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## Paraguay

### BIOFUELS ANNUAL

#### Enter a Descriptive Report Name

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**Report Highlights:**

Biofuels production in Paraguay is expected to continue to increase in 2009. Preliminary projections for 2010 show a potentially significant jump in both biodiesel and ethanol production as several investments in new plants and expanded capacity come on line. Domestic consumption is expected to follow closely the supply trend. The ethanol industry projects small exports in 2009, with somewhat larger exports in 2010.

**Post:**

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*Situation and Outlook*

Paraguay continues to expand its biofuel industry, and it is expected to become an important producer of biofuels in the future. Thanks to its very good weather, rich soils, and broad agricultural base and culture, Paraguay has the opportunity to add value to much of its agricultural production. The government in place since 2008 encourages biofuels, particularly biodiesel production by small rural families. Recent official policies continue to support the use of biofuels. So far, investment has been in small plants, with capacities ranging between 2-36 million liters per year. There are 13 ethanol plants and six authorized plants of biodiesel. Most of the ethanol companies are expanding capacity to meet a growing domestic demand and potential exports. Investment in biodiesel production is at a slower pace.

Paraguay imports all the petroleum it uses. Since 1999, gasoline has been mixed with ethanol at different blending levels. In October 2005, Paraguay passed a law promoting biofuels. The main objectives behind this law are to diversify the supply of renewable energy, diminish the dependence on imported fossil fuel, substitute fossil fuel with renewable fuels, improve environmental quality, develop the farm sector (focused primarily on small producers), and to export ethanol and biodiesel. The law sets mandated mixes for gasoline and diesel. Diesel accounts for approximately 70 percent of the fuel consumption while the rest is gasoline (already mixed with 24 percent ethanol).

### Biofuel Policy

In October 2005, the Paraguayan Congress passed Law 2748 for Biofuels Promotion. The main points of this Law and its following decrees are:

- It declares production of biofuels to be of "national interest".
- It recognizes biodiesel, anhydrous ethanol and hydrated ethanol as fuels.
- It establishes minimum mix mandates for biodiesel at 1 percent in diesel for 2007, 3 percent in 2008, and 5 percent for 2009. However, due to the lack of sufficient local supply, in June 2009 the mix was reduced to 1 percent until further notice. The maximum blending mix at gas stations can reach 20 percent.
- It establishes mix mandates for ethanol of a minimum of 20 percent and a maximum of 24 percent in gasoline of 95 octanes or under. In March 2009, the government set all mixes at 24 percent.
- Biofuel use is mandatory as long as there is sufficient local supply.
- It encourages the production of different feedstocks for biofuel production, which has to be of local origin.
- Some tax benefits are provided, especially concerning investment.
- The Ministry of Industry will control investment and will determine production levels. The Ministry of Agriculture and Livestock will certify feedstocks.

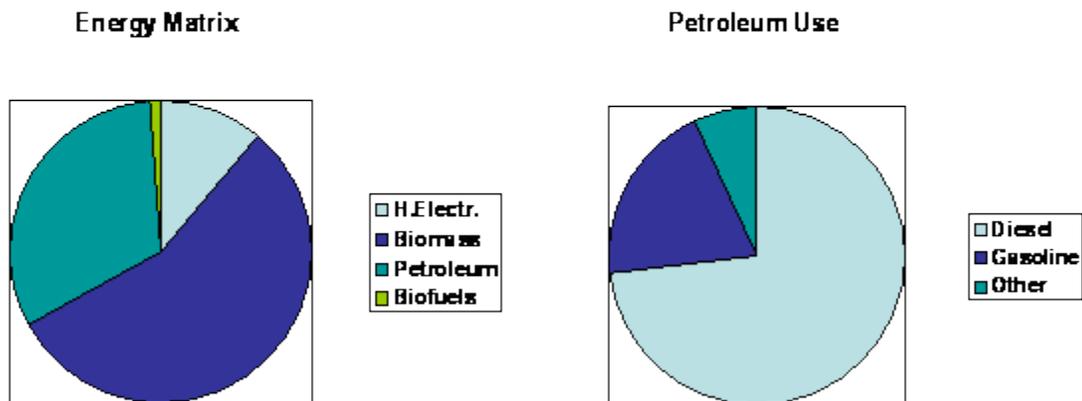
In May 2008, and because of proposed changes made by the official and private sectors, the government passed Decree 12240 reducing the VAT on biodiesel and ethanol to 2 percent and eliminating import duties on flex fuel and E85 new and used cars.

### The Energy Market

Paraguay's main energy source is hydroelectricity, which it exports significant amounts to Argentina and Brazil. However, biomass, mostly wood and charcoal, is the largest source of energy consumed domestically in homes and the industry. Then follow petroleum products which are imported (Paraguay does not produce oil or gas), hydroelectricity, and finally biofuels with just over 1 percent of the total. Of the country's total energy consumption, industry, transportation, and residential/commercial sectors demand roughly one third each.

In 2009, Paraguay is expected to consume approximately 1.1 billion liters of diesel and 450 million liters of gasoline (of which approximately 100 million liters is ethanol). Small volumes of kerosene and fuel oil will also be consumed. There is free importation of diesel and gasoline. However, Petropar, the national oil company, sets the domestic price of diesel, which is generally subsidized.

## Paraguayan Energy Matrix and Petroleum Use



Ethanol

Blending requirements for ethanol with gasoline have changed several times in the past years. The last modification took place in March 2009, through Resolution 162 of the Ministry of Industry and Commerce, by which it set mandated mixes at the highest of 24 percent. In 2009, production is expected to reach 110 million liters, significantly higher than last year, which had some technical difficulties at the plants and with the sugar cane crop. Private and official sources estimate production for 2010 at 150 million liters, with growing exports.

Paraguay has had a mixing requirement since Decree 2162 of March 1999 and its following resolutions. It first established that gasoline be mixed with 7 percent ethanol.

In 2009, roughly 50 percent of ethanol in Paraguay will be obtained from sugar cane, 30 percent from molasses, and the rest from grain (primarily corn).

There are eight sugar mills in Paraguay, of which two have distilleries that produce anhydrous ethanol. In addition, there are two distilleries, which produce hydrated ethanol. One of the sugar mills utilizes grains once the sugar cane harvest is over. There are 11 autonomous distilleries and 7 dehydrators in Paraguay. Petropar, Paraguay's national oil company, is the country's largest ethanol producer accounting for approximately one third in 2009.

Paraguay is the world's largest exporter of organic sugar. Crop 2008/09 will total approximately 105,000 hectares planted with sugar cane. Official studies indicate that the country has the potential to expand to 450,000 hectares. Sugar cane is produced in 14 of the 17 departamentos (states), but the largest concentration is in the central part of the eastern region. Planted area has been growing continuously since 2001. Sugarcane production has a strong social and economic importance as more than 25,000 farmers, most of which are small-scale producers, make a living with it.

Private sources estimate that in crop 2009-10 there will be some 112,000 hectares planted with sugar cane. Roughly, 70 percent of the country's sugar cane will be used to produce conventional and organic sugar, and the balance will be used for ethanol production. Contacts indicate that the country's average production of sugar cane is 55 tons per hectare, which if used exclusively for ethanol yields about 4,000 liters.

There is one sugar mill in the eastern part of the country that can also use grains, primarily corn and sorghum. Paraguay's historic corn production is about one million tons, used domestically for animal feed and human consumption. Another alternative feedstock for ethanol production is manioc, also known as cassava, which is widely produced on about 300,000 hectares in Paraguay.

Ethanol domestic consumption for 2009 is forecast up at 100 million liters. Consumption in 2010 is projected to increase further at 115 million liters. The recent official permission to

import flex fuel and E85 cars duty free, is expected to increase the demand for gasoline and ethanol. Approximately 95 percent of all ethanol sold is dehydrated. There is a local company researching on mixing ethanol with diesel at a 5-8 percent. Tests are well underway and they are expecting the official approval to begin its blending and commercialization in late 2009 or 2010. If finally authorized, it will result in an additional ethanol consumption of approximately 70-90 million liters per year.

