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Report Highlights:

The Brazilian Low Carbon market framework has successfully been set. Renovabio was implemented in late 2019 and has progressed well. CBio trading levels in 2021 (January thru early August) ranged from R\$27 to R\$34/metric ton (mt) of carbon or about US\$5.1 to US\$6.6/mt of carbon at the current exchange rate. The National Agency for Petroleum, Natural Gas, and Biofuels (ANP) has reduced the volume of biodiesel blended to diesel below the recommended levels since mid-2020, in an attempt to control biodiesel prices which drastically increased due to high prices of soybeans, major biodiesel feedstock. ANP has also proposed a new model for marketing biodiesel which should favor imports. Total ethanol production for 2021 is estimated at 30.43 billion liters, a decrease of 13 percent relative to the revised figure for 2020 (35.08 billion liters), mainly because sugarcane production has been severely damaged and sugar-ethanol producers have favored sugar production.

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I. Executive Summary

On December 9, 2020, Brazil reconfirmed its commitment made in 2015 at the Conference of the Parties (COP21) to reduce domestic emissions of greenhouse gases (GHG) by 37 percent by 2025 and by 43 percent by 2030 based on 2005 levels. The country also reported that the country’s Nationally Determined Contribution (NDC) is compatible with an indicative long-term objective of reaching climate neutrality in 2060.

However, the updated version of Brazil’s national 2005 inventory of GHG shows total emission of 2.8 billion tons of carbon dioxide equivalent (GtCO₂e) as opposed to the previously calculated 2.1 billion tons of GtCO₂e. Therefore, in practice, the revision allows Brazil to emit higher GHG emissions in 2030 while still meeting its stated NDC, e.g., an additional 400 million tons of GtCO₂e.

The recently implemented National Biofuels Policy, known as RenovaBio, is an important tool to support Brazil in reaching its climate goals. Indeed, the program was designed to support the country’s commitments formulated at COP21, with a focus on the promotion and development of biofuels. The RenovaBio operation is based on three main instruments:

- 1) Annual carbon intensity reduction targets (CO₂/MJ) for a minimum period of ten years.
- 2) Certification of biofuels by efficiency in reducing GHG emissions.
- 3) Decarbonization Credits (CBio).

According to the National Agency for Petroleum, Natural Gas and Biofuels (ANP), Brazil’s decarbonization credit market nearly met the program’s combined targets for 2019 and 2020 (14.898 million Cbios, with a total of 14.535 million CBios credits traded and retired at B3 exchange as of December 31, representing 97.6 percent of the combined target.

CBio trading levels in 2020 ranged from R\$15 to R\$65/metric ton (mt) of carbon or about US\$2.88 to US\$12.5/mt of carbon with the current exchange rate. CBio trading levels in 2021 (January thru early August) ranged from R\$27 to R\$34/mt of carbon or about US\$5.1 to US\$6.6/mt of carbon with the current exchange rate.

No changes have been made to the current ethanol mandate, which remains at 27 percent (E27) for Gasoline C (Gasolina comum) since March 16, 2015. No changes have been made on the Contribution for Intervention in Economic Domain (CIDE) and Contribution to the Social Integration

Program/Contribution for Financing Social Security (PIS/COFINS) taxes for ethanol or gasoline. The ethanol Tariff-Rate Quota (TRQ) expired on December 14, 2020, resulting in all ethanol imports being assessed a 20 percent import tariff (except for Mercosul countries which have duty-free access).

Following the National Council for Energy Policy (CNPE)'s Resolution on March 1, 2021, ANP increased the volume of biodiesel blended with diesel sold at the pump to 13 percent (B13). However, ANP has been reducing the volume of biodiesel blended below the recommended levels since mid-2020, in an attempt to control biodiesel prices which drastically increased due to high prices of soybeans, a major biodiesel feedstock.

In late April, ANP announced a proposal and the parameters to shift biodiesel trading from the country's current public auction model to a hybrid model, starting in January 2022. The new model would allow biodiesel producers and distributors to settle over-the-counter (OTC) contracts to guarantee 80 percent of biodiesel supply. According to the new biodiesel market model proposal, ANP reported that imported biodiesel could become competitive.

Brazil remains the second largest producer and consumer of ethanol, following the United States, the top producer, consumer and exporter. Total Brazilian ethanol production for 2021 is estimated at 30.43 billion liters, a decrease of 13 percent relative to the revised figure for 2020 (35.08 billion liters). Although corn-based ethanol production has been sharply increasing, sugarcane production has been severely damaged and sugar-ethanol producers have favored sugar production, thus limiting sugarcane-based ethanol production. Total ethanol consumption for use as fuel in 2021 is estimated at 27.99 billion liters, nearly a one-million-liter reduction relative to 2020 (28.93 billion liters). ATO/Sao Paulo estimates that gasoline C consumption will reach 37 billion liters based on updated numbers from ANP and the current pace of the Brazilian economy. Hydrous ethanol consumption, however, should drop by 1.26 billion liters in 2021 given that the ethanol/gasoline price ratio has mostly favored gasoline consumption. Ethanol trade in 2021 will likely contract as opposed to 2020.

Brazil remains the third largest biodiesel producer, following Indonesia and the United States. Brazilian biodiesel production remains tightly regulated by the government. Total Brazilian biodiesel production in 2021 is forecast at 6.9 billion liters, a light increase of 400 million liters vis-à-vis 2020. Despite the relevant projected growth in the diesel consumption for 2021, the steady reduction of the mandatory blend levels has negatively affected the volumes required to be delivered in the public auction. Biodiesel trade is still nearly nonexistent.

II. Policy and Programs

Brazil's Commitments to Reduce Greenhouse Gas Emissions

In December 2015, Brazil joined COP21 of the United Nations Framework Convention on Climate Change (UNFCCC) in Paris. At COP21, each country submitted a plan to reduce domestic emissions of greenhouse gases, called an "Intended Nationally Determined Contribution (NDC)."

Brazil committed to reducing domestic emissions of GHG by 37 percent by 2025 and by 43 percent by 2030, both based on 2005 levels. On December 9, 2020, the country reconfirmed its commitment and reported that its NDC is compatible with an indicative long-term objective of reaching climate neutrality

in 2060. However, the third and updated version of Brazil's national 2005 inventory of GHG shows total emission of 2.8 billion tons of carbon dioxide equivalent (GtCO₂e) as opposed to the previously calculated 2.1 billion tons of GtCO₂e. Therefore, in practice, the revision allows Brazil to emit higher GHG emissions in 2030 while still meeting its stated NDC, e.g., an additional 400 million tons of GtCO₂e.

Interestingly, the sectorial goals to reduce GHG emissions were not specified in the 2020 NDC submitted by Brazil as they were in 2015 when the country informed that the following measures among others would reduce GHG emissions (see "[Brazilian Biofuels Annual Gain Report 2018](#)" for additional information). The sectorial goals included in 2015 follow:

- The increase in the share of sustainable bioenergy in the Brazilian energy matrix to approximately 18 percent by 2030 by expanding biofuel consumption and increasing ethanol supply - including increasing the proportion of advanced biofuels (second generation) and the share of biodiesel in the diesel mix.
- Achieving an estimated 45 percent share of renewables in the energy matrix by 2030, including the use of renewable sources in the energy mix between 28 and 33 percent by 2030. Expanding the domestic use of non-fossil energy sources domestically. Achieving 10 percent of efficiency gains in the electricity sector by 2030.
- Adopting measures regarding land-use change and forests such as strengthening and enforcing the implementation of the Forest Code. Strengthening policies and measures to achieve, in the Brazilian Amazonia, zero illegal deforestation by 2030. Restoring and reforesting 12 million hectares of forests by 2030, for multiple purposes.

Although the submission of specific details on how the country will comply with its commitments is not mandatory by UNFCCC, according to climate change specialists, the omission of such details makes the Brazilian NDC submission in late 2020 vague and imprecise. In addition, Brazil has received much criticism on how President Bolsonaro's Administration is coping with climate change issues. As a result, on January 20, 2021, President Bolsonaro sent newly inaugurated President Biden a letter noting that Brazil has demonstrated its commitment to the Paris Agreement and that it will be essential for success in combating climate change to deepen the dialogue between both countries in the energy area.

Regardless of criticisms on how climate change policies have been conducted in Brazil, the recently implemented National Biofuels Policy, known as *RenovaBio*, is an important tool to support Brazil in reaching its climate goals. Indeed, the program was designed to support the country's commitments formulated at COP21, with a focus on the promotion and development of biofuels.

[RenovaBio's Legislative Framework](#)

The *RenovaBio* program's design was launched in December 2016 by the Ministry of Mines and Energy (MME). The Brazilian congress formalized the program on December 26, 2017, as the "National Biofuels Policy" through Bill #13,576.

The goals of RenovaBio include:

- Contributing to meet the country's commitments under the COP21 Paris Agreement under the UNFCCC.
- Contributing to the adequate ratio between energy efficiency and reduction of GHG emissions in the production, commercialization, and use of biofuels, including mechanisms for lifecycle assessment.
- Promoting the adequate expansion of the production and use of biofuels in the national energy matrix, emphasizing the continuity of fuels supply.
- Contributing to the predictability of biofuels in the national fuel market.

RenovaBio is based on three main instruments: annual carbon intensity reduction targets (CO₂/MJ), certification of biofuels by efficiency in reducing GHG emissions, and Decarbonization Credits (CBio). The annual carbon intensity reduction targets drive the program for a minimum period of ten years. RenovaBio provides the framework to certify biofuel production by its efficiency (using Life Cycle Analysis) in reducing GHG emissions and allows for the sale and trade of decarbonization credits (CBios). Each CBio represents one metric ton of carbon saved through the utilization of biofuels versus 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 and increases remuneration for producers enrolled in the program.

