

USDA Foreign Agricultural Service

GAIN Report

Global Agricultural Information Network

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Paraguay

Biofuels Annual

Paraguay

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Report Highlights:

Paraguay's ethanol production for 2011 is projected at a record 155 million liters. The industry continues to expand as a result of good returns and support from official policy to increase the demand to blend with gasoline. Despite the small market, biodiesel production is also expected to grow in 2011, totaling 36 million liters. Contacts indicate, however, that the sector will not grow significantly at current low prices. Some small quantities of ethanol and biodiesel could be exported in the near future to nearby countries.

Post:

Buenos Aires

Executive Summary:

Paraguay's ethanol industry continues to expand steadily as a result of government support to expand consumption, good returns for the industry, and the replacement of fossil fuel imports by bioethanol produced from locally produced feedstock. Ethanol output is expected to reach a record of 155 million liters in 2011. Domestic consumption is projected at a similar volume, growing due to an expected increase in the blending mandate from 24 to 25 percent and larger sales of fuel flex and E85 cars. Sugarcane and some grain (corn and sorghum) are the main feedstocks utilized in the process. A few local biorefineries are exploring the possibility of exporting ethanol to neighboring countries. Although current prices are not attractive, Paraguay can export large volumes of ethanol to the EU under the GSP+ program.

The local biodiesel industry is much less developed, although there is potential to expand since Paraguay is one of the world's top soybean producer and exporter. Industry contacts indicate that production could increase with greater enforcement of the blending mandate, reestablishment of the mandate to the original 5 percent, and the establishment of a profitable selling price scheme for processors and distributors. There are 6-7 medium, commercial-scale biorefineries which can either use tallow or vegetable oil as feedstock. The only plant currently in operation is owned by a large meat packer, which needs to process its tallow. Biodiesel production and consumption are forecast at 36 million liters in 2011, resulting in a 3 percent blending ratio. Some industry players doubt that this level will be reached.

There are some public and private programs which are working on research in this area, especially on crops which are already being produced in the country, such as sugarcane, corn, and manioc. Research is also done on feedstocks which are not currently used but which have great potential, such as jatropha and Coco Mbokaya.

Policy and Programs:

In October 2005, Paraguay passed Law 2748 for Biofuels Promotion. The main objectives include 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.

Government policy does not specify the type of feedstock to be used. However, ethanol production is mainly focused on sugarcane and grains, while biodiesel is primarily focused on tallow and vegetable oil. There are a few projects researching the potential use of other feedstocks such as Coco Mbokaya, Jatropha, spurge, and castor oil.

Paraguay's main energy source is hydroelectricity, with significant exports to Argentina

and Brazil. However, biomass, mostly wood and charcoal, is the largest source of energy consumed in homes and the industry. Then follow petroleum products which are imported (Paraguay does not produce oil or gas), hydroelectricity, and finally biofuels with a very small share of the total.

Following are the main points of the Biofuels Promotion Law (and its following decrees):

- Declares production of biofuels to be of "national interest".
- Recognizes biodiesel, anhydrous ethanol and hydrated ethanol as fuels.
- 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 a minimum 1 percent until further notice. The maximum blending mix at gas stations can reach 20 percent.
- 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.
- Encourages the production of different feedstocks for biofuel production, which has to be of local origin.
- Established tax benefits, 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, the government passed Decree 12240 reducing the Value Added Tax (VAT) on biodiesel and ethanol to 2 percent and eliminating import duties on flex fuel and E85 new and used cars.

There is no compulsory government environmental requirement for the production of feedstocks or the industrial process for biofuels.

Industry contacts report that the local ethanol industry is growing slowly, but steadily and has a good future, thanks to expected growth of the domestic market and potential exports. Ethanol mandates are being fulfilled and producers of ethanol currently enjoy very good returns as production costs are lower than the selling price to local fuel distributors. These same sources are doubtful about the future of biodiesel in Paraguay. Of the total fossil fuel demand, which is imported, diesel accounts for approximately 70 percent. Contacts indicate that despite the Biofuel Law, most fuel distributors do not comply with the mandate. Petropar, the national oil company, is the only company purchasing biodiesel from local producers, paying a price similar to what it sells its diesel fuel. This price scheme reportedly does not cover the cost of production of biodiesel from vegetable oil. The industry is working to include in the cost of diesel the higher price of biodiesel, which they claim, should be paid by consumers.

The Ministry of Agriculture has in place programs for research on jatropha, coco and sugarcane. The university, private entities and companies also have developed some

research. Private companies are adopting new sugarcane varieties, which in most cases come from Brazil and Argentina. There is also research on the use of grains and manioc. Some contacts indicate that research on sweet sorghum will likely begin soon.

Bioethanol and Biodiesel:

Bioethanol

Production

Ethanol production is expected to reach 155 million liters in 2011, a steady increase since the Biofuels Law was put in place. Blending requirements for ethanol with gasoline changed several times in the past years. 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. 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 as much as 24 percent. There are strong rumors that the mandate could be increased to 25 percent any time soon as a way to promote further use.

