fuel Vehicles						
Cylinder	**Until Dec/08**	**Dec/08 – Sep/09**	**Oct/09**	**Nov/09**	**Dec/09**	**Jan-Mar/10**
1000 cc	7	0	1.5	3	3	3
Up to 2000 cc	11	5.5	6.5	7.5	7.5	7.5
Over 2000 cc	18	18	18	18	18	18
Source: Federal Decree 6,687/2008 and Federal Decree 6,809/2009						

IPI tax values for Gasoline Vehicles						
Cylinder	**Until Dec/08**	**Dec/08 – Sep/09**	**Oct/09**	**Nov/09**	**Dec/09**	**Jan-Mar/10**
1000 cc	7	0	1.5	3	5	7
Up to 2000 cc	13	6.5	8	9.5	11	13
Over 2000 cc	25	25	25	25	25	25
Source: Federal Decree 6,687/2008 and Federal Decree 6,809/2009						

B. Tax incentives for ethanol fuel

The biggest incentives for ethanol, however, are the result of favorable tax treatment at the pump. The GoB provides preferential treatment for ethanol under both its CIDES and PIS/COFINS programs.

CIDE (Contribution for Intervention in Economic Domain) funds raised via this fuel federal tax are used to finance infrastructure works and maintenance of the transportation system, as well as finance environmental projects related to the oil and natural gas industry and; to pay subsidies, if determined by specific legislation, to ethanol, natural gas and oil derivates prices or distribution.

CIDE rates applied to fuels are determined by Federal Law #10,336 from December 2001. For gasoline, CIDE is charged to the manufacturer (Petrobras) upon sale to distributors. The CIDE value set at R$ 0.28/liter as of January 2004 was reduced to R$ 0.18/liter in May 2008 to prevent the increase in oil prices to be transferred to consumers. In June 2009, the value increased to R$ 0.23/liter and in February 2010 it temporarily drop to R$ 0.15/liter to avoid an increase in gasoline prices with the reduction of the ethanol content in gasoline during the Februrary-April 2010. CIDE was restored to R$ 0.23/liter as of May 1. Note that for ethanol, while CIDE is an applicable tax, it has been fixed at zero since May 2004.

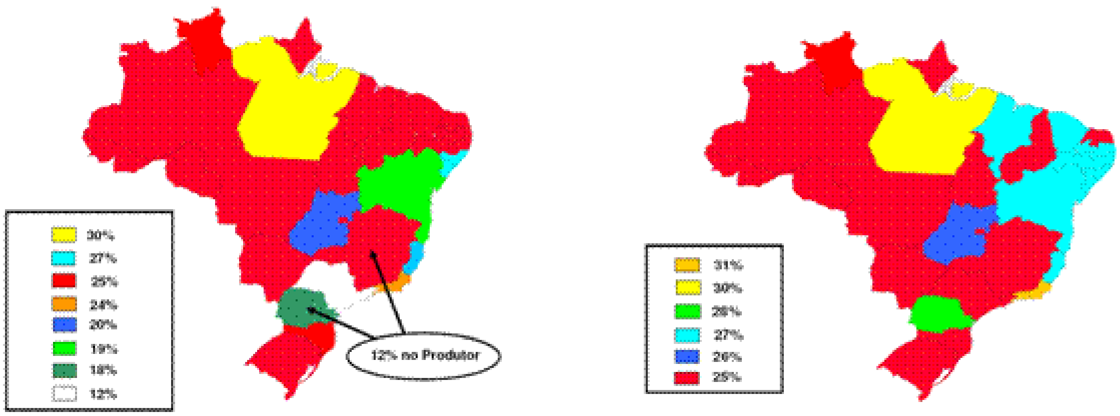
PIS/COFINS (Contribution to the Social Integration Program/Contribution for Financing Social Security) federal taxes are charged together. For gasoline, a cumulative fixed assessment of 9.25 % is charged to the manufacturer upon sale to distributors.

Until 2007, hydrated ethanol (E100), faced a cumulative tax rate of 3.65 percent that was assessed on sales between producers and distributors. An additional 8.20 percent was assessed on sales from distributors to retailers. Provisional Measure #413 from January 2008 mandated that all taxes be charged to producers (and importers) at the rate of 3.75 percent and 17.25 percent PIS and COFINS, respectively. After a long debate, Federal Law #11,727 in affect as of October 2008 replaced Provisional Measure #413 stimulating producers and distributors to adopt a specific tax rate per unit volume ("ad rem"), not to exceed 9.25 percent of the average price of the product at the retail level in the past 12 months. Currently, a contribution value of R$ 0.12/liter is charged for PIS/COFINS (R$ 0.048/liter on producers and R$ 0.072/liter on distributors).

At the state level, there are different tax regimes for the ICMS - tax for services and goods circulation. ICMS varies for ethanol from 12 to 30 percent, with most states charging 25 percent. ICMS for gasoline varies from 25 to 31 percent. In spite of most states charging the same ad valorem levy (25 percent) for both gasoline and ethanol, the state of Sao Paulo has a 12 percent tax rate for E100, against 25 percent for gasoline, which makes ethanol economically competitive with gasoline compared to other states. The graph below shows the different ICMS tax values applied for all Brazilian states, as reported by the Fuels Industry Syndicate (Sindicom).

ICMS - State Tax for Services and Goods Circulation

Ethanol | Gasoline



Source: Sindicom

2.2.4. Credit Line to fund Ethanol Plants Construction

In addition to the ethanol mandate and tax incentives, the National Bank for Social and Economic Development (BNDES) provides specific credit lines to fund renewable energy investments (new mills or the modernization of existing mills) over R$ 10 million (BNDES Finem). BNDES reports that funds are available for up to a limit of R$ 30 billion (approximately US$ 16.7 billion) and that over 100 operations have been approved. Several other credit lines from Nossa Caixa bank and other financial institutions are available fund for purchase of machinery, equipment, and sustainable projects targeting the reduction of Green House Gases (GHG).

2.2.5. Credit Line to fund Ethanol Stocks

In order to avoid sharp price fluctuations in the ethanol market in the future, BNDES established the Sugar-Ethanol Sector Support Program (PASS) establishing a credit line of R$ 2.4 billion at a 9 percent/year interest rate (approximately $1.4 billion) to create ethanol stocks. A similar program was established in 2009 but proved ineffective given the requirements to access the credit line were too strict and many ethanol mills could not meet those requirements

2.2.6. Ethanol Import Tariff

The import tariff applied to ethanol imports is set at 20 percent. However, in April 23, 2010, the GOB temporarily eliminated the tariff, by passing Resolution #21/2010 of the Foreign Trade Chamber (CAMEX)/Ministry of Development, Industry and Foreign Trade (MDIC). The temporarily elimination will be in effect until December 31, 2011.

GOB reports that the elimination of the 20 percent import tariff reflects its position to transform ethanol into a freely traded global energy commodity. Brazil is the largest producer of sugarcane ethanol and largest exporter of ethanol in the world, with 60 percent of global market share.

The import tariff will return to 20 percent as of January 1, 2012, if no further action is taken by GOB.

2.3. Government Support Programs for Biodiesel

2.3.1. The National Biodiesel Production Program (PNPB)

The National Biodiesel Production Program (PNPB) was created in 2004 to promote domestic biodiesel production, to reduce petroleum import dependency, and to lower pollutant emissions and health related costs. In addition, PNPB was established to generate jobs and income and alleviate regional economic disparities by passing on benefits to family farmers, especially those in North and Northeastern Brazil.

The program includes the participation of 14 ministries and the support of the Interministerial Executive Committee (CEI), under the Office of the Presidential Chief of Staff. The Ministry of Mines and Energy (MME) is in charge of the operational management of the PNPB.

Biodiesel includes any "renewable and biodegradable fuel for compression-ignition internal combustion piston engines, derived from vegetable oils or animal fats, which can partially or fully replace diesel oil of fossil origin". The PNPB is non-restrictive, allowing the use of several production technologies (ethanol, methanol).
Trans-esterification is the most commonly used process to produce biodiesel. It is a chemical reaction between a vegetable oil or animal fat and ethanol or methanol in the presence of a catalyzer. The reaction produces biodiesel and byproducts such as glycerin, meal and others, which add value to the biodiesel chain.
Federal Law #11,097, enacted in January, 2005, included biodiesel in the Brazilian energy matrix and delegated authority to the National Agency for Petroleum, Natural Gas and Biofuels (ANP), to regulate and monitor all activities related to biodiesel production, the mandatory blend (Bx), quality control, product distribution and marketing.

2.3.2. Biodiesel use mandate

Federal Law #11,097/2005 defined and established a legal mandate for use of biodiesel as a fuel. The law authorized the use of a two percent blend of biodiesel (B2) until 2008 when B2 became compulsory nationwide, i.e., all mineral diesel must have a two percent biodiesel blend. The Brazilian legislation had also foreseen the increase of the mandatory blend to five percent (B5) by 2013.

However, the rapid increase of the Brazilian industrial capacity and the likely oversupply of biodiesel in the domestic market led the National Council of Energy Policy (Conselho Nacional de Politica Energética- CNPE) to adopt requirements for higher blends. Resolution #2 of March, 2008 set a three percent blend (B3) as of July 2008; Resolution #2 of April, 2009, increased the blend to four percent (B4) as of July 2009 and Resolution #6 of September, 2009, finally set the blend at five percent (B5), as of January 2010. The government has given no indications that the biodiesel blend will be changed in 2011.

2.3.3. Tax Incentives

In order to encourage the production of biodiesel and to promote social inclusion, the GoB initially set federal tax exemptions and incentives, according to the nature of the raw material, size of producer and region of production, as shown in the table below.

Federal Taxes Incentives for Biofuel Production in Brazil (R$/liter)					
Tax Incentive	Biodiesel				Regular Diese
	Subsistence Agriculture North, Northeast regions w/ castor or palm	Subsistence Agriculture	Medium-Large Farmers North Northeast regions w/ castor or palm	All others	
IPI	full exemption	full exemption	full exemption	full exemption	full exemption
CIDE	full exemption	full exemption	full exemption	full exemption	0.07
PIS/COFINS	100% reduction (R$ 0.000)	68% reduction (R$ 0.070)	32% reduction (R$ 0.151)	0.218	0.148
ederal Tax su	100% reduction (R$ 0.000)	68% reduction (R$ 0.070)	32% reduction (R$ 0.151)	0.218	0.218
Source: Government of Brazil, Executive Orders # 5,297/04, 5,298/04 and 5,457/05.					

Executive Orders 6,458 and 6,606 of 2008, as well as MDA Normative Instruction #01 of 2009, altered tax incentives, depending on the production region and raw material used, as described in the following table.

Federal Tax Incentives for Biodiesel Production in Brazil (R$/m3)				
Criterion	**Percentage of Subsistence Agriculture**		**Raw Material**	
Region	North -15% Northeast-30%	Center-West-15% South/Southeast-30%	North, Northeast	Center-West, South/Southeast
Raw Material	All	All	Castor/Palm Oil	All
Federal Taxes	0.00	70.03%	151.50%	177.95%
Reduction PIS/COFONS	100%	89.60%	77.50%	73.57%
Source: Government of Brazil, Executive Orders # 5,297/04; 6,458/08; 6.606/08; Bill 11,116/05 and Nornative Instruction MDA # 01/2009.				

2.3.4. Biodiesel Stocks

ANP Resolutions #45 of 2007, later altered by Resolution #08 and #21 of 2008 mandated that strategic biodiesel stocks be created and managed by mineral diesel producers, namely Petrobras and REFAP, as of January 2008, in order to guarantee the regular supply of the product. The regulations state that strategic stocks should maintain, at all times, at least one month of domestic consumption.

2.3.5. Biodiesel Import Tariff

According to the Secretariat of Foreign Trade, the import tariff applied to biodiesel (NCM 3824.90.29) is set at 14 percent.

2.4. Bioethanol and Biodiesel in the Current Brazilian Energy Matrix

Environmental concerns make energy produced from biomass a key element towards sustainable development. The Ministry of Mines and Energy (MME) has set the increase of biofuels' share in the Brazilian energy matrix as one of the policy directives for the sector.

A key consequence of the former Proalcool program was the inclusion of sugarcane in the energy matrix. In fact, biomass from sugarcane and other sources has represented a significant share in the energy matrix, making Brazil a global leader in the use of renewable fuels, even with the decline of the program in the nineties.

The table below shows the evolution of energy generation in million metric tons, petroleum equivalent (tpe), by sugarcane derivatives (ethanol and burning of bagass) as well as the share they represent in the energy supply matrix, as reported by MME, since the mid-nineties.

Energy Generation by sugarcane derivatives (million tpe, %)							
Year	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Sugarcane derivatives	23.4	26.0	25.2	24.6	19.9	22.8	25.3
Share - %	19	20	18	17	13	15	14
Year	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Sugarcane derivatives	28.4	29.4	30.2	32.8	37.9	42.9	44.0
Share - %	14	15	14	15	16	17	18
Source: Ministry of Mines and Energy, MME							

Recent data reported by the MME, show that the domestic supply of energy in 2009 was 243.7 million metric tons petroleum equivalent (tpe), a 3.5 percent decrease compared to 2008 (252.6 million tpe). The drop is related to a slowdown in overall Brazilian economic activity, due to the world financial crisis that began in October 2008. The strong domestic demand for goods and services partially offset the poor performance of the metallurgical and mining industries, especially with regard to steel and aluminum production and iron ore exports. The table below shows the Brazilian energy supply, according to MME.

Brazilian Energy Supply (million TPE)				**Variation**	**Structure**
Type/Year	**2007**	**2008**	**2009**	**08/09**	**2009**
Non-Renewable Energy	129.103	136.615	128.726	-5.8%	52.8%
Petroleum and derivatives	89.239	92.410	92.263	-0.2%	37.9%
Natural Gas	22.199	25.934	21.329	-17.8%	8.8%
Mineral Coal and derivatives	14.356	14.562	11.706	-19.6%	4.8%
Uranium (U3O8) and derivatives	3.309	3.709	3.428	-7.6%	1.4%
Renewable Energy	109.656	115.980	114.953	-0.9%	47.2%
Hydraulic and Electric Energy	35.505	35.412	37.036	4.6%	15.2%
Log Wood and Vegetal Coal	28.628	29.227	24.610	-15.8%	10.1%
Sugarcane derivatives	*37.847*	*42.866*	*43.971*	2.6%	18.0%
Other Renewable sources 1/	7.676	8.475	9.336	10.2%	3.8%
Total Energy Supply	238.759	252.595	243.679	-3.5%	100.0%
Source: National Energetic Balance. TPE = Ton Petroleum Equivalent. 1/ Other renewable sources					

include biodiesel, eolic and lixivium for cellolosic production.

Brazil remains the worldwide leading supplier of energy from renewable sources. In spite of the relative stable supply in 2009 (114.8 million tpe) compared to 2008 (115.9 million tpe), the share of renewable energy in the Brazilian energy matrix increased from 45.9 percent in 2008 to 47.2 percent in 2009. This was largely due to the increased supply of energy from biomass. In 2009, biomass (log wood and vegetal coal, sugarcane derivatives, wind energy and biodiesel) contributed 77.9 million tpe or 32 percent of the energy supply matrix largely due to higher production of energy from sugarcane and biodiesel. Sugarcane derivatives (ethanol and bagass) contributed approximately 44 million tpe as follows: 13.5 million tpe for ethanol and 30.5 million tpe for bagass.

Renewable sources comprise 47.2 percent of the Brazilian energy supply, whereas they represent only 7.2 percent of the total for the Economic Cooperation and Development (OECD) countries.

MME also reports that the total domestic consumption of energy in 2009 was 220.9 million tpe, a 2.4 percent decrease compared to 2008 (226.4 million tpe), due to lower industrial activity. Industrial use (76.8 million tpe) and transportation (62.7 million tpe) represent the largest shares of energy use with 34.8 and 28.4 percent of the total, respectively.

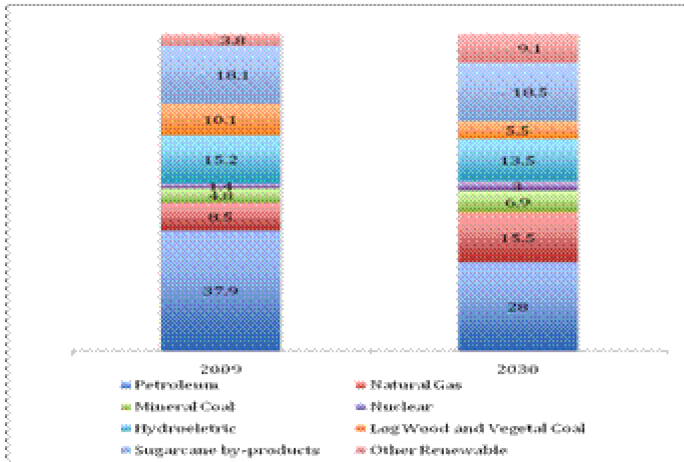
The table below shows the Brazilian electric energy supply matrix as reported by MME. Hydroelectric energy remains the supreme source of electric energy making up to 77 percent of total supply. Energy from biomass has steadily grown in the past years and represented the second largest source in 2009 (23.9 TWh, a 15 percent increase compared to 2008).

Electric Energy Supply Matrix (GWh)			
Source	**2008**	**2009**	**Variation**
Hydroelectric	369,556	390,988	5.8%
Nuclear	13,969	12,957	-7.2%
Natural Gas	28,778	13,332	-53.7%
Mineral Coal	6,206	5,214	-16.0%
Petroleum Derivatives	15,628	12,724	-18.6%
Biomass 1/	20,681	23,877	15.5%
Industrial Gas	8,301	7,066	-14.9%
Imports	42,211	39,666	-6.0%
Total	505,330	505,824	0.1%
Source: MME, Balanco Energético Nacional, 2009. 1/ Includes 1,183 and 1,238 GWh of wind energy in 2008 and 2009, respectively.			

In May 2010, the Secretariat of Energy Planning and Development (MME/SPE) released the National Energy Policy Directives and Priorities for the Energy Expansion Decennial Plan 2010/2019 (PDE-2019). The diversification of the energy matrix with the use of alternative sources such as biomass and wind energy is included among the many directives. PDE-2019 projects that by 2030, the Brazilian energy supply will increase to 557 million tpe, up 313 million tpe from 2009. The graph below shows the share in percentage of different energy sources as predicted by PDE-2019 in 2030 compared to 2009. Sugarcane derivatives and other renewable sources such as biodiesel and wind energy are forecast at

27.6 percent of the total supply, up 5.7 percentage points compared to 2009 (21.9 percent).

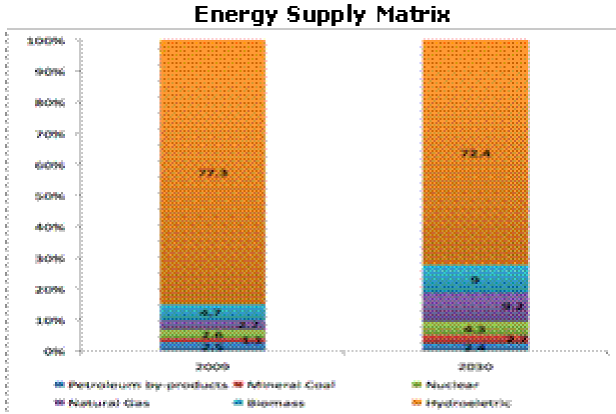
Share of Different Energy Sources in the Energy Supply Matrix



Source: MME/SPE, PDE-2019

PDE-2019 also projects that the electric energy supply will increase to 1,195 TWh in 2030, from 506 TWh in 2009. The share of electric energy from biomass is projected to increase from the current 4.7 percent to 9 percent in 2030. The graph below illustrates the forecast for electric energy supply for 2030 compared to 2009, as reported by MME.

Share of Different Energy Sources in the Electric Energy Supply Matrix



Source: MME/SPE, PDE-2019

Sugarcane products usually represent 60 to 70 percent of the biomass used to generate electricity. According to preliminary data from MME, the sugarcane sector generated 14.1 TWh in 2009 (8.2 TWh for self-consumption and 5.9 TWh sold to the grid), up 2.1 TWh from 2008 (7.6 TWh for self-consumption and 4.4 TWh sold to the grid).

Approximately 90 percent of the domestic electric energy supply is represented by renewable sources, whereas they represent only 16 percent of the total for the Economic Cooperation and Development (OECD) countries.

Brazil ranks first in the use of ethanol and biodiesel to power all domestic means of transportation. MME reports that the share of bioenergy in the energy for transportation matrix increased from 15 percent in 2007 to 18 percent in 2008 and 18.8 percent in 2009.

2.5. Environmental Sustainability Programs

The main purpose of using biofuels is grounded in the replacement of oil derivatives, thus reducing the dependency on fossil fuels and reducing green house gases (GHG) emissions. Brazil has a comfortable position in this regard, due to the vast use of hydraulic energy and the increasing use of biomass in the Brazilian energy matrix. MME reports that the use of renewable sources of energy have resulted in lower indicators for carbon dioxide (CO2) emissions (1.4 metric tons CO2/tpe of energy supply in 2009) compared to those from the Organization for Economic Cooperation and Development (OECD) countries (2.37 metric tons CO2/tpe of energy supply in 2007)

MACEDO [3] *et al* (2008) studied the energy and GHG emission balances for sugarcane for the 2005/06 crop for 44 mills in the center-southern region of Brazil and concluded that for each fossil energy unit used to produce sugarcane ethanol, 9.3 renewable energy units are produced as ethanol and surpluses of electric power and bagass. By 2020, the ratio between energy production and energy consumption is expected to increase to 11.6, as shown below.

Energy Balance Component	**2005/2006**	**2020 Scenario**
Sugarcane production and transport	210.2	238.0
Bioethanol production	23.6	24.0
Fossil Input (total)	233.8	262.0
Bioethanol	1,926.0	2,060.0
Bagasse surplus	176.0	0.0
Electricity surplus	82.8	972.0
Renewable Output (total)	2,185	3,032.0
Energy Production/Consumption		
Bioethanol + bagass	9.0	7.9
Bioethanol + bagass + electricity	9.3	11.6
Source: Macedo (2008)		

The study also shows that anhydrous ethanol used in 25 percent gasoline blends (E25) results in a net GHG emission reduction of approximately 1,900 kg CO2 eq/m3 of ethanol for 2005/06 and that it could potentially reach 2,260 kg CO2 eq/m3 of ethanol by 2020. The net increase in emissions reduction is associated with to the use of bagass and electricity surpluses and net emissions avoided, as shown in the following table. Even if aforementioned results were taken from a sample of approximately 10 percent of the mils in operation and the energy and GHG balances vary depending on agricultural and industrial parameters, it is cleqar that ethanol from sugarcane provides high environmental sustainable benefits.

Net emissions from sugarcane bioethanol production and use in Brazil ($kg CO_2eq/m^3$)					
	2005/2006		**2020 Scenario**		
Form of bioethanol use	E100	E25	E100	E100-FFV*	E25
Bioethanol/Soil Emissions	417	436	330	330	345
Avoided Emissions	-2,181	-2,323	2,763	-2,589	-2,930
Use of surplus biomass	-143	-150	0	0	0
Electricity surplus	-59	-62	-784	-784	-819
Use of bioethanol	-1,979	-2,111	-1,979	-1,805	-2,111
Net emissions	-1,764	-1,886	-2,433	-2,259	-2,585
Source: Macedo et al. (2008) . *FFV = Flex Fuel Vehicles.					

2.5.1. The Climate Change National and State Policies

Federal Law *12,187/2009* of December, 2009 sets the National Climate Change Policy (Politica Nacional sobre Mudança do Clima – PNMC) defining broad objectives to reduce gas emissions. According to PNMC, Brazil will voluntarily take actions to reduce GHG and other pollutant emissions between 36.1 and 38.9 percent by 2010 from 2010 values. To achieve the aforementioned targets GoB has developed several strategic plans in different areas and sectors, including an increase in the use of biofuels.

The state of São Paulo has also set a target to reduce GHG emissions: a 20 percent drop in CO2 emission by 2020 relative to 2005, as defined in the State Climate Change Policy (Sao Paulo State Law 13.978 from November 9, 2009).

2.5.2. Land Use Policies: Sugarcane Agri-ecological Zoning ("ZAE Cana")

In September 2009, MAPA launched the Sugarcane Agroecological Zoning (ZAE Cana) to promote sustainable sugarcane growth and development, while preserving the environment. ZAE Cana is a thorough study of all Brazilian geographical regions, taking into accounts not only soil and weather patterns, but also environmental, economic and social aspects, to guide the sustainable development of the industry.

MAPA's agricultural crop zonings have been commonly used by financial agents to provide credit to growers. The Ministry has forwarded ZAE Cana to Congress for passage. If approved, it will provide strict guidelines to grant financing to the sector, as follows:

- Exclusion of lands with native vegetation - prohibiting the cultivation of sugarcane in areas were native vegetation prevails;
- Exclusion of lands for cultivation in the Amazon and the Pantanal biomes, as well as in the Upper Paraguay River Basin;
- Identification of areas with agricultural potential without the need for irrigation;
- Identification of lands with slope under 12 percent, thus allowing the use of machinery for harvesting and therefore, avoiding the burning of the leaves and reducing CO_2 emissions;
- Respect for food security, e.g.; MAPA will guide the expansion of sugarcane production in order to avoid any risk of food supply and food security;
- Prioritazion of degraded areas and pastures, e.g.; if the Bill is approved, public and credit policies will prioritize sugarcane expansion in suitable degraded pasture areas (over 34 million hectares, as identified by ZAE Cana).

The agroecological zoning takes into account different levels of suitability and land use as shown in the table below. According to the ZAE Cane, Brazil has a total of 64.7 million hectares suitable for sugarcane expansion and approximately 53 percent of this total is represented by medium and high suitable pasture lands. Note that the zoning includes potential areas for sugarcane expansion, therefore, not including sugarcane areas already developed.

Summary Table: Sugarcane Agri-ecological Zoning ("ZAE Cana")		
Territory or Estimated Area	**Million (ha)**	**Percentage Related to the National Territory**
National Territory IBGE[1]	851.5	100%
Agricultural lands	553.5	65%
Land in use 2002 (Probio Esimate)[2]	235.5	27.7%
Environmentally restricted areas (including the Amazon and Pantanal biomes and Paraguay River Basin)	694.1	81.5%
Suitable areas that are currently being used for agricultural and livestock production	64.7	7.5%
Suitable areas that are currently being used for pasture (high and average suitability)	34.2	4.0%
Area currently cultivated with sugarcane 2008/2009 harvest[3]	7.8	0.9%
Expansion of sugarcane production foreseen for 2017[4] (EPE)	6.7	0.8%
Source: Ministry of Agriculture, Livestock and Supply (MAPA) [1] – IBGE – Brazilian Institute of Geography and Statistics [2]- PROBIO – Activity of the Program for Conservation and Sustainable Use of the Brazilian Biological Diversity [3]- Source: Conab, 2009 [4]- Adapted from the Energy Research Company (EPE) estimate, 2008		

The following map shows the geographical distribution of the potential land for sugarcane expansion, as well as the exclusion of the the Brazilian native biomes.

According to the ZAE Cane, Brazil currently cultivates roughly 1 percent of the total land (7.8 million hectares in 2008/09). The study shows that even if sugarcane production doubles by 2017, only 1.7 percent of the total Brazilian land would be used. The table below summarizes the major results for land use according to ZAE Cane.