Paraguay's ethanol production capacity is over 200 million liters annually. Producers are investing in expanding capacity and improving efficiency at their plants. Private projections indicate that by 2014, Paraguay could produce approximately 300 million liters of ethanol, consume 250 million liters and export the balance. This would allow the country to spend fewer dollars in importing petroleum and even generate more exports.

### Biodiesel

Resolution 236 of June 2009 of the Ministry of Industry and Commerce reduced the obligatory mix of biodiesel in diesel to 1 percent until further notice. Based on a previous resolution in 2007, the mandated mix for 2009 had to be 5 percent. The lack of local supply, high cost of feedstock and controlled diesel prices have not encouraged sufficient production. However, biodiesel producers indicate that local fuel distributors have not complied with the mandate and as a result, investment and supply have been significantly lower than anticipated. Production and consumption of biodiesel is expected to reach approximately 12 million liters in 2009, made primarily from tallow. Official contacts are optimistic that by 2010 a Spanish investment will inaugurate the largest biodiesel plant in Paraguay, with a production capacity of approximately 50 million liters per year. This volume would help to meet the original 5 percent mandate mix.

There are six biodiesel plants approved by the government. Only one uses tallow, while the others can use vegetable oil and fat as feedstock. Two leading local meat packers own biodiesel plants. Contacts indicate that there are some 20 small biodiesel plants for self-consumption scattered around the country and with no official control. The country's current biodiesel production capacity is estimated at 45 million liters a year.

There is free importation of diesel in Paraguay. However, the government, through Petropar -- the official oil company -- sets the price of diesel, which is normally lower than its cost of importation.

Paraguay's soybean crop in 2008-09 dropped significantly to approximately 3.8 million tons due to dry conditions. Paraguay's crushing capacity is roughly two million tons. Crushing capacity is expected to grow in the future, as a few companies have announced the intention

of expanding production. Soybeans that are not processed are exported as beans. The main market used to be Argentina, but recent policy changes in the neighboring country will shift exports to other markets. Paraguay provides good opportunities for the local soybean/biodiesel complex, as it eventually could replace the importation of fossil diesel with renewable fuels produced from locally grown feedstock, saving several million dollars in imports every year.

Apart from tallow and soybean oil, Paraguay has good potential in producing biodiesel from Coco Mbokaya (*Acrocomia totai*), a palm which is widely found in a vast area of the country. The government is trying to develop a system by which smaller producers harvest the beans in order to obtain an additional income. There are also studies to incorporate rapeseed as a winter rotation in the soybean area, which could expand productivity per hectare significantly. Sesame seed, sunflower, canola, castor oil, tung oil and peanuts are some other alternatives, which could expand in the future depending on productivity and market conditions.

Petropar inaugurated in 2008 the first laboratory that can test biodiesel quality, a key point in the development and use of biodiesel. The National Institute of Technology and Measurements is installing another laboratory.

#### Future Feedstock

Official research in feedstock for biofuels is limited, but there are plans to increase resources in the future. There are programs on research and extension of coco, castor oil, and jatropha.

Coco is a native palm and some studies estimate that about 50 percent of the beans are left unharvested. Its oil is of excellent quality and it is widely used in the soap and cosmetic industry. Official sources estimate that there are 10,000 hectares of castor oil plants in Paraguay and there are plans to increase the area by 50 percent. The government and the private sector have many expectations with jatropha production. This plant produces very well in Paraguay, especially in the western Chaco region. Preliminary results based on research of the Ministry of Agriculture's experiment stations, three-year-old plants yield 3-4 tons of beans per hectare, with 37 percent oil content of excellent quality. The harvest is done manually and this is seen as an opportunity for thousands of small-scale producers.

Some private entities and companies, for example sugar mills, conduct their own research, focused primarily on genetics, yield improvement, and crop management. Sugarcane remains the most promising feedstock for ethanol. Some private companies are also working in research and development of jatropha as their plans are to base their commercial production on this feedstock. The Inter-American Development Bank is funding projects for the development of coco and jatropha. The binational electricity companies Yacireta and Itaipu have renewable energy programs and fund several projects for small-scale rural producers in

their area of influence.

## Trade

Paraguay is not expected to become an important biofuels exporter in the short or medium term. However, as the industry develops and current and future investments come on line, there will be exports of both biofuels. Paraguay has the potential to grow different feedstocks efficiently, including second-generation material in the future. Investment in the biodiesel industry is slower than previously expected. On the contrary, the ethanol sector is advancing at a good rate. The private sector projects exports to the EU to reach 10 million liters in 2009 and 40 million liters in 2010, taking advantage of duty-free exports through EU's GSP Plus program under which ethanol was recently included. However, ethanol domestic consumption is expected to catch up with production in five years, as a result of the adoption of flex fuel cars and the potential use of ethanol in diesel. Therefore, excess ethanol for export is forecast to be quite limited.

Paraguay is a landlocked country surrounded by Argentina, Bolivia and Brazil. However, it has good connections to the Atlantic Ocean with a barge system through the Paraguay and Parana rivers, and with a trucking system to Paranagua port in Brazil (800 kilometers away from the eastern border of the country).

Paraguay will need to invest in infrastructure and logistics (terminals, storage, transportation, etc.) in order to be able to export large volumes of biofuels in the future.

Imports of biofuels into Paraguay are normally prohibited. However, they can be imported with a special official authorization. In mid-2008, the government authorized the importation of 6 million liters of ethanol from Brazil.

## Regional and Bilateral Agreements

Brazil and Paraguay signed in 2007 a Memorandum of Understanding on Biofuels. The main areas of cooperation and work are the evaluation of different feedstock; technological development of industrial processes; analysis of the system of infrastructure and logistics; enhance the integration of production and commercial systems; and investment in the Paraguayan biofuels sector.

At the end of 2006, the Mercosur region established a Special Working Group on Biofuels. The first meeting of this group took place in Uruguay and the four countries of Mercosur (Argentina, Brazil, Paraguay and Uruguay) and Venezuela participated. In late 2007, they defined an action plan. The main points were: the evaluation of different feedstocks and

different areas of production; identification of research organizations to encourage joint work; analysis of current regulations; analysis of the infrastructure and distribution of fuels; and identification of tools to promote investment in the biofuels sector. In mid 2008, member countries signed a Memorandum of Understanding to develop a program of cooperation for biofuels and its technology.

Contacts indicate that developments under the two agreements have moved slowly.

### Statistical Information

#### **Quantity of Feedstock Use in Biofuel Production in MT**

		2005	2006	2007	2008	2009
<b>Biodiesel</b>						
Vegetable Oil						
	Soybean oil				2,700	1,800
	Rapeseed Oil					
	Palm oil					
	Coconut oil					
	Animal Fats			3,000	7,000	10,000
	Recycled Vegetable oil					
	Other					
<b>Ethanol</b>						
	Corn/Sorghum			14,000	21,000	55,000
	Wheat					
	Sugarcane	267,000	270,000	300,000	385,000	715,000
	Sugar beat					
	Rye					
	Molasses	94,000	96,000	120,000	160,000	125,000
	Wood					
	Cassava/tubers					

#### **Biofuel Production/Consumption/Trade (million Liters)**

<b>Biodiesel</b>	2005	2006	2007	2008	2009
Beginning stocks*			0	0	0
Production			3	10	12
Imports			0	0	0

Total supply			3	10	12
Exports			0	0	0
Consumption			3	10	12
Ending stocks*			0	0	0

**Biofuel Production/Consumption/Trade (million Liters)**

<b>Ethanol</b>	2005	2006	2007	2008	2009
Beginning stocks*	0	0	0	0	0
Production	45	46	60	80	110
Imports	0	0	0	6	0
Total supply	45	46	60	80	110
Exports	0	0	0	0	10
Consumption	45	46	60	86	100