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Report Highlights:

Brazil is the world's second-largest ethanol and third-largest biodiesel producer but has yet to introduce renewable diesel or sustainable aviation fuel. Post forecasts total ethanol production at 32.5 billion liters in CY 2024, with cane ethanol forecast at 25.5 billion liters and corn ethanol production at seven billion liters. Post estimates biodiesel production at 8.9 billion liters in CY 2024, an 18 percent increase over the previous year. According to government sources, sugarcane ethanol and biodiesel contributed to the reduction of 71.1 MtCO2e GHG emissions in 2022 compared to the gasoline and diesel they replaced. In November 2023, Brazil announced a new target to reduce greenhouse gas (GHG) emissions by 48.4 percent by 2025 and 53.1 percent by 2030 compared to base year 2005.

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I. Executive Summary

In September 2016, at the twenty-first session of the Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC), Brazil officially joined the Paris Agreement, a multilateral effort to limit the global temperature increase to 1.5 degrees Celsius above pre-industrial levels.

Following a reduction in the Intended Nationally Determined Contribution (NDC) submitted in 2022, which was criticized by civil society and climate experts, the Brazilian government announced in November 2023 a new target to reduce greenhouse gas (GHG) emissions by 48.4 percent by 2025 and 53.1 percent by 2030 compared to 2005 emissions. The update removed the goal of achieving carbon neutrality by 2050 and added a commitment to submit new NDCs for 2035.

To ensure compliance with the targets and reduce GHG emissions in the transportation sector, the Brazilian government launched the National Biofuels Program, called RenovaBio, in December 2016, aiming at improving the regulatory framework for the use of biofuels in the country. RenovaBio is based on three main instruments: annual carbon intensity reduction targets, certification of biofuels marketed for greenhouse gas emissions (GHG) emission reduction, and decarbonization credits (CBios). Each CBio represents one metric ton of CO2e saved by the use of biofuels over fossil fuels, thereby incentivizing lower GHG emitting biofuels over higher emitting ones.

With current consumption over 30 billion liters, Brazil´s fuel ethanol market is second in size only to the U.S. market. Brazil´s ethanol program is the world´s oldest tracing its roots back to the mid-1970s. Under current legislation, the ethanol blend rate for Gasoline C can vary from 18 to 27.5 percent and has remained at 27 percent since 2015. Sugarcane is the primary feedstock for ethanol production in Brazil, followed by corn. Corn ethanol production in Brazil emerged in 2014/15, has remained on a steep upward trajectory, and is mostly concentrated in the center-west region of Brazil, particularly Mato Grosso, the center of corn production and close to poultry operations that consume DDGs produced as a byproduct of corn ethanol distillation. Post forecasts total ethanol production at 32.5 billion liters, from which 6.5 billion are corn ethanol.

As of January 1, 2024, the ethanol import tariff was raised from 16 to 18 percent. Brazil first imposed a tariff rate quota (TRQ) in 2017 and has since adjusted import tariffs on ethanol several times eventually adopting a simple duty on imports from non-Mercosur countries and even removing it once for most of 2022.

Cellulosic ethanol production using bagasse emerged in 2015, but it has not received the policy and program support needed to develop onto an industry to supply the domestic market and remains export-oriented shipping to countries where policy support exists for this low carbon intensity (CI) biofuel. Post estimates total cellulosic ethanol production at 51 million liters in 2024.

In addition to ethanol, Brazil also has a large biodiesel industry, the world´s third largest single-country market for biodiesel after the United States and Indonesia. Brazil´s biodiesel program began in 2005, with the National Program for the Production and Use of Biodiesel (PNPB), which manages mandatory minimum biodiesel blend rates with the current rate set at 14 percent (B14), soon to increase in March 2025 to B15. Brazil produced 7.5 billion liters of biodiesel in 2023 and the figure is expected to reach

8.9 billion liters in 2024 with a higher blend rate and growing diesel pool. About 69 percent of the biodiesel production in 2023 originated from soybean oil and 16 percent is made from greasy material. The remaining feedstock are tallow, palm oil and other fatty materials Post forecasts 2024 biodiesel consumption at 8.8 billion liters, an 18 percent increase from 2023.

As of August 2024, there is no commercial-scale production of hydrogenated renewable diesel (HDRD) in Brazil. The first HDRH biorefinery is being commissioned in Manaus (Amazonas), with the first phase of the project expected to be operational in 2025. The only company coprocessing fats and vegoils with crude oil to make diesel with renewable content (called Diesel R) at commercial scale is Brazil's state-owned oil and gas company Petrobras. The company´s biorefinery program will invest US$600 million to develop advanced and sustainable fuels until 2028. The company has been petitioning the federal government to include co-processed diesel in the existing mandate covering biodiesel, but this initiative is facing strong resistance from biodiesel and HDRD producers.

As yet, there is no commercial production of sustainable aviation fuel (SAF) in Brazil. However, about four ethanol plants have obtained the international certification ISCC CORSIA Plus (Carbon Offsetting and Reduction Scheme for International Aviation), which certifies compliance with the CORSIA requirements for SAF production. One of these companies is the only one producing sugarcane cellulosic ethanol, and part of its production is being sent to LanzaJet's AtJ-type SAF plant that was inaugurated in January 2024 in the U.S. state of Georgia. According to industry, the plant requires 60 million liters of ethanol per year.

On July 11, 2024, the ANP approved the commercialization of maritime fuel oil (bunker) containing 24 percent biodiesel. This was Brazil's first authorization granted for the continued commercialization of bunker with renewable content for use in ships. The approval has been granted to the Brazilian state-owned oil and gas company Petrobras.

II. Policy and Programs

Brazil´s Commitments to Reduce Greenhouse Gas Emissions

In September 2016, at the twenty-first session of the Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC), Brazil officially joined the Paris Agreement, a multilateral effort to limit the global temperature increase to 1.5 degrees Celsius above pre-industrial levels. At that time, Brazil reportedly emitted two billion metric tons of carbon dioxide equivalent (bi tCO2e), accounting for 2.5 percent of global emissions, and was the seventh largest emitter, behind Japan, India, Russia, the European Union, the United States and China, in ascending order. At COP21, each country submitted a plan to reduce domestic greenhouse gas emissions through an Intended Nationally Determined Contribution (NDC). Brazil committed to reducing its domestic emissions by 37 percent by 2025 and 43 percent by 2030, both from 2005 levels.

According to the Greenhouse Gas Emissions and Removals Estimation System (SEEG), Brazil was the seventh largest emitter in 2022 with three percent of the global total, totaling 2.3 bi tCO2e, an eight percent decrease from 2021, when gross emissions were 2.5 bi tCO2e. The reduction was primarily due to the decline in Amazon deforestation, but land-use change, including deforestation of all Brazilian biomes, accounts for 1.12 bi tCO2e, or 48 percent of the total. Agriculture ranks second, with 617

million tons of CO2e (MtCO2e), or 27 percent of the country's gross emissions. The energy sector ranks third with 412 MtCO2e and 18 percent of the total.

Following a reduction in the NDC submitted in 2022, which was criticized by civil society and climate experts, the Brazilian government announced in November 2023 a new target to reduce greenhouse gas (GHG) emissions by 48.4 percent by 2025 and 53.1 percent by 2030 compared to 2005 emissions. The update removed the goal of achieving carbon neutrality by 2050 and added a commitment to submit new NDCs for 2035. In addition, the updated version includes a political commitment to end illegal deforestation by 2030. The following chart shows Brazil's NDCs since 2016, in billion tons of carbon dioxide equivalent (bi tCO2e).

Table 1
Brazilian Nationally Determined Contributions (NDCs), in bi tCO2e

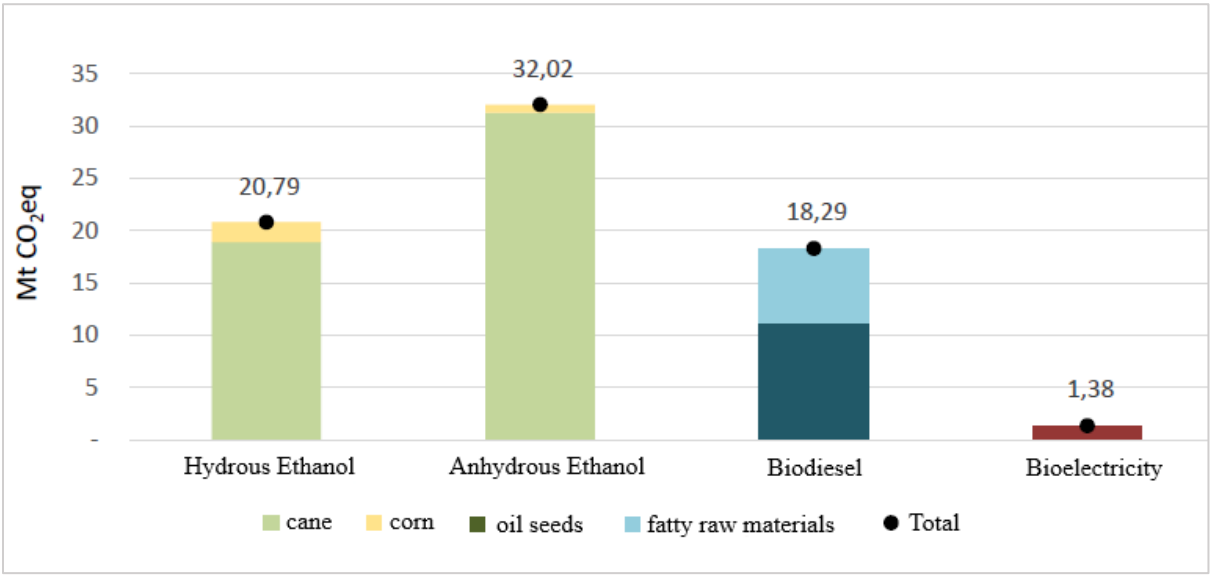
Year presented	2005 GHG Levels	2025 target	Reduction compared to 2005 (%)	2030 target	Reduction compared to 2005 (%)
2016 (original)	2.10	1.32	-37%	1.20	-43%
2020	2.84	1.79	-37%	1.62	-43%
2022	2.56	1.61	-37%	1.28	-50%
2023	2.56	1.32	-48.4%	1.20	-53.1%

Source: Ministry of the Environment and Climate (MMA); Chart Post Brasilia

The energy sector includes GHG emissions from burning fossil fuels in activities related to transportation, industry, and electricity generation. In 2024, Brazil currently supplies more than 80 percent of the electricity sector from renewable sources, including hydropower (48.7 percent), wind (13.7 percent), solar (5.9 percent), and biomass (7.7 percent). However, electricity generated from diesel and diesel oil accounts for 1.5 percent of the total, mainly to supply remote regions and thermoelectric plants. According to the latest available information, sectors related to fossil fuel production emitted 54.2 MtCO2e and the transport sector emitted 216.8 MtCO2e in 2022, making it the third largest emitter in Brazil, behind land use change and enteric fermentation, respectively. In the same year, there was a significant reduction in the use of fossil fuels, with a decrease in the use of natural gas (-68.2 percent), oil fuels (-93.8 percent), and mineral coal (-58.8 percent) compared to 2021.

According to SEEG, the significant use of biofuels in the Brazilian energy matrix reduces GHG emissions. In 2022, sugarcane ethanol (anhydrous and hydrous) and biodiesel contributed to the reduction of 71.1 MtCO2e GHG emissions compared to gasoline and diesel. The graph below shows the emissions avoided by using biofuels and biomass in 2022.

Figure 1
Brazilian Emissions Avoided with Biofuels, in 2022



Source: Energy Research Office (EPE).

To ensure the expansion of biofuels and strengthen their role as a tool to reduce GHG emissions in transport, the Brazilian government launched the National Biofuels Program, called RenovaBio, in December 2016, which modified the policy and regulatory framework for the use of biofuels in the country. RenovaBio's goals are in line with the country's commitments under the Paris Agreement and other international environmental commitments.

RenovaBio´s Legislative Framework

This report updates the "Brazilian Biofuels Annual Gain Report 2018", "Brazilian Biofuels Annual Gain Report 2019", and "Brazilian Biofuels Annual Gain Report 2020", and "Brazilian Biofuels Annual Gain Report 2021", and the "Brazilian Biofuels Annual Gain Report 2023" illustrating the legislative framework and the progress of the RenovaBio program.

In December 2016, the Ministry of Mines and Energy (MME) launched the RenovaBio program, and on December 26, 2017, the Brazilian Congress formalized the program as the "National Biofuels Policy" through Bill number 13,576. In addition to contributing to the fulfillment of the country's international climate commitments, RenovaBio aims to ensure the supply of biofuels in the national fuel market, promote the appropriate expansion of the production and use of biofuels in the energy matrix, and contribute to the appropriate relationship between energy efficiency and reduction of greenhouse gas emissions in the production, commercialization and use of biofuels, including mechanisms for life cycle assessment (LCA).

RenovaBio is based on three main instruments: annual carbon intensity reduction targets (measured through carbon dioxide per megajoule - CO2/MJ), certification of biofuels marketed for GHG emission reduction, and decarbonization credits (CBios). RenovaBio provides the framework for certifying biofuel production according to its GHG reduction efficiency through the use of life-cycle analysis and

enables the sale and trade of decarbonization credits (CBios). Each CBio represents one metric ton of CO2e not emitted by the use of biofuels over fossil fuels, thereby incentivizing lower GHG emitting biofuels over higher emitting ones. By creating a market for CBios, RenovaBio formalizes the environmental benefits of biofuels, increases compensation for producers participating in the program, and incorporates a market-based tool.

The National Energy Policy Council (CNPE) sets the annual GHG emission targets, and the Oil and Gas Regulatory Agency (ANP) divides them into mandatory annual targets for fuel distributors in proportion to their participation in the fossil fuel market. The annual carbon intensity reduction targets drive the program for a minimum of ten years.

The Brazilian Agricultural Research Corporation (Embrapa) has developed RenovaCalc, the methodology for calculating the carbon intensity of biofuels based on a life-cycle assessment compared to fossil fuels. The carbon emission of biofuels is measured in grams of CO2 equivalent per megajoule (gCO2/MJ) and calculated based on the "well-to-wheels" approach, which includes all materials consumed by the production process, from the extraction, acquisition, production or transformation of the feedstock, its conversion to biofuel, to its combustion in the engine.

Each biofuel producer registered in RenovaBio receives an efficiency score (called Energy-Environment Efficiency Score - EEES) based on the life cycle analysis of the biofuel produced and inversely proportional to the carbon intensity of the biofuel. The score reflects each producer's individual contribution to mitigating a specific amount of greenhouse gas emissions compared to fossil fuels (in tons of CO2 equivalent). The biofuels covered by RenovaBio are cellulosic ethanol, sugarcane and corn ethanol, biodiesel and HDRD, aviation biokerosene (HEFA-type SAF), and biomethane.

In January 2023, ANP released version 8.1 of RenovaCal[1], which consists of a database and a calculator for each type of biofuel. Each feedstock requires information on the production unit, eligibility requirements related to environmental compliance and proof of preservation of native forests, and data on the production process, including the agricultural, industrial, and distribution phases. RenovaCalc uses information provided by biofuel producers related to the agricultural and industrial phase to generate the carbon intensity score. This score is subtracted from the corresponding fossil fuel score, resulting in the final EEES.

ANP certifies biofuel producers and importers through the EEES. The certification also takes into account the origin of the biomass. For biomass produced in Brazil, the certification only includes feedstocks produced in agricultural units registered with the Ministry of Agriculture and Livestock (MAPA) that comply with the environmental legislation and preserve native vegetation.

Producers and importers of biofuels who wish to join RenovaBio must hire inspection companies registered with the ANP for the certification of eligible volume and validation of the EEES. The certification of efficient biofuels production is valid for three years after ANP´s final approval. The certification allows biofuel producers and importers to issue CBios.

[1] More information is available at https://www.gov.br/anp/pt-br/assuntos/renovabio/arq/renovacalc/renovacalc_biodiesel-v8-1-fechada.rar

ANP resolution number 758/2018 regulates biofuel certification, biomass eligibility criteria, and the registration of inspection firms. In 2023, ANP launched a public consultation to revise the resolution and modify regulations related to aspects of the biomass custody chain, changes in penalties for inspection firms and biofuels producers, information to be included in RenovaCalc, and the certification of foreign producers in RenovaBio. As of August 7, 2024, ANP has not published the outcome of the public consultation process.

RenovaBio´s Program´s Milestones and Updates

The RenovaBio program was officially launched on December 24, 2019. The main instrument of the program is the definition of annual decarbonization targets for fuel distributors, which should prove compliance through the retirement of CBios, a financial asset negotiated on the Brazilian Stock Exchange. Each CBios represents one ton of carbon dioxide captured before being emitted into the atmosphere.

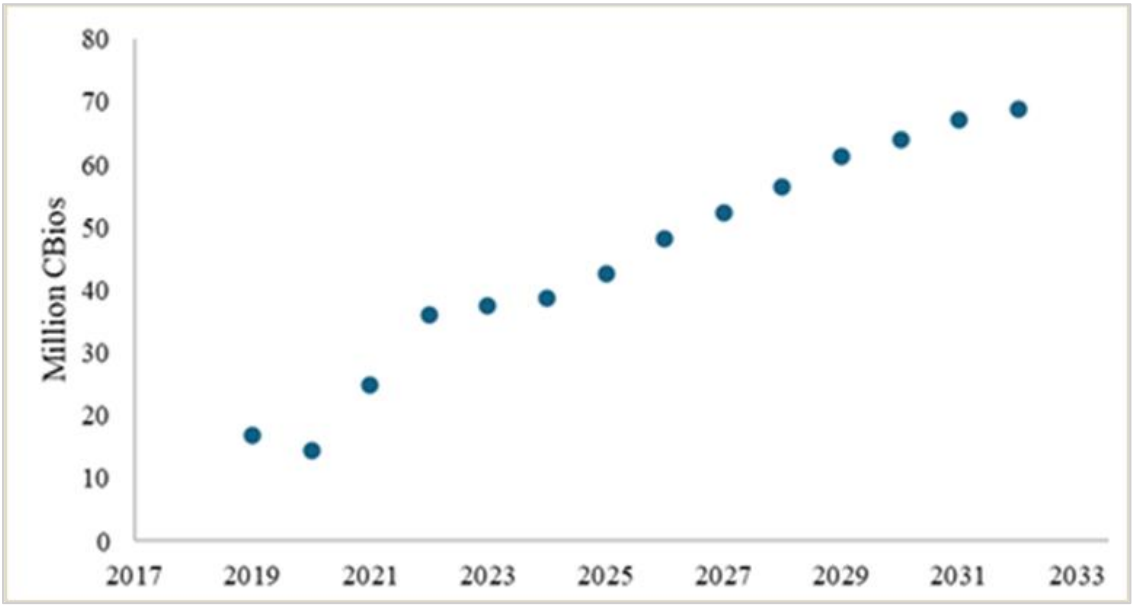
On April 27, 2020, the Brazilian stock exchange B3 started trading CBios. Producers and importers of biofuels must submit to the ANP the authorization and validation of the invoices to issue CBios. Once the documentation has been obtained, the issuers must appoint a bank or financial institution to issue the CBio and then submit it to B3 for registration, issuance, trading and retirement of the CBio.

From 2019 to December 2023, a total of 105 million CBios have been issued, meaning that biofuels have prevented the emission of 105 million metric tons of CO2 equivalent into the atmosphere. In 2023, a total of 33.1 million CBios were retired, representing 81 percent of the individual targets. As of July 12, 2024, B3 data indicates that 12 million CBios have been issued since January 2024. This represents 12 percent of the 2024 mandatory target. The figure takes into account the carryover stock of the 2021 mandatory amount plus the credits acquired in 2022 and 2023.

As of August 2, 2024, ANP had licensed 422 biofuel plants for operation. Of these, 333 were licensed under the RenovaBio program, including 291 ethanol plants, 38 biodiesel plants, and four biomethane plants that were certified with ANP's license for efficient biofuel production and authorized to issue CBios.

On November 29, 2023, the CNPE published the Resolution 6/2023, which established the annual mandatory GHG reduction targets for fuel sales through CBios. ANP Resolution 791/2019 established the criteria for individualizing the targets, which consists of calculating the market share of each fossil fuel distributor. The graph below shows the history of the targets set by the CNPE since 2019 and projected until 2033.

Figure 2
Annual Target of Decarbonization Credits (Cbios) – million CBios, 2018 to 2033



Source: Ministry of Mines and Energy (MME); Chart Post Brasília

Table 2
Annual Target for Decarbonization Credits, in million CBios

Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
CBios Target	16.8	14.5	24.8	35.9	37.4	38.7	42.5	48.0	52.3	56.4	61.2	64.0	67.1	68.8	71.2

Source: National Council of Energy Policy (CNPE); Chart Post Brasilia

The target for calendar year 2024 is 38.78 million CBios. Individual targets set for 2024 must be increased by the amount of CBios that the fuel distributor may not have achieved relative to its 2023 target. Distributors must purchase and retire (permanently withdraw from the market) CBios by March 31 of the following year to demonstrate compliance with the target assigned to them by the ANP. The top five distributors represent approximately 65 percent of the total combined 2024 target.

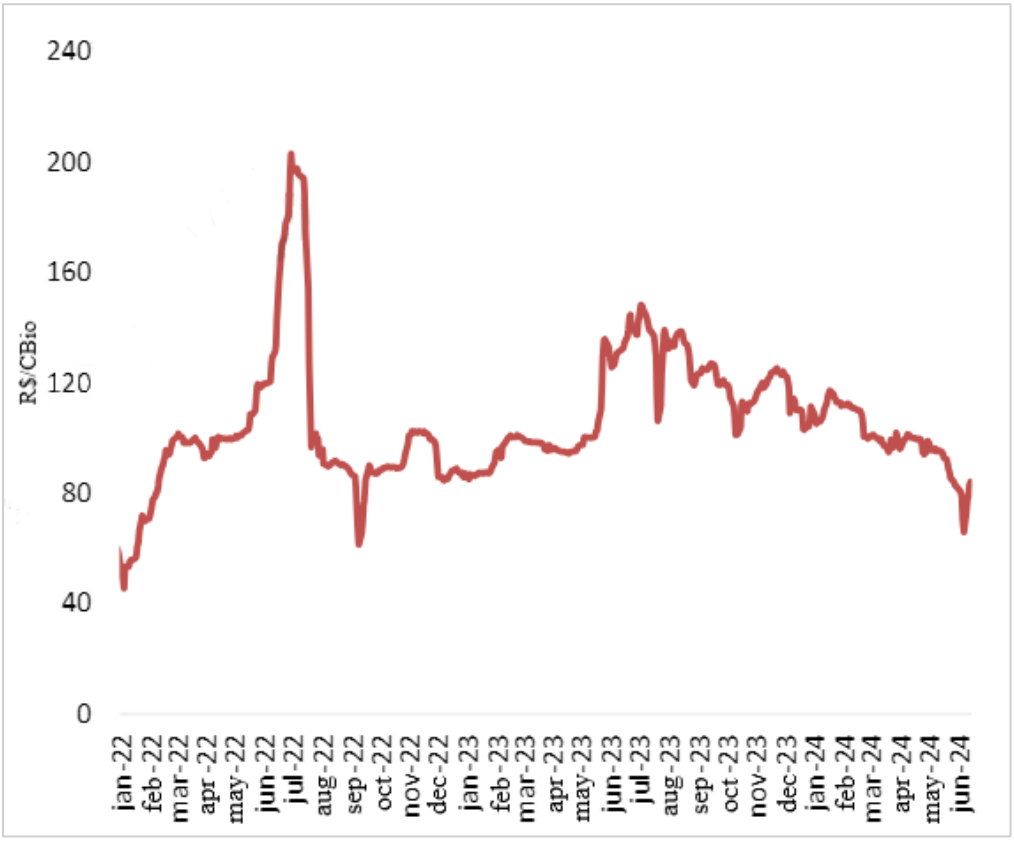
Table 3
RenovaBio Individual Targets for the Five Main Fossil Fuel Distributors

Company's name	Sum of Emissions (tCO2 equivalent)	Market Share (%)	Definitive Target 2024 (CBios)
Vibra Energia	65,906,454.69	24.61%	9,544,136
Raízen	48,564,115.17	18.13%	7,032,733
Ipiranga	48,466,508.78	18.10%	7,018,598
Alesat	6,154,246.39	2.30%	891,217
Petróleo Sabbá	5,702,833.68	2.13%	825,847

Source: Oil and Gas Agency (ANP); Chart Post Brasilia

According to the ANP, between January and July 2024, a total of 7.6 million CBios were retired, 16 percent of the annual target. The average trading price of CBios between January and July 2024 was R$94.53/CBio, with an average high of R$96.42/CBio and an average low of R$93.12/CBios. The main reasons for the sharp price decrease are the cooling demand for ethanol and the high number of non-compliances by fuel distributors, which generates a large backlog. However, for 2024, the biodiesel blending increase to 14 percent and the expected gradual resumption of ethanol consumption are contributing to a slight increase in CBio prices. The chart below shows the fluctuations of CBios prices, per Datagro´s latest data available.

Figure 3
Price of Decarbonization Credit (CBIO) – January 2022 to June 2024



Source: Datagro

Government Support for Fuel Ethanol

1) Gasoline C Use Mandate

No changes were made to the current ethanol mandate, which remains at 27 percent (E27) for gasoline C (*gasolina comum)* as of March 16, 2015. *Gasolina comum* is the official term used for ethanol-blended gasoline, which uses anhydrous ethanol. The other fuel used in Brazil´s light-duty fleet is pure E100 anhydrous ethanol.

The ethanol-use mandate has been in effect since 1931, with a voluntary five percent ethanol blended into imported gasoline. In 1938, the ethanol blending in gasoline became mandatory. The implementation of the ProAlcool program in 1975 developed the ethanol industry and the first 100-percent ethanol vehicle produced in Brazil became operational in 1979.

Under current legislation, the ethanol blend can vary from 18 to 27.5 percent and is currently set at 27 percent. In September 2023, the federal government submitted to Congress the Fuel of the Future bill, which proposes measures to promote low-carbon mobility systems and support Brazil's international goals to reduce greenhouse gas emissions. One of the proposals is an increase in the ethanol blending

mandate from 22 to 30 percent. The lower house of Congress approved the Fuel of the Future bill in March 2024, and it is awaiting approval in the Senate.

Table 4
Anhydrous Ethanol Use Mandate

Anhydrous Ethanol Use Mandate		
Year	**Month**	**Mandate**
2006	Jan-Feb	E25
	Mar-Oct	E20
	Nov-Dec	E23
2007	Jan-May	E23
	Jun-Dec	E25
2008	Jan-Dec	E25
2009	Jan-Dec	E25
2010	Jan	E25
	Feb-Apr	E20
	May-Dec	E25
2011	Jan-Sep	E25
	Oct-Dec	E20
2012	Jan-Dec	E20
2013	Jan-Apr	E20
	May-Dec	E25
2014	Jan-Dec	E25
2015	Jan-Mar 15th	E25
	Mar 16th - Dec	E27
2016	Jan-Present	E27

Source: Ministry of Mines and Energy (MME); Chart Post Brasilia

2) Tax Policy Incentives

2.1 Light Duty Fuels

Brazil has price freedom in all fuel and oil derivatives segments, including production, distribution and resale. There is no direct government intervention or setting of minimum or maximum prices. Service stations are free to set the final price and may pass on tax increases to consumers, but the ANP and consumer protection agencies monitor for possible pricing abuses.

The Brazilian government provides incentives and disincentives for gasoline C and hydrous ethanol at

the pump and actively uses tax policy to do so. Brazil has both federal and state taxes applied to transport fuels. The federal taxes are called Contribution for Intervention in the Economic Area (CIDE) and there is also the Contribution to the Social Integration Program and the Contribution for the Financing of Social Security (PIS/Cofins). The state-level tax applied to fuels is the Tax on Operations related to the Circulation of Goods (ICMS). Tax policy is driven by multiple goals which change over time, but the most common factors are to control inflation, adjust ethanol supply and demand, which can be impacted by sugar prices and gasoline prices, and changes in public sector budgets.

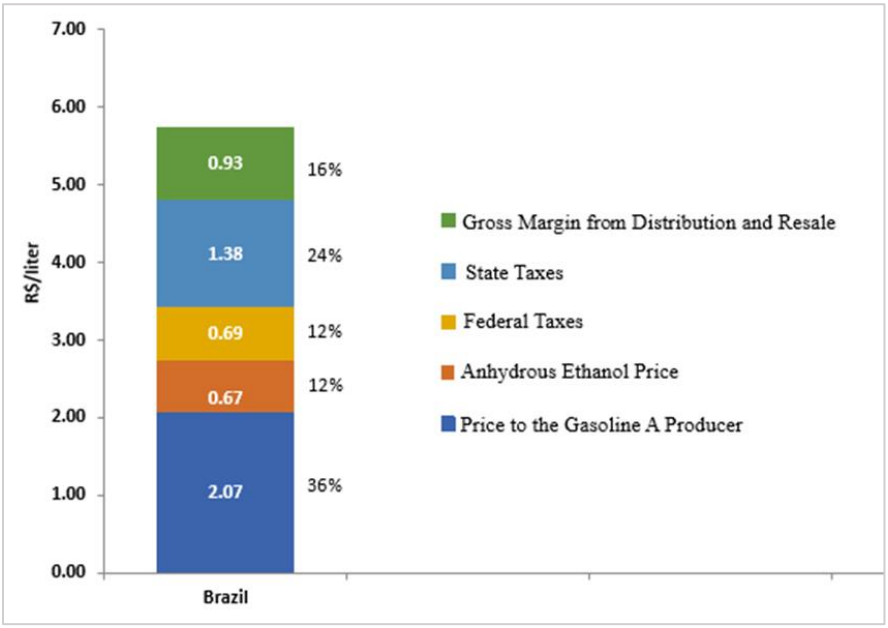
The fuels and biofuels sector has historically benefited from direct subsidies or tax breaks to stimulate producers and reduce prices for consumers. In 2021, the federal government granted subsidies or tax exemptions amounted to R$67.7 billion to oil, coal and natural gas producers. In 2022, the amount reached R$80.9 billion, of which R$40.7 billion were tax exemptions for diesel oil, gasoline and liquified petroleum gas (LPG), R$20 million in tax breaks for the production of biodiesel and R$2.1 billion in tax exemptions for the consumption of hydrated ethanol. In 2023, the fuel and biofuels sector received R$31.1 billion in incentives. These figures include calculations related to resources coming from the federal budget to promote the sectors and uncollected taxes from special tax regimes and exemption programs.