	Classes of Suitability	Suitable Areas Given Type of Land Use by Class of Suitability (ha)				
		Al	**Ag**	**Ac**	**Al+Ag**	**Al+Ag+Ac**
Total Areas for Brazil	**High (H)**	11.3 mi	600 th	7.3 mi	11.9 mi	19.2 mi
	Medium (M)	22.8 mi	2.01 mi	16.3 mi	24.8 mi	19.2 mi
	Low (L)	3.04 mi	483 th	731 th	3.5 mi	4.2 mi
	H+M	34.1 mi	2.6 mi	23.7 mi	36.7 mi	60.4 mi
	H+M+L	37.2 mi	3.09 mi	24.4 mi	40.3 mi	64.7 mi

Source: Ministry of Agriculture, Livestock and Supply (MAPA)
Caption: Al: areas used with livestock; Ag: areas used with agriculture and livestock; Ac: areas used with agriculture; Mi: million; Th: thousand

In addition to the Brazilian ZAE-Sugarcane, the state of Sao Paulo, major sugarcane grower in Brazil has set also set the Sao Paulo Agri-Environmental Zoning for the suga-ethanol sector defining areas suitable and not suitable for sugarcane production based on sound and restrictive land use variables.

2.5.3. Environment License

Ethanol plants must have an environmental license to operate. The environmental license is defined by the Environment National Policy (Law # 6,938/1981) which sets the regulations, conditions, restrictions and environmental control measures with which mill owners must comply. An environment impact report (EIA/RIMA) is also part of requirements to obtain the license. The sugar-ethanol industry is regulated by the Environment National Council (Conama) Resolutions #01/86, 06/86, 09/87, 13/90, 237/97 and 289/01. The biodiesel industry is regulated by the Petroleum, Natural Gas and Biofuels Agency (ANP) according to ANP Resolution #41/2004. An environment impact report (EIA/RIMA) may not be required depending on the place the plant will be settled.

As opposed to ethanol plants, biodiesel plants are not required to provide an environment impact report to obtain the authorization for operation. ANP is responsible for providing the authorization for production and commercialization for all biodiesel plants operating in Brazil.

2.5.4. Legislation on Sugarcane Burning

Federal Decree 2,661 from July 1998, followed by the state of Sao Paulo Law 10,547 in 2000, reformulated by Law #11,241 in September 2002 provide different schedules for banning sugarcane burning both in Brazil and the state of Sao Paulo, respectively. They also refer to specific areas where sugarcane burning is categorically prohibited such as protected ranges, adjacent of urban areas, highways, railways, airports, forest reserves and preservation units. The table below shows the burning reduction schedule for both Sao Paulo state and Brazil.

State Decree (São Paulo) 2002			**Federal Law 1998**		
Year	**Flat Areas[1]**	**Hilly Areas[2]**	**Year**	**Flat Areas[1]**	**Hilly Areas[2]**
2002	20%	-	-		
2006	30%	-	**2003**	25%	-
2011	50%	10%	**2008**	50%	-
2016	80%	20%	**2013**	75%	-
2021	100%	30%	**2018**	100%	-
2026	-	50%	-	-	-
2031	-	100%	-	-	-

Source: Macedo, I.C.. Sugarcane's Energy (2005).
[1] Area where mechanical harvesting is possible: tilt < 12%
[2] Area where mechanical harvesting is not possible: tilt > 12%

According to the federal decree, by 2018, sugarcane burning will be prohibited in areas where mechanization is possible (slope lower than 12 percent). The decree does not have a say on hilly non-mechanized areas (slopes over 12 percent), but it is expected that overtime those hilly areas will lose competitiveness to mechanized and burn free areas, therefore, forcing the migration of production to more competitive land.

The state of Sao Paulo law determines that by 2021, sugarcane burning will be prohibited in areas where mechanization is possible (slope lower than 12 percent; and that by 2031, all hilly and non-mechanized cultivated areas must eliminate the burning of the cane stocks.

However, in July 2007, the Sao Paulo State Secretariats of Environment and Agriculture and Supply and the Sugar and Ethanol Millers Association (UNICA) signed a cooperation protocol called "Agri-Enviromental Protocol" committing themselves to eliminate the burning by 2014 and 2017 for mechanized and non-mechanized areas, respectively.

According to UNICA, roughly 50 percent of the Brazilian sugarcane crushed in Brazil has already been mechanically harvested without burning. The remaining feedstock is still burned and manually picked.

2.5.5. Oilseeds Agri-ecological Zoning

The Ministry of Agriculture, Livestock and Supply (MAPA) has conducted the agri-ecological zoning of different oilseeds such as cottonseed, peanuts, canola, palm oil, sunflower, castor oil and soybeans. The zoning will determine the most suitable areas as well as most appropriate period of the year for planting the aforementioned oilseeds, to avoid losses due to weather adversities. Financial and insurance agencies use the zoning to provide credit.

2.6. Social/Economic Sustainability Programs

2.6.1. Bioethanol

Agriculture accounts for 20 percent of the labor force. The sugar/ethanol industry employs about 1 million people, (511,000 in agricultural activities and 489,000 in the sugar/ethanol industry).

As a consequence of the fade out program to abolish sugarcane burning, the harvest of the feedstock will be mechanized, thus eliminating labor in the fields. UNICA has set partnership with several companies and has provided professional training to sugarcane cutters, therefore improving their skills and abilities to perform more complex functions. The program will ultimately enable the migration of current sugarcane labor to other sectors of the economy. The project RenovAção, led by Unica, is a step further to assist sugarcane laborers and it targets the professionalization of 7,000 workers per year in the state of Sao Paulo.

2.6.2. Biodiesel "Social Fuel Stamp"

Under the National Biodiesel Production Program (PNPB), the biodiesel Social Fuel Stamp is a mechanism created by the government to provide incentives for poorer farmers (family farmers) in disadvantaged areas. Resolution #1 and #2 of 2005 set by the Ministry of Agrarian Development - MDA state that biodiesel producers must comply with the following requirements to obtain the stamp:

- Purchase minimum raw material percentages from family farmers;
- Guarantee the purchase of available quantities;
- Set contracts with farmers, provide technical assistance and training.

The minimum percentages that must be purchased from family farmers vary according to region and are currently set at 30 percent for the Northeast, Southeast and Southern regions; 10 percent for the Center-West and North for the 2009/10 crop and 15 percent for the Center-West and North for the 2010/11 crop (Resolution #1 of February, 2009).

Biodiesel producers with the "Social Fuel Stamp" are eligible for tax incentives as described in **Section 2.3.3 – Tax incentives**, better credit terms, and classification as a socially friendly company.

2.7. Biofuels Specifications and Vehicle Efficiency

Ethanol can be used as fuel in Otto cycle engines (spark-ignition internal combustion) in two distinct ways: (1) in gasoline and anhydrous ethanol blends; (2) as pure ethanol, usually hydrated ethanol. ANP Resolution #36/2005 sets the specifications for both types of ethanol. According to that resolution, anhydrous ethanol must contain less than 0.6 percent of water by mass, whereas for hydrated ethanol the content must be between 6.2 and 7.4 percent.

Hydrated ethanol must be used in engines adapted or manufactured specifically for this purpose, e.g., with higher compression ratios, thus allowing the use of the higher octane rating relative to gasoline. Gasoline powered cars which compulsorily includes 20 to 25 percent of anhydrous ethanol also required some engine modifications. In 2003, the flexible or flex-fuel vehicles were introduced to the market with the incorporation of electronics in advanced systems that control fuel-air mixing and ignition.

Flex-fuel engines are able to use gasoline (with 20 to 25 percent anhydrous ethanol), pure hydrated ethanol or any proportion of theses two fuels. The table below shows the necessary modifications for different ethanol contents in gasoline, according to Joseph Jr. [4] (2005).

	Changes to a pure gasoline vehicle											
% of bioethanol in gasoline	Carburetor	Fuel Injection	Fuel Pump	Fuel Filter	Ignition System	Fuel Tank	Catalytic Converser	Basic Engine	Engine Oil	Intake Header	Exhaust System	Cold-start System
≤5%	Any vehicle											
≤ 10%		Vehicles produced from 1990 on										
≤ 25%	Brazilian gasoline vehicle											
≥ 85%	Flexible Vehicle used in the USA and in Canada											
≥ 85%	Flexible Vehicle used in Brazil											
Source: Joseph Jr., H. Ethanol Fuel: Vehicular application technology. São Paulo. Anfavea, Energy and Environment Division, 2005.												
No changes are necessary				Changes are probably necessary								

ANP Resolution #7 of March, 2008 sets the norms and specifications for all biodiesel produced and marketed by authorized agents. The Brazilian Vehicle Manufacturers Association (ANFAVEA) has committed itself to upholding diesel engine warranties with the 5 percent biodiesel blend (B5) within ANP's specifications. Fuel, engine and emissions tests under the coordination of the Science and Technology Ministry (MCT) have shownо need for any adaptation in the diesel engines.

2.8. Biofuels Research and Development Programs

In 2005, the federal government released the Bio-energy Policy Directives 2006-2011 ("Diretrizes da Politica de Bioenergia 2006-2011") aiming to consolidate Brazil as a global leader in biofuels research and development, including the following objectives:

- consolidation of the country's leadership in conventional or first generation biofuels and;
- development of advanced biofuels;
- development of agri-biotechology (seeds and enzymes);
- development of biochemical and "green chemistry products (biorefinery) such polymers , resins, etc.

In June 2006, MAPA released the Brazilian Agri-energy Plan, which establishes a framework for public and private actions related to bioenergy fields, based on the Bio-energy Policy Directives. The specific goals include:

- changing the energy matrix towards sustainabity;
- increasing the share of agri-energy in the energy matrix;
- promoting the regional development through expansion of agriculture focused on bioenergy and adding value to the production chain;
- creating job opportunities;
- increasing income generation;
- reducing green-house gas emissions;
- reducing petroleum imports;
- increasing biofuels exports.

A key strategic action of the plan was the creation of Embrapa Agri-energy Research Center focusing on technology transfer and investment in biofuels research projects. The Brazilian Agricultural Research Corporation (Embrapa) is MAPA's equivalent to USDA's Agricultural Research Service and is Brazil's largest agricultural research entity.

Embrapa has been a major research entity for basic crops, many of them related to agri-energy such as castor beans, soybeans and palm kernel, which are currently, or may become, inputs into biofuels, particularly biodiesel production. Traditionally, Embrapa had not played a role in sugarcane development, major source for biofuels production. The creation of Embrapa Agri-energy will close this gap.

Embrapa Agri-energy has set the following strategic mid-term priorities:

A. Development of new energy technologies (ethanol from cellulose, products of bio-refinery, hydrogen)

- enzymatic pathway for ethanol from lignocellosic materials;
- enzymes, fungi, bacteria and catalysts for energy production;
- R&D focusing on the concept of bio-refinery.

B. Development of technologies for economical use of by-products and residues

- economical use of meals, glycerin and by-products of biodiesel production
- economical use of by-products from the charcoal industry for the production of biofertilizers and biopesticides;
- economical use of residues and by-product from conventional and advanced biofuels production processes.

In addition to the newly created Embrapa Agri-energy, several other Brazilian public (federal and state levels) and private institutions have been working on biofuels research to provide sound technology for the sector. During the last decades, emphasis was placed on feedstock development, more specifically sugarcane, with regard to genetics improvement, agricultural mechanization, management, biological pest control, recycling of waters and better conservation practices. Agricultural yields increased from 65 to 85 metric tons of sugarcane per hectare from 1975 to 2010, and industrial yields increased from 4,550 liters of ethanol to 6,800 liters per hectare during the same period.

The oldest state funded institution is the Agronomical Institute of Campinas (IAC) which has worked with sugarcane since 1892. Today, IAC runs the program ProCana for genetic improvement of sugarcane varieties among other important research and development programs.

In 1990, the Agricultural Science Center of Sao Carlos Federal University (Universidade Federal de Sao Carlos – UFSCar) inherited the former National Program for Sugarcane Improvement (Planalsucar) which provided significant contributions during the Proalcool program. In 1991, a group of universities created the Inter-University Network for the Development of the Sugar-Alcohol Sector (Ridesa) to provide continuity to former Planalsucar research programs.

Undoubtly, the Sugarcane Technological Center (CTC) located in Sao Paulo state remains the leading research center for sugarcane, sugar and ethanol in Brazil, responsible for over 70 percent of all research and development related to the sugar-ethanol-energy sector in the country. CTC is a private institution that has worked in this field for over 40 years. The more than 200 associates are located throughout Brazil providing CTC a unique opportunity to establish field trials and develop projects in varied locations with distinct soil, topography and weather.

About 70 CTC sugarcane varieties account for over 50 percent of the total area planted to sugarcane in Brazil. The institution's research projects include the entire sugarcane production chain, from the field to industry. Projects include not only breeding programs, but also crop management, industrial and agricultural mechanization, sugar and ethanol production, biomass power generation and development of biodegradable plastics. With regard to the use of biotechnology, CTC has been conducting research since 1990.

During 1998-2001, the research Support Foundation of the State of Sao Paulo ("Fundacao de Amparo a Pesquisa do Estado de Sao Paulo" – FAPESP) funded the Sugarcane Genome Project ("Projeto Genoma Cana de Acucar") to sequence sugarcane's over 50,000 genes. Based on the results, several Brazilian institutions have been working on advanced biotechnological methods to identify sugarcane clones with superior resistance to disease, sucrose content, biomass content, and other advanced trails.

In 2007, FAPESP issued a document identifying biofuels research as one of the institution's priorities for the next 5-10 years. FAPESP has supported hundreds of research and development activities including universities and private companies such as Dedini and Brasken. The Dedini agreement includes R$ 100 million for research projects on technologies for biofuels production. The agreement with Brasken includes R$ 50 million for synthesis-process research using renewable raw material derived from sugars, bioethanol and other biofuel chain products, with emphasis on "green polymers".

CanaVialis and Allelyx are two private companies working on research focusing on improving transgenic varieties, e.g., inserting genes from different varieties into the sugarcane genome to obtain more productive varieties. In December 2008, Monsanto acquired both companies formely controlled by Votorantin Holding.

2.9. The Biofuels Memorandum of Understanding

On March 9, 2007, the Presidents of the United States and Brazil signed a Memorandum Of Understanding (MOU) expressing their intention to cooperate on the development of a global biofuels industry through a three-pronged approach.