In November 2018, the Ministry of Mines and Energy (MME)/National Petroleum, Natural Gas, and Biofuels Agency (ANP) adopted Resolution #758/2018, which defines the following program standards:

- 1) The efficient production or importation of biofuels. It sets up the criteria to calculate the Energetic-Environment Efficiency Score/Rank for domestic biofuels producers as well as for imports.
- 2) It defines the requirements for accrediting certification of inspectors and the certification of individual plants.
- 3) The program established RenovaCalc, the analytical tool to measure a biofuel's carbon intensity score, comparing biofuels to the equivalent fossil fuel.

Under RenovaBio, certified producers and importers of biofuels can sell CBios, which aids a producer's profitability. The program is voluntary for biofuel producers and importers but mandatory for fuel distributors, which are required to achieve individual decarbonization goals based on their market share. The number of CBios that each party can sell depends on the volume of biofuel sold and the party's environmental/energy efficiency rating, determined by RenovaCalc.

The rationale behind RenovaBio is the recognition that the biofuels sector, in addition to offering a basket of goods in the fuel market, helps reduce GHG emissions. By creating a market for CBio, RenovaBio formalizes the environmental benefits of biofuels and rewards the industry for that.

There are currently nine biofuels production routes approved under Renovabio, which includes ethanol (first-generation and/or cellulosic) from sugarcane, corn, or both; biodiesel, biomethane; and hydroprocessed ester and fatty acids (HEFA) for biokerosene jet fuel.

RenovaBio Program's Updates

This report updates the "[Brazilian Biofuels Annual Gain Report 2018](#)", "[Brazilian Biofuels Annual Gain Report 2019](#)", and "[Brazilian Biofuels Annual Gain Report 2020](#)", illustrating the progress of the RenovaBio program.

The RenovaBio program was officially launched on December 24, 2019. The program's implementation had a slow start, but it picked up momentum once Brazil's B3 stock exchange started to trade CBios on April 27, 2020. While fuel distributors are obligated to purchase CBios, producers and investors can also trade CBios on the B3 exchange.

Due to the outbreak of the COVID-19 pandemic and the resulting negative impact on the Brazilian transport fuel pools, MME was forced to review the program's compulsory targets in the program's first year. These targets aim to reduce the carbon intensity (CI) of transportation fuels. On September 10, 2020, MME officially reduced by 18 percent the targeted number of CBios to be sold between 2020 through 2030, from a total of approximately 759 million CBios (set initially in June 2019) to approximately 620 million CBios. MME also reduced by nearly 50 percent the targeted number of CBios to be sold in 2020 (from 28.7 million to 14.53 million CBios). The target for 2021 was reduced by 40 percent, from 41 million to 24.86 million CBios.

According to the National Agency for Petroleum, Natural Gas and Biofuels (ANP), Brazil's decarbonization credit market nearly met the program's combined targets for 2019 and 2020 (14.898 million Cbios, with a total of 14.535 million CBios credits traded and retired at B3 exchange as of December 31, representing 97.6 percent of the combined target.

However, ANP reported that 35 out of the 141 fuel distributors did not reach their mandatory targets for 2020 or 2.4 percent of the program's total target. According to the legislation, fuel distributors who do not meet their given targets are subject to a penalty and must aggregate their unmet 2020 quota with their 2021 target.

CBio trading levels in 2020 ranged from R\$15 to R\$65/mt of carbon or about US\$2.88 to US\$12.5/mt of carbon with the current exchange rate. CBio trading levels in 2021 (January thru early August) ranged from R\$27 to R\$34/mt of carbon or about US\$5.1 to US\$6.6/mt of carbon with the current exchange rate. Taxes applied at CBios remain an ongoing issue at the Brazilian Congress.

It is worth noting that major ethanol-producing companies have already reported gains from the CBio market in their annual earnings reports. Sao Martinho, a major Brazilian sugar and ethanol producer, reported net revenue from CBios of 27.18 million reais (US\$5.4 million) for the 2020/2021 crop year that ended March 31. The company reported selling approximately 832,000 CBios at an average net price of R\$32.7 per CBios. Sugar and ethanol producer Copersucar also reported CBios in its earnings report, noting that its 33 associated mills participated in RenovaBio and registered a total of 3.1 million CBios during the 2020/2021 crop season. Copersucar further pointed out that the CBios generated by those mills represented 18 percent of the total CBio market in 2020.

On December 21, 2020, ANP hosted a public audience to discuss several topics that would be addressed in 2021. These topics include the automatic reduction of the RenovaBio targets whenever non-obligated

parties retire CBios from the market. According to the program, only CBios traded by obligated parties (fuel distributors) are subject to retirement under the program to meet the compulsory target. ANP also considered a proposal to reduce current RenovaBio targets based on CBios traded in long-term forward contracts.

As mandated by Resolution #8/2020 of the National Council for Energy Policy, ANP set the aggregate 2021 target for reducing greenhouse gas emissions at 24.86 mt of CO₂ equivalent. In March 2021, ANP established the 2021 individual targets that fuel distributors, listed below must meet:

- Petrobras Distribuidora (6.55 million CBios, equal to 26.3 percent of the total)
- Ipiranga (4.72 million CBios, equal to 19 percent of the total)
- Raizen (4.38 million CBios, equal to 17.6 percent of the total)
- Alesat (912,104 CBios, equal to 3.7 percent of the total)
- Petroleo Sabbá (674,428 CBios, equal to 2.7 percent of the total)

Together, these five distributors represent roughly 70 percent of the total combined target for 2021. The calculation of the targets for reducing GHG applicable to each fuel distributor considers the fossil fuel sales data reported in the Product Movement Information System (SIMP) set by ANP's Resolution # 729, from May 11, 2018. The calculation of the market share of each fuel distributor in the sale of fossil fuels was carried out according to the methodology described in article # 6 of ANP Resolution # 791, from June 14, 2019.

Note that total stock of 21.69 million CBios or roughly 87 percent of the compulsory target for 2021, were available for trade on the B3 exchange until July 31st. ANP estimates between 30.9 and 32.4 million CBios are likely to be issued during 2021, roughly 27 percent over the 2021 target set for trading on the B3.

In May 2021, ANP approved Resolution #843, altering the previous resolution (ANP #791 from June 12, 2019). The new resolution regulates the reduction of individual targets by fuel distributors at the same proportion of the CBios withdrawn from the market and retired by non-obligated parties at RenovaBio. Thus, before calculating the individual annual targets for each fuel distributor, ANP will reduce the amount of CBios retired at the previous year by non-obligated parties from the annual target established by CNPE to the following year. The new resolution may also consider that CBios retired by fuel distributors in quantities greater than their individual goals established for a given year be considered for meeting the target for the following year.

A total of 177 CBios were retired from the market by the non-obligated parties. Based on that, ANP updated last July, the target for GHG reductions in 2021 to 24,859,823 CBios, or 177 less than the original target of 24.86 million CBios. As a result, ANP slightly reduced the individual targets by fuel distributors to comply with the aforementioned resolution.

Also, in July, ANP opened public consultations until August 6 for proposals on annual targets for reducing GHG emissions from transport fuels for the 2022 through 2031 period (see proposed targets in table below). MME proposed a 5.3 percent increase for the target in 2022, e.g., from 34.17 to 35.98 million CBios; no changes in the targets from 2023 through 2030; and 95.67 million CBios for 2031.

| Year | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| Annual Target (in millions of CBios) | 35.98 | 42.35 | 50.81 | 58.91 | 66.49 | 72.93 | 79.29 | 85.51 | 90.67 | 95.67 |
| Tolerance Interval | -- | 50.85 | 59.31 | 67.41 | 74.99 | 81.43 | 87.79 | 94.01 | 99.17 | 104.17 |
| | -- | 33.85 | 42.31 | 50.41 | 57.99 | 64.43 | 70.79 | 77.01 | 82.17 | 87.17 |

Source: ANP

There are currently 278 biofuel plants (representing 68 percent of the total plants in Brazil) certified to issue CBios (241 sugarcane ethanol plants, 5 sugar and corn ethanol plants, 1 cellulosic ethanol plant, two corn ethanol plants, 27 biodiesel plants, and two biomethane plants). Another 12 plants are in the process of getting the required certification. Updated information can be found at <https://observatoriodacana.com.br/listagem.php?idMn=142>. ANP has authorized nine companies to certify plants aiming to issue CBios. The companies are Green Domus, SGS, Instituto Totum, Fundacao Vanzolini, KPMG, Benri, Verifit, Intertek, ABNT.

When RenovaBio was launched in late 2019, the focus was on the primary biofuel source, sugarcane. However, more emphasis has been given to adapting the program and regulations to consider production from different sources such as soybean-based biodiesel and corn-based ethanol. Unlike sugarcane-based ethanol, in which the raw material tends to be sourced directly from a few producers in the vicinity of the ethanol plant, many corn ethanol and biodiesel plants nationwide acquire feedstock from different suppliers, thus representing an obstacle towards the certification for issuing CBios. Similarly, U.S. corn ethanol plants have expressed their difficulties in meeting the program's requirements, given that the U.S. corn ethanol production chain is also fragmented.

ANP has been currently working on a custody chain approach that will likely include a mass balance method to overcome some of the obstacles faced by biodiesel and corn-ethanol producers to get certified under RenovaBio. The agency has yet made no announcement.