With the intent to control escalating fuel prices and their impact on the inflation rate, in June 2022, the Brazilian government approved Complementary Bill No. 194, which capped the state ICMS tax on fuels at 17-18 percent, depending on the state, and reduced the PIS/Cofins and CIDE taxes on gasoline and ethanol to zero. The law capping the ICMS tax took effect on June 27, 2022, and the revised PIS/Cofins and CIDE taxes took effect on June 23, 2022. At the time, the ICMS capped at 17-18 percent increased the competitiveness of gasoline C over hydrous ethanol in many regions of Brazil and ultimately cause ethanol prices to fall in the near term.

In the beginning of 2023, the Minister of Finance advocated for the resumption of federal tax collection over fuels and supported a single and harmonized ICMS rate to all Brazilian states. After a few months of negotiations with states and governors, the single and fixed rate of the ICMS on gasoline and ethanol went into effect in June 2023. The ICMS tax for gasoline is currently set at R$ 1.37 per liter throughout the country and for hydrous ethanol it varies between 12 percent and 22 percent, depending on the state. Currently, the PIS/Cofins and CIDE tax is fixed at R$ 0.68 per liter for gasoline C and R$ 0.24 per liter for hydrous ethanol.

Per the latest official update from the ANP, in February 2024, federal and state taxes correspond to 36 percent of the gasoline C price. The composition of the gasoline price is represented in the table below:

Figure 4
Composition of the gasoline C price – R$/liter, February and March 2024



Source: Oil and Gas Agency (ANP); Chart Post Brasilia
Note: Gasoline A refer to gasoline without ethanol blend

2.2 Tax Reform

In December 2023, after four decades of debate, the Brazilian Congress approved the long-awaited tax reform aimed at reducing the complexity of the tax collection system and unifying several taxes into a Value Added Tax (VAT), divided into the Contribution on Goods and Services (CBS) for federal taxes and the Tax on Goods and Services (IBS) for state and municipal taxes. In addition to the CBS and IBS, the tax reform also created the Selective Tax, which is levied on products that are harmful to health or have a greater environmental impact.

Currently, Congress is focused on discussing and approving complementary laws to regulate approximately 71 provisions of the reform, including the VAT rate and the sectors exempt or with a reduced rate. The new VAT is expected to be phased in from 2026, with full implementation by 2033.

Electric vehicles are included in the selective tax list. The justification is that although electric vehicles do not emit carbon dioxide there are minerals in their components. However, diesel-powered trucks are excluded from the selective tax due to concerns with road freight[2] increase. The selective tax list also includes the oil and gas sector.

The tax reform proposal for fuels establishes a tax rate based on the average price of the last 36 months,

[2] In 2018, a 10-day truckers' strike triggered by high diesel prices abruptly disrupted the supply of goods and basic inputs, causing economic losses of about 50 billion reais across all sectors. To end the strike, the government reduced taxes on diesel and imposed minimum freight prices. Approximately 65 percent of all goods are transported by road.

adjusted annually to reduce price volatility and avoid abrupt changes due to conjunctural issues that can affect the fuel sector. As of August 7, 2024, the details of the proposal have not been released to the public.

Please refer to "Brazilian Biofuels Annual Gain Report 2015, "Brazilian Biofuels Annual Gain Report 2017", "Brazilian Biofuels Annual Gain Report 2020", and "Brazilian Biofuels Annual Gain Report 2022" for historical information on CIDE and PIS/COFINS.

2.3 Light Duty Vehicles

Tax incentives have played an important role in supporting ethanol consumption thru the introduction of flex-fuel vehicles and no significant support for electric vehicles. With higher taxes on engines that consume more fossil fuel, tax incentives tends to encourage a more fuel-efficient fleet. The table below shows the value of Tax on Industrialized Products (IPI), Contribution to the Social Integration Program/Contribution for Financing Social Security (PIS/Cofins), and state tax for Circulation of Goods and Services (ICMS) for different categories of vehicles as reported by the National Association of Motor Vehicle Manufacturers (ANFAVEA). Note that IPI on flex cars has been lowered compared to gasoline-only powered vehicles.

Table 5
Taxes Applied to Ethanol, Flex-Fuel and Gasoline Vehicles, Percentage

Year	Taxes	1000 cc	1001-2000 cc		Over 2000 cc	
		Gasoline/ Ethanol/ Flex	Gasoline	Ethanol / Flex	Gasoline	Ethanol/ Flex
2013	IPI	2	8	7	25	18
	ICMS	12	12	12	12	12
	PIS/COFINS	11.6	11.6	11.6	11.6	11.6
	% of Avg MSRP	23.6	27.4	26.8	36.4	33.1
2014	IPI	3	10	9	25	18
	ICMS	12	12	12	12	12
	PIS/COFINS	11.6	11.6	11.6	11.6	11.6
	% of Avg MSRP	24.4	28.6	28	36.4	33.1
2015/ thru 2021	IPI	7	13	11	25	18
	ICMS	12	12	12	12	12
	PIS/COFINS	11.6	11.6	11.6	11.6	11.6
	% of Avg MSRP	27.1	30.4	29.2	36.4	33.1
2022 and 2023	IPI	5.27	9.78	8.28	18.81	13.55
	ICMS	12	12	12	12	12
	PIS/COFINS	11.6	11.6	11.6	11.6	11.6
	% of Avg MSRP	24.7	27.3	26.4	32.3	29.5

Source: National Association of Motor Vehicle Manufacturers (ANFAVEA); Chart Post Brasilia

Note: Please refer to the "Brazilian Biofuels Annual Gain Report 2015" for historical information since 2004.

3) Low-interest Credit Lines

The following programs directly or indirectly provide incentives and credit lines for biofuel production. Subsidized credit lines for the adoption of sustainable agricultural practices and the conversion of pasture and degraded land to cropland have the potential to expand land use for the planting of soybeans, corn, sugarcane, and other feedstocks potentially suitable to biofuel production.

3.1 Safra Plan

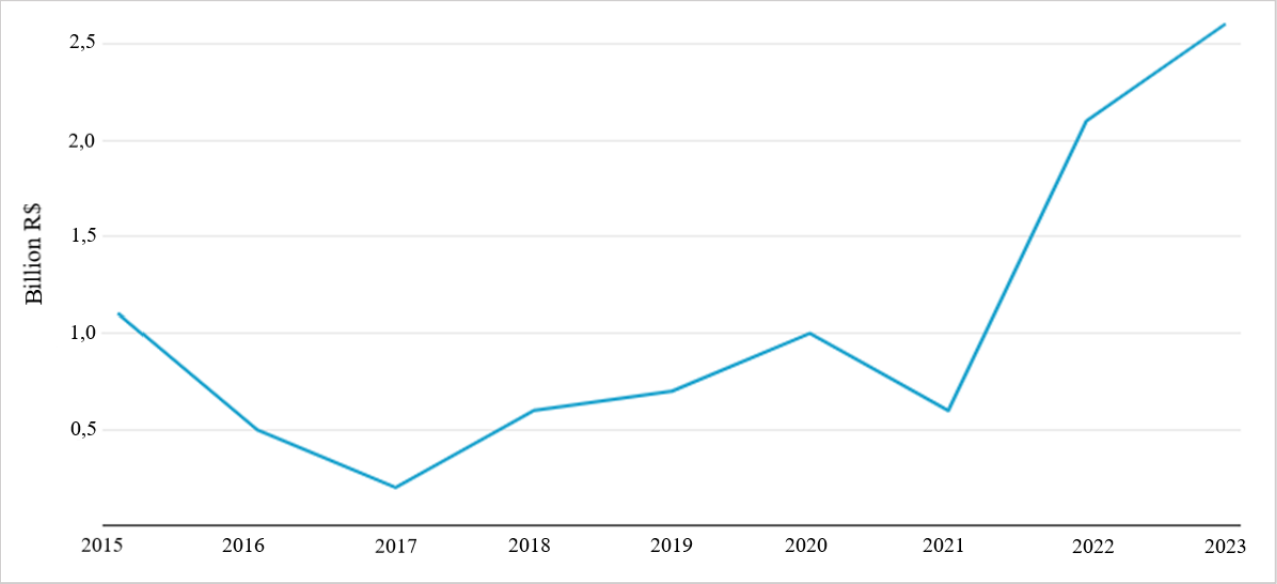
On July 3, 2024, the Ministry of Agriculture and Livestock announced the 2024/25 Crop Plan. A total of R$400 billion will be released to finance agricultural and livestock programs, an increase of 10 percent compared to the resources available in the 2023/24 Crop Plan (R$364 billion).

There are no resources for biofuel producers, but medium and large farmers can access funding through programs that support specific areas, such as the Program to Finance Sustainable Agricultural Systems (RenovAgro), which can support the planting of sugarcane, corn, soybean and other agricultural inputs. For more information on Plano Safra please refer to Brazil Unveils 2024-25 Crop Plan with Funds for the Upcoming Agricultural Season.

3.2 Brazilian Development Bank (BNDES)

The Brazilian Development Bank (BNDES) is one of the most important financial institutions in Brazil. The bank offers several financial support mechanisms to Brazilian companies of all sizes, allowing investments in all sectors of the economy. In 2023, the BNDES approved R$2.6 billion to finance projects related to ethanol, biomethane, biodiesel and other biofuels. The amount was the largest in the last nine years and was released through four main credit lines: Finem, *Mais Inovação*, RenovaBio and *Finame Direto*, that offer longer funding terms and better rates.

Figure 5
BNDES Financing for Biofuels – 2015 to 2023



Source: Brazilian Development Bank (BNDES); Chart Post Brasilia

The BNDES Finem Credit for Direct Projects offers financing for projects related to biofuels transportation and distribution infrastructure, construction and services for biorefineries. These terms include financing costs, BNDES remuneration and a credit risk percentage that varies depending on risk and contract duration.

Launched in 2021, the BNDES RenovaBio line supports biofuel producers with the aim of increasing companies' compliance with the program by offering discounts of up to 0.4% on interest rates to clients who can demonstrate improvements in environmental indicators. BNDES RenovaBio sets targets for the reduction of carbon emissions according to the current level of energy and environmental efficiency of each client. According to the latest data, as of March 2023, BNDES RenovaBio has financed 12 operations and invested more than one billion reais.

BNDES *Mais Inovação* finances projects related to research, development and innovation, including pioneering plants focused on the production of advanced biofuels.

The BNDES Finem credit line finances projects focused on sustainability or aimed at the production or use of biogas, biomethane, low-carbon hydrogen, recovery and conservation of ecosystems and biodiversity, environmental planning and management, recovery of environmental liabilities, energy efficiency and the acquisition of efficient vehicles, machinery and equipment. Financing terms vary according to the type of project.

3.3 Plan New Industry Brazil

In January 2024, the federal government launched the New Industry Brazil Plan to stimulate industrial growth by 2033 through subsidies, low-interest loans, tax incentives, and federal investments totaling

R$300 billion. Sectors that will benefit include agribusiness, health, urban infrastructure, information technology, bioeconomy and defense.

For the bioeconomy sector, priority for funding and credit access will be given to technological solutions for reducing greenhouse gas emissions through carbon capture, utilization and storage (CCUS) and bioenergy energy with carbon capture and storage (BECCS), development of biotechnology for the production and processing of biomass for biofuels, developing technologies for the production of renewable diesel, synthetic fuels and sustainable aviation fuels (SAFs), low-carbon hydrogen and bio-products and bio-inputs from renewable sources.

They also include increasing the share of biofuels in the transportation energy matrix by 50 percent from the current 21.4 percent by 2033. One of the measures announced and already implemented is the anticipation of the timetable for increasing the biodiesel blend in diesel, which has increased from 13 percent in April 2023 to 14 percent in March 2024, and to 15 percent from March 2025. The financing lines will be available through public calls supported by the Studies and Projects Financing Company (FINEP, linked to the Ministry of Science, Technology and Innovation MCTI) and the BNDES.

3.4 Mover Program

On June 27, 2024, the federal government launched the Green Mobility and Innovation Program (Mover), which replaces the Rota2030 program and provides financial credits of R$19 billion between 2024 and 2028 to companies that commit to investing in research and development to produce electric and hybrid vehicles, emphasizing alternative fuels. The program expands the sustainability requirements of the light-duty vehicle, bus and truck fleet and encourages investment in new technological routes through tax incentives. The credits will be used to offset federal taxes.

At the time of its launch, the program had already qualified 89 companies: 70 auto parts manufacturers, 10 light vehicle manufacturers, six heavy duty vehicle manufacturers and two research and development companies. Among the eligibility criteria are the requirement of metrics for measuring carbon emissions at all stages of vehicle production and disposal, including the life-cycle assessment of the energy source used, including fuels.

In the previous Rota2030 program, the life cycle assessment (LCA) used was “tank to wheel”, which made electric vehicles carbon neutral. Beginning 2027, the Mover program requires an even more comprehensive and rigorous measurement, called "cradle to grave" LCA, which includes the carbon footprint of all components and all stages of vehicle production, use and disposal. Mover program is part of the New Industry Brazil.

4) Import Policy

As of January 1, 2024, the ethanol import tariff is 18 percent. Following a tariff rate quota (TRQ) first imposed in 2017 with an out of quota duty of 20 percent that was lowered to 18 percent in November 2021. The Brazilian federal government announced the reduction of the ethanol import tariff to zero effective from March 21, 2022 through December 31, 2022, which was subsequently extended until January 31, 2023. The authority deciding on the tariff is the Chamber of Foreign Trade (Camex), an inter-agency collegiate responsible for foreign trade policy linked to the Ministry of Trade and

Development (MDIC). From February 1, 2023 to December 31, 2023, the import tariff was 16 percent. The table below provides historical information on Brazil's import tariff for ethanol.

Table 6
Tariff Rate for Ethanol Imports to Brazil

Year	Import Tariff Rate (percent)	TRQ pro-rated duty-free quota NCM 2207.10.10 NCM 2207.20.11
From January 1st, 2024	18	Not applicable
Feb 1st, 2023, to Dec. 31st, 2023	16	Not applicable
March 2022 to January 2023	Free Flow (zero tariff)	Not applicable
November 2021 to March 2022	18	In 2017, the duty-free quota was 150 million liters quarterly/600 million liters annually. From 2019 to 2022, the quota expanded to 750 million liters annually.
September 2017 to November 2021	20	
2011 to September 2017	Free flow (zero tariff)	Not applicable

Source: Foreign Trade Chamber; Chart Post Brasilia

Please refer to "Brazilian Biofuels Annual Gain Report 2017" and "Brazilian Biofuels Annual Gain Report 2020" and "Brazilian Biofuels Annual Gain Report 2021", "Brazilian Biofuels Annual Gain Report 2023" for historical information on the ethanol import tariff and duty-free tariff-rate quota (TRQ).

