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Colombia

Biofuels Annual Report

2016

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Report Highlight:

Colombia's biofuel mandates remain unchanged resulting in little incentive to increase production or consumption. The lack of clarity of the Government of Colombia (GOC) on maintaining or adjusting blend mandates has also created concern in the biofuels industry. Even though ethanol production capacity increased to 1.65 million liters per day in 2015, Colombia is unable to meet its current E8 blending mandate.

Post: Bogota.

I. Executive Summary

The fuel market in Colombia is highly controlled by the Government. The Ministry of Mines and Energy (MME) establishes the biofuels blend mandate and also regulates fuel and biofuel prices. Moreover, in May 2015, the MME issued a methodology to calculate the need to import ethanol based on resolution 9-0454 of April 2014, which authorizes imports only if the blend mandate cannot be satisfied with domestic production. In addition to regulating imports, the MME sets technical regulations on biofuel standards.

In 2015, Colombian sugarcane-based ethanol production capacity increased to 1.65 million liters per day, a 32 percent increase from 2014. This increase was primarily due to a new ethanol plant in the Cauca river valley. Even though this new plant increased domestic capacity, it was not enough to meet the E8 blend mandate. Demand for domestic gasoline increased because of the closure of the border with Venezuela, which limited fuel contraband. In addition, a new plant owned by the state-oil company should come online in 2017, adding about 100 million liters a year of ethanol to national capacity.

Colombian palm oil-based biodiesel production capacity remained at 590 million liters per year, slightly below the necessary production to meet the current biodiesel blend in diesel fuel mandates of B8 and/or B10, depending on the region of Colombia. Even though there are no official figures on the actual volume of biodiesel blend demand, biodiesel production and diesel consumption data suggest that the average biodiesel blend in Colombia reaches about 7.9%. The expansion of palm area planted and palm oil production in Colombia shows the potential for an increase in palm oil-based biodiesel production. However, GOC policies supporting the sector remain unclear, therefore production capabilities remain unchanged. According to the National Biofuels Federation of Colombia (FEDEBIOCOMBUSTIBLES), two new facilities will come online in 2017, adding 110 million liters to domestic capacity.

II. Gasoline and Diesel Market:

The state-owned Colombian Petroleum Enterprise (ECOPETROL) is responsible for managing all aspects related to the petrochemical industry. There are five petroleum refineries in Colombia but 98-percent of all refining capacity is accounted by two facilities: Barrancabermeja and Cartagena. The current demand for gasoline and diesel is supplied by ECOPETROL. Countrywide demand for gasoline is source by domestic production, while around 55-percent of diesel demand is provided by imports.

Fuel distributors have increased in the recent years to fifteen, but the market is dominated by three major distributors: Terpel, Exxon, which operates Esso and Mobil, and Chevron, which operates Texaco.

In 2015 the demand for local gasoline increased by 2 million liters to 17.0 million liters a day due to the closing of the border with Venezuela. The price of Venezuelan gasoline is much cheaper than Colombian, which represents an incentive for contraband. The closing of the border reduced the availability of the black market fuel, which meant that Colombia's largest refiner, ECOPETROL, had to supply gasoline in border Departments where consumers had been using the illegally obtained fuel.

According to the MME's Unit of Mining and Energy Planning (UPME), gasoline and diesel demand will rise during the next ten years mainly due to growth in the Colombian economy. The table below presents the history and outlook for fuel in Colombia.

Fuel Use History (Million Liters)											
Calendar Year	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Gasoline Total	4,817	4,720	4,579	4,373	4,402	4,519	4,748	4,908	5,155	5,502	6,144
Diesel Total	4,962	5,362	5,726	5,944	6,294	6,702	7,206	7,637	7,620	7,747	8,112
On-road	4,885	5,260	5,630	5,662	5,909	6,084	6,547	6,745	6,879	7,056	7,389
Agriculture											
Construction & Mining											
Shipping & Rail											
Industry											
Heating											
Jet Fuel Total											
Total Fuel Markets	9,780	10,082	10,305	10,317	10,696	11,221	11,953	12,545	12,775	13,249	14,256

Fuel Use Projections (Million Liters)											
Calendar Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
Gasoline Total	6,278	6,502	6,818	7,146	7,416	7,695	7,907	8,292	8,620	8,988	9,262
Diesel Total	8,373	8,630	8,903	9,177	9,415	9,719	9,968	10,249	10,629	11,050	11,386
On-road	7,626	7,860	8,109	8,358	8,575	8,852	9,079	9,334	9,681	10,064	10,370
Agriculture											
Construction & Mining											
Shipping & Rail											
Industry											
Heating											
Jet Fuel Total											
Total Fuel Markets	14,651	15,132	15,722	16,323	16,830	17,414	17,875	18,541	19,249	20,037	20,648

Source: Unit of Mining and Energy Planning (UPME).

Colombia has approximately 4.8 million motor vehicles, according to the Ministry of Transportation. In terms of type of fuel used, 48 percent of vehicles use diesel and 52 percent use gasoline. MME established temporary fleet efficiency goals for new vehicles in 2012, but that policy was eliminated shortly after its announcement due to domestic auto industry complaints. According to vehicle manufacturers, the World Wide Fuel Charter states that the maximum amount of ethanol to be blended in gasoline-powered vehicles is 10-percent (or E10), and the biodiesel to be used in diesel-powered vehicles is five-percent (or B5). The Colombian Vehicle Manufacturers Association only supports voluntary blends above E10 and B5. However, tests performed in Colombia show that vehicles can run on E15 and higher blends. The current regulation establishes blend mandates of E8 and B8 or B10, depending on the region.

Fuel prices are controlled by the Regulatory Commission of Energy and Gas (CREG) and the MME. The MME periodically issues regulations on gasoline and diesel prices according to a pricing structure based on four components: Producer income, maximum wholesale distributor price, maximum retailer price and consumer price. The international prices of gasoline and diesel are taken as the reference price for producer income, then taxes, transportation and marketing fees, margin and evaporation loss are added to determine distributor, retailer and consumer prices.

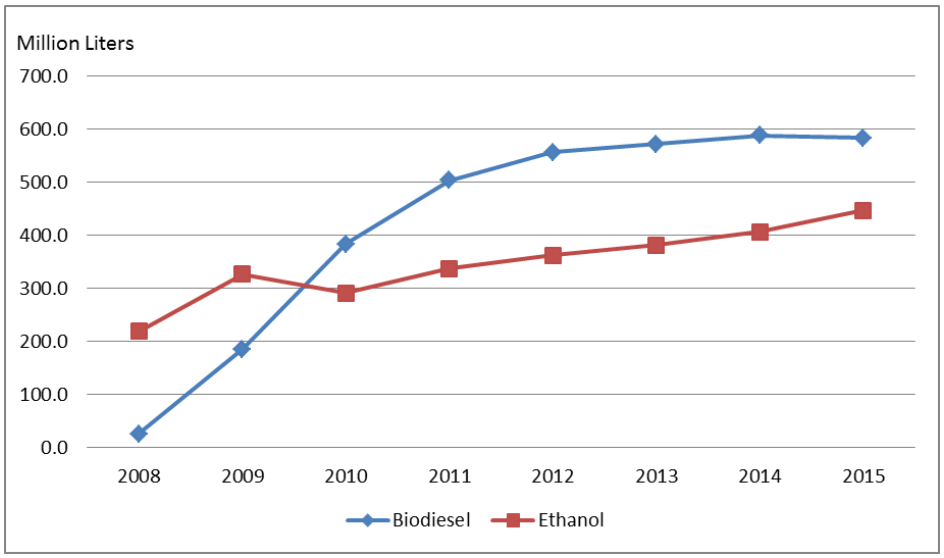
III. Policy and Programs

Since 2001 the Government of Colombia has promoted the production and use of biofuels aimed at

diversifying their sources of energy by reducing its dependency on fossil-fuels, using environmentally friendly fuels to mitigate greenhouse gas emissions, and also developing the Colombian agro-industry to encourage employment in rural areas. The GOC identified sugarcane and palm oil as the most likely crops for producing ethanol and biodiesel, respectively.

The MME is the authority that regulates Colombia's biofuels policy. The legal instruments that originated the Colombian biofuels strategy were two laws issued by the MME: Law 693 of 2001 for ethanol, and Law 939 of 2004 for biodiesel. The biofuels policy and corresponding blend mandates were primarily developed to support additional revenue streams for the sugarcane and palm oil industries. In addition, biofuel production facilities receive a special tax designation as an industrial free trade zone and therefore pay zero taxes on revenues. Biofuel sales are also excluded from paying a 16% value-added-tax. Ethanol sales are exempt from regional Departmental taxes. However, biodiesel sales are levied a Departmental tax of US$0.15 per gallon.

The illustration below shows the growth in the industry from 2008 to 2015:



Colombian Biofuels Production. Source: The National Biofuels Federation of Colombia (FEDEBIOCOMBUSTIBLES).

The current mandate for biodiesel blending in diesel fuel is either B8 or B10 depending on the region of the country. For ethanol, the blend mandate was previously either E8 or E10 depending on the region of Colombia. The MME increased the gasoline blend mandate to E10 on October 31, 2013 (MME Resolution 9-0932) to stimulate domestic production, but resulted in record levels of U.S. ethanol exports to Colombia. Three months later on January 31, 2014, the GOC reduced the mandate back to E8 (MME Resolution 9-0153). The reduction in the blend mandate was followed by MME resolution 9-0454 on April 2014 that limited trade access for imports if the blend mandate could be satisfied with domestic production. Trade abruptly fell to zero as the MME delayed for about one year the publishing of a methodology to determine the necessary import volumes (MME Resolution 4-0565 of May 2015).

Post previous calculations indicated that Colombian domestic ethanol production has never been able to meet the E8 blend mandate without some imports. The lack of domestic capacity to supply the ethanol

blend mandate was evident on April 30, 2015, when the GOC suspended MME Resolution 4-052, removing the blend mandate entirely for a month due to a shortage of domestic ethanol production. According to MME, removing the blend mandate was necessary due to excessive rains and harvesting challenges in the primary sugar-producing region of Colombia, limiting feedstock availability for ethanol. On July 8, 2016, the MME issued Resolution 4-0661, interrupting the ethanol blend mandate due to transportation protests held in June and July, 2016, which limited the availability of ethanol. On July 26, 2016, MME's Resolution 4-0717 reestablished the blend mandate. Therefore, during several weeks in 2015 and 2016 Colombian gasoline was blended with little or no ethanol.

The regulatory measures removing the blend mandate showcases the inconsistent and insular nature of GOC biofuel policies that cater to domestic industry concerns with competition, as opposed to meeting blend mandate goals through domestic production and, if necessary, imports. This insular focused approach applies to biodiesel as well, even though GOC trade protectionist measures are not as overt as with ethanol. Post calculations also indicate that Colombia cannot fulfill the biodiesel blend mandate with only domestic production.

In addition to blend mandates, the MME announces monthly prices that fuel distributors or blenders must pay to domestic producers of biofuels. The MME applies a price formula for gasoline and diesel fuel that includes a mandated price that must be paid by blenders to domestic biofuels producers. The most recent MME mandated price for a liter of ethanol was approximately $0.68. For biodiesel, the most recent MME mandated price per liter was about $0.96. Imported biofuels, however, are not subject to MME mandated prices creating opportunities for imports.

IV. Ethanol

Production:

Post forecasts ethanol production to reach 465 million liters in 2016, increasing further to 565 million liters in 2017 as a new ethanol facility owned by ECOPETROL begins operation. Colombian ethanol production is derived entirely from sugarcane. Sugarcane production sufficiently exceeds local demand creating a production surplus for ethanol and sugar. The sugarcane feedstock neither competes with the food supply nor takes land from alternative food crops. Ethanol production has displaced 41 percent of sugar for exports with little impact on domestic sugar prices and consumption, which has remained around 1.5 MMT during the last 10 years.

All of Colombia's ethanol production is supplied by six ethanol distilleries near the city of Cali in south central Colombia (see map below). The ethanol distilleries are clustered within larger industrial sugar production and milling facilities. In August 2015, a new plant owned by the Riopaila-Castilla sugar mill started operation adding about 400,000 liters a day, supporting an increase in the average domestic production to 1.65 million liters a day. Despite the increase in ethanol production capacity, the shortfall in sugarcane supply due to the weather phenomena "El Niño" has caused the ethanol production to remain stagnant during the first semester of 2016. Post forecasts ethanol production will increase by 2% at the end of 2016.

A new distillery managed by ECOPETROL is scheduled to begin operations in early 2017 and will have a capacity of 500,000 liters a day, 160 million liters a year. This new distillery located at the Meta's

Department will source sugarcane from 14,000 hectares established near the area. This plant will process sugarcane for ethanol production only and it will be the first ethanol facility in Colombia not linked to the sugar industry.

Currently, Colombian ethanol capacity is unable to fulfill the E8 blend mandate. Post estimates of ethanol demand are based on total Colombian gasoline consumption. The table below articulates the ethanol shortfall at both E8 and E10:

(Million liters)	**2011**	**2012**	**2013**	**2014**	**2015**
Production - Ethanol	337	370	388	406	456
Imports - Fuel Ethanol	7	8	21	18	7
Total Supply	344	378	409	424	463
Consumption - Gasoline	4,748	4,908	5,155	5,502	6,144
Est. Ethanol required – E8	*380*	*392*	*412*	*440*	*492*
Est. Ethanol required - E10	*475*	*490*	*515*	*550*	*614*

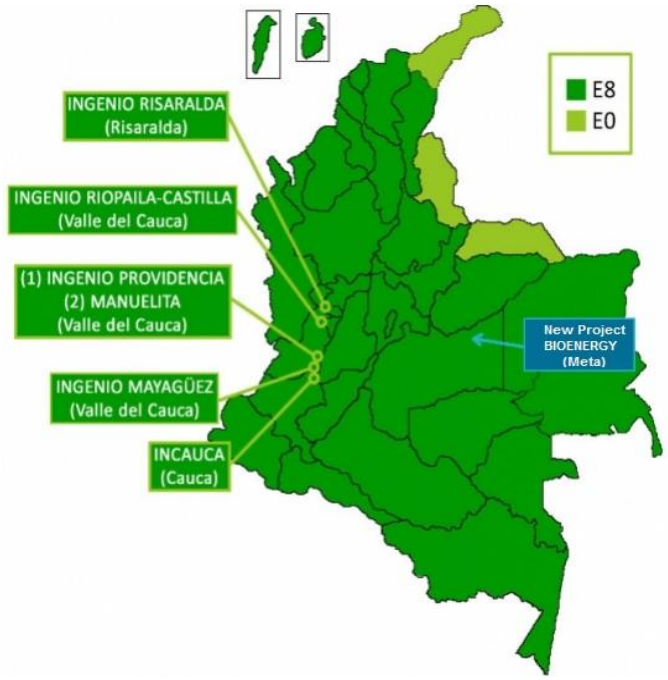
Colombia Ethanol Use Profile. Source: MME; FEDEBIOCOMBUSTIBLES. Calculation FAS-Bogota.

Consumption:

Post estimates that 2016 ethanol consumption will reach 482 million liters. Since late 2015, ethanol consumption has been driven by an increasing demand of local gasoline due to the closure of the border with Venezuela. Post estimates that 2017 ethanol consumption will increase to 570 million liters driven by an expected higher mandate for ethanol use.

The blend mandate changes across the country primarily along with the ethanol industry growth and imports supply. In the southern, central and most of the northern area of the country close to E8 is met, but in the border Departments with Venezuela no blend mandate has been reached due to smuggling issues. However, the current closure of the Venezuelan border has increased the demand of local gasoline and ethanol.

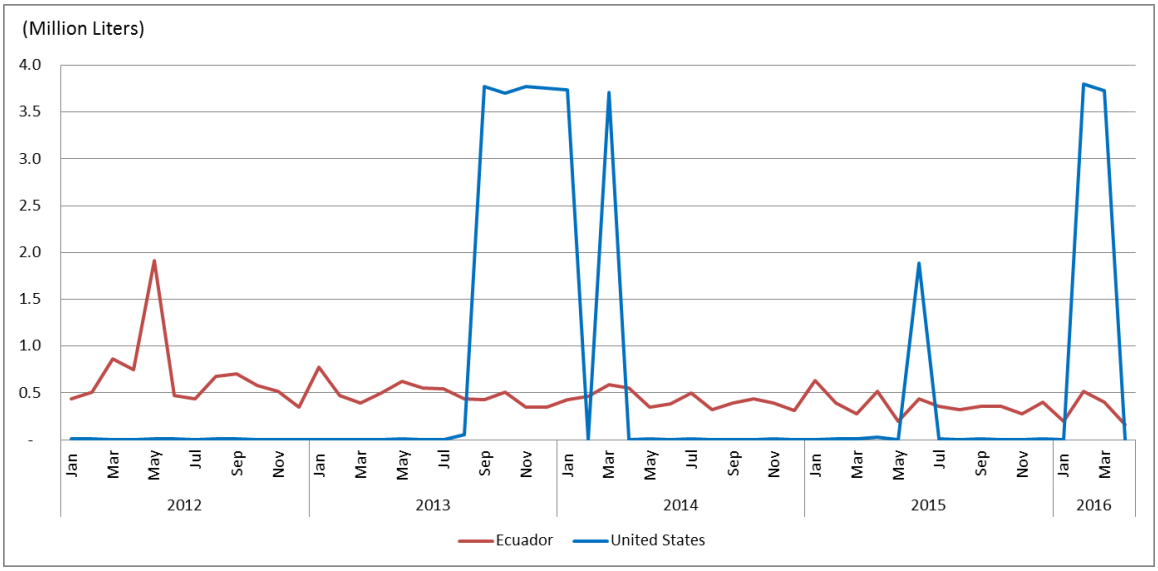
As a result of trade protectionist policies, Colombian ethanol consumption is almost entirely dependent on domestic ethanol production to fulfill the E8 blend mandate. There is no official data on the blend demand volume. However, Post calculations based on annual ethanol production and gasoline consumption show that the sugarcane-based ethanol industry is unable to supply the country with enough biofuel to reliably meet the current E8 blend mandate. The new ethanol plant that is expected to come online at the beginning of 2017 will support national production likely meeting the E8-E9 blend mandate. The national industry is planning to promote higher mandates for ethanol use.



Ethanol distelleries and blend mandate in Colombia. Source: FEDEBIOCOMBUSTIBLES.

Trade:

Since 2016 U.S. ethanol enters duty free under the CTPA. However, currently ethanol imports are subject to a MME's prior authorization given the resolution 9-0454 that restricts free access to the Colombian market. Regulatory restrictions notwithstanding, smaller volumes of ethanol imports, primarily from Ecuador, continued until early 2016. The graph below illustrates the U.S. ethanol import compared to the primary competitor, Ecuador.



Source: DANE - Global Trade Atlas.

After resolution 9-0454 in April 2014 was issued that restricted imports to the volume authorized by the MME, there was no relevant ethanol trade, except for May/June 2015 when the MME allowed 1 million liter of ethanol to be imported. In early 2016 the MME authorized ethanol imports as a result of a shortfall in local production as "El Niño" weather phenomena affected sugarcane production, the main feedstock of Colombian ethanol. In the first four months of 2016, 7.5 million liters of U.S. ethanol have been imported, which represented 85.5% of total imports.

In June 2016, the U.S. Grains Council (USGC), the Renewable Fuels Association (RFA) and Growth Energy, traveled to Colombia to support an increase in the blend mandate and encourage the country to import U.S. ethanol. The U.S. and Colombian ethanol industries are looking for a solution to allow U.S. imports when domestic supplies are inadequate.

The mechanism of administered prices for ethanol based on the international price for refined sugar creates market opportunities for ethanol producers abroad that uses less expensive feedstocks, or are able to produce at lower costs. As the price of corn remains low, U.S. corn-based ethanol will continue to be competitive against domestic and Andean Community (e.g. Ecuador) trade partners. In addition, U.S. ethanol is the lowest priced and highest quality ethanol available for export globally.

Stocks:

Colombia does not have programs to encourage storage or long-term stocks of biofuels. However, gasoline and diesel fuel regulations require stocks to adequately supply the market at 10 days of total fuel demand.

V. Biodiesel

Production:

Post forecasts biodiesel production to remain stagnant at 580 million liters in 2016, increasing to 700 million liters in 2017 as two new biodiesel facilities begin operation. There are nine biodiesel plants using palm oil as the primary feedstock, one of them started to produce biodiesel from used cooking oil in 2015.

Only 6 of the 9 plants are members of the FEDEBIOCOMBUSTIBLES. However, these six plants are fully operational and produce about 95 percent of the total Colombian biodiesel production. Two new biodiesel facilities are projected to come online in 2017, adding 110 million liters to national capacity. The table below shows the current biodiesel shortfall at the B10 blend mandate.

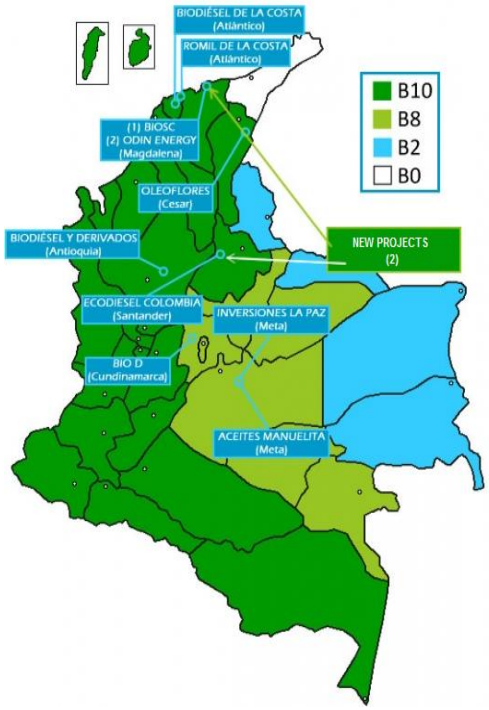
(Million liters)	**2011**	**2012**	**2013**	**2014**	**2015**
Production - Biodiesel	503	557	572	589	583
Imports - Biodiesel	0	0	0	0	0
Total Supply	503	557	572	589	583
Production - Diesel	*6,547*	*6,745*	*6,879*	*7,056*	*7,389*
Est. Biodiesel required – B8	*524*	*540*	*550*	*564*	*591*
Est. Biodiesel required – B10	*655*	*675*	*688*	*706*	*739*

Colombia Biodiesel Use Profile. Source: MME; FEDEBIOCOMBUSTIBLES. Calculation FAS-Bogota.

Consumption:

Colombia biodiesel consumption is entirely dependent on local production to meet the GOC blend mandate. According to FEDEBIOCOMBUSTIBLES, blend levels are B8 for blending facilities near Bogota and the Department of Guaviare and B10 for the Caribbean and Pacific coasts, and the central part of the country (see map below). Biodiesel consumption is currently B10 in the most populous regions of Colombia, covering 85 percent of the total population. Some remote areas along the eastern plains and border regions only blend between B2 and B8. Biodiesel consumption in 2015 reached 585 million liters. Post forecasts that biodiesel consumption will remain stagnant for 2016 and will probably increase up to 700 million liters in 2017 as new facilities may yet be ramping up operations.

The map below shows the production plants, the new projects and the blend mandate in each Department:



Biodiesel plants and blend mandate in Colombia. Source: FEDEBIOCOMBUSTIBLES

Trade:

Colombia neither imports nor exports palm-based biodiesel. The biofuels industry aspires to export biodiesel as palm area continues to expand, improving the potential for more biodiesel production.

Stocks:

Colombia does not have programs to encourage storage or long-term stocks of biofuels. However, gasoline and diesel fuel regulations require stocks to adequately supply the market at 10 days of total fuel demand.

VI. Advanced Biofuels

There is no production of advanced biofuels in Colombia.

VII. Biomass for Heat and Power

Most Colombian ethanol plants are energy self-sufficient and generate surplus power that is sold to the national electric grid. They use bagasse to generate energy needed for processing and surplus. The sugar sector capacity for electric power generation is at 237 megawatts (MW), of which 147 MW is for supporting self-sufficient plant operations with the remaining amount sold to utilities for public consumption.

The palm oil sector capacity for electric power is estimated at 340 MW. Palm oil producers generate energy from biomass and/or biogas to support self-sufficiency. Currently, there are only 3 palm oil plants that generate surplus, but there is no comprehensive information on quantity. The palm and ethanol industries claim to be capable of generating more power resources to sell to local utilities. However, without any further GOC subsidies there is little incentive.

VIII. Notes on Statistical Data

The source of production data for biofuels is FEDEBIOCOMBUSTIBLES, which receives information from the Colombian National Association of Sugar Producers (ASOCAÑA) for ethanol and the National Federation of Oil Palm Growers (FEDEPALMA) for palm oil and biodiesel. The National Department of Statics (DANE) is the primary source for trade data. Fuel consumption data is source by the MME's Unit of Mining and Energy Planning. Figures for biofuels consumption correspond to production and imports as there is limited data on stocks.

Ethanol Used as Fuel and Other Industrial Chemicals (Million Liters)										
Calendar Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Beginning Stocks	5	9	12	8	11	12	15	11	10	10
Fuel Begin Stocks	5	9	12	8	11	12	15	11	10	10
Production	256	327	291	337	370	388	406	456	465	565
Fuel Production	256	327	291	337	370	388	406	456	465	565
Imports	30	32	70	55	89	138	98	108	100	70
Fuel Imports	4	4	6	7	8	21	18	7	17	5
Exports										
Fuel Exports	0	0	0	0	0	0	0	0	0	0
Consumption	281	356	365	390	457	523	508	566	565	635
Fuel Consumption	256	328	301	341	377	406	428	464	482	570
Ending Stocks	9	12	8	11	12	15	11	10	10	10
Fuel Ending Stocks	9	12	8	11	12	15	11	10	10	10
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	5	5	5	5	5	5	5	6	6	7
Nameplate Capacity	378	378	378	378	412	412	412	465	542	652
Capacity Use (%)	68%	87%	77%	89%	90%	94%	99%	98%	86%	87%
Co-product Production (1,000 MT)										
Co-product A										
Co-product B										
Feedstock Use for Fuel (1,000 MT)										
Sugar-cane	3,667	3,416	4,350	4,405	4,480	4,450	4,450	4,600	5,100	6,215
Feedstock B										
Feedstock C										
Feedstock D										
Market Penetration (Million Liters)										
Fuel Ethanol	256	328	301	341	377	406	428	464	482	570
Gasoline	4,373	4,402	4,519	4,748	4,908	5,155	5,502	6,144	6,278	6,502
Blend Rate (%)	5.9%	7.5%	6.7%	7.2%	7.7%	7.9%	7.8%	7.6%	7.7%	8.8%

Biodiesel (Million Liters)										
Calendar Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Beginning Stocks	0	0	5	4	5	6	3	8	6	5
Production	26	185	384	503	557	572	589	583	580	680
Imports	0	0	0	0	0	0	0	0	0	0
Exports	0	0	0	0	0	0	0	0	0	0
Consumption	26	180	385	502	556	575	584	585	581	680
Ending Stocks	0	5	4	5	6	3	8	6	5	5
BalanceCheck	0	0	0	0	0	0	0	0	0	0
Production Capacity										
Number of Biorefineries	1	2	5	5	6	6	6	6	6	8
Nameplate Capacity	68	204	525	525	590	590	590	590	590	700
Capacity Use (%)	38.0%	90.8%	73.1%	95.9%	94.3%	96.9%	99.8%	98.8%	98.3%	97%
Feedstock Use for Fuel (1,000 MT)										
Palm Oil	41	163	337	443	490	505	505	510	510	595
Feedstock B										
Feedstock C										
Feedstock D										
Market Penetration (Million Liters)										
Biodiesel, on-road use	26	180	385	502	556	575	584	585	581	680
Diesel, on-road use	5,662	5,909	6,084	6,547	6,745	6,879	7,056	7,389	7,626	7,860
Blend Rate (%)	0.5%	3.0%	6.3%	7.7%	8.2%	8.4%	8.3%	7.9%	7.6%	8.7%
Diesel, total use										