I. Bilateral: The Participants intend to advance the research and development of next generation biofuels technology;

II. Third Countries: The Participants intend to work jointly to bring the benefits of biofuels to select third countries through feasibility studies and technical assistance aimed at stimulating private sector investment in biofuels. The Participants intend to begin work in Central America and the Caribbean to encourage local production and consumption of biofuels, with a view to continue joint work in key regions across the globe.

III. Global: The Participants desire to expand the biofuels marketplace through cooperation on the establishment of uniform standards and codes.

Following the MOU, several actions have been taken such as the on-going technical exchanges between the U.S. National Renewable Energy Lab (NREL) and Brazil's Petrobras/Research Center CEPES and the Bioethanol Science and Technology Center (CTBE) located in Campinas, state of Sao Paulo. These collaborative exchanges have addressed biofuels matters such as lifecycle greenhouse gas emission reductions and energy yield. Brazil and the United States have also steadily cooperated to promote the development of biofuels industries and policies in Central American and African countries.

[1] Leite, A.D.. A Energia do Brasil, 2007. Elsevier Editora, Brazil.
[2] Leite, A.D.. A Energia do Brasil, 2007. Elsevier Editora, Brazil
[3] MACEDO, I.C. et. Al. "Greenhouse gases emissions in the production and use of ethanol from sugarcane in Brazil: the 2005/06 averages and a prediction for 2020". *Biomass and Bioenergy*, v. 32 (4), 2008.
[4] Joseph Jr., H. Ethanol Fuel: Vehicular application technology. São Paulo. Anfavea, Energy and Environment Division, 2005.

Bioethanol and Biodiesel:

3. Conventional Bioethanol

Conventional bioethanol is defined as first generation ethanol derived from sugars and starches used to transport fuels as a substitute for fossil fuels. Bioethanol is an alcohol made by fermenting the sugar components of plant materials such as corn and wheat starch, sugarcane, sugarbeet, sorghum, and cassava.

3.1. Brazilian Bioethanol Production, Supply and Demand (PS&D) Table

Sugarcane remains the exclusive source of feedstock for bioethanol production in Brazil. The tables below show the Brazilian bioethanol supply and demand (PS&D) spreadsheets for "**All Uses**" and "**Fuel Use Only**" for calendar years 2006 through 2011. Several remarks must be made in order to build the aforementioned tables - see ***Notes on Statistical Data – Bioethanol*** **(*Section 6.1.*)**.

ATO/Sao Paulo has historically reported all figures related to the sugar-ethanol industry in marketing years (MY) and, therefore, made all necessary adjustments to convert from marketing to calendar years. The Brazilian official marketing year for sugarcane, sugar and ethanol production, as determined by the Brazilian government, remains May-April for the center-southern producing states, although sugarcane crushing has started as early as

March in the past couple of years. The official marketing year for the North-Northeast is September-August.

Note: ***no Brazilian authority official or trade source maintains production figures on use "for fuel" or "other uses".*** All bioethanol production figures are solely reported as hydrated and anhydrous volumes. According to post contacts, ethanol plants produce different specifications of hydrated and/or anhydrous, but make no distinction between fuel/other uses. The use for fuels/other uses (industrial, refined or neutral) are determined at the consumer level.

Total Conventional Bioethanol Production, Supply & Demand - All Uses (million liters)						
CY	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Begin Stocks	2,743.0	3,373.2	4,828.6	5,730.2	4,847.3	7,137.3
Production	17,782.0	22,556.9	27,103.2	26,934.1	30,500.0	32,500.0
Imports	0.1	4.1	0.5	4.4	1,000.0	1,050.0
Fuel	0.0	0.0	0.0	0.0	0.0	0.0
Other Uses	0.1	4.1	0.5	4.4	1,000.0	1,050.0
Total Supply	17,782.1	22,561.0	27,103.7	26,938.5	31,500.0	33,550.0
Exports	3,428.9	3,532.7	5,124.0	3,296.5	2,500.0	3,200.0
Fuel	2,444.8	1,932.4	3,043.7	1,117.5	700.0	1,200.0
Other Uses	984.1	1,600.3	2,080.3	2,179.0	1,800.0	2,000.0
Consumption	13,723.0	17,573.0	21,078.0	24,525.0	26,710.0	27,520.0
Fuel	12,698.0	16,203.0	19,600.0	22,800.0	24,950.0	25,700.0
Other Uses	1,025.0	1,370.0	1,478.0	1,725.0	1,760.0	1,820.0
Ending Stocks	3,373.2	4,828.6	5,730.2	4,847.3	7,137.3	9,967.3
Production Capacity (Conventional Fuel)						
No. of Biorefineries	352	377	407	426	436	441
Capacity	27,500	32,540	38,300	35,600	40,100	42,800
Feedstock Use (1,000 MT)						
Sugarcane	215,196	269,645	334,729	357,061	378,968	403,572
Source: Prepared by ATO/Sao Paulo based on MAPA, SECEX, Datagro, ANP, UNICA and several industry sources. Numbers for 2010 and 2011 are estimates.						

Total Conventional Bioethanol Production, Supply & Demand - Fuel Use Only (million liters)						
CY	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Beginning Stocks	2,386.3	3,016.4	4,467.7	5,368.9	4,481.5	5,771.5
Production	15,772.9	19,586.6	23,544.9	23,030.2	26,940.0	28,680.0
Imports	0.0	0.0	0.0	0.0	0.0	0.0
Exports	2,444.8	1,932.4	3,043.7	1,117.5	700.0	1,200.0
Consumption	12,698.0	16,203.0	19,600.0	22,800.0	24,950.0	25,700.0
Ending Stocks	3,016.4	4,467.7	5,368.9	4,481.5	5,771.5	7,551.5
Production Capacity (Conventional Fuel)						
No. of Biorefineries	352	377	407	426	436	441
Capacity	24,393	28,255	33,272	30,440	35,419	37,769

Feedstock Use (1,000 MT)						
Sugarcane	190,882	234,138	290,783	305,307	334,734	356,137
Source: Prepared by ATO/Sao Paulo based on the "Bioethanol Production, Supply and Demand - All Uses" table. Numbers for 2010 and 2011 are estimates.						

3.2. Production

A. Production Estimates

The Agricultural Trade Office (ATO)/Sao Paulo forecasts 2011 total bioethanol production at 32.5 billion liters, up 2 billion liters from the 2010 estimate (30.5 billion liters). Ethanol for fuels production is forecast at 28.68 billion liters for 2001, up 6 percent from the estimated figure for 2010 (26.94 billion liters).

Post projections are based on industry sources. To be in accordance with the actual feedstock production cycle, the following narrative describes sugarcane and ethanol production in marketing years (MY). Note that all necessary adjustments were made to covert production figures from MY to calendar years.

The ATO/Sao Paulo estimate for total sugarcane production for MY 2010/11 (May-April) remains unchanged at 660 million metric tons (mmt), up 9 percent from previous crop (603 mmt). Gain Report # BR10002 - Brazilian Sugar Annual Report, April 10, 2010 - includes a comprehensive overview for Brazilian sugarcane production.

The center-south (CS) region is expected to harvest 596 mmt of sugarcane, up 10 percent from the previous crop, primarily due to the large volume of sugarcane left in the fields and good weather conditions supporting crop development; and secondarily, due to area expansion from new mills. The North-Northeastern (NNE) production is forecast at 64 mmt, up 2 mmt from 2009/10.

Total sucrose (total reducing sugar – TRS) content diverted for sugar and ethanol production for MY 2010/11 remains unchanged at 44.65 and 55.35 percent, respectively, as opposed to 43.5 and 56.5 percent for the previous crop. Although, a higher volume of sugarcane is likely to be destined to ethanol production to guarantee the domestic supply, sugar production will likely increase to supply export markets.

Based on the aforementioned sugar/ethanol breakdown, Post estimates total ethanol production for MY 2010/11 at 29.4 billion liters (8 liters of anhydrous and 21.4 billion liters of hydrated ethanol), up 3.7 billion liters relatively to 2009/10 (7 billion liters of anhydrous and 18.7 billion liters of hydrated ethanol).

It is still too early to project MY 2011/12 production figures. More precise numbers should be available in the first quarter of 2011 with the development of feedstock from new sugarcane plantings and recovery from current harvested areas; e.g., sugarcane from second, third, fourth, fifth and older cuts; as well as projections for sugar and ethanol demand both the domestic and international markets. The current production forecast is based on the assumption that regular weather conditions will prevail throughout the sugarcane production cycle.

Post projects sugarcane production for MY 2011/12 at 685 mmt, a four percent increase vis-à-vis the current crop. The pace of area expansion in the CS is likely to be lower than previous years. The CS is expected to produce 620 mmt, as a result of the completion of investments from new projects since 2006/07 and to a minor extent, due to investments in new areas from five potential new projects that should start running in 2011, as reported by UNICA. NNE sugarcane production should remain stable at 65 mmt.

USDA forecasts show that the sugar production in India should increase to 24.7 mmt for MY 2010/11 (October-September), a 27 percent increase compared to the current crop. India should become net exporter, therefore regaining some market from Brazil. Therefore, the Brazilian sugar production for MY 2011/12 should be negatively affected by the expected increased production in India.

The domestic demand for ethanol should remain attractive and consequently, ehtanol production levels will rely on the price relationship between ethanol and gasoline at the pump (see section 3.3 Consumption below). Based on the aforementioned assumptions and industry information, ATO/Sao Paulo projects that total Brazilian ethanol production for MY 2011/12 should increase by 7 percent, totaling 31.5 billion liters at the expense of sugar production which will remain similar to MY 2010/11 or even decrease marginally.

UNICA has made a long-term projection for sugarcane and ethanol production in Brazil. According to the association, sugarcane production projections are 829 and 1,038 million metric tons for MY 2015/16 and 2020/21, respectively; whereas ethanol production is forecast at 46.9 and 65.3 billion liters for the aforementioned periods, respectively. Despite the projected continuous expansion, sugarcane still represents approximately 2-3 percent of total agricultural land in the country and the use of agricultural feedstocks in biofuel production is not expected to have a significant impact on food and feed markets.

B. Industrial Capacity

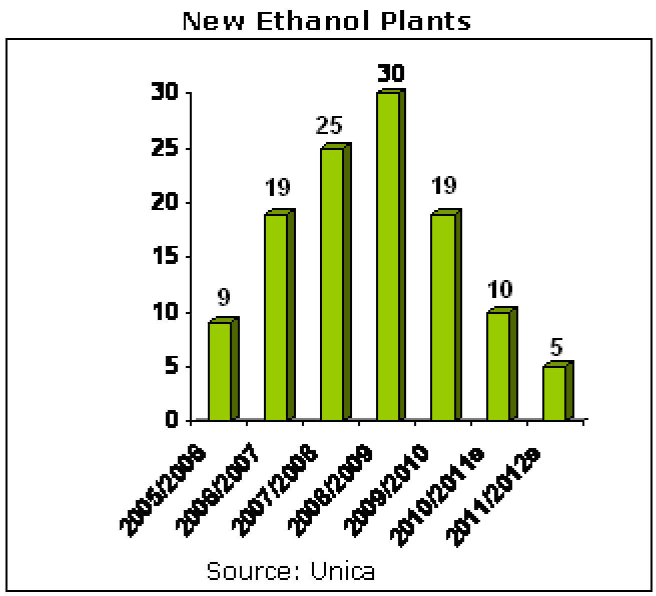
Total industrial capacity for sugarcane crushing in the center-southern sugar-ethanol plants is approximately 3 mmt of sugarcane/day. Crushing capacity in the northeastern plants is estimated at 400,000 mmt/day. Thus, Brazilian installed crushing capacity is approximately 3.4 mmt/day.

Ethanol installed industrial capacity depends on yearly decisions made by individual plants to produce sugar and/or ethanol. Post contacts report that the industry responds to the theoretical ratio of 40:60 to change from sugar to ethanol production or vice versa from harvest to harvest. Once producing units, adjust their plants to produce a set ratio of sugar/ethanol in a given year, there is much less flexibility to change it during the crushing season.

Ethanol production capacity estimated in this report was based on production figures reported by UNICA. Post took the highest ethanol production figure in a given 15-day period, and extrapolated to the entire Center-south crushing season. A similar procedure was followed for Northeast production based on MAPA reports. Sugarcane crushed for ethanol production was calculated based on the actual production breakdown for sugar/ethanol as described in previous Gain reports. On average, one metric ton of sugarcane produces 80.5 liters of ethanol.

C. New Investments and Credit

The low sugar and ethanol prices during 2007 and 2008, along with the global financial crisis in October 2008 became a major impediment to new investments in the sector in 2009. The graph below shows the evolution of new ethanol (and sugar) plants as of MY 2005/06 as reported by UNICA. UNICA estimates ten new plants for 2010/11 and five new plants for 2011/12, a sharp decrease compared to 30 new plants in 2008/09. Total number of sugar-ethanol mills in 2010 is estimated at 436 units, whereas total operating units for 2011 are projected at 441.



Total credit to finance investments and even to run daily operations became scarce during 2008 and 2009, and debt levels steadily increased in the sector. According to industry information, the liquid debt at the sugar-ethanol plants increased from R$ 28 to 40 billion (approximately US$ 16 to $23 billion) from 2007/08 to 2009/10.

The sector has gone through a new period of mergers and acquisitions due to: (1) the high debt level observed in several producing units and; (2) expectations that ethanol will become a global commodity in the mid-term with increased demand worldwide; (3) improved ethanol and sugar prices in 2009 and 2010.

Major Brazilian sugar-ethanol groups with solid financial balances were encouraged to expand their businesses. Industry sources estimate that the market share of the five major sugar-ethanol groups in Brazil increased from 12 to 27 percent from MY 2004/05 to 2009/10. In addition, several foreign investments have also occurred in the sector. In MY 2006/07, foreign investment represented approximately 7 percent of all sugarcane crushed in Brazil, whereas they are likely to represent roughly 40 percent for MY 2010/11.