Government Support for Biodiesel

1) The National Program for the Production and Use of Biodiesel

Law No. 11,097 of January 13, 2005, established the National Program for the Production and Use of Biodiesel (PNPB) and regulated the mandatory addition of a minimum percentage of biodiesel to diesel oil sold to consumers. The goal was to reach 5 percent (B5) blending by 2013, with a mandatory B2 blending beginning in 2008. As the Brazilian market matured, the CNPE gradually increased the percentage until reaching B5 in January 2010, three years before the date established by law.

The PNPB provides support for research, development and innovation throughout the production chain, from the agricultural phase to industrial production processes, including storage. The regulations allow the production of biodiesel from different oilseeds, allowing the participation of agribusiness and family farming. The ANP is responsible for regulating the fuel quality standards and monitoring the production and marketing of biodiesel. Fuel distributors and refineries are responsible for blending biodiesel with fossil diesel.

2) The Biodiesel Market Model

Until 2021, biodiesel was sold in Brazil through public auctions, promoted by the ANP based on specific guidelines established by the Ministry of Mines and Energy. The auctions had the purpose to provide economic support to the biodiesel production chain and create conditions for the gradual consolidation of the sector until it became competitive.

On December 30, 2020, the CNPE issued the Resolution No. 14 with guidelines to implement a new market model for biodiesel trading to replace the traditional public biodiesel auctions. The new biodiesel market model became effective on January 1, 2022. The model allows biodiesel producers and distributors to settle over-the-counter (OTC) contracts to guarantee 80 percent of the biodiesel supply for two months, using the same calendar as the public auctions. The remaining 20 percent can be traded on the spot market. Only fuel distributors with at least a five percent market share in any fuel in 2020 will be required to commit 80 percent of the volume traded to OTC contracts.

Law No. 13,033/2014 establishes the mandatory percentage of biodiesel blended in diesel oil sold to consumers, and the ANP is responsible for establishing minimum targets for biodiesel production and distribution in accordance with Resolution 857/2021.

The biodiesel blending mandate was changed several times, due to allegations regarding the quality of biodiesel, the lack of compliance with decarbonization goals by distributors, who complained about high costs. After much pressure from biodiesel producers, on December 19, 2023, the CNPE approved the anticipation of the 14 percent mandate (B14) of biodiesel blended in diesel to begin in March 2024. The previous estimate was that B14 would come into effect in 2025. On the same occasion, CNPE also anticipated the 15 percent mandate (B15) to March 1, 2025 instead of March 2026.

Table 7
Biodiesel Use Mandate

Biodiesel Use Mandate	
Year	**Mandate**
2003	Optional
Jan-08	B2
Jul-08	B3
Jul-09	B4
Jan-10	B5
Aug-14	B6
Nov-14	B7
Mar-17	B8
Mar-18	B10
Sep-19	B11
Mar-20	B12
Sep-20	B10
Nov-20	B11
Jan-21	B12
Mar-21	B13
May-21	B10
Sep-21	B12
Nov-21	B10
Jan-22	B10
Apr-23	B12
Mar-24	B14
Mar-25	B15*

*Source: Oil and Gas Agency (ANP); *Proposed*

3) Social Impacts of Biodiesel

To include family farming in the biodiesel production chain, the Ministry of Agrarian Development (MDA) created the Social Fuel Seal in 2005, a certificate awarded to biodiesel producers that purchase a minimum percentage of raw materials from family farmers and provide technical assistance to farmers. Companies registered in the Social Fuel Seal may receive a partial or total reduction in federal taxes.

In October 2020, Decree 10,527 established the Social Biofuel Seal and established the PIS/Cofins reduction coefficients for federal taxes applicable to the production and sale of biodiesel. The objectives of the Social Biofuel Seal are promoting the development of family farming through the inclusion of producers in the biodiesel and other biofuels chain and promoting oilseed and food production chains in the northern, northeastern and semi-arid regions.

The decree was updated in January 2024 with new subsidies for family farming aimed at reducing inequalities, mitigating climate impacts, and promoting energy and food security. Fuel distributors must purchase at least 80 percent of their biodiesel from producers registered in the Social Biofuel Seal. As of

May 24, 2024, 55 companies have registered with the Social Biofuel Seal, including Petrobras, JBS, COFCO, Cargill, Bunge, BSBios and ADM.

On June 28, 2024, the federal government published new rules allowing the purchase of other feedstock and products from family farmers for purposes unrelated to biodiesel production. The rule applies to the northern, northeastern and semi-arid regions. The new text expands the family farm purchasing options for biodiesel producers seeking the seal.

The Ministry of Agrarian Development and Family Farming is responsible for establishing the requirements for obtaining and managing the seal and for evaluating and inspecting biodiesel producers to grant the benefit.

4) Import Policy

Through Resolutions 857/2021 and 962/2023, the ANP regulated the import of biodiesel for the mandatory blend, which would enter into force in January 2024. The importation of biodiesel for self-use or experimentation was allowed but for the mandatory blend prohibited. The imported volume of biodiesel for each fuel distributor was limited to 20% of the total volume for mandatory blending.

On December 19, 2023, the CNPE suspended the import of biofuels, and a working group will decide on the matter. Brazilian biodiesel associations pressured the MME and CNPE to block imports, arguing that imports would disrupt the national biodiesel production chain and affect competition. As of July 2024, the working group had not decided on the issue.

Government Support for Advanced Biofuels

1) Fuel of the Future Bill

On September 18, 2023, the Federal Government submitted to Congress Bill number 4516/2023, known as Fuel of the Future, which includes measures to promote low-carbon and sustainable fuels use to reduce greenhouse gas emissions. The main proposals are:

- Integration between RenovaBio, Mover Program and the Brazilian Vehicle Labeling Program. Creation of the National Sustainable Aviation Fuel Program (ProBioQAV) and the National Green Diesel Program.
- Increase in the minimum and maximum mandatory blend of ethanol in gasoline.
- Regulation of synthetic fuels.
- Create the framework for the capture and geological storage of carbon dioxide.

The Fuel of the Future Law is based on the results of the Federal Program of the same name, approved by CNPE Resolution No. 7/2021, which was designed to promote measures to expand the use of sustainable fuels and the development of fuel technologies for land, water and air transportation. The Fuel of the Future Program proposed the integration of biofuel policies such as RenovaBio and the PNPB, evaluated the environmental-energy efficiency in the fuel life cycle, and sought to promote innovation and technological development. The results of the program led to the drafting of the Fuel of the Future Bill in Congress. As of July 2024, the bill was pending approval in the Senate after being

approved in the lower house.

The federal government is promoting cross-cutting initiatives to promote and expand the use of renewable fuels. In addition to the Fuel of the Future bill, the Ministry of Finance is supporting the Ecological Transformation Plan (ETP), which aims to reduce GHG emissions through six axes, including energy transition and a strong focus on the use of biofuels to decarbonize the transportation sector, anticipating mandatory biodiesel blending targets. The ETP dialogues with the proposals outlined in the Fuel of the Future bill.

The proposal related to the National Green Diesel Program (PNDV) aims at promoting the research, production, marketing and energy use of renewable diesel. The bill also delegates to the CNPE the annual definition of the mandatory minimum renewable diesel content in the diesel pool through 2037, limited to 3 percent, produced from raw materials exclusively derived from renewable biomass.

The proposal to create the National Sustainable Aviation Fuel Program (ProBioQav) has the purpose to encourage research, production and marketing of SAF. ANP will establish the values of the total greenhouse gas emissions per unit of energy (gCO2e/MJ) computed from the life-cycle analysis of each SAF pathway. The bill also establishes that, as of 2027, air operators will be obliged to reduce GHG emissions in their domestic operations through the use of SAF. The National Civil Aviation Agency (ANAC) will establish the calculation methodology for verifying the reduction in emissions associated with the use of SAF. The percentage reduction in emissions starts at 1 percent in 2027 and reaches 10 percent in 2037, with an increase of 1 percent per year from 2029 onwards[3].

2) Renewable Diesel and Co-Processed Diesel and Jet Kerosene

ANP regulates renewable diesel through Resolution number 842. According to the text, renewable diesel is defined as "biofuel composed of paraffinic hydrocarbons intended for vehicles equipped with diesel cycle engines" and produced using the following routes:

I - hydro-treatment of vegetable oil and animal oil fats[4];
II - synthesis gas from biomass;
III - fermentation of sugar cane juice; and
IV - oligomerization of ethyl alcohol (ethanol) or isobutanol (isobutanol).

Of the four types listed above, only HDRD is commercialized at scale in a few countries. There is no blend mandate for renewable diesel, despite pressure from producers investing in production capacity.

3) Sustainable Aviation Fuel (SAF)

ANP Resolution 856 of October 22, 2021 establishes the specifications for aviation kerosene (JET A and JET C) and alternative aviation fuel kerosene. According to this resolution, the following production routes for sustainable aviation fuels are authorized in Brazil:

[3] The calculation basis on which the emission reduction obligations will be computed will be given by the volume of emissions resulting from the domestic operations carried out by the airline in the corresponding year, assuming that all operations have used fossil fuel.
[4] Known internationally as hydrogenation-derived renewable diesel (HDRD).

- SPK-HCHEFA: Synthetic paraffinic kerosene from bioderived hydrocarbons, hydrotreated fatty acids and fatty acid esters.
- CHJ: Synthetic kerosene from hydrothermolysis conversion.
- SIP: Synthetic iso-paraffins from hydrotreated fermented sugar.
- SPK-FT: Hydrotreated and Synthetic paraffinic kerosene from Fischer-Tropsch.
- SPK-HEFA: Synthetic paraffinic kerosene from hydrotreated fatty acids and fatty acid esters.
- SPK/A: Paraffinic synthesized kerosene with aromatics.
- SPK-ATK: Alcohol-to-jet synthetic paraffinic kerosene.

Figure 6
SAF Production Routes Authorized and Sustainable Inputs

Route	Sustainable Inputs
SPK-HEFA	Vegetable oils (new and recycled) and animal fats
SPK-HCHEFA	
SPK-FT	Municipal solid waste, agriculture and agro-industrial waste
SPK/A	
SPK-ATJ	Sugar or starch crops and lignocellulosic feedstocks
SIP	Carbohydrates (sucrose)
CHJ	Sewage, fertilizer, residues from: food processing, forestry, agricultural and agro-industrial

Source: Energy Research Office (EPE)

There are two online platforms that are available for the monitoring of the SAF data. The first is SAFmaps[5], a collaborative project of the University of Campinas (Unicamp) and the Boeing-Embraer Joint Research Center for Sustainable Aviation Fuels. Information compiled and validated by the project include suitability of each feedstock in areas within one of the 12 Brazilian States in scope, supply chain economics, data about potential pathways-refining process and aspects of sustainability. The second platform is Conexão SAF[6], an informal forum that aims to bring together public and private actors to identify and develop proposals and solutions that will enable the Brazilian aviation sector to decarbonize through the use of SAF. Conexão SAF seeks to to identify the technical, regulatory, tax, production and logistical challenges for the production and consumption of SAF in Brazil.

III. Ethanol

Production, Supply and Distribution (PS&D)

Sugarcane is the primary feedstock for ethanol production in Brazil, followed by corn. Brazilian government agencies and trade sources do not separate ethanol use for fuel from other uses. All ethanol production figures are reported in hydrous and anhydrous volumes only. According to Post contacts, ethanol plants produce different specifications of hydrous and/or anhydrous, but do not distinguish between fuel and other uses. Actual fuel and other uses (industrial and chemical, refined, and/or neutral) are determined at the end use. To be in accordance with the actual feedstock production cycle, the following narrative describes sugarcane and ethanol production in marketing years (MY) April through March, unless otherwise stated.

[5] Available at http://www.safmaps.com/
[6] Available at https://hotsites.anac.gov.br/conexaosaf/

Table 8

Production, Supply and Distribution of Ethanol in Brazil

Ethanol Used as Fuel and Other Industrial Chemicals (Million Liters)											
Calendar Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Beginning Stocks	8,995	10,167	8,232	8,012	8,973	10,401	12,327	14,451	13,370	12,293	14,446
Fuel Begin Stocks	8,590	9,713	7,765	7,520	8,475	9,899	11,820	13,939	12,853	12,849	15,235
Production	28,553	30,365	28,405	28,142	33,078	37,383	35,081	29,980	30,746	35,359	32,500
Fuel Production	25,585	27,248	25,546	25,170	30,233	34,407	30,897	26,195	27,600	31,309	28,831
>of which is cellulosic (a)	0	2	6	17	25	30	32	40	53	32	51
Imports	452	513	835	1,796	1,775	1,457	1,008	432	322	59	200
Fuel Imports	403	500	810	1,791	1,770	1,452	1,003	427	316	57	197
Exports	1,398	1,867	1,789	1,380	1,685	1,941	2,669	1,948	2,445	2,510	2,600
Fuel Exports	780	900	400	443	840	1,090	850	300	320	315	320
Consumption	26,435	30,946	27,671	27,597	31,740	34,973	31,296	29,545	29,700	30,755	31,900
Fuel Consumption	24,085	28,796	26,201	25,562	29,740	32,848	28,931	27,408	27,600	28,665	29,709
Ending Stocks	10,167	8,232	8,012	8,973	10,401	12,327	14,451	13,370	12,293	14,446	12,646
Fuel Ending Stocks	9,713	7,765	7,520	8,475	9,899	11,820	13,939	12,853	12,849	15,235	14,234
Refineries (Sugarcane-only) Producing First Generation Fuel Ethanol (Million Liters)											
Number of Refineries	382	382	383	384	369	359	347	343	337	330	333
Nameplate Capacity	37,930	38,050	39,677	40,012	43,105	43,105	42,800	50,500	54,280	54,957	55,100
Refineries (Corn-only and Corn/Sugarcane Flex) Producing First Generation Fuel Ethanol (Million Liters)											
Number of Refineries	n/a	n/a	n/a	n/a	n/a	n/a	11	19	17	17	22
Nameplate Capacity	n/a	n/a	n/a	n/a	n/a	n/a	2,500	4,000	5,000	5,487	5,600
Capacity Use (%)	n/a	n/a	n/a	n/a	n/a	n/a	68%	48%	50%	52%	52%
Refineries Producing Cellulosic Fuel Ethanol (Million Liters)											
Number of Refineries	1	3	3	3	3	3	3	3	2	1	2
Nameplate Capacity	82	127	127	127	127	127	127	75	75	82	164
Capacity Use (%)	0%	2%	5%	13%	20%	24%	25%	53%	51%	39%	31%
Co-product Production (1,000 MT)											
Bagasse	118,971	126,008	117,492	115,467	134,721	150,096	135,913	111,017	120,897	110,842	122,260
DDGs	33	91	151	310	541	998	1,824	2,474	2,993	4,266	4,690
Corn Oil	2	5	9	18	31	57	105	142	172	239	270
Feedstock Use for Fuel Ethanol (1,000 MT)											
Sugarcane	356,913	378,025	352,475	346,400	404,163	450,288	407,738	333,050	366,355	326,006	325,700
Corn	107	291	481	990	1,727	3,190	5,827	7,904	9,564	13,318	15,500
Bagasse for Cellulosic Fuel	0	0.011	0.033	0.094	0.139	0.167	0.178	0.222	0.350	0.129	1.400
Market Penetration (Million Liters)											
Fuel Ethanol Use	24,085	28,796	26,201	25,562	29,740	32,848	28,931	27,408	27,600	28,665	31,009
Hydrous Ethanol for Fuel	12,994	17,862	14,586	13,642	19,385	22,544	19,258	16,792	15,986	16,233	17,100
Anhydrous Ethanol in Gasoline C	11,091	10,934	11,615	11,920	10,355	10,304	9,673	10,616	11,614	12,432	12,609
Gasoline C (includes anydrous)	44,364	41,137	43,019	44,150	38,352	38,165	35,824	39,317	43,014	46,048	46,700
Gasoline C Blend Rate	25.00%	26.60%	27.00%	27.00%	27.00%	27.00%	27.00%	27.00%	27%	27%	27%
Ethanol Blend Rate Overall	42.0%	48.8%	45.5%	44.2%	51.5%	54.1%	52.5%	48.8%	46.8%	46.0%	46.6%

Note: See section VI: Notes on Statistical Data covering sources and certain calculations. f/ forecast
Forecasts developed by USDA Brasilia.

Production

Brazil is the world's second largest producer of ethanol after the United States. Sugarcane is the source of most of Brazil's ethanol, but corn ethanol production is growing rapidly since 2017. Favorable weather conditions and previous investments in new sugarcane varieties and field renovations have improved productivity and increased yields. As a result, the MY 2023/24 sugarcane crop (April to March) exceeded market expectations, reaching an impressive record 705.2 million metric tons (MMT), eight percent higher than the already optimistic initial estimate of 652 million MMT. Favorable international sugar prices encouraged producers to prioritize sugar over ethanol production.

The main sugarcane growing area is the Center-South, which comprises the states of São Paulo, Rio de Janeiro, Espírito Santo, Minas Gerais, Goiás, Mato Grosso and Mato Grosso do Sul. The North-Northeastern region includes Bahia, Sergipe, Alagoas, Pernambuco, Paraíba, Rio Grande do Norte, Piauí, Maranhão, Tocantins, Pará, Acre, and Amazonas.

Figure 6

Ethanol Producing Facilities, 2024

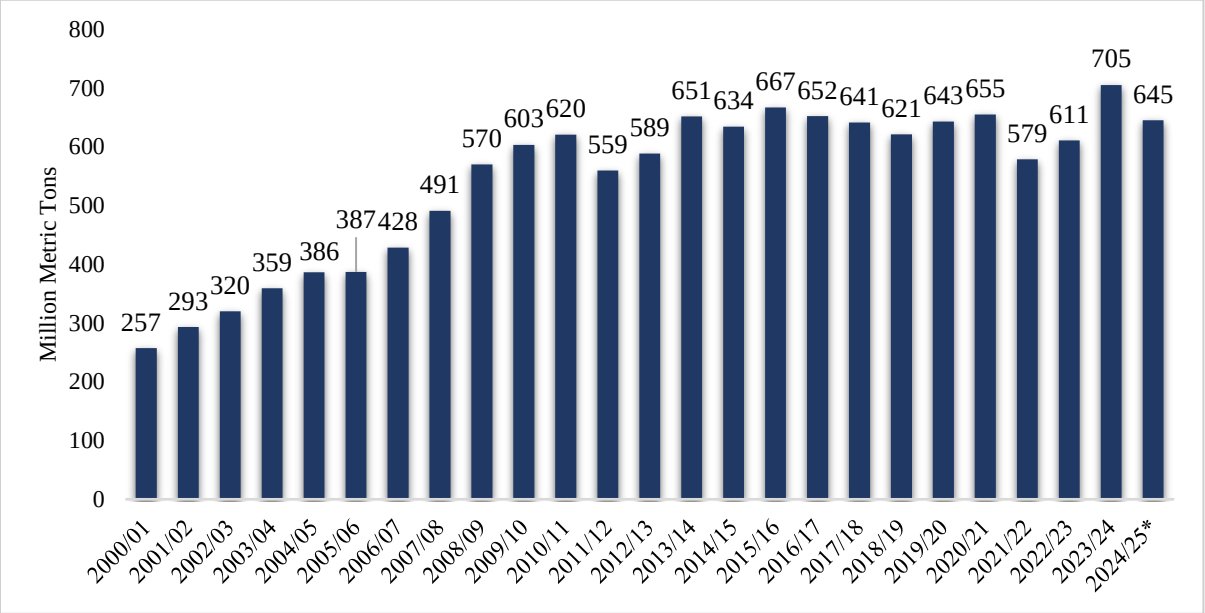
Source: Oil and Gas Agency (ANP)

1) Sugarcane Ethanol

While the MY 2023/24 sugarcane harvest was a record, production in MY 2024/25 is unlikely to follow the same trajectory. Irregular rainfall in the Center-South (CS) region from December 2023 to March 2024 is likely to affect the performance of the cane to be harvested and reduce overall production.

Post forecasts the Brazilian sugarcane crop for MY2024/25 (April to March) at 645 MMT, down 8.5 percent from MY2023/24 (705.2 MMT). The sugar/ethanol mix is forecast at the proportion of 51 percent and 49 percent, respectively. Cane ethanol is forecast at 26 billion liters, down 11 percent from the last crop season (29 billion liters).

Figure 7
Brazilian Sugarcane Production, in Million Metric Tons



***Source**: National Supply Agency (Conab); Chart Post Brasília *Forecast*

Bagasse, the by-product of sugarcane processing, is mostly used for co-generation of electricity to supply mills and is a key reason sugarcane ethanol's carbon intensity is lower than grain-based ethanol. In 2023, the consumption of bagasse in the energy sector has increased due to the growth in sugarcane processing and accounted for about 22 percent of the industry's energy generation, the second largest source after electricity, which in Brazil has a relatively low CI score due to high renewable content (mainly hydropower).

As of July 2024, there are 356 sugarcane plants in operation in Brazil. Of these, 224 produce sugar and ethanol, 13 produce sugar, and 112 produce ethanol. Post forecasts that sugarcane mills will continue to favor sugar production in MY2024/25 due to attractive international prices, and the sugar/ethanol mix is estimated at 51 percent sugar and 49 percent ethanol.

Producers in CS Brazil faced a challenging market for ethanol sales in 2023/24. Despite the plant's higher sugar mix, the ethanol market was oversupplied, not only because of the region's larger cane crop, but more importantly because consumers were slow to switch fueling their vehicles from gasoline C to hydrous ethanol in the face of more competitive prices at the pump. As a result, prices responded slowly throughout the season after falling to their lowest levels since the pandemic.

Between January and July 2024, the average parity between the prices of hydrated ethanol and gasoline C for consumers remains at about 64 percent, an attractive percentage for ethanol. Thus, even if ethanol continues to increase in value at the mills, the price parity between hydrated ethanol and C gasoline at the pump should remain below 70 percent, which is considered the inflection point in the consumption curve.

In July 2024, the volume of ethanol traded at the hydrous ethanol plants was lower, but prices responded due to producers' firm stance and lower negotiating margins. Sugar cane producers continue to pay close attention to the attractiveness of sugar sales to the foreign market, driven by the strong appreciation of the dollar against the Brazilian real throughout June.

From January 1st to August 5, 2024, calculations carried out by the Center for Advanced Studies in Applied Economics/ Luiz de Queiroz College of Agriculture (Cepea/Esalq) show that the Cepea/Esalq hydrous index[7] at an average R$2.2758/liter, down 14 percent compared to the same period of 2023 (RS2.5990/liter). For anhydrous[8], the average was at R$2.5735/liter, down 17 percent compared to the same period of last year (R$3,0276/liter).

In terms of hydrated ethanol consumption, between January and June 2024, consumption totaled 10,446 billion liters, an increase of 51 percent compared to the same period in 2023. On the other hand, consumption of C gasoline (blended with 27 percent ethanol) decreased by 8.6 percent from January to June, totaling 21,369 billion liters, a decrease of 7.6 percent compared to the same period in 2023. As a result, between January and June 2024, on average, about 45 percent of gasoline consumption was replaced by ethanol, compared to an average of 39 percent in the same period in 2023. Hydrous ethanol consumption remains below its potential.

Due to the slow recovery in ethanol consumption at the domestic market, the sugar-energy sector had to deal with high ethanol stocks, reaching a peak of 10.8 billion liters (anhydrous and hydrous) on November 15th, 2023, 20.4 percent above that observed a year ago or the equivalent of 67 percent of the sector's static ethanol tanking capacity in the CS region. With high stocks, producers had little bargaining power to boost ethanol prices at the end of the 2023/24 season. The beginning of the offseason in the CS region rapidly reduced ethanol stocks reaching a low of 1.9 billion liters in April 2024.

4) Corn Ethanol

Corn ethanol is booming in Brazil due to the availability of grain and relatively low production costs. In MY2023/24 (April to March), corn ethanol production reached six billion liters, up 41 percent from MY2022/23. For MY2024/25, Post forecasts corn ethanol production to reach seven billion liters, an

[7] Figures exclude freight and ICMS. Annual indicator for fuel hydrous ethanol in the state of São Paulo.
[8] Figures exclude freight. Annual indicator for anhydrous ethanol in the state of São Paulo.

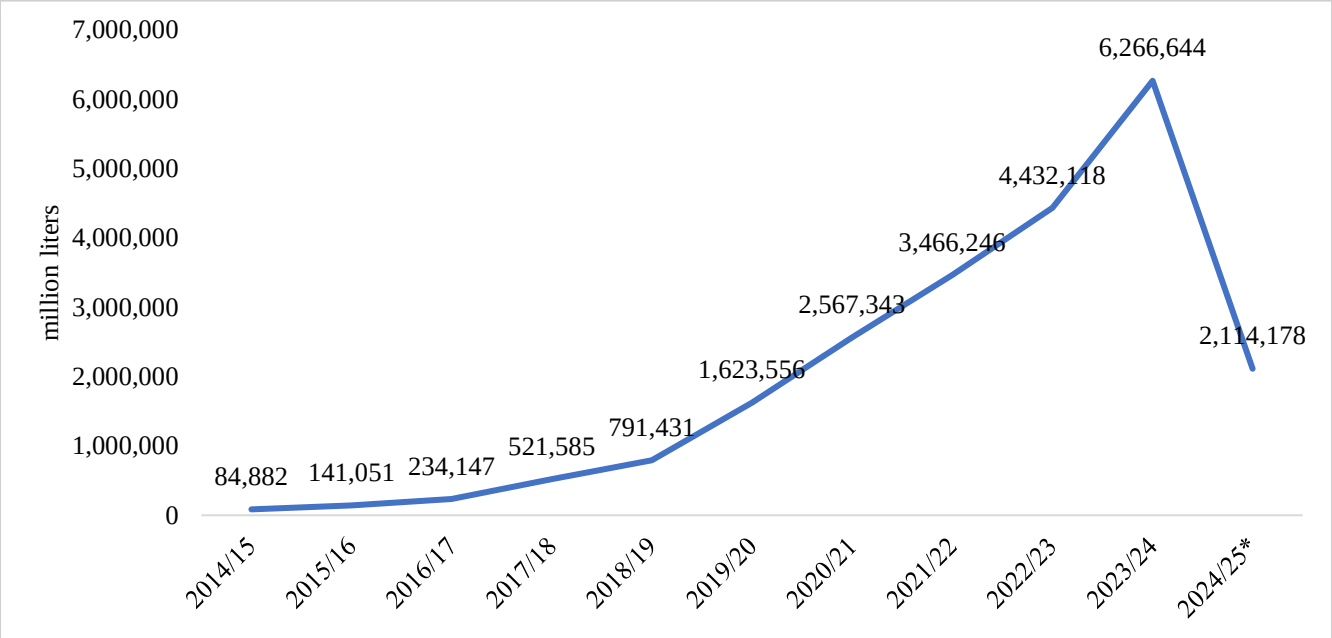
increase of one billion liters from the previous season.

As of July 2024, 22 corn ethanol plants were operating in Brazil, with a combined nameplate capacity of 7.22 billion liters/per year, representing a demand of 17 MMT of corn, or 15 percent of the corn production for the 2023/24 crop season. Each metric ton of corn can produce an average of 417 liters of ethanol, 313 kilograms of DDGs, and 18 liters of corn oil[9].

According to the National Union of Corn Ethanol (UNEM), there are nine corn ethanol plants under construction with a total capacity of 2.75 billion liters per year and 11 plants commissioned. If all projects are completed, Brazilian corn ethanol production could reach 13.8 billion liters within the next eight years, requiring over 30 million tons of corn.

During the corn marketing year 2023/24 (March-February), Brazil produced 135,500 million tons of corn, and about 10 percent of the total went to produce ethanol. Corn ethanol production in Brazil is mostly concentrated in the center-west region of Brazil, particularly Mato Grosso, close to relatively cheap corn supplies and poultry operations that consume DDGs produced as a byproduct of ethanol distillation.

Figure 8
Evolution of Corn Ethanol Production – in Marketing Years



*Source: Union of the Sugarcane and Bioenergy Industry (Unica); Chart Post Brasilia *April to July*

5) Wheat Ethanol

In April 2024, a Brazilian biodiesel company received a license to begin the commissioning phase of Brazil's first wheat ethanol plant located in the southern state of Rio Grande do Sul. The wheat will be

[9] For more information see the Grain and Feed Update – August 2024.

genetically modified, and the plant will also have capacity to use sorghum and triticale. When operational, the plant will produce 209 million liters of ethanol, 153 metric tons of bran and 27,000 metric tons of gluten, using 525,000 metric tons of wheat and other grains.

The plant received R$729 million in financing from the National Development Bank (BNDES). Brazil produced 10.5 million tons of wheat during the wheat marketing year 2023/24 (October – September)[10].

A second wheat ethanol plant, also located in Rio Grande do Sul, is expected to begin operations in 2024 with a nameplate capacity of 12 million liters of ethanol. The plant will also use rye, barley and corn. The total investment amounts to R$110 million.

Rio Grande do Sul is the largest wheat-producing state in Brazil, with 1.5 million hectares.

2) 6) Cellulosic Ethanol

Brazilian cellulosic ethanol is produced primarily from sugarcane bagasse and is estimated to have a carbon footprint 30 percent lower than sugarcane ethanol .

In 2023, Raízen was only large-scale producer of cellulosic ethanol in Brazil. In April 2024, the company inaugurated its second cellulosic ethanol plant in Guariba, São Paulo. The first plant is operating since 2014 in Piracicaba, São Paulo, and has an installed capacity of 82 million liters per year. Both plants have a total installed industrial capacity of 164 million liters per year. Between 2024 and 2025, the company plans to inaugurate four new cellulosic ethanol plants, each with an installed capacity of 82 million liters per year, for a total of 328 million liters per year by MY2025/26. The company envisions operating 20 cellulosic plants with an annual installed capacity of 1.6 billion liters by 2031. This long-term plan requires long-term, pre-signed contracts with customers in Europe, the U.S. and Asia, where policy incentivizes lower carbon emission ethanol.

Consumption

Table 9
Brazilian Fuel Consumption Matrix (million liters)

	2018	**2019**	**2020**	**2021**	**2022**	**2023**	**2024****
Gasoline C*	38,352	38,165	35,824	39,317	43,014	46,048	21,419
Hydrated Ethanol	19,385	22,544	19,258	16,792	15,986	16,233	10,739

*Source: Oil and Gas Agency. * Gasoline C includes 27% of anhydrous ethanol. **coversto January-Jun.*

Post estimates total domestic demand for ethanol (fuel and other uses) for the calendar year 2024 will be

[10] For more information, please refer to Grain and Feed August 2024

relatively stable compared to 2023. Total ethanol consumption for 2024 is estimated at 31.9 billion liters and total ethanol consumption for use as fuel is estimated at 29.7 billion liters. As comparison, in 2023, total ethanol consumption was 30.7 billion liters and total ethanol for use as fuel was 28.6 billion liters. Estimates are based on updated number from ANP and the current pace of the Brazilian economy. No changes have been made to the current ethanol mandate in gasoline C, which remains 27 percent (E27).

The consumption of gasoline C and hydrous fuel ethanol are usually negatively correlated given that most of the Brazilian light vehicle fleet is flex-fuel and consumers choose one or another fuel depending on the price parity. Consumers´ decision to buy hydrous ethanol or gasoline at the pump is mainly driven by the 70 percent ratio between hydrous ethanol and gasoline prices. Hydrous ethanol is more advantageous if the price ratio is below 70 percent, and gasoline price is more attractive if the price ratio is above 70. The calculation refers to the energy content of each fuel with ethanol's energy content 36 percent lower than pure fossil gasoline.

The size and composition of the Brazilian light vehicle fleet affect the opportunity for ethanol consumption depending on the ethanol/gasoline price ratio. According to the Ministry of Transportation, as of June 2024, Brazil has a total fleet of 121 million vehicles, from which 62 million are light-duty vehicles. The table below shows the licensing of flex-fuel vehicles and hydrous-ethanol powered cars (light-duty vehicles), as reported by the Brazilian Association of Vehicle Manufacturers (ANFAVEA). Sales of light-duty vehicles represent 79 percent of total vehicle sales between January and June 2024.

Table 10
Licensing of Light-Duty Vehicles (units)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024*
Ethanol and Flex Fuel	2,940,508	2,194,020	1,750,754	1,927,221	2,168,173	2,328,650	1,664,999	1,624,348	1,633,280	1,809,864	849,194
Gasoline	184,841	136,150	80,495	68,902	81,935	73,854	58,930	53,588	48,804	60,569	45,293
Electric, Hybrid, Hybrid Plugin	855	846	1,091	3,296	3,970	11,858	19,687	34,990	49,261	93,908	76,269

*Source: National Association of Vehicle Manufacturers (ANFAVEA) * Covers January to June*
Note: The licensing figures include passenger cars and light commercial vehicles.

Trade

1) Exports

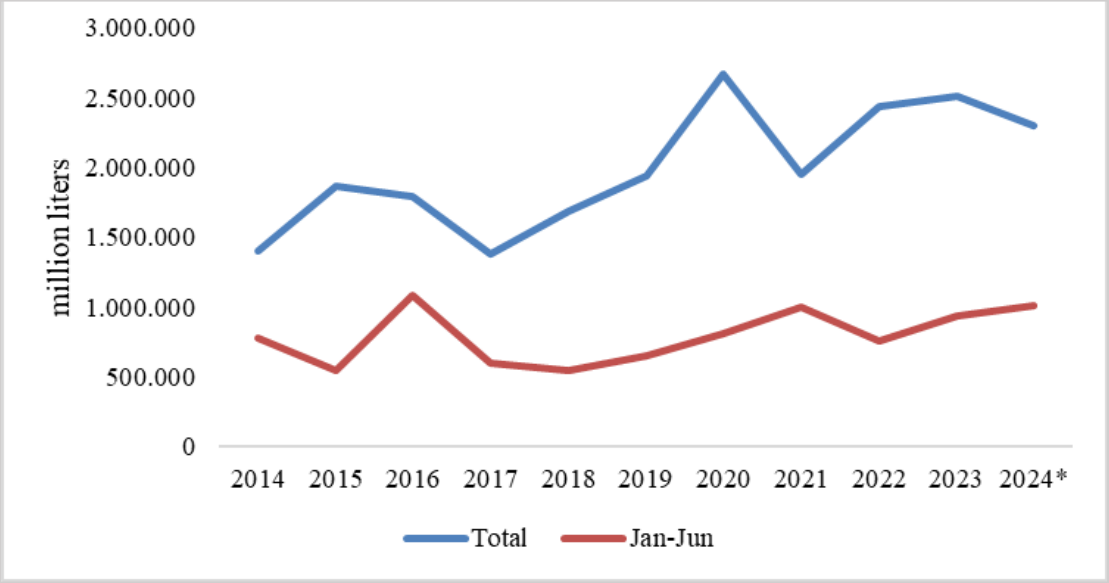
Brazilian ethanol exports reached 2.6 billion liters in the calendar year 2023, a slight increase compared to the previous year (2.4 billion liters). Major export destinations in 2023 were South Korea, the Netherlands and the United States, as reported by Trade Data Monitor based on the Brazilian Secretariat of Foreign Trade (Secex).

Post estimates total Brazilian exports for the calendar year 2024 at 2.3 billion liters based on the current export pace as reported by the Secex. From January to June 2024, Brazil exported 1 billion liters, an increase of seven percent compared to the same period of 2023 (940 million liters). South Korea remains

the primary export market for the Brazilian ethanol, which is used in non-fuel applications and a small amount is likely transhipped to Japan. The United States and Singapore complete the top three destinations of ethanol exports from Brazil in the January to June 2024 period.

All or nearly all of the ethanol shipped to the United States is consumed as fuel in California due to the favorable carbon intensity (CI) rating that Brazilian sugarcane ethanol receives under California's Low Carbon Fuel Standard (LCFS) and the state's carbon credit market. Further favoring Brazilian ethanol, the U.S. Environmental Protection Agency's (EPA) Renewable Fuel Standard (RFS) recognizes sugarcane ethanol as an advanced biofuel, and the Renewable Identification Number (RIN) for advanced biofuels (D5 RINs) has historically been valued at a significant premium over the conventional corn ethanol RIN (D6 RIN).

Figure 9
Brazilian Ethanol Exports, in Million Liters



*Source: Trade Data Monitor based on the Brazilian Secretariat of Foreign Trade; Chart Post Brasilia * Forecast*

Table 11
Brazilian Ethanol Exports, in Million Liters

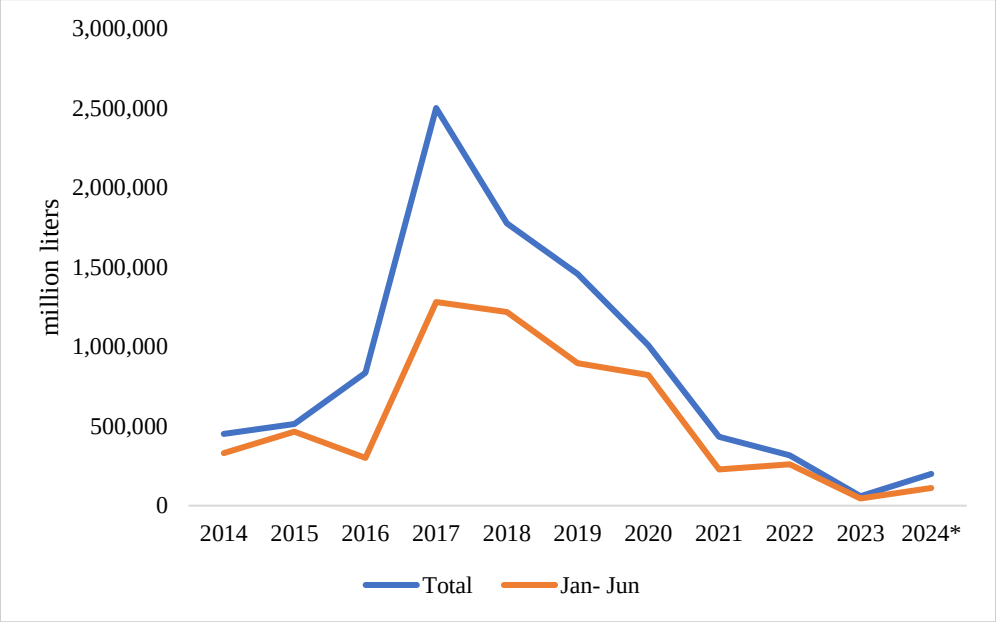
Calendar Year - (NCM 2207.10, 2207.20.11, 2207.2019), Volume 1,000 Liters					
Country	**2020**	**2021**	**2022**	**2023**	**2024***
South Korea	915,900	778,440	739,542	820,261	401,242
Netherlands	274,152	118,384	710,866	588,10	36,463
United States	994,829	465,461	461,980	376,06	195,48
United Kingdom	58,456	18,366	105,780	17,849	216,000
Japan	36,843	77,175	88,243	42,047	25,712
Nigeria	7,191	79,730	52,988	96,365	49,349
Philippines	46,289	41,843	43,315	128,920	69,947
Ghana	34,851	41,269	43,150	46,387	14,901
India	71,722	70,497	31,475	71,880	62,568
Total	**2,668,972**	**1,948,181**	**2,439,885**	**2,510,369**	**1,011,216**

*Source: Trade Data Monitor (TDM) and Brazilian Secretariat of Foreign Trade (Secex). Note: Numbers may not add due to rounding. / *2024 = January to June*

2) Imports

Post estimates total Brazilian ethanol imports for 2024 at 200 million liters, a 70 percent increase over 2023 imports (59 million liters). Ethanol imports have decreased since 2021 given the weak currency relative to the U.S. dollar, the import duty on U.S. ethanol and generally higher price of U.S. ethanol but also aided by investment in increasing productivity and expansion of Brazil´s corn ethanol production.

Figure 10
Brazilian Ethanol Imports, in Million Liters



*Source: Trade Data Monitor (TDM) and Brazilian Secretariat of Foreign Trade; Chart Post Brasilia * Forecast*

In January 2024, Brazil raised its tariff on ethanol imports from non-Mercosur suppliers from 16 to 18 percent. The majority of imports currently originates from Paraguay, a member of the Mercosur bloc, which benefits from a zero tariff. From 2014 to 2022, the U.S. was Brazil´s largest ethanol supplier.

Table 12
Brazilian Ethanol Imports from Selected Countries

Calendar Year - (NCM 2207.10, 2207.20.11, 2207.2019) Volume 1,000 Liters											
Country	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024***
United States	402,691	495,139	829,819	2,499,415	1,772,587	1,321,216	836,097	269,483	212,325	0.479	79,830
Paraguay	5,159	4,070	2,000	0	2,336	136,011	164,101	162,535	103,207	59,011	30,996
Others	44,153	13,671	2,806	864	409	375	172,626	243	324	123	57
Total Imports	**452,003**	**512,880**	**834,625**	**2,500,279**	**1,775,332**	**1,457,602**	**1,008,723**	**432,261**	**315,856**	**59,613**	**110,883**

*Source: Trade Data Monitor (TDM) and Brazilian Secretariat of Foreign Trade. Note: Numbers may not add due to rounding. / *Covers January to July*

IV. Biodiesel

Production, Supply and Distribution (PS&D)

Table 13
Production, Supply and Distribution of Biodiesel in Brazil

Biodiesel (Million Liters)											
Calendar Year	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024 f**
Beginning Stocks	105	85	89	90	99	111	112	113	49	61	86
Production	3,430	4,020	3,801	4,310	5,410	5,925	6,500	6,870	6,765	7,527	8,900
Imports	0	0	0	0	0	0	1	2	2	2	2
Exports	40	12	0	0	0	0	4	8	5	4	4
Consumption	3,410	4,004	3,800	4,301	5,398	5,924	6,496	6,928	6,750	7,500	8,850
Ending Stocks	85	89	90	99	111	112	113	49	61	86	134
Production Capacity (Million Liters)											
Number of Biorefineries	58	57	51	51	51	51	51	50	57	61	62
Nameplate Capacity	7,722	7,860	7,191	8,140	8,500	8,500	9,792	11,190	13,661	14,377	14,885
Capacity Use (%)	44%	51%	53%	53%	64%	70%	66%	61%	50%	52%	55%
Feedstock Use (1,000 MT)											
Soybean oil, crude	2,300	2,760	2,615	2,714	3,406	3,609	4,159	4,445	5,010	4,687	5,600
Animal Fat (Tallow)	704	775	612	699	834	792	718	695	733	611	630
Used Cooking Oil	25	17	27	57	86	89	77	111	104	102	100
Palm Oil	0	0	0	32	66	112	155	158	147	171	165
Other	110	120	210	450	570	830	830	870	850	872	820
Market Penetration (Million Liters)											
Biodiesel, on-road use	2,458	2,927	2,759	3,122	3,918	4,300	4,715	5,029	4,737	5,529	6,195
Diesel Pool, on-road use 1/	43,283	41,813	39,402	39,759	40,381	41,593	41,719	45,087	44,275	45,873	47,040
Blend Rate (%)	5.7%	7.0%	7.0%	7.9%	9.7%	10.3%	11.3%	11.2%	10.7%	11.4%	13.2%
Diesel Pool, total 1/	60,032	57,211	54,279	54,772	55,629	57,298	57,472	62,112	63,161	65,533	67,200

Note: See section VI: Notes on Statistical Data covering sources and certain calculations. f/ forecast Forecasts developed by USDA Brasilia. Note 1/ Fuel pools are defined as fossil fuels plus all "bio-components" (biofuels) blended with fossil diesel.

Production

In 2023, Brazil produced 7.5 billion liters of biodiesel. With the biodiesel market remaining insular with no trade, production is forecast to jump 18 percent reaching a record 8.9 billion in 2024 powered by a growing diesel pool and rising blend. In January 2024, CNPE increased the blending mandate from 12 to 14 percent effective March 1, 2024. The CNPE also decided to introduce B15 blending starting in 2025 instead of 2026.

According to updated information reported by ANP, about 69 percent of the biodiesel production in 2023 originated from soybean oil and 16 percent is made from greasy material. The remaining feedstock are animal fat (tallow, six percent), and palm oil (two percent). In addition, six percent of the production comes from other fatty materials blended in tanks and by-products of biodiesel production.

The major producing regions are the South and Midwest. The South region accounted for 42 percent of total biodiesel production in 2023. The Midwest region accounted for 40 percent of the total. The largest biodiesel producing state is Rio Grande do Sul, which produced 23 percent of the total biodiesel in 2023 with nine biodiesel plants and a nameplate capacity of three million liters per year, which represents 21 percent of the Brazilian production capacity.

In May 2024, the Rio Grande do Sul was hit by devastating floods impacting biodiesel plants' logistics receiving inputs and transporting production.

To avoid a supply crisis, on May 6 the ANP approved the flexibilization of the biodiesel blend in diesel to two percent, down from the current 14 percent, and of anhydrous ethanol in gasoline to 21 percent, down from the mandatory 27 percent. On May 17, the ANP decided to limit the changes to just three municipalities - Canoas, Esteio and Rio Grande - which were the most affected. On May 22, the agency again changed the minimum percentages to seven percent for biodiesel and maintained the 21 percent for ethanol in the three municipalities.

By July 2024, it was observed that despite the temporary reduction in B diesel (diesel blended with biodiesel) consumption in the first weeks of May, there was a rapid normalization of supply between the end of May and the beginning of June[11].

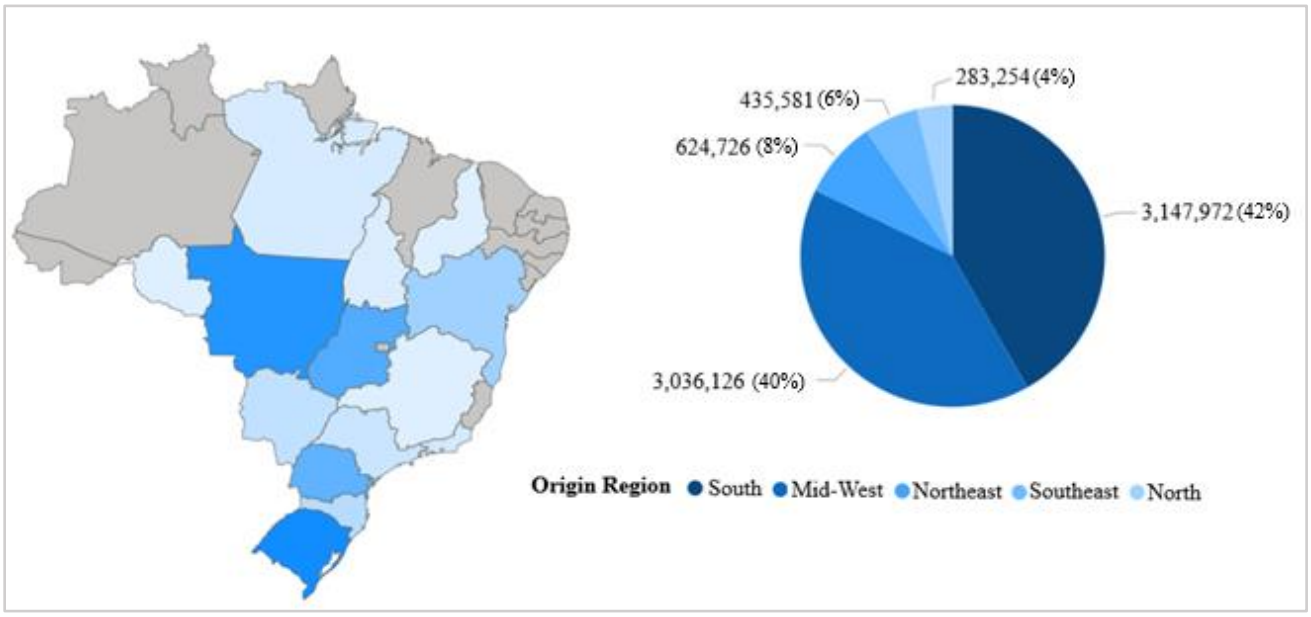
[11] Please refer to Unprecedented floods in Rio Grande do Sul threaten Brazil's agricultural output for more details about the preliminary impacts of the floods in the Rio Grande do Sul state.

Figure 11
Biodiesel Operating Plants in Brazil, 2023

Source: Oil and Gas Agency (ANP)

According to ANP, Brazil currently has 60 plants licensed to produce biodiesel. Half of the plants are located in the center-western states of Mato Grosso (19), Mato Grosso do Sul (3) and Goiás (8), with abundant soybean supplies. According to ANP, the authorized industrial capacity for 2024 is estimated at or 14.8 billion liters per year, an increase of 3.5 percent compared to 2023 (14.3 billion liters per year).

Figure 12
Biodiesel Production by Region, in Million Liters - 2023



Source: Oil and Gas Agency (ANP); Chart Post Brasilia

Cumulative biodiesel production from January through June 2024 reached 4.2 billion liters, a 27 percent increase over the same period in 2023 (3.3 billion liters). Soybean oil accounted for 73 percent of the total. Tallow accounted for 6 percent of biodiesel production and palm oil for one percent. The remaining 15 percent came from fats and 5 percent from various feedstocks, including chicken fat, pork fat, cottonseed oil, rapeseed/canola oil, used cooking oil, and corn oil.

Market Prices

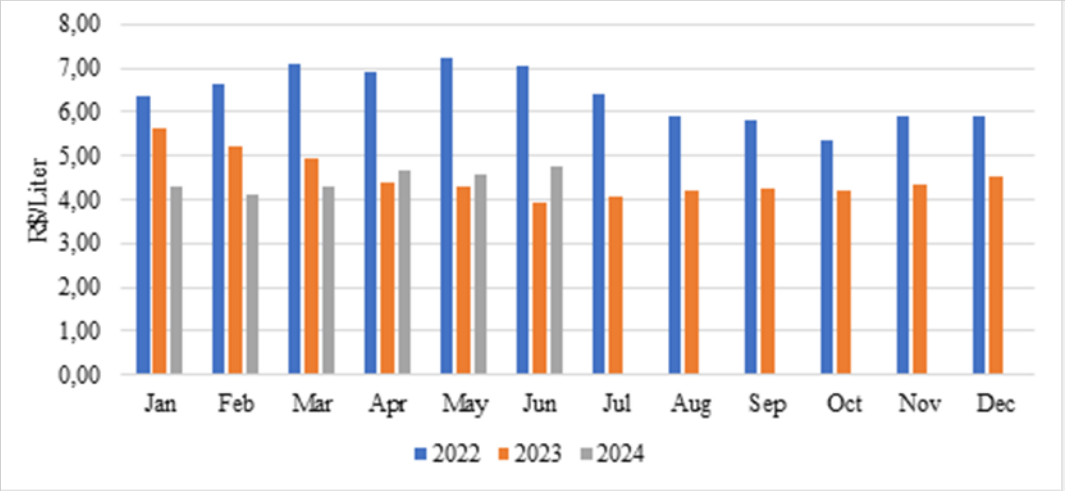
Brazil is the leading producer of soybeans, accounting for nearly 40 percent of global soybean production and 55 percent of global exports.

Brazil produced 10.8 MMT of soybean oil in the MY 2022/23. Biodiesel is priced using soybean oil, which accounts for about 69 percent of Brazilian biodiesel, and the charts below illustrate the similar movement of biodiesel and soybean oil price. Refer to Oilseeds and Products Annual and Oilseeds and Products Update for more information. Feedstocks account for approximately 80 percent of the biodiesel production cost, whereas other inputs such as methanol and additives represent 10 percent of the total cost. According to post contacts, feedstocks like animal fat (tallow) and other vegetable oils also follow soybean oil prices. Changes in the international soybean oil prices, Brazil´s Real exchange rate, and plant energy operating costs directly impact biodiesel production costs.

Biodiesel average price between January to December 2023 was R$4.4893/liter, with a high of R$5.71108/liter and a low of R$3.83846/liter. From January to June 2024, the average biodiesel weekly price was R$4.44720/liter. Soybean prices remained elevated throughout 2023 due to high domestic production, large international margins, and less concern about international demand. Soybean oil prices

declined compared to 2022 due to steady domestic production and balanced biofuel demand[12].

Figure 13
Biodiesel Prices in R$/Liter



Source: Oil and Gas Agency (ANP); Chart Post Brasilia
Note: Average of biodiesel monthly prices as reported by ANP.

Consumption

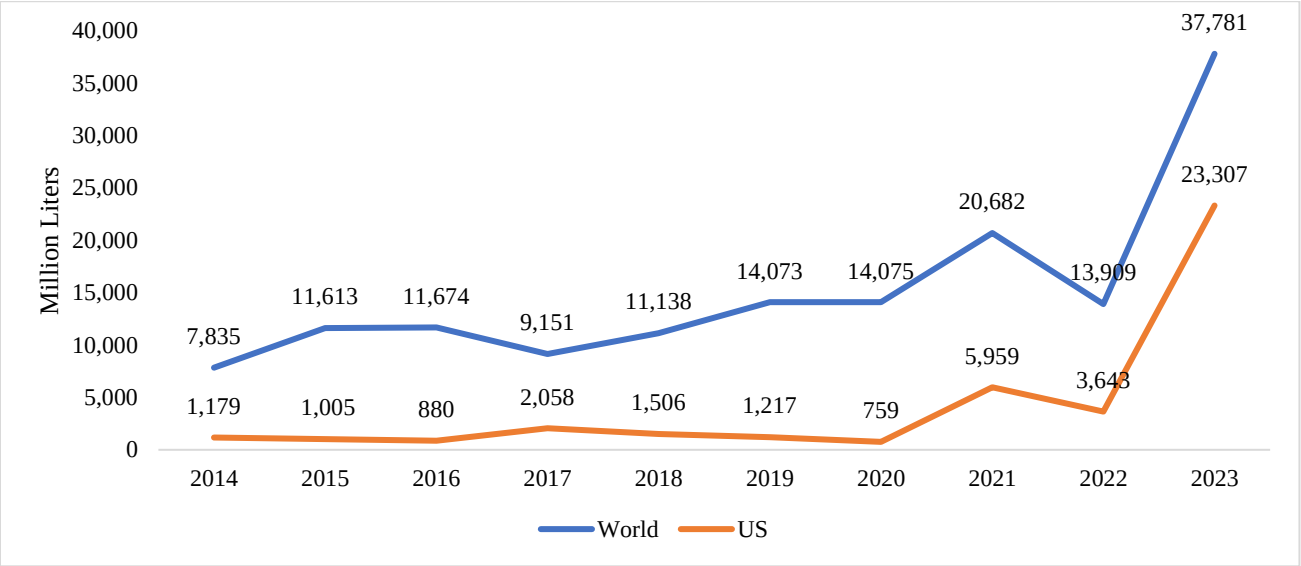
Biodiesel consumption is rising, driven by rapid fuel pool growth and increases in the mandatory blend rate. Increased biodiesel production is supported by good soybean harvests and adequate supplies of a dozen other feedstock. The growth of the Brazilian economy, which is expected to end 2024 with a two percent increase in Gross Domestic Production (GDP), driven by the demand for goods and services, requires more road freight transportation, demanding more diesel and, consequently, biodiesel. Post forecasts 2024 biodiesel consumption at 8.85 billion liters, an 18 percent increase from 2023 (7.5 billion liters). The total diesel pool, which includes biodiesel, increased by three percent in 2023, reaching 65.5 billion liters. For 2024, Post projects the total diesel pool to reach 67.2 billion liters.

Trade

Brazil does not export significant amount of pure biodiesel (B100) and their blends above B30 because it is not generally cost-competitive. On June 20, 2024, the Ministry of Agriculture and Livestock (MAPA) announced that the United States has accepted the International Plant Health Certificate (IVHSC) for the export of used cooking oil (UCO) from Brazil to be used as biodiesel feedstock. To meet U.S. requirements, MAPA's Department of Inspection of Plant Origin Products (DIPOV) will issue a certificate of traceability, identity and origin of the product based on audits of the self-control procedures of the storing and exporting facilities. Brazil became a major export of UCO and tallow to the U.S, which is likely directed to U.S. biodiesel and renewable diesel production.

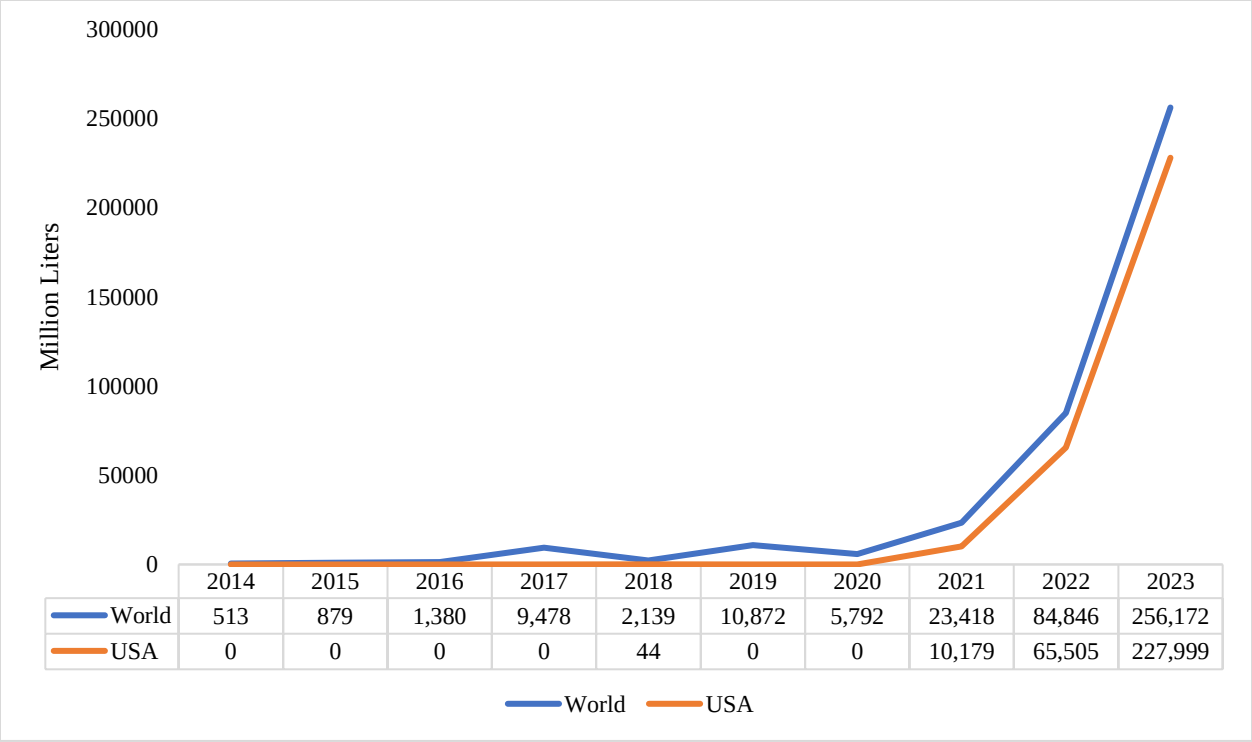
[12] Refer to Oilseeds and Products Annual and Oilseeds and Products Update for more information.

Figure 14
Brazilian Used Cooking Oil Exports, NCM 1518.00 – in Million Liters



Source: Trade Data Monitor; Chart Post Brasilia

Figure 15
Brazilian Tallow Exports, NCM 1502.10 – in Million Liters



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
World	513	879	1,380	9,478	2,139	10,872	5,792	23,418	84,846	256,172
USA	0	0	0	0	44	0	0	10,179	65,505	227,999

Source: Trade Data Monitor; Chart Post Brasilia

The ANP does not allow imports of biodiesel except in "exceptional circumstances," which in practice means zero. The ANP sets strict quality standards for biodiesel, which poses a challenge to biofuel imports. In addition to the technical criteria, the local market is concerned about the possibility of authorizing imports of biodiesel, which would both harm the workforce in the soybean chain and reduce the sector's contribution to GDP.