Government Support for Ethanol Programs

Anhydrous Ethanol Use Mandate

No changes have been made to the current ethanol mandate, which remains at 27 percent (E27) for Gasoline C (*Gasolina comum*) since March 16, 2015. *Gasolina comum* is the official term used in Brazil for ethanol-blended gasoline, which uses anhydrous ethanol. The only other liquid fuel used for Brazil's light-duty fleet is pure E100 "hydrous" ethanol. There is no market for unblended fossil gasoline in Brazil.

The ethanol-use mandate has been mandatory since 1977 when legislation required a 4.5 percent blend of anhydrous ethanol to gasoline. According to the current legislation, the ethanol blend can vary from 18 to 27.5 percent and it is currently set at 27 percent. The table below shows the ethanol-use mandate since 2006.

| 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: MME

In May 2021, the National Federation for Fuel and Lubricants Commerce (Fecombustíveis), which represents fuel retailers in Brazil, sent a letter to MME requesting that the anhydrous ethanol blend rate in Brazil's gasoline be temporarily reduced from 27 to 18 percent. The request was based on the fact that ethanol prices have steadily increased due to the tighter sugarcane supply.

The Sugarcane Industry Union (UNICA), the major ethanol producers association in Brazil, reported being opposed Fecombustíveis' request to drop the ethanol mandate from 27 to 18 percent. According to UNICA, the harvest had just started in April and production would pick up in the following weeks. In addition, 80 percent of the volume to supply the current year has already been contracted by fuel distributors. MME has not taken any action to change the ethanol blend.

Tax Incentives for Ethanol Fuel

Brazil has a complex tax system, including several taxes at the federal, state, and municipal level. Depending on policymakers' economic and financial strategies, the Brazilian Government (GOB) can provide incentives for gasoline and/or ethanol at the pump. Currently, the GOB gives preferential treatment to ethanol compared to gasoline under both the Contribution for Intervention in Economic Domain (CIDE) and the Contribution to the Social Integration Program/Contribution for Financing Social Security (PIS/COFINS) programs. In addition, governments from several Brazilian states provide differential treatment for ethanol by using the Tax for Circulation of Goods and Services (ICMS) for ethanol and gasoline.

No changes have been made to the current taxes applied to ethanol and gasoline. Please refer to [“Brazilian Biofuels Annual Gain Report 2015”](#), [“Brazilian Biofuels Annual Gain Report 2017”](#) and [“Brazilian Biofuels Annual Gain Report 2020”](#) for historical information on CIDE and PIS/COFINS.

1. CIDE for ethanol, while an applicable tax, has been fixed to zero since May 2004, according to Presidential Decree # 5,060 of April 2014. For gasoline, Presidential Decree # 8,395 of January 2015 increased the CIDE from zero to R\$ 0.10/liter. No changes have been made on the CIDE for ethanol and gasoline since 2015.
2. In July 2017, the PIS/COFINS tax for gasoline rose from R\$0.38 cents/liter to R\$0.7925 cents/liter. The increase for ethanol producers rose from R\$0.12 cents/liter to R\$0.1309 cents/liter, while for ethanol distributors, it increased from zero to R\$0.1109 cents/liter. The lower increase for ethanol compared to gasoline tends to favor the competitiveness of hydrous ethanol, given that the difference in PIS/COFINS for gasoline and ethanol is now R\$0.55 cents/liter.
3. Tax for Circulation of Goods and Services (ICMS): ICMS is a state tax which varies from state to state. The payment of ICMS is also related to different tax regimes depending on the state. As reported by Fecombustiveis in July 2021, the current ICMS tax charged on ethanol varies from 13.3 to 32 percent. In contrast, ICMS for gasoline varies from 25 to 34 percent. The tax rate can vary based on a number of state-level factors and largely depends on the state’s overall tax revenue and budget for a given year. According to the Ministry of Economics, the figures below show the current ICMS set by each Brazilian state in July 2021. Note that the state of São Paulo was the only state which increased the ICMS applied to hydrous ethanol from 12 percent in 2020 to 13.3 on January 15, 2021.

| ICMS Tax by Brazilian State | | | |
|------------------------------------|----|-----------------|------------------------|
| State | | Gasoline | Hydrous Ethanol |
| Acre | AC | 25.0% | 25.0% |
| Alagoas | AL | 29.0% | 25.0% |
| Amapá | AP | 25.0% | 25.0% |
| Amazonas | AM | 25.0% | 25.0% |
| Bahia | BA | 28.0% | 20.0% |
| Ceara | CE | 29.0% | 25.0% |
| Distrito Federal | DF | 28.0% | 28.0% |
| Espírito Santo | ES | 27.0% | 27.0% |
| Goiás | GO | 30.0% | 25.0% |
| Maranhão | MA | 30.5% | 26.0% |
| Mato Grosso | MT | 25.0% | 25.0% |
| Mato Grosso do Sul | MS | 30.0% | 20.0% |
| Minas Gerais | MG | 31.0% | 16.0% |
| Pará | PA | 28.0% | 25.0% |
| Paraíba | PB | 29.0% | 23.0% |
| Paraná | PR | 29.0% | 18.0% |
| Pernambuco | PE | 29.0% | 25.0% |
| Piauí | PI | 31.0% | 22.0% |
| Rio de Janeiro | RJ | 34.0% | 32.0% |
| Rio Grande do Norte | RN | 29.0% | 23.0% |
| Rio Grande do Sul | RS | 30.0% | 30.0% |
| Rondônia | RO | 26.0% | 26.0% |
| Roraima | RR | 25.0% | 25.0% |
| Santa Catarina | SC | 25.0% | 25.0% |
| São Paulo | SP | 25.0% | 13.3% |
| Sergipe | SE | 29.0% | 27.0% |
| Tocantins | TO | 29.0% | 29.0% |

Source: FECOMBUSTIVEIS, Receita Federal, July, 2021

Direct Sales of Hydrous Ethanol

In June 2020, Brazil's National Energy Council (CNPE) approved a resolution that authorizes producers of hydrous ethanol fuel to sell directly from the mill to gas station owners. The resolution allows producers to bypass fuel distribution companies, which had been mandatory before, thus encouraging more competition in the industry.

On August 11, 2021, the Brazilian Government issued Provisional Measure # 1,063 about the direct sales of hydrous ethanol, thus ending the compulsory sale from producers and importers to fuel distributors. The Provisional Measure includes guidelines regarding paying federal taxes (PIS/CONFINS) on hydrous ethanol. For direct sales of hydrous ethanol to the gas station, taxes should be charged directly to producers or importers. However, if sales are made to the fuel distributor, taxes should be applied to both the producer/importer and the fuel distributor as set by the current legislation. ANP should release the specific regulations on the issue within 90 days. Please refer to "[Brazilian Biofuels Annual Gain Report 2020](#)" for additional information.

Note that Provisional Measure # 1,063 also established the end of the compulsory fidelity of fuel stations to the distributors' flag. A fuel station from a specific commercial flag (from a specific fuel distributor) will be allowed to sell fuel from other distributors as long as the consumer is fully informed. The new rule cannot be applied to current contracts

Tax Incentives for Ethanol, Gasoline and Flex-Fuel Vehicles

Tax incentives have played an important role in supporting ethanol consumption since the introduction of flex-fuel cars. 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.

The table below updates taxes applied to ethanol, flex-fuel, and gasoline vehicles for 2013 through 2020. No changes have been made to the tax incentives for ethanol-flex-fuel vehicles compared to gasoline vehicles last year. Please refer to the "[Brazilian Biofuels Annual Gain Report 2015](#)" for historical information since 2004.

| 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 2020 | 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 |
| Source: National Association of Motor Vehicle Manufacturers (ANFAVEA) | | | | | | |
| MSRP = Manufacturer Suggested Retail Price. The aggregation of the individual taxes does not necessarily add up to the Average Retail Price (fourth row) percentage because each tax applies to different steps of the production chain and not to the final retail price. During 2013, the Brazilian government offered temporary tax breaks to some categories. | | | | | | |

Credit Lines

The Brazilian Agricultural Crop and Livestock Plan for 2021/22 was announced in June 2021 by the Ministry of Agriculture, Livestock and Supply (MAPA). A total of R\$251.2 billion will be released to fund agricultural and livestock programs, an increase of six percent relative to the last season. The plan includes greater emphasis on the credit line for the Greenhouse Gases Emission Reduction Program (“Programa ABC”) to support sustainable agricultural practices. The “Programa ABC” credit line is set at R\$5.05 billion, more than double the amount available last season (R\$ 2.5 billion) at a 5.5 to 7 percent interest rate and repayment period to be determined depending on the use of the funds.

Moreover, the Brazilian National Economic and Social Development Bank (BNDES) regularly announces specific credit lines to support the renewal and/or development of new sugarcane fields (BNDES Prorenova); to support the acquisition, marketing or production of machinery and equipment (BNDES Finame Direto), among others.

Ethanol Import Tariff

On August 31, 2019, the Secretary of Foreign Trade & International Affairs published Ordinance No. 547, which approved a 20 percent import tax on ethanol imports above 750 million liters per year. This duty-free tariff-rate quota (TRQ) would expire on August 31, 2020. The renewed quota was 150 million liters higher than the previous one (600 million liters per year) initially imposed in September 2017.

On September 11, 2020, right after the expiration of the TRQ on August 31, 2020, Brazil and the United States released a joint statement on the state of negotiations regarding bilateral ethanol trade. The U.S. and Brazil announced their decision to conduct results-oriented discussions on an arrangement to improve market access for ethanol and sugar in Brazil and the U.S. Note that the Brazilian sugar and ethanol industry has steadily advocated that the United States should increase its TRQ for Brazilian sugar, which is usually set at 152,692 metric tons at the beginning of every Fiscal Year (FY). Such meetings took place over 90 days starting September 14, 2020.