The aforementioned mergers and acquisitions and higher credit availability as of late 2009 and 2010 have improved the financial situation for the sector. Indeed, industry sources estimate the debt level for MY 2010/11 at R$ 35 billion (approximately US$ 20 billion), below R$ 5 billion from MY 2009/10.

D. Sugarcane and Ethanol Prices received by Producers.

Sugarcane prices received by third party suppliers for major producing states are based on a formula that takes into account prices for sugar and ethanol prices both in the domestic and international markets. The State of Sao Paulo Sugarcane, Sugar and Ethanol Growers Council (CONSECANA) was the first to develop this formula for the state of Sao Paulo, major producing state comprising roughly 60 percent of the Brazilian production.

According to CONSECANA, the average sugarcane price (April 2009-March 2010) for the state of Sao Paulo for the 2009/10 crop is R$ 0.3492 per kg of Total Reducing Sugars (TRS), or R$ 45.52 per ton of sugarcane, up R$ 6.30 per ton compared to the previous crop (R$ 0.2781 per kg of TRS, or approximately R$ 39.22 per ton of sugarcane), due to better sugar and ethanol prices during the crushing season relatively to the previous crop. The average CONSECANA price for the current crop (MY 2010/11) for the April-June 2010 period is R$ 0.3528 per kg of TRS, or R$ 45.27 per ton of sugarcane.

According to industry sources, sugarcane represents between 60 to 70 percent of the cost of producing ethanol. Current production cost is estimated at R$ 0.45/liter for hydrated ethanol and R$ 0.50/liter for anhydrous ethanol (ROE = US$ 1.00/R$ 1.75). The aforementioned numbers vary according to the efficiency of the plant.

The Ethanol Indexes released by the University of Sao Paulo's College of Agriculture "Luiz de Queiroz" (ESALQ) follow. The Indexes track anhydrous and hydrated prices received by producers in the domestic spot market. Ethanol prices have sharply increased during the off-season, December, 2009 – February 2010, due to lower availability of the product. In an attempt to reduce ethanol demand in further months, GOB decreased the percentage of ethanol in the gasoline blend from 25 to 20 percent during February-April 2010.

Fuel Hydrated Ethanol Prices: State of São Paulo (R$/000 liters).

Month	2006	2007	2008	2009	2010
January	1,018.24	845.36	697.18	781.40	1171.2
February	1,064.20	802.87	714.70	777.60	1095.8
March	1,208.53	855.05	754.56	656.80	825.2
April	1,063.46	940.51	715.60	621.30	799.70
May	848.56	690.84	697.10	585.40	724.30
June	854.55	587.86	665.30	602.00	720.30
July 1/	898.36	583.99	718.10	711.70	824.50
August	819.57	581.02	719.30	726.50	--
September	756.09	580.96	749.60	791.40	--
October	758.58	585.48	715.70	935.10	--
November	751.59	716.09	726.40	941.90	--
December	778.07	751.28	737.70	1000.40	--

Source: USP/ESALQ/CEPEA. 1/ July 2010 refers to July 16th. No taxes included.

Fuel Anhydrous Ethanol Prices: State of São Paulo (R$/000 liters).					
Month	**2006**	**2007**	**2008**	**2009**	**2010**
January	1,040.59	870.69	786.22	873.30	1285.40
February	1,063.94	837.39	808.08	860.30	1297.60
March	1,191.42	912.93	831.50	744.50	974.60
April	1,185.53	1,072.57	789.40	697.00	908.40
May	966.47	883.78	821.50	675.60	839.20
June	983.66	675.07	787.00	691.00	827.30
July 1/	1,036.03	668.53	873.20	801.00	943.10
August	955.43	665.58	858.50	820.70	--
September	878.49	660.73	891.20	912.90	--
October	867.02	664.44	902.20	1086.40	--
November	858.93	792.90	897.00	1093.80	--
December	849.55	851.07	880.60	1131.60	--
Source: USP/ESALQ/CEPEA. 1/ July 2010 refers to July 16th.					

3.3. Consumption

Brazil remains an important user of ethanol for fuel consumption. Total domestic demand for ethanol for calendar year 2011 is estimated at 26.71 billion liters, up 2.19 billion liters from 2009 consumption, due to steady sales of flex-fuel vehicles and attractive ethanol prices relative to gasoline. Total ethanol consumption for use as fuel is estimated at 24.95 billion liters for 2010. Ethanol consumption for other uses remained relatively stable at 1.76 billion liters.

As reported by the Brazilian Association of Vehicle Manufacturers (ANFAVEA), the size of the Brazilian light vehicle fleet was estimated at 25.4 million units in 2009. Total pure hydrated ethanol and flex fuel powered vehicles were estimated at approximately 8.38 million units in 2009, representing 33 percent of the total fleet. The table below shows the sales of FFV and hydrated ethanol powered cars since 2003. Sales of FFV currently represent over 90 percent of total monthly vehicle sales.

Domestic Sales of Alcohol Powered Vehicles (pure alcohol & flex fuel units)						
2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010 1/**
379,329	897,308	1,425,177	2,032,361	2,356,942	2,711,267	1,138,527
Source: National Association of Vehicle Manufacturers (ANFAVEA) 1/ January-May Note: flex fuel vehicles were introduced in March 2003.						

According to Datagro, fuel ethanol represented approximately 47.7 percent in gasoline equivalent of total Otto cycle fuels consumption in 2009, a sharp increase relative to 2008 (44.75 percent) due to steady sales of flex-fuel vehicles and attractive ethanol prices at the pump in 2009. The table below illustrates apparent consumption of liquid fuels in Brazil.

Brazilian Apparent Consumption of Liquid Fuels (000 m3, trillion Nm3)					
	2006	**2007**	**2008**	**2009**	**2010 3/**
Ethanol	12,699	16,204	19,962	22,523	6,253
Anhydrous	5,513	6,137	6,233	6,276	2,228
Hydrated	7,186	10,067	13,729	16,247	4,025
Gasoline "A" 1/	18,481	18,189	18,942	19,133	7,697
Natural Gas - light vehicles	2	3	2	2	1
Total Consump Otto Cycle2/	32,092	35,006	38,678	40,621	13,932
Diesel	36,708	41,558	44,764	44,299	15,168
Total Consump Otto+Diesel	68,800	76,564	83,442	84,920	29,100
Source: Datagro. 1/ Pure gasoline with no ethanol blended. 2/ Consumption estimated in gasoline equivalent. 3/Jan-April.					

Preliminary figures for January-April 2010, show that the ethanol share in the total Otto cycle fuels consumption decreased to 39.3 percent. Escalated ethanol prices at the pump in the first quarter of 2010 led many consumers to change from ethanol to gasoline.

The steady sales of flex-fuel vehicles do not solely guarantee a higher demand for ethanol given that consumers' decisions are driven by the ratio between ethanol and gasoline prices. The 70 percent ratio between ethanol and gasoline prices is the rule of thumb in determining whether flex car owners will choose to fill up with ethanol (price ratio below 70 percent) or gasoline (price ratio above 70 percent).

Due to lower availability of ethanol during the January-February 2010 period, gasoline consumption was favored in several Brazilian states, as reported in the tables below, thus reducing ethanol demand in the first quarter of 2010. Note that even in the month of June, when the crushing season in the center-south is running at full pace, price ratio for some locations (Minas Gerais and Porto Alegre) still do not entice consumers to choose ethanol over gasoline.

Gasoline and Ethanol Prices in Selected States (average price, R$/liter)									
		Gasoline				**Ethanol**			
		2007	**2008**	**2009**	**2010**	**2007**	**2008**	**2009**	**2010**
Sao Paulo State	**Jan**	2.405	2.380	2.393	2.477	1.367	1.290	1.312	1.807
	Feb	2.339	2.376	2.398	2.509	1.361	1.257	1.331	1.831
	Jun	2.419	2.385	2.349	2.399	1.314	1.259	1.168	1.274
	Aug	2.384	2.394	2.351		1.128	1.264	1.231	
Sao Paulo City	**Jan**	2.403	2.376	2.391	2.475	1.363	1.291	1.312	1.810
	Feb	2.397	2.372	2.396	2.508	1.356	1.264	1.327	1.835
	Jun	2.416	2.383	2.346	2.395	1.316	1.264	1.180	1.274
	Aug	2.383	2.393	2.348		1.135	1.270	1.230	
Minas Gerais	**Jan**	2.392	2.405	2.381	2.489	1.749	1.606	1.611	1.965
	Feb	2.360	2.389	2.374	2.509	1.744	1.577	1.623	2.077
	Jun	2.404	2.368	2.326	2.412	1.662	1.568	1.501	1.678
	Aug	2.372	2.356	2.361		1.526	1.575	1.564	

Belo Horizonte (MG Capital)	**Jan**	2.345	2.369	2.331	2.405	1.733	1.589	1.597	1.926
	Feb	2.315	2.346	2.329	2.458	1.730	1.554	1.612	2.064
	Jun	2.379	2.322	2.282	2.379	1.643	1.547	1.487	1.661
	Aug	2.342	2.315	2.313		1.500	1.571	1.547	
Rio Janeiro State	**Jan**	2.488	2.505	2.537	2.641	1.728	1.624	1.685	2.044
	Feb	2.488	2.501	2.535	2.663	1.754	1.614	1.695	2.104
	Jun	2.511	2.513	2.524	2.613	1.653	1.635	1.588	1.703
	Aug	2.490	2.576	2.526		1.513	1.658	1.604	
Rio Janeiro Capital	**Jan**	2.481	2.500	2.534	2.640	1.717	1.614	1.680	2.050
	Feb	2.483	2.496	2.531	2.660	1.737	1.603	1.692	2.106
	Jun	2.507	2.509	2.521	2.611	1.640	1.627	1.579	1.695
	Aug	2.486	2.513	2.523		1.500	1.653	1.598	
Porto Alegre (RS Capital)	**Aug**	2.600	2.463	2.538	2.568	1.848	1.792	1.746	2.257
	Jan	2.463	2.326	2.538	2.592	1.829	1.693	1.765	2.335
	Feb	2.585	2.514	2.419	2.488	1.789	1.731	1.550	1.765
	Jun	2.481	2.566	2.577		1.512	1.744	1.765	
Goiania (GO Capital)	**Aug**	2.329	2.539	2.565	2.654	1.425	1.569	1.581	1.838
	Jan	2.499	2.502	2.564	2.655	1.487	1.508	1.581	1.897
	Feb	2.583	2.330	2.562	2.304	1.359	1.368	1.483	1.227
	Jun	2.233	2.452	2.556		1.093	1.472	1.411	
Fortaleza (CE Capital)	**Aug**	2.625	2.667	2.388	2.530	1.661	1.829	1.615	1.909
	Jan	2.620	2.655	2.533	2.530	1.680	1.814	1.747	2.013
	Feb	2.492	2.439	2.363	2.663	1.719	1.726	1.671	1.807
	Jun	2.638	2.589	2.575		1.676	1.885	1.768	
Source: Petroleum, Natural Gas and Biofuels National Agency (ANP).									

Ratio Ethanol/Gasoline Prices					
		2007	**2008**	**2009**	**2010**
Sao Paulo	**Jan**	57%	54%	55%	73%
	Feb	58%	53%	56%	73%
	Jun	54%	53%	50%	53%
	Aug	47%	53%	52%	
Sao Paulo	**Jan**	57%	54%	55%	73%
	Feb	57%	53%	55%	73%
	Jun	54%	53%	50%	53%
	Aug	48%	53%	52%	
Minas Gerais	**Jan**	73%	67%	68%	79%
	Feb	74%	66%	68%	83%
	Jun	69%	66%	65%	70%
	Aug	64%	67%	66%	
Belo Horizonte	**Jan**	74%	67%	69%	80%
	Feb	75%	66%	69%	84%
	Jun	69%	67%	65%	70%
	Aug	64%	68%	67%	
Rio Janeiro	**Jan**	69%	65%	66%	77%

	Feb	70%	65%	67%	79%
	Jun	66%	65%	63%	65%
	Aug	61%	64%	63%	
Rio de Janeiro	**Jan**	69%	65%	66%	78%
	Feb	70%	64%	67%	79%
	Jun	65%	65%	63%	65%
	Aug	60%	66%	63%	
Porto Alegre	**Jan**	71%	73%	69%	88%
	Feb	74%	73%	70%	90%
	Jun	69%	69%	64%	71%
	Aug	61%	68%	68%	
Goiania	**Jan**	61%	62%	62%	69%
	Feb	60%	60%	62%	71%
	Jun	53%	59%	58%	53%
	Aug	49%	60%	55%	
Fortaleza	**Jan**	63%	69%	68%	75%
	Feb	64%	68%	69%	80%
	Jun	69%	71%	71%	68%
	Aug	64%	73%	69%	
Source: Petroleum, Natural Gas and Biofuels National Agency (ANP).					
Gray Area means gasoline prices more attractive than ethanol					

Fuel consumption in Brazil, as reported by the Petroleum, Natural Gas and Biofuels National Agency (ANP), follows. Figures take into account the product sales by distributors and do not include illegal sales, which were common for hydrated ethanol due to tax differentiation between both types of ethanol. The Brazilian government has taken some measures to avoid tax evasion and according to Post contacts, ANP figures as of 2008 better reflect total hydrated ethanol consumption.

Brazilian Fuel Consumption Matrix (000 m3)					
	2006	**2007**	**2008**	**2009**	**2010 1/**
Diesel	39,008	41,558	44,764	44,298	19,249
Gasoline C**	24,008	24,325	25,175	25,409	12,247
Hydrated Ethanol	6,187	9,367	13,290	16,470	5,320
Source: ANP. ** Gasoline C includes 20-25 percent of anhydrous ethanol. 1/ 2010 refers to January-May					

3.4. Trade

A. Exports

Brazilian total ethanol exports for 2010 are forecast at 2.5 billion liters, a 0.8 billion liter reduction compared to 2009, mostly due to an expected decrease in direct exports to the United States and India. Total fuel ethanol exports are estimated at 0.7 billion liter, down

0.4 billion liters from the previous year. Industry sources report that Brazil should regain export levels for fuel ethanol in 2011, e.g., fuel ethanol exports are expected to rebound to 1.2 billion liters, whereas exports for other fuels are forecast at 2 billion liters. Total ethanol exports for 2011 are, therefore, projected at 3.2 billion liters.