In 2010, roughly 60 percent of ethanol in Paraguay will be obtained from sugarcane (and an unknown volume of molasses), and the rest from grains, primarily corn. Most ethanol refineries own part of the sugarcane they process, however, Petropar buys cane exclusively from third parties.

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, is the country's largest ethanol producer accounting for approximately one third of the total in 2010.

Paraguay is the world's largest exporter of organic sugar. The sugarcane area is estimated between 100,000-105,000 hectares. Official studies indicate that the country has the potential to expand to 450,000 hectares. Sugarcane 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 estimations indicate that about 30 percent of the sugarcane crop is used directly for the production of ethanol. Most players point out that the current bottleneck for increased ethanol output is the crop area. They also indicate that 130,000 hectares of sugarcane are needed to fully utilize the total sugar and alcohol production capacity. Several biorefineries are investing in the expansion of plantations.

There is one sugar mill in the eastern part of the country that can also use grains, primarily corn and sorghum. Paraguay's normal 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.

Paraguay's ethanol production capacity is projected at 280 million liters in 2011. Producers are investing in expanding capacity and improving efficiency at their plants. One new ethanol biorefinery will be inaugurated in 2010 and two more are projected for 2011. Private projections indicate that by 2014, Paraguay could produce approximately 300 million liters of ethanol, consume 250 million liters and export the balance.

Most players in the local ethanol industry are in a good financial situation as the business is profitable. Refineries currently sell ethanol to fuel companies at approximately US\$0.74 per liter, well above production costs. E85 is currently in promotion and sells at US\$0.72 per liter at the pump and E24 at US\$1.06 per liter. The big difference is the tax paid by gasoline.

Consumption

Ethanol domestic consumption for 2011 is forecast to increase to 150 million liters. This follows an estimated increase in consumption in 2010 to 130 million liters. As a result of the recent official permission to import flex fuel and E85 cars duty free, the demand for ethanol is growing. Approximately 95 percent of all ethanol sold is dehydrated.

Paraguay's gasoline market in 2010 is estimated at 450 million liters (including the 24

percent ethanol mandate). Practically the whole demand is for private vehicle use. Historically, of the total fuel consumption, diesel accounted for 80 percent and gasoline 20 percent. With new policy in place, the importation of E85 and flex fuel cars, and the conversion of many engines to flex fuel, is resulting in a larger use of gasoline (and thus, ethanol). Currently, the proportion is estimated to be closer to 70/30. The use of flex fuel cars and E85 has promoted the use of E85 gasoline, which in 2009 totaled about 12 million liters. The sale of this fuel is provisionally authorized, and it is expected to increase to 15 million liters.

Trade

Paraguay does not export ethanol for fuel use. However, some local industries are confident that they will begin to export small quantities of ethanol (either for fuel or industry) in the short term. The main market is expected to be Uruguay, which has implemented a mandatory Biofuel Law and usually imports relatively small volumes from Argentina. Another potential market could be Argentina, which with its biofuel mandate in place, could run short of ethanol for either fuel or industry use.

Paraguay could also export a significant volume of ethanol duty-free to the EU under the GSP+ program. However, local exporters indicate that current prices are not attractive.

Exports and imports of ethanol are duty free but have to be approved by the Ministry of Industry and Commerce.

Stocks

Stocks are usually kept at the end of the calendar year to use in the first months of the following year, until May-June when the new sugarcane harvest begins. Petropar and two private biorefineries are the only ones to have good storage capacity.

Statistical Information

Conventional & Advanced Bioethanol (million liters)						
CY	2006	2007	2008	2009	2010	2011

Production	46	65	90	120	140	155
Imports	0	0	6	0	0	0
Exports	0	0	0	0	0	0
Consumption	45	60	86	110	130	150
Ending Stocks	10	15	25	35	45	50
Production Capacity (Conventional Fuel)						
No. of Biorefineries			9	11	12	14
Capacity			236	250	260	280
Production Capacity (Advanced Fuel)						
No. of Biorefineries						
Capacity						
Co-product Production (1,000 MT)						
Product Y						
Product Z						
Feedstock Use (1,000 MT)						
Sugarcane			900	960	1100	1300
Grains			50	115	135	140
Feedstock C						
Feedstock D						

Biodiesel

Production

Biodiesel output for 2011 is projected at 36 million liters, the highest ever, although the final volume will depend on official policies. Contacts report a number of problems that have recently affected the development of local biodiesel. The most important are: 1) lack of enforcement of the mandate; 2) the diesel market dominated by Petropar, which these contacts claim many times sets prices below cost; 3) resistance to increase the price of diesel at the pump, reflecting higher production costs of biodiesel when using vegetable oil; 4) lack of consumer knowledge on biodiesel and some technical problems, especially during winter time; and 6) operational problems, where Petropar reportedly last year mixed by mistake biodiesel at higher percentages than indicated.