During this period, Brazil agreed to maintain a pro-rata TRQ of 187.5 million liters of ethanol, which is proportional to the total annual volume of the TRQ that was in force until August 30, 2020. Brazil and the U.S. agreed to proceed in this manner in the spirit of the economic partnership created under Presidents Bolsonaro and Trump's leadership. Given that no agreement was reached between the U.S. and Brazil, following the 90-day period, the ethanol TRQ expired on December 14, 2020, resulting in all ethanol imports being assessed a 20 percent import tariff (except for Mercosul countries which have duty-free access). Please refer to "[Brazilian Biofuels Annual Gain Report 2017](#)" and "[Brazilian Biofuels Annual Gain Report 2020](#)" for historical information on the ethanol TRQ.

The EU-MERCOSUL Free Trade Agreement (FTA)

On June 28, 2019, the European Union (EU) and Mercosur reached a provisional agreement on a Free Trade Agreement (FTA), concluding two decades of talks. The EU will become the first major partner with which Mercosur has struck a trade agreement. The European Union is already Mercosur's biggest trade and investment partner and its second largest for goods trade.

According to the provisional agreement, the EU will establish a duty-free TRQ of 562 million liters of ethanol for industrial use per year and an additional TRQ of 250 million liters at reduced tariff rates. The EU will also establish a TRQ for 180,000 metric tons for sugar imports. See "Brazilian Biofuels Annual Report 2019" for further details.

The four Mercosul governments, the 27 national governments of the EU, and the European Parliament will have to ratify the deal before entering into force. However, the ratification of the agreement by the European Commission and European Parliament is still not certain.

In October 2020, the European Parliament symbolically rejected the agreement expressing concerns related to the environmental policies of President Bolsonaro's administration. Even if the agreement is ratified and Brazil wins improved market access, it could face future penalties for any actions that compromise the environmental services provided by the country's biomes. EU farmers who are worried about increased competition could also discourage approval. In particular, EU producers are worried about the ethanol and beef concessions awarded to Mercosul countries.

Government Support for Biodiesel Programs

The National Biodiesel Production Program

The National Biodiesel Production Program (PNPB) was created in 2004 to promote domestic biodiesel production, reduce petroleum import dependency, and lower pollutant emissions and health-related costs. In addition, PNPB was established to generate jobs and income and alleviate regional economic disparities by passing on benefits to family farmers, especially those in North and Northeastern Brazil.

Federal Law #11,097, enacted in January 2005, included biodiesel in the Brazilian energy matrix and delegated authority to ANP to regulate and monitor all activities related to biodiesel production, the mandatory blend (Bx), quality control, product distribution, and marketing.

Under PNPB, the government regulates the biodiesel market through a public auction system that sets the volume of biodiesel that should be produced and delivered to fuel distributors in a particular period of the year and the average sales price. The auction system gives preference to producers with the “Social Fuel Stamp,” a mechanism created by the government to provide incentives for more impoverished farmers (family farmers) in disadvantaged areas. The “Social Fuel Stamp” is issued by MAPA and should be renewed every five years.

Only biodiesel producers with the aforementioned stamp are eligible for 80 percent of the total auctioned volume. Note that the remainder auctioned volume can be delivered by biodiesel producers with or without the “Social Fuel Stamp.” In order to obtain the stamp, biodiesel producers must comply with the following requirements:

- Purchase minimum raw material percentages from family farmers,
- Guarantee the purchase of available quantities,
- Set contracts with farmers, provide technical assistance, and training.

The Biodiesel Mandate

Federal Law #11,097/2005 defined and established a legal mandate for the use of biodiesel as a fuel. The law authorized using a two percent blend of biodiesel (B2) until 2008 when B2 became compulsory nationwide, i.e., all mineral diesel must have a two percent biodiesel blend. However, the rapid increase of the Brazilian industrial capacity and the likely oversupply of biodiesel in the domestic market led the CNPE to adopt requirements for higher blends.

CNPE Resolution #16, from October 2018, recommends the annual increase of the biodiesel blend by one percent, from B11 in June 2019 (which was effective in September 2019), to B12 in March 2020, B13 in March 2021, B14 in March 2022, and up to B15 by March 2023.

Following CNPE’s Resolution, on March 1, 2020, ANP increased the volume of biodiesel blended with diesel sold at the pump to 12 percent (B12). However, for the first time since the CNPE’s Resolution and in an attempt to control biodiesel prices which drastically increased in the following auctions due to shortages in biodiesel feedstock, ANP reduced the volume of biodiesel blended to diesel from 13 to 10

percent as of September 2020 and later to 11 percent effective November 2020 for the 75th and 76th auctions for deliveries in September/October and November/December, respectively.

The blend returned to 12 percent in January 2021. On March 1, 2021, Brazil increased the volume of biodiesel blended with diesel sold at the pump to 13 percent (B13), following CNPE’s Resolution #16 from 2018. However, due to persistent high feedstock prices, ANP again reduced the volume of biodiesel blended to diesel, now from 13 to ten percent as of May 2021 for the 79th and 80th auctions for deliveries in May/June and July/August, respectively.

Despite the biodiesel blend reduction, auction prices remained sharply elevated. The 79th auction generated 1.05 billion liters of biodiesel at an average price of R\$ 5.536 reals/liter (US\$3.8/gal), an increase of 18 percent compared to the average price for the previous biodiesel auction (78th auction). In late June, biodiesel prices in the 80th auction remained stable at the local currency and similar to the previous auction, generating 1.102 billion liters of biodiesel at an average price of 5.485 reals per liter (US\$4.2/gal).

On July 12, CNPE authorized the return of the biodiesel blend to 12 percent for the 81st auction with deliveries in September/October. GOB expects that the mandate revision for the 81st biodiesel auction should help to avoid an excessive increase in the final price of diesel to the final consumer, as the resumption of economic activity contributes to rising domestic fuel demand. Note that it was just on March 1, 2021, that the mandatory biodiesel blend rate was raised to 13 percent, up from the 12 percent blend rate that had been in place since March 2020. The table below shows the evolution of the biodiesel use mandate as reported by ANP.

| Biodiesel Use Mandate | |
|-----------------------|----------|
| Year | Mandate |
| 2003 | optional |
| Jan/2008 | B2 |
| Jul/2008 | B3 |
| Jul/2009 | B4 |
| Jan/2010 | B5 |
| Aug/2014 | B6 |
| Nov/2014 | B7 |
| Mar/2017 | B8 |
| Mar/2018 | B10 |
| Sep/2019 | B11 |
| Mar/2020 | B12 |
| Sep/2020 | B10 |
| Nov/2020 | B11 |
| Jan/2021 | B12 |
| Mar/2021 | B13 |
| May/2021 | B10 |
| Sep/2021 | B12 |

Source: ANP

A New Model for the Biodiesel Market

On December 30, 2020, CNPE issued Resolution #14 with guidelines to implement a new market environment for biodiesel trade, which should replace the current biodiesel public auctions. ANP is responsible for regulating the new biodiesel marketing model, which will come into effect on January 1, 2022, and must comply with the following:

- protection of consumer interests concerning price, product quality, and supply;
- guarantee of fuel supply in the national territory;
- promotion of free competition;
- increase in the participation of biofuels in the national energy mix based on economic, social, and environmental perspectives;
- be in accordance with the National Biofuels Policy.

According to CNPE's Resolution, the new model will only allow the sale of biodiesel from ANP authorized biodiesel plants. The Resolution provides a 12-month transition period to the new market model. The new model must ensure that up to 80 percent of biodiesel sold in Brazil is originated from biodiesel plants with the "Social Biofuel Stamp." The percentage will be set co-jointly by the MME and MAPA. Until January 1, 2022, public auctions will continue to be promoted and operated in the current structure, as provided in CNPE Resolution # 5/2007.

In late April, ANP announced a proposal and the parameters to shift biodiesel trading from the country's current public auction model to a hybrid model, starting in January 2022. The model will allow biodiesel producers and distributors to settle over-the-counter (OTC) contracts to guarantee 80 percent of biodiesel supply for the next two months, following the same calendar used for the current public auction. The remaining 20 percent will be traded in the spot market. Only fuel distributors with at least five percent of market share in any fuel in 2020 will need to commit 80 percent of the traded volume to OTC contracts.

According to ANP, the new model will allow 86 percent of the biodiesel sold by Brazilian distributors in 2020 to be traded under the mandatory OTC model. Biodiesel producers with a market share of three percent or more in 2020 will also need to commit 80 percent of the volume traded in the same two-month period of the prior year through OTC contracts. On August 12, ANP started a 45-day public comment period about the new model for the biodiesel market to further elaborate the proposal.

Biodiesel and Biodiesel Feedstock Import Policy

There is no formal restriction to biodiesel imports other than paying the import tariff. According to the Secretariat of Foreign Trade (SECEX), the import tariff applied to biodiesel blends above B30, including pure (B100) biodiesel (NCM 3826.00.00), is fixed at 14 percent. The import tariff for petroleum oils containing biodiesel up to and including B30 (NCM 2710.20) is zero.

However, the PNPB program currently requires that only domestically produced biodiesel be eligible to participate in the auction system used to regulate the market, which makes biodiesel imports not attractive. Note that the public auction system ultimately sets the volume of biodiesel that should be produced and delivered to fuel distributors in a particular period of the year to supply the market. The

auction system also provides preference to biodiesel producers eligible for the Social Fuel Stamp described above.

According to the new biodiesel market model proposal, ANP reported that imported biodiesel could become competitive. The proposal reports that imports would start as of January 2023 (one year after the implementation of the new biodiesel market model) and that no mandatory volume target would be imposed for importers.