The absence of an external market is partly explained by the internal supply capacity and the structure of the Brazilian biodiesel market, which is heavily regulated. In addition, there is internal pressure from biodiesel producers and associations to avoid imports, alleging possible price increases and potential risk to supply caused by problems in negotiations with biodiesel and diesel suppliers, contracting of collection logistics and regulatory obligations and contracts with the ANP, which would be unbalanced with the entry of imported biodiesel.

V. Advanced Biofuels

Hydrogenated Renewable Diesel (HDRD)

Renewable diesel is not yet commercialized in Brazil, but early investments are underway to build the country’s first large-scale commercial plant. Renewable diesel (referred to “green diesel” in Brazilian legislation) is typically used as a full replacement to petroleum diesel because, unlike biodiesel, it has no blending limit in unmodified diesel engines designed to run on petroleum diesel. The composition of renewable diesel is nearly identical to petroleum diesel in performance characteristics, consisting of paraffinic hydrocarbons (C12-C18), differently from biodiesel, which consists of mono-alkyl esters of long-chain fatty acids. The first type of renewable diesel commercialized in Brazil is hydrogenation-derived renewable diesel (HDRD), which is produced with the same vegetable oils or animal fats used by biodiesel.

Brasil BioFuels (BBF) has commissioned the HDRD biorefinery in Manaus (Amazonas). The first phase of the project expected to be operational in 2025. The plant envisions a nameplate capacity of 641 million liters Vibra, one of the largest fuel distribution companies announced in 2023 that it will have exclusive rights to purchase the fuel for five years.

Co-processed Diesel and Jet Kerosene

Co-processed diesel (referred to as “R diesel” in Brazilian legislation), uses a hydrocracker production unit (essentially the same used to make petroleum diesel and HDRD) to produce diesel with both fossil crude oil and biogenic renewable content. The reduction in emissions associated with the renewable portion is reported to be at least 60 percent compared to crude oil based diesel. As with HDRD and all renewable diesels, co-processed diesel also requires no engine modification.

The only company co-processing diesel on a commercial scale is Brazil's state-owned oil and gas company Petrobras. The company´s biorefinery program will invest US$600 million to develop advanced and sustainable fuels until 2028. The company is petitioning the federal government to create a use requirement alongside the biofuel mandate, but is facing strong pressure from biodiesel producers and companies investing or planning to invest in HDRD and other renewable diesels.

According to Petrobras, the current nameplate capacity for the production of co-processed diesel stands at 1.6 billion liters and Petrobras has expansion plans for 10.6 billion by 2027. Since 2022, the company has conducting tests and started production at its refinery in Paraná. Two other refineries in São Paulo are being adapted to produce co-processed diesel, and the company is commissioning a plant to produce sustainable aviation fuel (SAF) and co-processed diesel.

In February 2024, the company announced that it would begin selling co-processed diesel using 5 percent vegetable oil in the state of São Paulo in March 2024. Also in February, the company announced that it had received international certification from the International Sustainability Carbon and Certification (ISCC), which quantifies greenhouse gas emissions throughout the lifecycle of co-processed diesel and ensures traceability of the production chain.

Sustainable Aviation Fuels (SAF)

There is no commercial production of SAF in Brazil. However, Raízen, BP Bunge Bioenergia, FS, Coruripe and Adecoagro have obtained the ISCC Corsia Plus (Carbon Offsetting and Reduction Scheme for International Aviation), which certifies that they meet the requirements for SAF production one of which is does not permit the use of food crops as feedstock. Raízen is the only company producing cellulosic ethanol, and part of its production has reportedly been shipped to the LanzaJet SAF plant in the US state of Georgia. Industry agents estimate that Brazil can produce about 12 billion liters of SAF per year from waste and fatty residues, enough to supply the domestic market and export.

There are numerous small-scale projects to produce SAF, including a biogas plant in located in the binational hydroelectric plant Itaipu, in Paraná; a BBF biorefinery to produce SAF from palm oil in Manaus (Amazonas); an Acelen Renováveis macaúba biorefinery in Maratipe (Bahia), and a Senai Institute of Renewable Energy Innovation laboratory to produce SAF from glycerin.

The main challenges identified by Brazil's industry is stable long-term policy guidance and incentives to unlock the investment capital needed, and the SAF industry worldwide looks for more qualifying SAF pathways, some of which will permit 100 percent substitution with fossil jet kerosene. The availability and price of raw materials also raise questions, in addition to higher costs of production compared to conventional ethanol and biodiesel/HDRD industries. Finally, there are concerns about the food security debate and the misinformation surrounding the issue.

Bunker fuel

On July 11, 2024, the ANP approved the commercialization of maritime fuel oil (bunker fuel) containing 24 percent biodiesel. It will be the first authorization granted in Brazil for the commercialization of bunker fuel with renewable content for use in ships. The approval was granted to Petrobras. Between September 2022 and January 2024, the company conducted tests on vessels using blends of biodiesel ranging from 10 percent to 24 percent. There were no problems with the engine function and other operating systems. The last test, at B24, confirmed a GHG reduction of about 19 percent compared to fuel with no renewable content.

The biodiesel will be blended with the bunker fuel at the terminal according to the current ANP specifications. The ANP will revise Resolution #903/2022, which details the specifications for marine

fuels, which currently provides for a maximum content of 0.5 percent by volume of biodiesel in marine diesel oil. The measure is in line with the strategy adopted in 2023 by the member states of the International Maritime Organization (IMO), including Brazil, to reduce emissions from ships. The goal is to achieve zero net greenhouse gas emissions from shipping by 2050.

VI. Notes on Statistical Data

Ethanol
The beginning stocks for the Ethanol Used as Fuel and Other Industrial Chemicals table (excluding ethanol for beverages) are based on information from the Ministry of Agriculture, Livestock and Supply (MAPA) and reflect all stocks at the ethanol plants as of January 1, each year. Beginning Stocks for the ethanol "For Fuel Only" are estimated based on the historical average use of bioethanol for fuel/other uses. On average, ethanol for fuel has represented 90 percent of the total ethanol disappearance (use).

All figures related to the sugar-ethanol industry are reported in marketing years using original source data, then necessary adjustments are made to convert from marketing to calendar years. As determined by the Brazilian government, the official Brazil marketing year for sugarcane, sugar, and ethanol production is April through March for the center-south producing states, and September through for the north-northeast region.

MAPA provides ethanol production estimates for Fuel and Other Industrial Chemicals. Given that all Brazilian official publications and industry sources report production in hydrous and anhydrous ethanol only, 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).
Domestic consumption figures are based on information provided by ANP, UNICA and other Post contacts. ANP provides the industrial daily capacity for ethanol production and Post Brasilia multiplies that capacity by 215 days (the average annual duration for the sugarcane crushing) to derive annual production capacity.

Trade figures are based on Trade Data Monitor (TDM), the official government trade data as compiled and reported by the Brazilian Secretariat of Foreign Trade (SECEX). SECEX breaks down ethanol trade into four categories:

- NCM 2207.10.10 – Undenatured ethylic alcohol with ethanol content equal to or over 80 percent with water content equal to or below 1 percent volume. Undenatured alcohol is defined as pure ethanol with no additives and is suitable for consumption.
- NCM 2207.10.90 - Undenatured ethylic alcohol with ethanol content equal to or over 80 percent, others. Undenatured alcohol is defined as pure ethanol with no additives and suitable for consumption.
- NCM 2207.20.11 - Denatured ethylic alcohol with any ethanol content and water content equal to or below 1 percent volume. Denatured alcohol is defined as ethanol with additives that make it poisonous and/or unpalatable, thus not 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.
- NCM 2207.20.19 - Denatured ethylic alcohol with any ethanol content, others. Denatured

alcohol is defined as ethanol with additives that make it poisonous and/or unpalatable, thus not 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.

There are no trade codes defining end use, not for use as fuel additive to gasoline or any other uses. Post estimated ethanol "for fuel" based on industry sources.

ANP is the primarily source for sugarcane crushed for ethanol production. Feedstock use and co-product data are consistent with fuel ethanol production figures and based on the following conversion rates:

- 1 metric ton of sugarcane = 80 liters of ethanol (average value with yearly variation based on sugar content).
- 1 metric ton of molasses = 246 liters
- 1 metric ton of corn = 417 liters of ethanol
- 1 metric ton of corn yields 313 kg of Dried Distilled Grains (DDGs)
- 1 metric ton of corn yields 18 liters of corn oil
- 1metric ton of bagasse = about 300kg of bagasse

Biodiesel

Historical production numbers are based on figures reported by ANP and forecasts are based on projections for diesel consumption and the biodiesel mandate for the following year. Consumption figures are based on petroleum diesel consumption and the mandatory mixture of biodiesel in mineral diesel set by Brazilian legislation.

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

- From 2006 through 2011 - NCM 3824.90.29 – Other industrial fatty acid derivatives, mixtures and preparations containing fatty alcohols or carboxylic acids or their derivatives.
- As of 2012 – NCM 3826.00.00 – Pure biodiesel (B100) and their blends above B30.
- As of 2012 – NCM 2710.20 – Petroleum oils containing biodiesel up to and including 30% by volume. The following assumption was made: 1 metric ton of petroleum oils and oils obtained from bituminous minerals which fall under NCM 2710.20 is equivalent to 0.15 metric tons of pure biodiesel (B100).

The number of biorefineries, nameplate capacity and feedstock use are based on ANP's data and consistent with biodiesel production figures and industry reporting. Biodiesel's mass volume conversion rate is one metric ton = 1,136 liters, The following feedstock biodiesel conversion rates apply:

- 1 metric ton of soy oil, crude = 1,113 liters of biodiesel
- 1 metric ton of palm oil = 1,087 liters of biodiesel
- 1 metric ton of animal fat/grease = 1,043 liters of biodiesel
- 1 metric ton of used cooking oil = 1,043 liters of UCO

VII. Appendix

Exchange Rate

Table 14
Exchange Rate between Brazilian Real and U.S. Dollar

R$/US$1.00 - official rate, last day of period								
Month	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
January	3.13	3.16	3.65	4.25	5.48	5.36	5.10	4.95
February	3.10	3.24	3.74	4.50	5.53	5.14	5.21	4.98
March	3.17	3.32	3.90	5.20	5.70	4.74	5.08	4.99
April	3.20	3.48	3.94	5.43	5.40	4.92	5.00	5.17
May	3.26	3.74	3.94	5.43	5.23	4.79	5.09	5.24
June	3.30	3.86	3.83	5.48	5.00	5.23	4.81	5.55
July	3.13	3.75	3.76	5.20	5.12	5.18	4.74	5.66
August 1/	3.15	4.14	4.14	5.47	5.14	5.17	4.92	5.65
September	3.17	4.00	4.16	5.64	5.44	5.40	5.00	
October	3.27	3.72	4.00	5.77	5.64	5.26	5.05	
November	3.26	3.86	4.22	5.33	5.62	5.29	4.93	
December	3.31	3.87	4.03	5.20	5.58	5.21	4.84	

Source: Brazilian Central Bank (BACEN) 1/August 2024 refers to August 6

List of Abbreviations

ANAC – National Civil Aviation Agency
ANFAVEA – National Association of Motor Vehicle Manufacturers
ANP – Oil and Gas Agency
Bi tCO2e - Billion Metric Tons of Carbon Dioxide Equivalent
BNDES - Brazilian Development Bank
BECCS – Bioenergy Energy with Carbon Capture and Storage
Camex – Foreign Trade Chamber
CBios – Decarbonization credits
CBS – Contribution on Goods and Services
CCUS – Carbon capture, utilization and storage
Cepea - Center for Advanced Studies in Applied Economics
CI – Carbon Intensity
CIDE - Contribution for Intervention in the Economic Area
CNPE - National Energy Policy Council
Cofins - Contribution for the Financing of Social Security
CONAB – National Supply Company
CO2/MJ - Carbon Dioxide per Megajoule
COP - Conference of the Parties

CORSIA - Carbon Offsetting and Reduction Scheme for International Aviation
CS – Center-South
DIPOV – Department of Plant Origin Products Inspection
Embrapa - Brazilian Agricultural Research Corporation
EPA – Environmental Protection Agency
EPE - Energy Research Office
EEES - Energy-Environment Efficiency Score
Esalq – Luiz de Queiroz College of Agriculture
ETP – Ecological Transformation Plan
FGE – First Generation Ethanol
FGE Flex – First Generation Cane and Corn Ethanol
GDP – Gross Domestic Product
GHG - Greenhouse Gas Emissions
gCO2/MJ - Grams of CO2 Equivalent per Megajoule
HDRD - Hydrogenated Renewable Diesel
IBS – Tax on Goods and Services
ICAO - International Civil Aviation Organization
ICMS - Tax on Operations related to the Circulation of Goods
IMO – International Maritime Organization
ISCC – International Sustainability Carbon and Certification
IVHSC - International Plant Health Certificate
LCA – Life-cycle assessment
LCFS – Low Carbon Fuel Standard
LPG – Liquified Petroleum Gas
MAPA – Ministry of Agriculture and Livestock
MCTI – Ministry of Science, Technology and Innovation
MDA – Ministry of Agrarian Development
MtCO2e - Million Tons of CO2e
MMA- Ministry of the Environment and Climate
MME – Ministry of Mines and Energy
MMT – Million Metric Tons
NDC - Intended Nationally Determined Contribution
OTC – Over-the-counter contracts
PIS - Contribution to the Social Integration Program
PNDV – National Green Diesel Program
PNPB – National Program for the Production and Use of Biodiesel
ProBioQav – National Sustainable Aviation Fuel Program
RFS – Renewable Fuel Standard
RenovaBio - National Biofuels Program
RenovaCalc – Tool for calculating the carbon intensity of biofuels and generating the Energy-Environment Efficiency Score
RIN – Renewable Identification Number
SAF – Sustainable aviation fuel
SECEX – Secretariat of Foreign Trade
SEEG - Greenhouse Gas Emissions and Removals Estimation System
SGE – Second Generation Ethanol (sugarcane cellulosic ethanol)

SPK/A - Paraffinic synthesized kerosene with aromatics
SPK-ATK - Alcohol-to-jet synthetic paraffinic kerosene
SPK-HCHEFA - Synthetic paraffinic kerosene from bioderived hydrocarbons, hydrotreated fatty acids and fatty acid esters.
PK-HEFA - Synthetic paraffinic kerosene from hydrotreated fatty acids and fatty acid esters
SPK-FT - Hydrotreated and Synthetic paraffinic kerosene from Fischer-Tropsch.
TDM – Trade Data Monitor
UCO – Used Cooking Oil
UNEM – National Union of Corn Ethanol
UNICA – Union of the Sugarcane and Bioenergy Industry
Unicamp – University of Campinas
UNFCCC - United Nations Framework Convention on Climate Change
VAT – Value Added Tax

Attachments:

No Attachments