Currently, biodiesel at a commercial level is only produced from tallow. The entire supply of tallow is only sufficient to reach a 1.5 percent blending ratio and this does not take into account competing uses for tallow. To accomplish the original 5 percent

blending mandate, Paraguay will have to utilize vegetable oil (most likely from soybeans) as feedstock, which at current prices, it is significantly more costly to produce than biodiesel from tallow. Its production cost is also significantly higher than the current local price of biodiesel. At current prices and costs of production, industry contacts indicate that B5 made of vegetable oil would cost US\$0.01 per liter more than pure diesel at the pump, which currently sells at US\$0.96 a liter.

Resolution 236 of June 2009 of the Ministry of Industry and Commerce reduced the obligatory mix of 5 percent of biodiesel in diesel to a minimum of 1 percent. The lack of local supply, high cost of feedstock and controlled diesel prices did not encourage production.

There are currently six biodiesel plants approved by the government, with an estimated production capacity of 50 million liters. Most of them can use vegetable oil and animal fat as feedstock. Two leading local meat packers own biodiesel plants. The production capacity of the approved companies vary from 4-12 million liters a year. Contacts indicate that there are around 20 small biodiesel plants for self-consumption scattered around the country and with no official control. Their production is primarily based on vegetable oil produced by them. Currently the only biodiesel plant operating is part of a large slaughter plant which needs to process its tallow output due to market conditions. There are some investors waiting to see that the business becomes profitable to begin the installation of plants. Currently there is a Spanish company interested in putting into operation in 2011 three modular plants with a total capacity of approximately 45 million liters. They most likely will use vegetable oil as feedstock.

Imports of diesel in Paraguay are not restricted, but the government, through Petropar, sets the price of diesel. The price is often below the cost of importation, with private fuel distributors only importing when prices are favorable.

Paraguay's soybean crop in 2009-10 was 7.2 million tons, ranking it as the world's 6th largest producer and 4th largest exporter. Paraguay's crushing capacity is roughly two million tons. Soybeans that are not processed are exported as beans. The large production provides potential opportunities to eventually replace some imports of diesel with renewable fuels produced from locally grown feedstock.

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. 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.

Research in feedstock for biofuels is limited. There are a few public and private programs on research and extension of coco, castor oil, and jatropha. Coco Mbokaya is a native palm and some studies estimate that about 50 percent of the beans are not harvested. Its oil is of excellent quality and it is widely used in the soap and cosmetic industry. The government is trying to develop a system by which smaller producers harvest the beans in order to obtain an additional income. 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 are very interested in jatropha production. The 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, show that 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. 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.

Petropar since 2008 has had the only laboratory that can test biodiesel quality, a key point in the development and use of biodiesel.

Consumption

Biodiesel consumption for 2011 is projected at 36 million liters, the highest ever. Of the total fuel market, diesel accounts for roughly 70 percent with an estimated volume of 1.1 billion liters in 2010. Approximately 30 percent of it is consumed by cargo and passenger transport, another 30 percent by the industry and farm equipment, and the balance by private vehicles.

Currently, the only company buying biodiesel is Petropar. In mid 2009, it marketed by mistake B30, which caused several problems and the product had to be recalled. It

continued buying biodiesel following these problems, but did not mix the product, accumulating large stocks. In 2010 it began to start mixing to reduce stocks, while buying small quantities from the very few plants operating.

There is some discussion on the quality of biodiesel made from tallow. While producers report no concerns or problems, some contacts claim that it should not be used during the coldest months of the year because it can clog engine filters. Contacts in the industry envision a market where tallow biodiesel is sold during the summer time while vegetable oil biodiesel is sold throughout the year.

Trade

Significant biodiesel exports from Paraguay are not expected in the short or medium term. One of the large processing plants is exploring the possibility of exporting small volumes of biodiesel to Brazil.

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 connected to Paranagua port in Brazil (800 kilometers 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.

Exports and imports of biodiesel are duty free but have to be approved by the Ministry of Industry and Commerce.

Stocks

Local biodiesel production is small and there are generally practically no stocks. Due to technical problems previously discussed, Petropar in the last part of 2009 bought biodiesel but did not blend it, accumulating approximately 4 million liters by the end of the year. The mixing will be done throughout 2010 with the goal of eliminating the stock.

Statistical Information

Conventional & Advanced Biodiesel (million liters)						
CY	2006	2007	2008	2009	2010	2011
Production		3	10	8	12	36
Imports		0	0	0	0	0
Exports		0	0	0	0	0
Consumption		3	10	4	16	36
Ending Stocks		0	0	4	0	0
Production Capacity (Conventional Fuel)						
No. of Biorefineries			6	6	6	7
Capacity			46	50	50	100
Production Capacity (Advanced Fuel)						
No. of Biorefineries						
Capacity						
Feedstock Use (1,000 MT)						
Tallow		3	10	8	12	15
Vegetable Oil						18
Feedstock C						
Feedstock D						

Notes on Statistical Data: