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GAIN Report

Global Agricultural Information Network

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Paraguay

Biofuels Annual

2015

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Report Highlights:

Paraguayan ethanol production is forecast to reach a record 215 million liters in 2016. This is a result of expected larger sales of gasoline as the local economy continues to expand. In 2015, the Paraguayan Congress passed a law under which sugarcane is required to be the primary feedstock used for ethanol. Once ethanol from sugarcane is no longer available, ethanol from other feedstocks can be used. The biodiesel local industry continues to face problems of commercialization and quality. Both biodiesel production and consumption for 2016 are forecast at 12 million liters, representing roughly a 0.8 percent blend rate, lower than the 1 percent official mandate.

Post:

Buenos Aires

Author Defined:

Policy and Programs:

The most recent modification on the Paraguayan biofuels sector was Law 5444, named "Promotion of Consumption of Bioethanol" passed on July 2015. The salient points of this law are:

- The Ministry of Industry and Commerce will define the mandate mixes based on the domestic supply of bioethanol, utilizing first ethanol produced from sugarcane planted locally, and once that supply is finished, ethanol from other feedstocks (primarily grains) can be utilized.
- Local gasoline distributors have to guarantee a national coverage and availability of E85.
- Within the next 12 months, the government will implement a National Program to promote and make more efficient the production of sugarcane by small producers and regulate its production and commercialization.
- The governmental fleet will progressively switch to E85, and public transport will have to gradually incorporate bioethanol.

Previous Biofuels Regulations:

- In February 2013, through decree 10703, the government established that diesel type III (the lowest quality, and the most widely used), has to be mixed with biodiesel, while mixing with higher quality diesel is still optional. It also established that gasoline (except jet fuel and 97 octane) has to be mixed.

- This decree also established that the Ministry of Industry and Commerce will set mix mandates. To increase the biodiesel mix, processors will have to request an increase from the government. The current mandate for ethanol is 25 percent. Diesel type III has to be blended at a one percent ratio with biodiesel (originally, biodiesel blends were set to be higher, but the lack of incentives, quality problems and negative returns forced mixes to be lowered).

- Decree 10703 also allows the blending of biodiesel made from different feedstocks, as long as the final product complies with required quality standards.

- This decree also created the Inter-Institutional Unit to monitor and regulate the biodiesel industry. This unit is formed by the Ministry of Industry and Commerce, Ministry of Agriculture and Ministry of Economy. Its main goals are to promote a sustainable and competitive production of biodiesel, set the reference price, and to regulate production and distribution of biodiesel in the local market.

- Decree 10724, of February 2013, established the methodology to set the price of diesel type III, which was modified to include the cost of blending with biofuel. This allows the national oil company to purchase biofuel and pass on the higher cost to the end consumer. The price of biodiesel was set at US\$1.26 per liter (the

current price is US\$0.90 per liter). The price of ethanol is not regulated.

- In March 2013, through Decree 10761 the government increased the Value Added Tax (VAT) on biodiesel to 10 percent, as a way of allowing biodiesel processors to fully recover the tax, which previously had been set at 2 percent (in December 2013 the government exempted biofuels from the value added tax).

In May 2008, the Government of Paraguay established that flex fuel and E85 new cars were exempt from import duties.

In October 2005, Paraguay passed Law 2748 for Biofuels Promotion. The main objectives 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. Following are the main points of the Biofuels Promotion Law (and decrees):

- Declares production of biofuels to be of “national interest”.
- Recognizes biodiesel, anhydrous ethanol and hydrated ethanol as fuels. Through Decree 10703 of February 2013, it also includes as biodiesel the synthetic biofuel or its mixes produced from biomass applying the FischerTropsch process.
- 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 Agriculture and Livestock will certify feedstocks.

Government policy did not specify the type of feedstock to be used (until recently based primarily on grains and sugarcane). However, Law 5444 of July 2015 establishes that bioethanol has to be produced from sugarcane, and once its availability finishes ethanol from other feedstocks can be used. Biodiesel is largely focused on vegetable oil and, at a lesser extent, beef tallow. There are a few projects researching and expanding the potential use of other feedstocks.

Energy Market:

Paraguay’s energy supply is primarily hydroelectric, with 57 percent share, followed by biomass with 27 percent and fossil fuels with 16 percent. However, of the country’s total energy consumption, biomass accounts for 46 percent, followed by fossil fuels with 38 percent and hydroelectricity with 16 percent. Paraguay exports great amounts of electricity to Argentina and Brazil, but underutilizes it domestically. Biomass, chiefly wood and coal, is the largest source of energy consumed, mostly in homes and the industry, followed by imported petroleum products (Paraguay does not produce oil or gas). Biofuels are also consumed on a smaller scale.

The local fuel market in 2016 is projected at a record 2.24 billion liters. Diesel is expected to account for approximately 65 percent of the total, while gasoline (including ethanol) makes up the balance. Fuel

consumption of both diesel and gasoline is expected to continue to grow in the future, being very dependent on the development of the local economy and the agricultural sector. The demand of E85 is expected to expand as a result of Law 5444 which promotes and encourages its distribution and use. Private estimates indicate that of the total number of vehicles, 4 percent are flex fuel, 46 percent run on gasoline and 50 percent on diesel. Paraguay, being an important agricultural producer and with no railway system, will continue to be a strong consumer of diesel in the future. In 2014, Petropar, the national oil company, accounted for 54 percent of the country's diesel sales and 6 percent of gasoline sales while the balance was marketed by private companies.

Fuel Use Projections (Million Liters)										
Calendar Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Gasoline Total	780	827	870	910	950	1,000	1,050	1,100	1,160	1,240
Diesel Total	1,460	1,530	1,590	1,700	1,780	1,860	1940	2040	2150	2250
On-road										
Agriculture										
Construction/mining										
Shipping/rail										
Industry										
Heating										
Jet Fuel Total	47	49	51	52	54	56	58	59	62	65
Total Fuel Markets	2,287	2,406	2,511	2,662	2,784	2,916	3048	3199	3372	3555

There is no compulsory environmental mandate for the production of feedstocks or the industrial process for biofuels. Paraguay has environmental legislation focused primarily on trying to avoid deforestation, water pollution and contamination. With respect to GHG emissions from the biofuels industry, it is considered to be low as most of Paraguay's soybeans are done using no-till technology. Sugarcane production normally uses large volumes of fertilizers, but roughly 60 percent of Paraguay's sugarcane acreage is devoted to organic sugar. At the industrial stage, the sugar sector burns large volumes of bagasse to produce its own energy. The heavy use of biomass (wood and coal) produces environmental problems related to deforestation and soil degradation. It will be some time until Paraguay exports biodiesel as it will first need to invest heavily to supply its domestic demand.

There are a few entities or organizations which have researched or still research on different feedstocks which could potentially be suited for Paraguay's producing environment. Most programs are aimed at small producers. Examples of these are non-toxic varieties of Jatropha, Coco Mbokaja and different tree varieties whose seeds could eventually be used to produce biodiesel. Regarding ethanol, the government will implement over the next 12 months a National Program to improve the productivity of sugarcane at the farm and processing levels.

Local sugar mills and distilleries use bagasse to generate electricity for their own use. A few other industries are utilizing wood chips to replace fuel oil or gas.

Ethanol

Production

Paraguay is projected to produce a record of 215 million liters of bioethanol in 2016. As long as the government maintains the current mix mandate and the growth of flex fuel cars expands slowly, the total consumption in the short term will basically be tied to the increase in gasoline demand. There are reports that the mandate mix could be increased from the current 25 percent to 27 percent (as happened in Brazil last March).

There are 12 bioethanol plants in Paraguay, with a total production capacity of 340 million liters per year. Only 3 plants produce exclusively from sugarcane, including state-owned Petropar. The other 9 plants have the flexibility of using sugarcane and/or grains as feedstock. The smallest plant has a production capacity of 5 million liters per year, while the largest (by far) has a capacity to produce 150 million liters. Most of these plants are located to the east of Asuncion, Paraguay's capital city. The largest plants usually own cane plantations and have higher productivity than most independent farmers.

Contacts estimate that 65 percent of the ethanol produced in Paraguay in 2016 will be produced from sugarcane, while the rest will be from grains (mostly corn). In 2014 these percentages were the opposite. This switch is the result of the recently passed law determining that bioethanol has to be produced from sugarcane and that once this is no longer available, it can be produced from other feedstocks. This clearly provides a significant advantage to sugarcane and it is aimed at helping small cane producers. Contacts indicate that the low productivity and efficiency of most small cane producers makes this type of ethanol much more expensive than that produced with grains. Petropar, the national oil company purchases cane exclusively from third parties. Due to the high price of cane in Paraguay, many ethanol plants invested heavily in the past few years to become multi feedstock, increasing the use of corn, and being able to operate the plants all year around. In general, the corn used for ethanol is not the best quality. Distiller's grains are used for animal feed in the domestic market and are also exported.

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. There are 12 autonomous distilleries and 10 dehydrators in Paraguay. Inpasa is a relatively new company which already produces over 60 percent of Paraguay's ethanol. It primarily uses corn, and in smaller proportions sorghum, and sugarcane as feedstocks. Petropar is the country's second largest ethanol producer accounting for approximately 10-15 percent of the total.

Paraguay has approximately 110,000 hectares of sugarcane, with approximately 23-25,000 small cane producers. Productivity is low compared to neighboring countries due to the use of marginal soils, soil degradation, and old, low productive sugarcane varieties. Through Law 5444 of July 2015, the Government has to implement a National Program to improve the efficiency of sugarcane at the farmer (small) and industrial levels.

Paraguay's corn production in the past few years averaged 3 million tons, of which approximately 70-80 percent was exported. The balance is used domestically for animal feed, human consumption, and ethanol. Ethanol production capacity in Paraguay is projected at 340 million liters in 2016. Ethanol companies are continuously investing in improving efficiency, increasing production capacity and expanding production area and productivity at the farm level.

Consumption

Paraguayan ethanol consumption in 2016 is forecast at 215 million liters, the highest ever. This is mainly as a result of an expected larger gasoline demand as the local economy is projected to continue to grow at a solid pace. The Paraguayan economy is one of the fastest growing in the region.

The local gasoline market in 2016 is projected at 780 million liters (including ethanol), a slight increase from what is expected in 2015. Practically the entire demand is for private vehicle use. Historically, of the total fuel consumption, diesel accounted for 80 percent and gasoline 20 percent. With new policies in place, the importation (tax free) of E85 and flex fuel cars, and the conversion of many engines to flex fuel, the use of gasoline (and thus, ethanol) is expected to gain share. Currently, the proportion is estimated to be roughly 65/35. The use of flex fuel cars and E85 has promoted the use of E85 gasoline.

A large increase of ethanol consumption in Paraguay would depend on an expansion of the use of flex fuel cars which today represent roughly 3 percent of the total 800,000 cars running in Paraguay. Law 5444 of July 2015 is expected to boost consumption of ethanol, especially with country wide supply coverage. Some private projections for 2020 set dehydrated ethanol consumption at 450 million liters and hydrous ethanol (used in flex fuel vehicles) at 200 million liters.

Trade

There is no trade in ethanol in Paraguay. Exports of ethanol are permitted while imports pay no duties but have to be approved by the Ministry of Industry and Commerce. Contacts indicate it is unlikely that there will be imports. There are discussions about exploring the possibility of opening markets for small exports in certain times of the year, but the potential in the short term is negligible.

Ethanol Used as Fuel and Other Industrial Chemicals (Million Liters)										
Calendar Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Beginning Stocks	0	0	0	0	0	0	0	0	0	0
Fuel Begin Stocks	10	15	25	35	35	15	15	15	15	15
Production										
Fuel Production	65	90	120	130	130	165	180	195	205	215
Imports										
Fuel Imports	0	6								
Exports										
Fuel Exports	0	0	0	0	0	0	0	0	0	0
Consumption										
Fuel Consumption	60	86	110	130	150	165	180	195	205	215

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Ending Stocks										
Fuel Ending Stocks	15	25	35	35	15	15	15	15	15	15
Total BalanceCheck	0	0	0	0	0	0	0	0	0	0
Fuel BalanceCheck	0	0	0	0	0	0	0	0	0	0
Production Capacity										
Number of Refineries	9	9	11	12	12	12	12	13	13	13
Nameplate Capacity	236	236	250	260	260	260	260	340	340	340
Capacity Use (%)			48%	50%	50%	63%	69%	57%	60%	63%
Co-product Production (1,000 MT)										
DDGS	0	0	35	46	55	92	70	95	80	55
Feedstock Use (1,000 MT)										
Grains	0	50	115	150	180	300	225	315	255	190
Sugarcane	0	1,080	1,140	1,080	900	700	1,350	1,050	1,500	2,080
Feedstock C										
Feedstock D										
Market Penetration (Liters - specify unit)										
Fuel Ethanol	60	86	110	130	150	165	180	195	205	215
Gasoline	282	371	426	551	620	636	670	710	750	780
Blend Rate (%)			25.8%	23.6%	24.2%	25.9%	26.9%	27.5%	27.3%	27.6%

Biodiesel

Production

Biodiesel production in 2016 in Paraguay is forecast to remain unchanged at 12 million liters. Despite the official mandate which is set at 1 percent, the expected mix is forecast to remain at 0.8-0.9 percent. It is difficult for Paraguay to maintain a constant supply of biodiesel throughout the year. When the official price is not profitable for biodiesel producers, the supply is hurt. Also there are at times quality problems requiring that some plants suspend production. The current price biodiesel producers are paid is US\$0.90 per liter and the government is studying the possibility of increasing it.

If the local biodiesel industry wants to develop into a larger scale business, contacts indicate that it will have to address several challenges such as: establish a viable price scheme, improve product quality, increase

production scale, incorporate new technology, adapt the fuel distribution network for biodiesel, expand the number of laboratories, and implement and adopt a control system.

Most biodiesel produced domestically is made from vegetable oil, mostly soybean oil. In some cases other feedstock are used, like in 2013, where Coco oil was used due to excess availability in the market. Small volumes of canola and sunflower oil are sometimes used, as well as cooking oil.

Only three local plants are active in providing biodiesel commercially. A local cooperative in the interior of the country distributes diesel mixed with biodiesel but is not focused on the urban market. Some large grain farmers produce biodiesel made from vegetable oil for their own use.

The government has only approved four biodiesel plants, with an estimated production capacity of 25 million liters. This is lower than a few years ago as two plants were dismantled, which significantly reduce the country's production capacity. Most of the plants can use vegetable oil and animal fat as feedstock. The production capacity of the approved companies vary from 4-12 million liters a year. There are around 20 small biodiesel plants for self-consumption scattered around the country and have no official regulation. Imports of diesel in Paraguay are not restricted but the government, through Petropar, normally sets the price of diesel.

Paraguay is the world's 6th largest soybean producer, with output ranging between 8-9 million tons a year. It is also the 4th largest exporter of soybeans. Paraguay's crushing capacity is currently estimated at 4.5 million tons capacity. A few large plants were recently inaugurated. Although these plants have no plans of producing biodiesel in the short term, the large availability of vegetable oil presents an opportunity for local biodiesel processors and the country to continue the path of replacing a portion of imported diesel by biodiesel manufactured from domestically produced feedstock.

There are a few public and private programs on research and extension on biofuels. However, the main focus is on Coco Mbokaja which is a native palm and some studies estimate that about 50 percent of the beans are currently 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.

Consumption

Biodiesel consumption in Paraguay is projected to remain unchanged at 12 million liters in 2016. The sector continues to operate under a complicated condition, without a stable supply throughout the year. Further policy changes and investment would be necessary to encourage larger production. Contacts believe Paraguay would benefit strongly from the production and consumption of local biodiesel which would help cut some imports of diesel and add value to its agricultural production.

Since 2015 Petropar and most private fuel distributors mix biodiesel with diesel, but not at a regular basis. The mandated mix is 1 percent, but it is only being mixed at approximately 0.8-0.9 percent.

Paraguay's diesel market in 2016 is projected at 1.46 billion liters, a slight increase from the previous year.

Cargo, public transportation and agriculture use almost exclusively diesel. Historically, of the total fuel consumption, diesel accounted for 80 percent and gasoline 20 percent. With new policies in place, the importation (tax free) of E85 and flex fuel cars, and the conversion of many engines to flex fuel, is resulting in a decrease of use of diesel in private vehicles. The current relation diesel/gasoline is estimated at approximately

65/35. Of the country's diesel market approximately 1/3 of it is consumed by cargo and passenger transport, another 1/3 by the industry and farm equipment, and the balance by private vehicles.

Trade

Paraguay is not expected to export biodiesel in the medium term as it would first require large investment and a significant growth in production to supply the local market.

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).

Exports and imports of biodiesel are duty free but have to be approved by the Ministry of Industry and Commerce. Contacts indicate that imports of biodiesel are very unlikely.

Biodiesel (Million Liters)										
Calendar Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Beginning Stocks	0	0	0	4	0	0	0	0	0	0
Production	3	10	8	6	1	2	8	8	12	12
Imports	0	0	0	0	0	0	0	0	0	0
Exports	0	0	0	0	0	0	0	0	0	0
Consumption	3	10	4	10	1	2	8	8	12	12
Ending Stocks	0	0	4	0	0	0	0	0	0	0
Balance Check	0	0	0	0	0	0	0	0	0	0
Production Capacity										
Number of Biorefineries		5	6	6	4	4	4	4	4	4
Nameplate Capacity		30	45	45	25	25	25	25	25	25
Capacity Use (%)	#DIV/0!	33.3%	17.8%	13.3%	4.0%	8.0%	32.0%	32.0%	48.0%	48.0%
Feedstock Use (1,000 MT)										
Soybean oil					1	2	8	8	12	12
Beef Tallow	3	10	8	6	0	0	0	0	0	0
Feedstock C										
Feedstock D										
Market Penetration (Liters - specify unit)										

Biodiesel, on-road use	3	10	4	10	1	2	8	8	12	12
Diesel, on-road use	937	1,050	1,050	1,220	1,260	1,155	1,265	1,330	1,400	1,460
Blend Rate (%)	0.3%	1.0%	0.4%	0.8%	0.1%	0.2%	0.6%	0.6%	0.9%	0.8%
Diesel, total use										

Stocks

With such a small output, there are normally no stocks.

Advanced Biofuels

There is very little work done on these kinds of biofuels.