Biodiesel imports could be a significant step to support adequate biodiesel supply in the future years. The switch to the new model will not necessarily always guarantee adequate biodiesel supply and/or encourage investments in biodiesel production and logistics.

Currently, Brazil imports biodiesel feedstocks. In fact, in November 2020, CNPE published Resolution # 9 to allow for the use of imported biodiesel feedstock such as soybeans or soybean oil in biodiesel production, given that soybean oil prices have been steadily increasing. Note that soybeans represent roughly 75 percent of the raw material used for biodiesel production. The resolution did not specify for how long the measure would be in effect.

Government Support for Advanced Biofuels

In May 2021, ANP approved [Resolution #842](#), setting up the routes, specifications, and quality requirements to be followed by the Brazilian Market for “diesel verde” (“green diesel”), also known as renewable diesel. Production from routes/sources of raw material other than listed by the Resolution must be previously approved by ANP. Green diesel production should follow one of the specific routes/raw materials below:

- Hydrotreatment of vegetable oil, algae oil, microalgae oil, animal fat and fatty acids from biomass; which results in a Hydrogenation-derived Renewable Diesel (HDRD)
- synthesis gas from biomass, via the Fischer-Tropsch process
- fermentation of carbohydrates from biomass
- oligomerization of ethyl alcohol (ethanol) or isobutyl alcohol (isobutanol)
- catalytic hydrothermolysis of vegetable oil (natural or residual), algae oil, microalgae oil, animal fat and biomass fatty acids.

According to industry sources, the aforementioned ANP’s resolution does not allow Petrobras, the Brazilian oil company, to include co-processing fuel under the green or renewable diesel definition. Co-processing fuel is fossil fuel processed in a fuel refinery with a “x” percent of a biomass raw material added to the processing.

No significant changes have been made to the current status of advanced biofuels research, development, and production in Brazil. However, in June 2021, the Brazilian Congress submitted Bill Proposal #1,873/21, which creates a federal program to encourage the research, production and consumption of advanced biofuels in Brazil. The proposal also sets an agenda to increase the blend of advanced biofuels in fossil diesel and jet fuels from two percent in 2027 to five percent in 2030 with an annual increase of one percent. The proposal is under analysis by the Commission of Mines and Energy of the Lower House and should be later analyzed by the Commission of Constitution and Justice.

III. Ethanol

Brazilian Ethanol Production, Supply and Demand (PS&D) Tables

Sugarcane is the main source of feedstock for ethanol production in Brazil, followed by corn. The table below shows the Brazilian ethanol production, supply and demand (PS&D) spreadsheet for Ethanol Used as Fuel and Other Uses (Industrial and Chemicals, excluding ethanol for beverages) for calendar years 2012 through 2021. (Refer to Section VI: Notes on Statistical Data – Ethanol or further information on these tables).

No Brazilian government entity or trade source maintains production figures on use “for fuel” or “other uses.” All ethanol production figures are reported solely as hydrous and anhydrous volumes. According to ATO/Sao Paulo contacts, ethanol plants produce different specifications of hydrous and/or anhydrous but make no distinction between fuel and other uses. The actual use for fuels and other uses (industrial and chemical, refined, and/or neutral) are determined at end-use.

| Ethanol Used as Fuel and Other Industrial Chemicals (Million Liters) | | | | | | | | | | |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Calendar Year | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021f |
| Beginning Stocks | 6,891 | 7,894 | 8,995 | 10,167 | 8,232 | 8,012 | 8,973 | 10,401 | 12,327 | 14,431 |
| Fuel Begin Stocks | 6,488 | 7,490 | 8,590 | 9,713 | 7,765 | 7,520 | 8,475 | 9,899 | 11,820 | 13,921 |
| Production | 23,509 | 27,642 | 28,553 | 30,365 | 28,405 | 28,142 | 33,078 | 37,383 | 35,081 | 30,430 |
| Fuel Production | 20,739 | 24,377 | 25,585 | 27,248 | 25,546 | 25,170 | 30,233 | 34,407 | 30,897 | 26,630 |
| <i>>of which is cellulosic (a)</i> | 0 | 0 | 0 | 2 | 6 | 17 | 25 | 30 | 32 | 40 |
| Imports | 554 | 132 | 452 | 513 | 835 | 1,796 | 1,775 | 1,457 | 988 | 485 |
| Fuel Imports | 553 | 131 | 403 | 500 | 810 | 1,791 | 1,770 | 1,452 | 985 | 480 |
| Exports | 3,055 | 2,917 | 1,398 | 1,867 | 1,789 | 1,380 | 1,685 | 1,941 | 2,669 | 2,000 |
| Fuel Exports | 2,500 | 1,952 | 780 | 900 | 400 | 443 | 840 | 1,090 | 850 | 200 |
| Consumption | 20,005 | 23,756 | 26,435 | 30,946 | 27,671 | 27,597 | 31,740 | 34,973 | 31,296 | 29,990 |
| Fuel Consumption | 17,790 | 21,456 | 24,085 | 28,796 | 26,201 | 25,562 | 29,740 | 32,848 | 28,931 | 27,990 |
| Ending Stocks | 7,894 | 8,995 | 10,167 | 8,232 | 8,012 | 8,973 | 10,401 | 12,327 | 14,431 | 13,356 |
| Fuel Ending Stocks | 7,490 | 8,590 | 9,713 | 7,765 | 7,520 | 8,475 | 9,899 | 11,820 | 13,921 | 12,841 |
| Refineries (Sugarcane-only) Producing First Generation Fuel Ethanol (Million Liters) | | | | | | | | | | |
| Number of Refineries | 408 | 399 | 382 | 382 | 383 | 384 | 369 | 359 | 347 | 343 |
| Nameplate Capacity | 41,600 | 40,700 | 37,930 | 38,050 | 39,677 | 40,012 | 43,105 | 43,105 | 42,800 | 54,500 |
| Refineries (Corn-only and Corn/Sugarcane Flex) Producing First Generation Fuel Ethanol (Million Liters) | | | | | | | | | | |
| Number of Refineries | 0 | 0 | n/a | n/a | n/a | n/a | n/a | n/a | 11 | 19 |
| Nameplate Capacity | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2,500 | 4,000 |
| Capacity Use (%) | 50% | 60% | 67% | 72% | 64% | 63% | 70% | 80% | 68% | 45% |

| Refineries Producing Cellulosic Fuel Ethanol (Million Liters) | | | | | | | | | | |
|---|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Number of Refineries | 0 | 0 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Nameplate Capacity | 0 | 0 | 82 | 127 | 127 | 127 | 127 | 127 | 127 | 75 |
| Capacity Use (%) | -- | -- | 0% | 2% | 5% | 13% | 20% | 24% | 25% | 53% |
| Co-product Production (1,000 MT) | | | | | | | | | | |
| Bagasse | 97,954 | 115,175 | 118,971 | 126,008 | 117,492 | 115,467 | 134,721 | 150,096 | 135,913 | 112,500 |
| DDGs | 0 | 0 | 33 | 91 | 151 | 310 | 541 | 998 | 1,824 | 2,545 |
| Corn Oil | 0 | 0 | 2 | 5 | 9 | 18 | 31 | 57 | 105 | 146 |
| Feedstock Use for Fuel Ethanol (1,000 MT) | | | | | | | | | | |
| Sugarcane | 259,238 | 304,713 | 319,257 | 339,221 | 316,998 | 309,817 | 369,401 | 414,441 | 359,108 | 295,354 |
| Corn | 0 | 0 | 107 | 291 | 481 | 990 | 1,727 | 3,190 | 5,827 | 8,129 |
| Bagasse for Cellulosic Fuel | 0 | 0 | 0 | 0.011 | 0.033 | 0.094 | 0.139 | 0.167 | 0.178 | 0.222 |
| Market Penetration (Million Liters) | | | | | | | | | | |
| Fuel Ethanol Use | 17,790 | 21,456 | 24,085 | 28,796 | 26,201 | 25,562 | 29,740 | 32,848 | 28,931 | 27,990 |
| Hydrous Ethanol for Fuel | 9,850 | 11,755 | 12,994 | 17,862 | 14,586 | 13,642 | 19,385 | 22,544 | 19,258 | 18,000 |
| Anhydrous Ethanol in Gasoline C | 7,940 | 9,701 | 11,091 | 10,934 | 11,615 | 11,920 | 10,355 | 10,304 | 9,673 | 9,990 |
| Gasoline C (includes anhydrous) | 39,698 | 41,426 | 44,364 | 41,137 | 43,019 | 44,150 | 38,352 | 38,165 | 35,824 | 37,000 |
| Gasoline C Blend Rate | 20.0% | 23.4% | 25.0% | 26.6% | 27.0% | 27.0% | 27.0% | 27.0% | 27.0% | 27.0% |
| Ethanol Blend Rate Overall | 35.9% | 40.3% | 42.0% | 48.8% | 45.5% | 44.2% | 51.5% | 54.1% | 52.5% | 50.9% |
| Source: Source: Prepared by ATO/Sao Paulo based on MAPA, SECEX, Datagro, ANP, UNICA and industry sources. f/ forecast | | | | | | | | | | |

Production

Ethanol is an alcohol, made by fermenting sugar components of plant materials such as corn and wheat starch, sugarcane, sugar beet, sorghum, and cassava. Total ethanol production for 2021 is estimated at 30.43 billion liters, a significant drop of 13 percent relative to the revised figure for 2020 (35.08 billion liters). Ethanol production for fuel use is estimated at 26.63 billion liters, a decrease of 4.27 billion liters vis-à-vis the previous season. The reduction is based on the lower sugarcane output for the 2021/22 crop and sugar-ethanol plants' decisions to divert more sugarcane towards sugar production as they did in the previous cycle. The expected increase in corn-based ethanol production should partially offset the reduction from sugarcane ethanol.

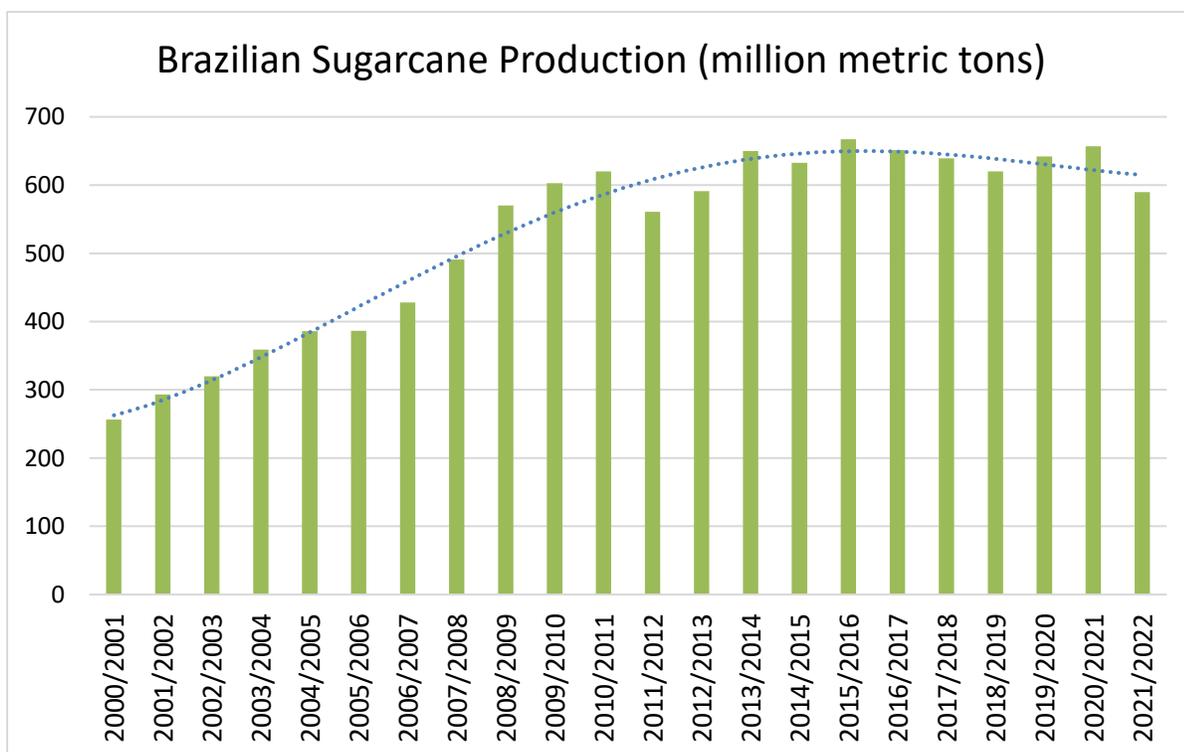
Sugarcane Ethanol

To be in accordance with the actual feedstock production cycle, the following narrative describes sugarcane and ethanol production in marketing years. Post currently estimates Brazil's marketing year (MY April through March, unless otherwise stated) 2021/22 sugarcane crush at 590 million metric tons (mmt), a notable drop of ten percent vis-à-vis to MY 2020/21 (657 mmt).

The Center-South (CS) region production is estimated at 535 mmt of sugarcane, a 12 percent decrease compared to the previous season (605 mmt). Several factors should contribute to the expected reduction of the output for the upcoming crop. The dry weather that prevailed during 2020, especially during August/October damaged sugarcane fields and reduced the production potential. In addition, the lack of rainfall combined with high temperatures also favored the incidence of fire outbreaks in the fields, therefore harming cane stocks. Criminal fire in sugarcane fields was also reported by post contacts. Rainfall volumes during January-July 2021 were well below average, thus limiting stock development. In addition, steady grain prices have encouraged the migration of marginal sugarcane areas from sugarcane to soybeans and corn.

More recently, sugarcane fields in the CS, a major Brazilian production region, have been affected by severe frosts in June 30, July 20 and July 30. Frosts not only damaged fields already harvested and/or showing sprouting buds, which will bring negative impact for the next crop but also damaged fields to be harvested in the current season, leading sugar-ethanol plants to harvest such areas as fast as they can to avoid further losses. Note that part of these areas would only be harvested in the final third of the crop; therefore, the overall productivity of the fields will be reduced. Indeed, some sugar-ethanol plants are likely to finish the crushing season as early as October, as opposed to December.

North-Northeastern (NNE) production for MY 2021/22 is projected at 55 mmt, an increase of 3 mmt compared to the revised estimate for the previous crop (52 mmt), assuming that regular weather conditions prevail until the beginning of the crop in the second semester of the year. The graph below shows the evolution of the Brazilian sugarcane production since 2000.



Source: USDA/ATO/Sao Paulo

Sugar prices have recovered since March 2020 and overall, have remained much more attractive than ethanol prices (which can potentially also aggregate the value from CBios), especially for sugar sold in the domestic market. The graph below shows sugar #11 future prices reported by the Intercontinental Exchange (ICE), illustrating the upward trend of sugar prices since March 2020.



Source: Intercontinental Exchange (ICE).

On the other hand, despite ethanol prices (which potentially aggregate the value from CBios) having reacted during the current crop, they have generally remained less attractive than sugar. Indeed, the COVID-19 pandemic and the social distance measures continue to influence the Brazilian economy, promoting a negative impact in the Otto cycle fuels demand, e.g., gasoline containing 27 percent of anhydrous ethanol; and hydrous ethanol. (Refer to Section IV: Ethanol – Consumption for further reference).

As a consequence, sugar-ethanol plants should remain focusing on sugar production and the sugar-ethanol production mix will likely be similar to the previous season. The ATO/Sao Paulo projection for the total sucrose (total reducing sugar, TRS) content diverted to sugar and ethanol production for MY 2021/22 is set at 46 and 54 percent, respectively, relatively unchanged from 46.15 and 53.85 percent, respectively, for MY 2020/21. Therefore, total Brazilian sugarcane-based ethanol production in 2021 is estimated at 27 billion liters, a drop of 17 percent relative to revised production figure for 2020 (32.62 billion liters).

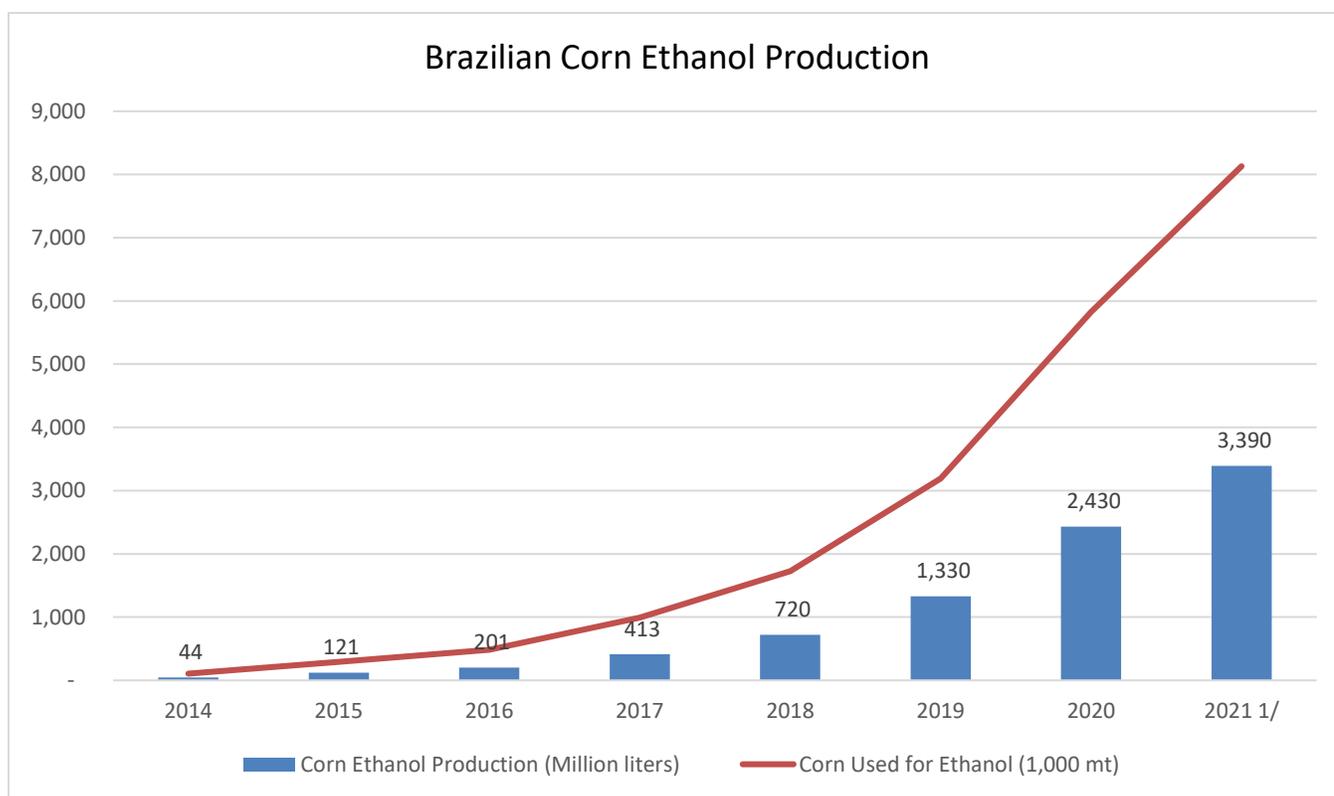
Corn Ethanol

Corn ethanol production remains notably growing in Brazil. Total Brazilian corn-ethanol production in 2021 is estimated at 3.39 billion liters, an increase of 40 percent vis-à-vis revised production figure for 2020 (2.43 billion liters), based on updated information from the Corn Ethanol National Union (UNEM) and UNICA. Post estimates that corn ethanol will represent 11 percent of Brazil’s total ethanol production in 2021, given that ethanol production from sugarcane is expected to drop. According to UNEM, Brazil will likely produce 8 billion liters of corn ethanol by 2028. (Refer to [Corn Ethanol Production Booms in Brazil](#) Gain Report for further information)

Total corn used to produce corn-based ethanol in 2021 is estimated at roughly 8.13 mmt, an increase of 2.30 mmt compared to the corn volume consumed in 2020 (5.827 mmt) and representing approximately nine percent of the corn crop in 2021/22 (93 mmt). The expected drop in corn production due to delayed

plantings and weather-related problems such as below rainfall volumes have affected to some extent production areas, especially for second-crop corn or “milho safrinha” (*Refer to the [Brazilian Grain and Feed Update Gain Report - June 2021](#) for further information*). Recent frosts have also affected corn fields in southern Brazil with likely damages in productivity, which has still been assessed. The lower expected corn production should not be an issue limiting corn-ethanol production, though. UNEM reports that corn-ethanol plants are reasonably stocked with the grain and operating with 85 percent of their industrial capacity.

The graph below shows the evolution of corn used for ethanol production and total corn ethanol production in Brazil since the early stages of the industry. Note that each ton of corn can produce on average 417 liters of ethanol, 313 kilograms of DDGS, and 18 liters of corn oil, as well as the co-generation of electric power, which most plants sell back to the grid.



Source: FAS Brazil chart based on data from UNEM and UNICA. 2021 1/ figure is an estimate.

Expansion potential for Brazil’s corn ethanol industry remains limited by local fuel demand, profitability, and logistical challenges. Corn ethanol production in Brazil is mostly concentrated in Brazil’s Center-West region, close to relatively cheap corn supplies and poultry operations that consume some of the DDGS produced as a co-product of ethanol distillation.

Most of the corn-based ethanol is also consumed in the region or distributed to buyers in 10 states in western and northern Brazil. One major limitation for growth of the corn ethanol sector is the low population density of the region, which corresponds to little fuel demand in general. Moreover, the

options to transport ethanol out of the region are limited, with most ethanol needing to travel 1,000 kilometers or more by truck before potentially being placed on barges or larger ocean-going vessels. While corn ethanol is currently primarily supplied to Brazil's sparsely populated interior, producers are exploring options to sell to the population centers in the northeastern region, which frequently lack ethanol to meet local demand.

States in southern Brazil are another target market for corn ethanol producers. Currently, corn ethanol can be moved south from the Rondonopolis rail terminal in southern Mato Grosso. While ethanol needs to be trucked from the production site to Rondonopolis, the railway provides a connection to the Port of Santos, more than 1,000 kilometers away. There are projects underway to expand the railway north from Rondonopolis to Lucas do Rio Verde, which would bring a rail connection even closer to the major corn ethanol production region. The ethanol pipeline might be an option, although the product still must be moved by truck to Uberaba. Note that there are plans to extend the pipeline to Rondonopolis in the future. *(Please refer to Section III: Ethanol – Logistics: Ethanol Pipeline for further information)*

Advanced Ethanol

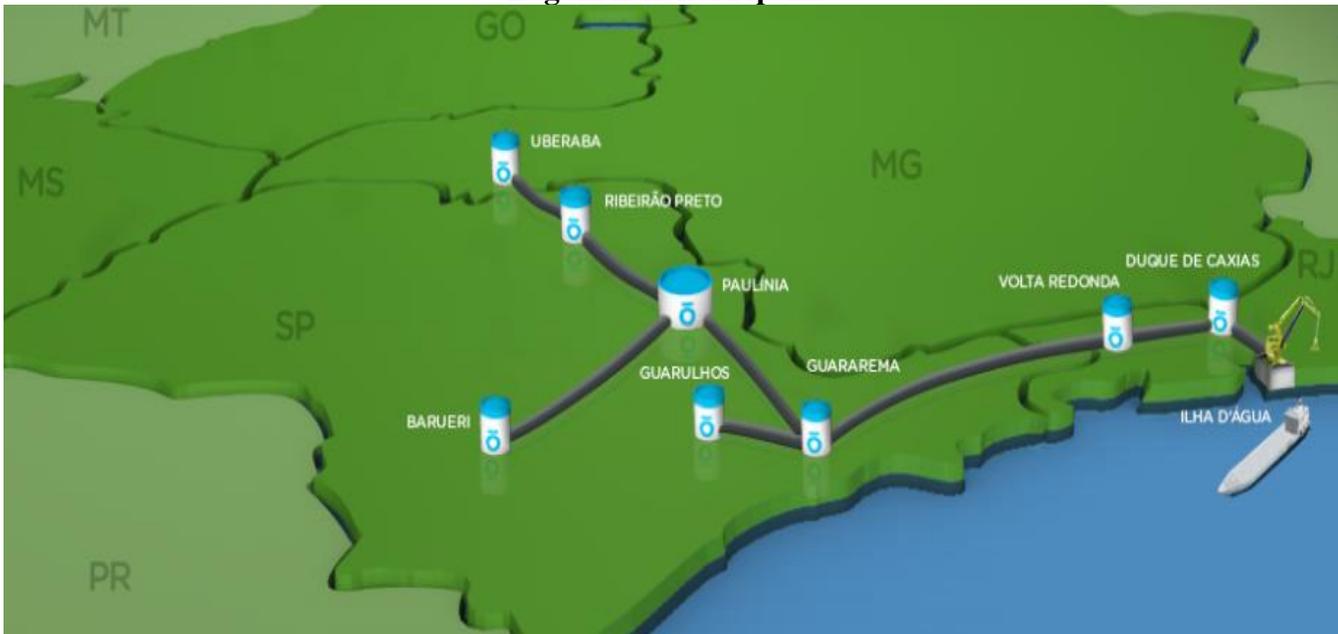
Total cellulosic ethanol production for 2021 is estimated at 40 million liters, an increase of 8 million liters relative to 2020. Plants have not reached full capacity due to operational/mechanical challenges. This amount still represents an insignificant share of total ethanol production in Brazil.

Logistics: Ethanol Pipeline

Brazil has one ethanol pipeline, which is operated by Logum, a joint venture by Copersucar (30 percent share), Raizen (30 percent share), Petrobras (30 percent share) and Uniduto Logistica (10 percent share). The map below illustrates the Logum pipeline system which currently connects Brazil's principal ethanol-producing regions in the Center-South with major fuel consumer centers such as the metropolitan regions of Sao Paulo and Rio de Janeiro.

The pipeline currently extends 1,400 km and has the capacity to move 4 billion liters of ethanol per year. Due to the COVID-19 pandemic, Logum reported that the company moved 2.1 billion liters in 2020 as opposed to 2.5 billion liters in 2019. Logum expects to deliver an additional 128 km of pipeline in 2021, connecting the current pipeline to the city of Sao Paulo, and expects to expand capacity to 6 billion liters to meet an expected increase in demand driven by the requirements of the RenovaBio program.

Logum Ethanol Pipeline



Source: Logum

Industrial Capacity

The total number of ethanol plants in 2021 is 365 units, four additional units compared to the revised figure for 2020 (361 units). This figure includes 343 sugarcane-based ethanol plants, seven corn-based ethanol plants, 12 flex plants producing ethanol from both sugarcane and/or corn, and three cellulosic ethanol plants.

According to updated information provided by UNEM, there are currently 19 plants producing ethanol from corn in Brazil, mainly in the state of Mato Grosso, followed by Goiás, Paraná, and São Paulo. Seven units are corn-only plants, while the remaining 12 are flex-plants that produce ethanol from sugarcane and corn. Post estimates current industrial capacity at 4 billion liters. Industry sources report at least nine other corn-ethanol plant projects in the planning, development, construction and/or expansion stage. These plants could potentially start operations as of 2022.

The map below shows the location of the ethanol plants in the country. The total hydrated ethanol production capacity for 2021 is reported at 58.5 billion liters per year. This figure reflects the authorized hydrated ethanol production capacity of 243.842 million liters per day, as reported by ANP, and assumes an average of 240 crushing days. ANP reports anhydrous ethanol production capacity at 130.961 million per day or 31.43 billion liters/year assuming a 240-day crushing cycle.

Distribution of Ethanol Plants in Brazil



Source: ANP

Ethanol installed industrial capacity depends mostly on annual decisions made by individual sugar-ethanol plants to produce sugar and/or ethanol. Post contacts report that the industry responds to the ratio of 40:60 to switch between sugar and ethanol production or vice versa from harvest to harvest. Once producing units adjust their plants to produce a set ratio of sugar/ethanol in a given year, there is much less flexibility to change it during the crushing season.

Sugarcane and Ethanol Prices Received by Producers

Sugarcane prices received by third-party suppliers for major producing states are based on a formula that considers prices for sugar and ethanol in both the domestic and international markets. The State of Sao Paulo Sugarcane, Sugar and Ethanol Growers Council (CONSECANA) was the first to develop this formula for the state of Sao Paulo, the major producing state, which accounts for roughly 60 percent of Center-South production.

The cumulative CONSECANA price (April 2020 through March 2021) for the state of Sao Paulo for the 2020/21 crop was R\$0.7783 per kg of TRS or approximately R\$94.93 per ton of sugarcane delivered at

the mill, an increase of R\$14.69 compared to the previous season (R\$80.24 per ton of sugarcane delivered at the mill).