The tables below show ethanol exports (NCM 2207.10.00 and 2207.20.10) for 2007, 2008, 2009 and 2010 (January-June), as reported by the Brazilian Secretariat of Foreign Trade (SECEX). Exports to the Caribbean countries are usually later dehydrated and re-exported to the U.S., thus exempted from paying the US$ 0.54 per gallon tariff. The higher export volumes directly exported to the United States in 2008 are related to the damage of the corn crop in Iowa, a major corn producer. Corn prices in the United States sharply increased, thus making the Brazilian fuel price competitive, even with the payment of the tariff.

Brazilian Ethanol Exports by Country of Destination (NCM 2207.10.00, 000 liters, MT, US$ 000 FOB)

	CY 2007			CY 2008		
Country	**Volume**	**Weight**	**Value**	**Volume**	**Weight**	**Value**
U.S.A.	844,423	668,478	361,252	1,532,118	1,213,960	755,843
Netherlands	790,777	626,684	335,792	1,326,306	1,053,130	617,954
Jamaica	278,042	224,770	109,469	404,967	327,347	182,858
El Salvador	219,382	177,398	83,484	352,076	284,705	151,294
Japan	364,003	293,797	152,594	260,541	210,567	112,893
Trinidad & Tobago	158,869	128,395	64,779	221,962	179,429	99,047
Virgin Island	52,141	42,159	20,780	185,969	150,360	85,691
South Korea	62,584	50,618	25,092	184,710	149,276	81,068
Costa Rica	170,320	137,698	69,908	108,269	87,515	46,785
Nigeria	122,879	99,325	49,410	91,566	74,023	42,288
Others	381,787	305,045	166,615	405,155	324,275	190,604
Total	3,445,207	2,754,368	1,439,175	5,073,638	4,054,588	2,366,327
Source : Brazilian Secretariat of Foreign Trade (SECEX).						

Brazilian Alcohol Exports by Country of Destination (NCM 2207.10.00, 000 liters, MT, US$ 000 FOB)

	CY 2009			CY 2010 1/		
Country	**Volume**	**Weight**	**Value**	**Volume**	**Weight**	**Value**
Netherlands	678,335	539,672	290,459	77,798	61,969	39,729
Jamaica	437,657	353,491	152,439	30,218	24,412	12,360
India	367,570	296,998	125,426	26,503	21,424	12,740
South Korea	313,714	253,299	139,520	102,104	82,461	50,754
Japan	279,961	226,182	108,753	70,228	56,485	39,750
U.S.A.	272,193	216,152	135,322	120,503	95,158	75,454
United Kingdom	161,637	127,495	79,268	102,840	81,127	62,808
Trinidad & Tobago	139,951	113,140	48,270	75	57	70
Nigeria	115,766	93,597	49,335	13,789	11,145	5,365
Costa Rica	100,276	80,921	32,291	0	0	0
Others	429,084	345,498	176,827	121,282	97,191	72,374

Total	3,296,145	2,646,444	1,337,910	665,340	531,431	371,405
Source: Brazilian Secretariat of Foreign Trade (SECEX). 1/ Jan-Jun.						

Brazilian Alcohol Exports by Country of Destination (NCM 2207.20.10, 000 liters, MT, US$ 000 FOB)						
	CY 2007			CY 2008		
Country	**Volume**	**Weight**	**Value**	**Volume**	**Weight**	**Value**
Jamaica	30,926	24,906	12,742	26,590	21,507	11,914
Netherlands	17,779	14,061	7,276	15,226	12,009	7,879
Nigeria	0	0	0	5,200	4,209	2,159
U.S.A.	14,274	11,276	7,819	2,000	1,580	1,019
Philippines	1,564	1,234	585	499	393	238
Fiinland	0	0	0	306	241	114
Cameroon	246	197	224	240	193	209
Ivory Coast	140	112	127	140	113	128
Argelia	0	0	0	93	75	70
Togo	0	0	0	41	32	39
Others	22,531	17,960	9,697	21	17	13
Total	87,460	69,748	38,471	50,355	40,369	23,783
Source : Brazilian Secretariat of Foreign Trade (SECEX)						

Brazilian Alcohol Exports by Country of Destination (NCM 2207.20.10, 000 liters, MT, US$ 000 FOB)						
	CY 2009			CY 2010 1/		
	Volume	**Weight**	**Value**	**Volume**	**Weight**	**Value**
Netherlands	130	105	86	0	0	0
Ivory Coast	120	97	92	40	32	38
Denmark	49	40	39	0	0	0
Congo	20	16	19	0	0	0
Paraguay	1	5	6	3	3	4
Chile	0	0	0	0	0	0
Japan	0	0	0	0	0	0
Uruguay	0	0	0	45	37	45
Argentina	0	0	0	171	138	131
Cameroon	0	0	0	40	32	37
Total	320	263	243	298	242	256
Source : Brazilian Secretariat of Foreign Trade (SECEX) 1/ Jan-Jun						

B. Imports

The table below shows Brazilian ethanol imports by calendar year, as reported by SECEX. Imports are mainly for industrial use.

Brazilian Ethanol Imports (000 liters)					
	2006	2007	2008	2009	2010 1/
NCM 2007.10.00	90	305	465	3,062	665,340
NCM 2007.20.10	6	3,803	2	1,346	298
Total	96	4,108	467	4,408	665,639
Source: SECEX. 1/ January-June					

3.5. Ending Stocks

Beginning stocks for the bioethanol for "All Uses" table is based on information from MAPA and reflect all stocks at ethanol plants on January 1, 2006. Beginning stocks for the bioethanol "For Fuel Only" table is estimated based on historical average use of bioethanol for fuel/other uses.

On average, ethanol for fuel has represented 87 percent of total ethanol disappearance (use), therefore Post assumed this percentage to calculate the theoretical beginning stocks for fuel in January 1, 2006. All other stock figures were calculated based on the difference between total supply and disappearance (consumption and exports).

ATO/Sao Paulo forecasts ending stocks for fuel ethanol at 7.55 billion liters for 2011, up 1.78 billion liters from the 2010 stock level (5.77 billion liters). Ending stocks measured on December 31 of each year do not actually reflect the supply and demand balance. In general, ethanol plants in the center-south are nearing the end of the crushing, whereas ethanol plants in the northeast are fully operating. As a consequence, stock levels are expected to be high.

Stock figures measured on April 1, after subtracting the disappearance (consumption and exports) during the first quarter of the year, will likely show a more realistic picture about product availability in the beginning of the new crop season (April).

4. Conventional Biodiesel

Conventional biodiesel is defined as first generation biodiesel derived from animal fats and vegetable oils used to transport fuels as a substitute for fossil fuels. Biodiesel is a trans-esterified vegetable oil also known as fatty acid methyl esterproduced from soy oil, rapeseed, oil, other vegetable oils, animal fats, and recycled cooking oils.

4.1. Brazilian Biodiesel Production, Supply and Demand (PS&D) Table

The table below shows the Brazil's Biodiesel supply and demand (PS&D) table for calendar years (CY) 2006 through 2011.

Total Conventional Biodiesel Production, Supply and Demand (million liters)						
CY	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Begin Production	0.00	0.00	44.67	90.00	134.69	135.41
Production	69.00	404.33	1,167.13	1,608.05	2,450.00	2,650.00
Imports	3.87	3.65	5.04	4.35	6.50	7.00
Total Supply	72.87	407.98	1,216.84	1,702.40	2,591.19	2,792.41
Exports	3.54	2.54	1.47	2.78	7.50	8.00
Consumption	69.33	360.77	1,125.37	1,564.93	2,448.27	2,644.14
Ending Stocks	0.00	44.67	90.00	134.69	135.41	140.28
Production Capacity (Conventional Fuel)						
No. of Biorefineries	7	36	62	63	64	70
Capacity	300	1,800	3,600	4,350	5,076	5,500
Feedstock Use (1,000 MT)						
Soybeans	259	1,519	4,385	6,042	9,205	9,956
Cottonseed	15	86	248	341	520	562
Animal Fat	9,730	57,012	164,570	226,742	345,460	373,660
Source: Prepared by ATO/SP based on ANP, SECEX and industry sources. Note: biodiesel density estimated at 0.875 g/cm3						

4.2. Production

A. Feedstock

Biodiesel can be produced from several raw materials such as soybeans, castor seed (*Ricinus communis*), African palm oil ("dendê"), "pinhao manso" (*Jatropha curcas*), sunflower, peanut, animal fat, fried oil or others.

Despite the variety of feedstock which can potentially be used to produce biodiesel, updated information from the ANP, shows that production breakdown by source remains unchanged: soybeans represent on average, 80 percent of the total biodiesel feedstock, followed by animal tallow (15 percent) and cottonseed oil (roughly 4 percent).

The tables below show official USDA data for soy and cotton oil production for MY 2006/07 through 2009/10, as well as a projection for MY 2010/11. A small percentage of total soy and cotton oil production displayed below is used for biodiesel production, as reported in the PS&D table (feedstock use).

Brazilian Soybeans and Products Production (000 hectares, 000 metric tons)					
	2006/07	**2007/08**	**2008/09**	**2009/10**	**2010/11**
Area harvested	20,700	21,300	21,600	23,500	23,500
Soybeans	59,000	61,000	57,800	69,000	65,000
Soybeans for crushing	31,511	31,895	30,778	33,785	32,800
Meal, Soybean	24,420	24,720	23,850	26,180	25,420
Oil, Soybean	6,050	6,120	5,910	6,485	6,290
Source: USDA/FAS					

Brazilian Cotton and Products Production (000 hectares, 000 metric tons)					
	2006/07	2007/08	2008/09	2009/10	2010/11
Area Harvested	1,094	1,077	843	836	1000
Seed Cotton 1/	3,918	4,078	3,114	3,114	3940
Lint Cotton	1,524	1,602	1,193	1,251	1524
CottonSeed	2,125	2,300	1,930	1,950	2150
Meal, Cottonseed	1,045	1,130	948	958	1060
Oil, Cottonseed	350	380	318	322	355
Source: USDA/FAS 1/ Seed cotton calculated based on average lint yields.					

B. Production Estimates

Biodiesel production remains regulated by the government. Post projects total biodiesel production for 2011 at 2.65 billion liters, up 8 percent from the 2010 forecast (2.45 billion liters), assuming that the mandatory biodiesel mixture remains unchanged at 5 percent. The production estimate for 2009 is 1.61billion liters, as reported by ANP. Cumulative January-April 2010 production is approximately 720 million liters, or 63 percent of the auctioned volume for January-June 2010. biodiesel production is reported below.

Brazilian Biodiesel Monthly Production (000 liters)						
Month	2005	2006	2007	2008	2009	2010
January	-	1,075	17,109	76,784	90,352	144,206
February	-	1,043	16,933	77,085	80,224	177,100
March	8	1,725	22,637	63,680	131,991	213,740
April	13	1,786	18,773	64,350	105,458	184,897
May	26	2,578	26,005	75,999	103,663	-
June	23	6,490	27,158	102,767	141,139	-
July	7	3,331	26,718	107,786	154,557	-
August	57	5,102	43,959	109,534	167,086	-
September	2	6,735	46,013	132,258	160,538	-
October	34	8,581	53,609	126,817	156,811	-
November	281	16,025	56,401	118,014	166,192	-
December	285	14,531	49,016	112,053	150,042	-
Total	736	69,002	404,329	1,167,128	1,608,053	719,943
Source: ANP						

ANP reports that as of June 2010, Brazil has 63 plants authorized to produce biodiesel and 19 plants in the process of receiving the authorization from the agency. Current authorized industrial capacity is estimated at 14.182 million liters/day or 5.1 billion liters/year, based on a 360 day operation cycle. This represents approximately 2.1 times the mandatory biodiesel production to be blended in mineral diesel (B5) in 2010; and a 19 percent increase compared to the authorized industrial capacity for the same period in 2009 (11.95

million liters/day).

ATO/Sao Paulo projetcts industrial capacity for 2010 and 2011, at 64 and 70 plants or 5.1 and 5.5 bilion liters per year, respectively, based on a 360 day operation cycle. Projections are based on information for authorized plants and requests for authorization provided by ANP and industry sources.

C. Cost of Production and Market Prices

The biodiesel market remains regulated by the government through a public auction system which sets the volume of biodiesel that should be produced and delivered to fuel distributors in a particular period of the year as well as the average sales price. The auction system gives preference to producers with the Social Fuel Stamp (see Section 2.6.2 – Biodiesel Social Fuel Stamp), given that only those with the aforementioned stamp are eligible for production of 80 percent of the total auctioned volume.

The tables below summarize the results of all auctions from 2005 to 2010. ANP coordinated eight auctions (12th to 15th auctions spitt into two sessions, and benefitting only producers with the Social Fuel Stamp in the first session) to guarantee biodiesel supply in 2009. During November 2009-May 2010, 1.74 billion liters of biodiesel were sold for delivery during January-September 2010 (16th to 18th auctions). Additional auctions should take place in the upcoming months to guarantee supply for the last quarter of the year.

Biodiesel Auctions				
Auction	**1st Auct.**	**2nd Auct.**	**3rd Auct.**	**4th Auct.**
Date	11/23/2005	3/30/2006	7/11/2006	7/12/2006
Number of Suppliers	4	8	4	12
Offered Quantity (m3)	92,500	315,520	125,400	1,141,335
Purchased Quantity (m3)	70,000	170,000	50,000	550,000
Opening/Ref. Price (R$/m3)	1,920.00	1,908.00	1,904.84	1,904.51
Average Price (R$/m3) 1/	1,904.84	1,859.65	1,753.79	1,746.48
Price Discount (%)	-0.79	-2.53	-7.93	-8.29
Delivery Date	Jan-Dec/06	Jul/06-Jun/07	Jan-Dec/07	Jan-Dec/07
Source: ANP 1/ Price FOB, including PIS/PASEP and COFINS, excluding ICMS				

Biodiesel Auctions				
Auction	**5th Auct.**	**6th Auct.**	**7th Auct.**	**8th Auct.**
Date	2/13/2007	11/13/2007	11/14/2007	10/4/2008
Number of Suppliers	4	11	10	17
Offered Quantity (m3)	50,000	304,000	76,000	473,140
Purchased Quantity (m3)	45,000	304,000	76,000	264,000
Opening/Reference Price (R$/m3)	1,904.51	2,400.00	2,400.00	2,804.00
Average Price (R$/m3) 1/	1,862.14	1,865.60	1,863.20	2,691.70
Price Discount (%)	-2.22	-22.30	-22.40	-4.00
Delivery Date	up to Dec/07	Jan-Jun/08	Jan-Jun/08	Jul-Set/08

Source: ANP 1/ Price FOB, including PIS/PASEP and COFINS, excluding ICMS

Biodiesel Auctions					
Auction	**9th Auct.**	**10th Auct.**	**11th Auct.**	**12th Auct.1**	**12th Auct.2**
Date	11/4/2008	8/14/2008	8/15/2008	11/24/2008	11/24/2008
Number of Suppliers	13	20	17	21	21
Offered Quantity (m3)	181,810	347,060	94,760		449,890
Purchased Quantity (m3)	66,000	264,000	66,000	264,000	66,000
Opening/Reference Price (R$/m3)	2,804.00	2,620.00	2,620.00	2,400.00	2,400.00
Average Price (R$/m3) 1/	2,685.23	2,604.64	2,609.70	2,385.93	2,388.87
Price Discount (%)	-4.24	-0.59	-0.39	-0.59	-0.46
Delivery Date	Jul-Set/08	Oct-Dec/08	Oct-Dec/08	Jan-Mar/09	Jan-Mar/09
Source: ANP 1/ Price FOB, including PIS/PASEP and COFINS, excluding ICMS					

Biodiesel Auctions				
Auction	**13th Auct.1**	**13th Auct.2**	**14th Auct. 1**	**14th Auct. 2**
Date	2/27/2009	2/27/2009	5/29/2009	5/29/2009
Number of Suppliers	18	21	26	27
Offered Quantity (m3)	578,152		645,624	
Purchased Quantity (m3)	252,000	63,000	368,000	92,000
Opening/Reference Price (R$/m3)	2,360.00	2,360.00	2,360.00	2,360.00
Average Price (R$/m3) 1/	2,222.68	1,885.38	2,306.98	2,316.95
Price Discount (%)	-5.82	-27.97	-2.25	-1.82
Delivery Date	Apr-Jun/09	Apr-Jun/09	Jul-Sep/09	Jul-Sep/09
Source: ANP 1/ Price FOB, including PIS/PASEP and COFINS, excluding ICMS				

Biodiesel Auctions				
Auction	**15th Auct.1**	**15th Auct.2**	**16th Auct.1**	**16th Auct.2**
Date	8/27/2009	8/27/2009	11/17/2009	11/17/2009
Number of Suppliers	24	21	27	28
Offered Quantity (m3)	684,931		725,179	
Purchased Quantity (m3)	368,000	92,000	460,000	115,000
Opening/Reference Price (R$/m3)	2,300.00	2,360.00	2,350.00	2,350.00
Average Price (R$/m3) 1/	2,263.63	2,275.36	2,328.54	2,319.18
Price Discount (%)	-1.58	-1.07	-0.91	-1.31
Delivery Date	Oct-Dec/09	Oct-Dec/09	Jan-Mar/10	Jan-Mar/10
Source: ANP 1/ Price FOB, including PIS/PASEP and COFINS, excluding ICMS				

Biodiesel Auctions				
Auction	**17th Auct.1**	**17th Auct2**	**18th Auct.1**	**18th Auct.2**

Date	3/1/2010	3/2/2010	05/27-28/10	5/31/2010
Number of Suppliers	29	20	27	27
Offered Quantity (m3)	565,000		600,000	
Purchased Quantity (m3)	452,000	113,000	480,000	120,000
Opening/Reference Price (R$/m3)	2,300.00	2,300.00	2,320.00	2,320.00
Average Price (R$/m3) 1/	2,241.69	2,218.49	2,193.32	1,754.60
Price Discount (%)	-2.54	-3.54	-5.46	-24.37
Delivery Date	Apr-Jun/10	Apr-Jun/10	Jul-Sep/10	Jul-Sep/10
Source: ANP 1/ Price FOB, including PIS/PASEP and COFINS, excluding ICMS				

Biodiesel prices received by producers are determined by the public auction system (see Average Price in the tables above). Producers are not allowed to change the sales price set at the auctions and consequently must search for low cost raw material or hedge their activities to offset risk.

According to the Brazilian Association of Vegetable Oil Industries (ABIOVE), raw materials make up to approximately 80 percent of the biodiesel production cost. Given that 80 percent of biodiesel production still results from the use of soybean oil, the profitability of the sector is highly dependent on oilseed prices.

Industry sources report that biodiesel production costs are estimated at R$ 2.0 - R$ 2.20/liter, depending on the producing region, considering soybean oil prices at R$ 1,700.00/ton and the exchange rate of R$ 1.75/US$.

The tables below show the price for soybean oil in 2009 and 2010 (January-June). The average crude price in the state of Sao Paulo for the first semester of 2010 is R 1,749.83/ton, as opposed to R$ R$ 1,917.64/ton for January-June 2009 and R$ 1.919.13/ton for July-December 2009. Given that the market price is set by the public auctions, the decreasing trend in oil prices has benefited producers’ profitability.

Soybean Oil, Crude - Prices (2009)						
Location	Jan	Feb	Mar	Apr	May	Jun
Chicago (US$/ton)	757.94	699.08	692.24	789.14	850.53	827.39
Prêmio (US$/ton)	-57.32	-40.34	-30.13	-18.19	-6.06	-8.27
Port of Paranaguá - Fob (US$/ton)	700.62	658.73	662.11	770.95	844.47	819.12
São Paulo - (R$/ton com ICMS 12%)	1,908	1,873	1,826	1,940	1,950	2,007
Elaborated by ABIOVE based on several sources.						

Soybean Oil, Crude - Prices (2009)						
Location	Jul	Aug	Sep	Oct	Nov	Dec
Chicago (US$/ton)	751.59	813.28	817.63	790.40	818.47	869.49
Prêmio (US$/ton)	-11.46	-1.65	-1.65	1.10	0.28	-10.58
Port of Paranaguá - Fob (US$/ton)	740.13	811.62	815.98	791.51	818.75	858.91

São Paulo - (R$/ton com ICMS 12%)	1,859	1,821	1,910	1,992	1,950	1,982
Elaborated by ABIOVE based on several sources.						

Soybean Oil, Crude - Prices (2010)						
Location	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**
Chicago (US$/ton)	876.00	844.80	869.99	865.16	844.07	818.04
Prêmio (US$/ton)	-3.58	-8.38	-47.40	-43.65	-12.49	-0.07
Port of Paranaguá - Fob (US$/ton)	872.42	836.43	822.59	821.51	831.58	817.96
São Paulo - (R$/ton com ICMS 12%)	1,795	1,840	1,732	1,674	1,733	1,723
Elaborated by ABIOVE based on several sources.						

4.3. Consumption

Biodiesel domestic consumption remains regulated by GOB, thus the sector must comply with the biodiesel mandate which requires all mineral diesel to have a five percent biodiesel blend (B5) as of 2010. Based on industry projections for mineral diesel domestic demand, ATO/Sao Paulo forecasts total biodiesel domestic consumption for 2010 and 2011 at 2.45 and 2.65 billion liters, respectively.

Biodiesel consumption for 2009 is estimated at 1.56 billion liters based on mineral diesel consumption of 44.3 billion liters and the mandatory mixture of three percent (B3) during the January-June period and 4 percent (B4) as of July 2009.

The table below shows the vehicle fuels consumption matrix from 2006-2010, according to ANP.

Brazilian Fuel Consumption Matrix (000 m3)					
	2006	**2007**	**2008**	**2009**	**2010 1/**
Diesel	39,008	41,558	44,764	44,298	19,249
Gasoline C**	24,008	24,325	25,175	25,409	12,247
Hydrated Ethanol	6,187	9,367	13,290	16,471	5,320
Source: ANP. ** Gasoline C includes 20-25 percent of anhydrous ethanol. 1/ 2010 refers to January-May					

4.4. Trade

The following tables show biodiesel imports and exports from 2006 - 2010 (January-June) in metric tons as reported bythe Brazilian Secretariat of Foreign Trade (SECEX) and converted to liters. To date, no significant exports have occurred. Nonetheless, Brazil can potentially become a net exporter due to the excess industrial capacity.

Brazilian Biodiesel Trade (NCM 3824.90.29, metric

tons)					
	2006	**2007**	**2008**	**2009**	**2010 1/**
Imports	3,385	3,194	4,409	3,803	2915
Exports	3,095	2,222	1,289	2,432	3365
Source: SECEX. 1/ Jan-Jun					

Brazilian Biodiesel Trade (NCM 3824.90.29, 000 Liters)					
	2006	**2007**	**2008**	**2009**	**2010 1/**
Imports	3,868	3,651	5,039	4,346	3,331
Exports	3,537	2,539	1,473	2,779	3,846
Source: ATO/Sao Paulo, based on SECEX figures and biodiesel density = 0.875 g/cm3					

Export figures by country of destination and imports by origin for the years 2008 - 2010 (January-May) are shown below, according to SECEX.

Brazilian Biodiesel Exports by Country of Destination (Metric tons, US$ 000 FOB)						
	CY 2008		**CY 2009**		**CY 2010 1/**	
Country	**Quantity**	**Value**	**Quantity**	**Value**	**Quantity**	**Value**
Argentina	224	676	1,525	3,559	2,524	4,704
Singapore	99	304	81	154	197	445
China	169	282	202	388	184	424
Uruguay	34	187	37	164	103	286
Chile	119	420	156	648	95	429
Peru	54	227	84	402	51	262
Indonesia	98	148	64	83	48	62
Mexico	21	53	58	118	35	50
Paraguay	142	873	8	42	30	147
Colombia	4	10	62	326	24	121
Others	326	797	154	322	74	259
Total	1,289	3,976	2,432	6,206	3,366	7,187
Source : Brazilian Secretariat of Foreign Trade SECEX - NCM 3824.90.29 - 1/ Jan - Jun						

Brazilian Biodiesel Imports by Country of Origin (Metric tons, US$ 000 FOB)						
	CY 2008		**CY 2009**		**CY 2010 1/**	
Country	**Quantity**	**Value**	**Quantity**	**Value**	**Quantity**	**Value**
Mexico	940	3,132	955	2,914	975	2,981
U.S.A.	1,526	4,513	1,287	4,798	936	3,631
Germany	694	2,718	538	1,772	353	1,180
Spain	37	180	3	19	199	572
Netherlands	310	1,102	311	1,157	180	653

Singapore	39	104	81	207	64	153
Denmark	489	1,087	358	931	61	122
United Kingdom	108	457	130	597	58	239
Italy	34	162	31	87	43	118
China	12	85	12	67	13	66
Others	220	661	99	348	32	291
Total	4,409	14,200	3,803	12,898	2,915	10,005
Source : Brazilian Secretariat of Foreign Trade SECEX - NCM 3824.90.29 - 1/ Jan - Jun						

4.5. Stocks

ATO/Sao Paulo forecasts biodiesel ending stocks for 2011 at 140 million liters, similar to 2010 (135 million liters), based on the difference between total supply and disappearance (consumption and exports).

Advanced Biofuels:

For reporting purposes, advanced biofuels include all next generation technologies and feedstocks beyond the conventional sugar, starch, oilseed and animal fat-based biofuels produced commercially through 2009. Adanced biofuels are generally derived from non-food crops or waste biomass. Examples of advanced biofuels include cellulosic ethanol, algae biodiesel and drop-in fuels, which are biomass-derived fuels chemically equivalent to gasoline, diesel and jet fossil fuels.

It is common knowledge that more efficient use of biomass will be achieved with the use of (1) biomass hydrolysis to convert cellulose from sugarcane waste (bagass and straw) and (2) biomass gasification which results in adequate fuels for efficient power generation and/or synthesis of liquid fuels.

No commercial use of advanced biofuels has begun yet. The sugarcane industry reports that economically feasible production of advanced biofuels should take at least five years. Petrobras, the Brazilian Petroleum Company, has developed a number of research projects to study advanced biofuels production in partnership with several private institutions.

Dedini Corporation, the largest Brazilian designer and manufacturer of sugar and biofuels processing plants, has developed a low acid process called Dedini Rapid Hydrolysis (DRH). DRH converts cellulose from sugarcane bagass, tops and leaves into sucrose using a strong lignin solvent at high temperatures enabling quick access to cellulose and hemicellulose, thus allowing sugar formation in minutes.

Dedini has recentely partnered with Novozynes, a company that produces biofuel enzymes which can be used for cellulosic ethanol production. The enzymes break down agricultural waste such as corn stove, wheat straw, wood chips and bagass, enabling fermentation to ethanol. The objective of the partnership is to develop a process using the enzymatic hydrolysis route from sugarcane residues. This would result in the implementation of a demonstration plant, integrated into sugarcane mill refineries.

The Bioethanol Science and Technology National Laboratory (CTBE) has built an ethanol plant to conduct experiments with advanced biofuels (cellulosic ethanol). The National Institute for Science and Technology has already invested approximately US$1 million to develop new enzymes for advanced biofuels production.

Grupo São Martinho one of the largest sugar and ethanol producers in Brasil has established a joint venture with Amyris Biotechnologies. SMA Indústria Química was created to build the first facility fully dedicated to the production of Amyris renewable products. Amyris will provide genetically engineered yeast to enable the joint venture to produce a specific molecule (farnesene), which may be used as an ingredient in a wide range of consumer and industrial products. The joint undertaking will produce renewable chemicals in an integrated chain beginning with the harvest of sugarcane and ending with the final product.

Biomass gasification technologies have been little used in Brasil. Temoquip is a private company that offers gasifiers of different conceptions with good performance and capacity between 0.5 to 5 Gcal/h.

Notes on Statistical Data:

6.1. Bioethanol

Beginning stocks for the bioethanol for "All Uses" table is based on information from the Ministry of Agriculture, Livestock and Supply (MAPA) and reflect all stocks at the ethanol plants as of January 1, 2006. Beginning Stocks for the bioethanol "For Fuel Only" table is estimated based on historical average use of bioethanol for fuel/other uses. On average, ethanol for fuel has represented 87 percent of the total ethanol disappearance (use), therefore Post assumed this percentage to calculate the theoretical beginning stocks for fuel in January 1, 2006. All other stock figures were calculated based on the difference between total supply and disappearance (consumption and exports).

Bioethanol production estimates for "All Uses" were provided by MAPA and are consistent with previous ATO/Sao Paulo GAIN reports submitted by MY. Production estimates "For Fuel Only" are taken as the difference between "production for All Uses" minus estimates for "disappearance for other uses" (domestic consumption and exports) given that all Brazilian official publications and industry sources report production in hydrated/anhydrous ethanol only.

Trade figures were based on the Brazilian Secretariat of Foreign Trade (SECEX). SECEX breaks down trade numbers in only two categories as described below:

- NCM 2207.10.00 – undenatured ethylic alcohol with ethanol content equal or over 80 percent. Undenatured alcohol is defined as pure ethanol with no additives and suitable for consumption.
- NCM 2207.20.10 - denatured ethylic alcohol with any ethanol content. Denatured alcohol is defined as ethanol with additives which make it poisonous and/or unpalatable, thus, no suitable for human consumption. Denatured alcohol is used as a solvent and as fuel for spirit burners and camping stoves. Different additives like methanol are used to make it difficult to use distillation or other simple processes to reverse the denaturation.

ATO/Sao Paulo made the assumption that all ethanol imports are for "other uses". There are no figures for ethanol exports "for fuel" and/or other uses. Post estimated ethanol "for fuel" based on the type of ethanol that is usually imported by the final destination, as reported by UNICA. Thus, the United States, the Caribbean countries and Sweden usually import ethanol "for fuel"; whereas Japan, Korea and several other importing countries, including the European Union import ethanol for industrial and other uses.

Domestic consumption figures were taken from information provided by Datagro and the Petroleum, Natural Gas and Biofuels National Agency (ANP).

The number of biorefineries were taken from MAPA and UNICA. Ethanol production capacity was based on production figures as reported by UNICA. Post took the highest ethanol production figure in a given 15-day period, as reported by the institution, and extrapolated to the entire Center-south crushing season. A similar procedure was performed for the Northeast production based on MAPA reports.

Sugarcane crushed for ethanol production was calculated based on the actual production breakdown for sugar/ethanol as described in previous GAIN reports. Note that on average, one metric ton of sugarcane produces 80.5 liters of ethanol.

6.2. Biodiesel

Production numbers are based on figures reported by ANP and forecasts are based on projections for diesel consumption and the results from the public auctions. Biodiesel market remains regulated by the government through a public auction system which sets the volume of biodiesel that should be produced and delivered to fuel distributors in a particular period.

Consumption figures are based on mineral diesel consumption and the mandatory mixture of biodiesel (B2, B3, B4, B5) in mineral diesel set by Brazilian legislation.

Trade figures were based on the Brazilian Secretariat of Foreign Trade (SECEX), as reported below:

- NCM 3824.90.29 – Other industrial fatty acid derivatives, mixtures and preparations containing fatty alcohols or carboxylic acids or their derivatives.

The number of biorefineries and production capacity are based on ANP reports. Feedstock use for biodiesel consumption is based on the following conversion rates:

- 0.875 metric ton of biodiesel = 1,000 liters of biodiesel
- 1 metric ton of biodiesel = 1.03 metric ton of soybean oil
- 1 metric ton of biodiesel = 1.00 metric ton of cottonseed oil
- Extraction rate for soybean oil = 0.1919
- Extraction rate for cottonseed oil = 0.1649
- 1 kg of animal fat = 1.064 liters of biodiesel

6.3. Exchange Rate

Exchange Rate (R$/US$1.00 - official rate, last day of period)							
Month	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
January	2.94	2.62	2.22	2.12	1.76	2.32	1.87
February	2.91	2.60	2.14	2.12	1.68	2.38	1.81
March	2.91	2.67	2.17	2.05	1.75	2.25	1.78

April	2.94	2.53	2.09	2.03	1.69	2.18	1.73
May	3.13	2.40	2.30	1.93	1.63	1.97	1.82
June	3.11	2.35	2.16	1.93	1.64	1.95	1.80
July 1/	3.03	2.39	2.18	1.88	1.57	1.87	1.77
August	2.93	2.36	2.14	1.96	1.63	1.88	--
September	2.86	2.22	2.17	1.84	1.92	1.78	--
October	2.99	2.25	2.14	1.74	2.12	1.74	--
November	2.73	2.21	2.17	1.78	2.33	1.75	--
December	2.65	2.26	2.14	1.77	2.34	1.74	--

Source : Gazeta Mercantil and BACEN (as of October 2006) 1/ July 2010 refers to July 26.

7. Definitions and Conversion Rates

Energy Units

Ton of oil equivalent. One toe is the energy content of a metric ton of oil.

Watt hour is the most common unit of measure for energy delivered by power plants. One watt is equal to 1 joule of energy per second.

Joule is the energy exerted by the force of one newton acting to move an object through a distance of one meter.

British Thermal Unit - Used unofficially in metric English-speaking countries to describe the heat value (energy content) of fuels, and also to describe the power, steam generation, heating and air conditioning industries. In scientific contexts, the Btu has largely been replaced by the joule (J), although it may be used as a measure of agricultural energy production (Btu/kg). It is approximately the amount of energy needed to heat one pound of water one degree Fahrenheit.

Bioenergy Terms

Advanced Biofuels
For reporting purposes, advanced biofuels includes all next generation technologies and feedstocks beyond the conventional sugar, starch, oilseed and animal fat-based biofuels produced commercially through 2009. Advanced biofuels are generally derived from non-food crops or waste biomass. Some examples of advanced biofuels include cellulosic ethanol, algae biodiesel, and "drop-in fuels" *(see Drop-in Fuels)*.

[Note: The above definition of "advanced" biofuels is less restrictive than that used in the 2008 US Farm Bill which defines "advanced biofuels" as all fuels derived from any renewable biomass other than ethanol made from corn kernel starch. The above definition is also different from that used in the U.S. Energy Independence and Security Act (EISA) of 2007. EISA defines "advanced biofuels" as any transport fuel made from renewable biomass, other than ethanol derived from corn starch, that meets a 50-percent GHG emissions savings as defined by EPA.]

Blends of mineral gasoline and bioethanol or mineral diesel and biodiesel with the number indicating the percentage of biofuel in the blend, e.g. B100 or E100 is pure 100 percent biodiesel or bioethanol. B5 is a common biodiesel blend equaling 5 percent biodiesel and 95% mineral diesel. Fuel quality standards frequently set limits on blends based on engine performance criteria.

Renewable energy made from materials derived from biological sources. Bioenergy includes both liquid transport biofuels and biopower (solid biomass).

Refers primarily to liquid transportation fuel derived from renewable biological sources.

ne)
A gas produced by the anaerobic digestion of organic matter including manure, sewage sludge, municipal solid waste, other biodegradable waste, or any biodegradable feedstock. Biogas is comprised primarily of methane and carbon dioxide, and typically used to generate electricity.

Renewable organic materials, such as wood, agricultural crops (eg. corn, rapeseed, sugarcane, switchgrass) or wastes, and municipal wastes, especially when used as a source of fuel or energy.

quid (BTL)
Processes, such as gasification and Fischer-Tropsch synthesis, that convert biomass into liquid fuels. Syngas is produced using the gasification process *(see Syngas)*. Syngas can be converted to different alcohols (ethanol, methanol, butanol, etc.) using fermentation, or syngas can be made into drop-in gasoline, diesel or jet fuel using the Fischer-Tropsch process *(see Drop-in Fuel)*.

Solid biomass that is burned to generate heat or steam for electricity generation. The biomass used is often by-products left over from forest~~s~~, food, and fiber industries. Biomass can be directly burned or co-fired with coal with no or minimal processing, or converted into gases, liquids or solids (eg. methane, bagasse, wood pellets). Common feedstocks: forest product wastes (chips, sawdust, wood pellets); field crop residues and farm animal manure; dedicated energy crops (bagasse from sugarcane, popular trees); and, landfill and municipal wastes.

The percentage of biofuel blended with fossil fuels and may be mandated.

Cellulosic Bioethanol or Biodiesel
Biofuels made primarily from cultivated, non-food energy crops (eg. grasses, poplar trees) or waste materials from the agricultural and forestry sectors using second generation biochemical or thermochemical technology platforms to break down plant fibers (cell walls) into sugars.

Biofuel
First generation biofuels derived from sugars, starches, animal fats and vegetable oils. Used as transport fuels as a substitute for fossil fuels.

Biodiesel: A trans-esterified vegetable oil (also known as a “fatty acid methyl ester”) produced from soyoil, rapeseed oil, other vegetable oils, animal fats, and recycled cooking oils.

Bioethanol: An alcohol made by fermenting the sugar components of plant materials like corn and wheat starch, sugarcane, sugar beet, sorghum, and cassava.

ocess
The technology used to convert biomass into biofuel (eg. fermentation, transesterification, and pyrolysis).

The non-fuel products produced when ethanol, biodiesel or other biofuel are produced (eg. distillers grains, vegetable oil, industrial chemicals, and bagasse). For this report, only report on animal feed and other agricultural products. For example, ethanol produced from 1 metric ton of corn yields 0.3 metric ton of distiller grains and (using dry-milling) 60 pounds. of corn oil, both important co-products that improve biorefinery profitability and lower lifecycle GHG emissions for ethanol. Distillers grains are an animal feed, and the corn oil can be used to produce biodiesel.

ns
\ cereal by-product (co-product) of the distillation process. There are two main sources of these grains. The traditional source was from brewers. More recently, ethanol plants are a growing source. Distillers grains are created by drying solids from stillage, and is subsequently sold for a variety of purposes, usually as fodder for livestock (especially ruminants).

Biomass-derived fuel that is chemically equivalent to gasoline, diesel, and jet fossil fuels. Unlike bioethanol which is corrosive, has a lower energy density and is chemically different from gasoline, drop-in gasoline requires no modifications to existing pipeline and storage/transport container infrastructure. Also known as "green gasoline," "green diesel," "green jet fuel," and "infrastructure-ready biofuels."

The raw material that is required (feeds into) for some industrial process in order to manufacture a product. Common feedstock in the bioenergy field are corn kernel starch, sugarcane, wheat starch, animal fats, soybean oil, forest residues, and municipal wastes.

Gasoline (Petrol) and Diesel Fuels
Synonymous with "fossil," "petroleum," "mineral," or "conventional" gasoline and diesel. Used as a benchmark to compare the greenhouse gas emissions, energy content, and other performance qualities of biofuels.

Green Gasoline, Green Diesel and Green Jet Fuel
Same as "Drop-in Fuel."

Greenhouse Gas (GHG)
Greenhouse gases are gases in an atmosphere that absorb and emit radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect. Substituting biofuels for fossil fuels is seen as one way of slowing global warming, so national policies may set minimum biofuel GHG emissions savings over fossil fuels in order to qualify biofuels for support schemes and against use mandates. The main greenhouse gases in the Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Each has a different atmospheric lifetime and global warming potential.

Transport fuels are a major source of carbon dioxide and livestock are a major source of methane.

[Note: Lifecycle greenhouse gas emissions for selected biofuel pathways are published in EPA's RFS2 of 2010. It is understood that these values will change over time for any given biofuel with the introduction of new pathways and new technologies.]

Renewable Energy
Energy generated from natural resources such as sunlight, wind, rain, tides, biomass and geothermal heat, which are naturally replenished.

(Biopower)
A bioenergy product derived from many organic materials. The most commonly used materials come from the forest products sector (sawdust, timber wastes), the agricultural sector (food and fiber crop residues, non-food energy crops, manure), and municipal collection facilities.

A mixture of carbon monoxide, carbon dioxide, hydrogen, and methane created during the gasification process of heating biomass in the presence of air, oxygen or steam. Syngas can be converted to a variety of fuels including hydrogen and alcohols, including ethanol, methanol and butanol. Syngas can be used as an end product but not in transportation and therefore is not reported in the required Transportation Fuels Consumption table *(see BTL)*.

Conversion Rates *(based on lower fuel heating values)*

Energy Content		
Gasoline	43.10 MJ/kg	43.10 GJ/MT
Ethanol	26.90 MJ/kg	26.90 GJ/MT
Diesel	42.80 MJ/kg	42.80 GJ/MT
Biodiesel	37.50 MJ/kg	37.50 GJ/MT
Pure Veg. Oil	34.60 MJ/kg	34.60 GJ/MT

Liquid Fuel Mass/Volume/Energy Content			
1 MT Ethanol	1267 Liters	0.64 Toe	25,397,252 Btu
1 MT Biodiesel	1136 Liters	0.90 Toe	35,714,885 Btu

Energy Unit Conversions (1 Row Unit = XXXX Column Units)				
	Tons of Oil Equivalent	Gigajoule	KiloWatt Hour	British Thermal Unit

1 Ton of Oil Equivalent	1	41.87	11,630.00	39,683,205.41
1 Gigajoule	0.024	1	277.78	947,817.08
1 Kilowatt Hour	0.000086	0.0036	1	3412.14
1 British Thermal Unit	0.000000025	0.00000106	0.000293	1