The cumulative CONSECANA price for the current crop (April 2021 through June 2021) for the state of Sao Paulo is R\$1.0141 per kg of TRS or approximately R\$127.35 per ton of sugarcane delivered at the mill. Note that CONSECANA's prices are based on both sugar and ethanol prices in domestic and international markets.

The tables below include the latest information publicly available for the Ethanol Indexes released by the University of Sao Paulo's College of Agriculture "Luiz de Queiroz" (ESALQ). The indexes track anhydrous and hydrous ethanol for fuel prices received by producers in the domestic spot market.

| Price for Fuel Hydrated Ethanol - State of Sao Paulo (R\$/000 liters). | | | | | | |
|---|-------------|-------------|-------------|-------------|-------------|-------------|
| Period | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
| January | 1,824.40 | 1,815.80 | 1,836.20 | 1,605.60 | 2,067.70 | 2,090.90 |
| February | 1,916.40 | 1,686.10 | 1,852.20 | 1,677.10 | 2,118.20 | 2,280.80 |
| March | 1,906.60 | 1,526.40 | 1,868.20 | 1,776.40 | 1,875.10 | 2,676.80 |
| April | 1,396.60 | 1,471.80 | 1,538.70 | 1,814.80 | 1,360.60 | 2,543.90 |
| May | 1,391.00 | 1,414.20 | 1,568.00 | 1,644.90 | 1,432.10 | -- |
| June | 1,501.90 | 1,327.70 | 1,633.70 | 1,617.70 | 1,637.10 | -- |
| July | 1,501.50 | 1,304.00 | 1,457.90 | 1,673.60 | 1,639.60 | -- |
| August | 1,559.70 | 1,406.40 | 1,461.60 | 1,729.10 | 1,726.10 | -- |
| September | 1,665.90 | 1,442.30 | 1,678.00 | 1,714.60 | 1,797.20 | -- |
| October | 1,857.90 | 1,533.90 | 1,792.80 | 1,803.00 | 1,985.20 | -- |
| November | 1,869.30 | 1,651.10 | 1,648.70 | 1,908.90 | 2,062.80 | -- |
| December | 1,867.90 | 1,748.00 | 1,664.80 | 1,998.50 | 2,044.30 | -- |
| Source: USP/ESALQ/CEPEA. | | | | | | |

| Price for Fuel Anhydrous Ethanol - State of Sao Paulo (R\$/000 liters). | | | | | | |
|--|-------------|-------------|-------------|-------------|-------------|-------------|
| Period | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
| January | 1,996.70 | 2,047.10 | 2,015.70 | 1,798.80 | 2,241.90 | 2,305.20 |
| February | 2,083.00 | 1,916.90 | 2,050.90 | 1,811.80 | 2,294.80 | 2,496.90 |
| March | 2,113.70 | 1,697.60 | 2,076.10 | 2,010.10 | 2,134.40 | 2,980.60 |
| April | 1,602.40 | 1,635.30 | 1,807.40 | 1,984.70 | 1,556.10 | 2,774.20 |
| May | 1,536.40 | 1,610.30 | 1,697.40 | 1,878.60 | 1,522.40 | -- |
| June | 1,678.10 | 1,509.90 | 1,817.90 | 1,798.20 | 1,781.80 | -- |
| July | 1,636.60 | 1,424.70 | 1,632.30 | 1,822.70 | 1,798.90 | -- |
| August | 1,726.30 | 1,552.30 | 1,557.20 | 1,906.40 | 1,882.50 | -- |
| September | 1,796.80 | 1,592.80 | 1,817.70 | 1,865.40 | 1,985.40 | -- |
| October | 2,018.30 | 1,669.70 | 1,957.90 | 1,943.70 | 2,160.50 | -- |
| November | 2,086.60 | 1,806.70 | 1,856.60 | 2,052.50 | 2,282.60 | -- |
| December | 2,075.70 | 1,928.80 | 1,829.60 | 2,165.70 | 2,258.10 | -- |

Source: USP/ESALQ/CEPEA.

Consumption

The table below shows ANP fuel consumption figures up to 2021 (January through June) for Otto-cycle fuel (gasoline and ethanol) vehicles.

| Brazilian Fuel Consumption Matrix (million liters) | | | | | | |
|---|-------------|-------------|-------------|-------------|-------------|----------------|
| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 1/ |
| Gasoline C* | 43,019 | 44,150 | 38,352 | 38,165 | 35,824 | 17,796 |
| Hydrated Ethanol | 14,586 | 13,642 | 19,385 | 22,544 | 19,258 | 9,207 |

Source: ANP. * Gasoline C includes 18-27.5% of anhydrous ethanol. 2021 1/ refers to January-June.

Otto-cycle fuel consumption in Brazil has significantly dropped since the beginning of the COVID-19 pandemic in March 2020, due to reduced mobility and the slowdown of the Brazilian economy. Several social isolation measures were taken by the Brazilian states such as the closure of non-essential commercial businesses, limiting public transportation, restricting the flow of vehicles and people in the cities, among others. Additionally, schools were closed, industrial plants were closed, and companies have adopted more telework policies. The economy contracted remarkably in 2020 resulting in a negative growth domestic product (GDP) of -4.1 percent.

According to ANP, gasoline C (pure gasoline plus anhydrous ethanol) consumption reduced from 38.17 billion liters in 2019 to 35.82 billion liters in 2020, a six percent drop. The agency reports that hydrous ethanol consumption decreased from 22.54 billion liters in 2019 to 19.26 billion liters in 2020, a decrease of 15 percent year on year.

The gradual reopening of the economy in 2021 and partial recovery in personal vehicle use has offset the drop in consumption; however, not enough to recover pre-pandemic consumption patterns. Gasoline C consumption picked up in 2021, reaching cumulative sales of 17.80 billion liters until June 2021, an eight percent vis-à-vis the same period in 2020 (16.46 billion liters), however still below the 18.49 billion liters consumed during January-June 2019. Hydrous ethanol cumulative sales during January-June 2021 (9.21 billion liters) increased three percent relative to the same period in 2020 (8.96 billion liters), but far from pre-pandemic levels (10.76 billion liters during January-June 2019).

ATO/Sao Paulo estimates total domestic demand for ethanol (fuel and other uses) for the calendar year 2021 at 29.99 billion liters, a reduction of four percent relative to the updated figure for the previous calendar year (31.29 billion liters). Total ethanol consumption for use as fuel in 2021 is estimated at 27.99 billion liters, a drop of 941,000 million liters vis-à-vis 2020 (28.93 billion liters).

Gasoline C (which includes 27 percent of anhydrous ethanol) and hydrous fuel ethanol consumption are strongly negatively correlated given that the majority of the Brazilian light vehicle fleet is flex-fuel and consumers choose one or another fuel depending on the price parity. Consumers' decisions to buy hydrous ethanol or gasoline at the pump are mainly driven by the ratio between hydrous ethanol and gasoline prices. The 70 percent ratio between hydrous ethanol and gasoline prices is the rule of thumb in determining whether flex car owners choose to fill up with hydrous ethanol (price ratio below 70 percent) or gasoline (price ratio above 70 percent). This decision is tied to the energy content of each fuel and the fact that ethanol's calorific content is approximately 36 percent lower than pure fossil gasoline.

ATO/Sao Paulo estimates that gasoline C consumption will reach 37 billion liters, up 3 percent from 2020, based on updated numbers from ANP and the current pace of the Brazilian economy. However, hydrous ethanol consumption in 2021 should drop by 1.26 billion liters in 2021, reaching 18 billion, a drop of 6.5 percent relative to 2020, given that the ethanol/gasoline price ratio has been mostly favored gasoline consumption as opposed to hydrous ethanol. No changes have been made to the current ethanol mandate, which was set at 27 percent (E27) for Gasoline C as of March 16, 2015.

The tables below show ethanol and gasoline prices at the pump as well as the price ratio for selected states, cities, and months. Note that nearly all ethanol/gasoline price ratios for 2021 favor gasoline consumption due to the overall increase in ethanol prices as compared to gasoline. This is observed even in the state of Sao Paulo where ethanol prices are traditionally more competitive because of the lower ICMS tax compared charged to ethanol.

| Gasoline and Ethanol Prices in Selected States (average price, R\$/liter) | | | | | | | | | |
|--|------------|-----------------|-------------|-------------|-------------|----------------|-------------|-------------|-------------|
| | | Gasoline | | | | Ethanol | | | |
| | | 2018 | 2019 | 2020 | 2021 | 2018 | 2019 | 2020 | 2021 |
| Sao Paulo State | Jan | 3.998 | 4.058 | 4.390 | 4.336 | 2.858 | 2.625 | 3.045 | 3.057 |
| | Feb | 4.004 | 3.974 | 4.374 | 4.639 | 2.884 | 2.607 | 3.055 | 3.264 |
| | Jun | 4.340 | 4.193 | 3.798 | 5.398 | 2.768 | 2.607 | 2.467 | 4.160 |
| | Aug | 4.214 | 4.083 | 4.007 | | 2.434 | 2.625 | 2.564 | |
| Sao Paulo City | Jan | 3.944 | 3.944 | 4.412 | 4.360 | 2.834 | 2.611 | 3.076 | 3.072 |
| | Feb | 3.954 | 3.933 | 4.384 | 4.657 | 2.865 | 2.579 | 3.062 | 3.270 |
| | Jun | 4.294 | 4.174 | 3.823 | 5.390 | 2.760 | 2.590 | 2.474 | 4.162 |
| | Aug | 4.170 | 4.045 | 4.017 | | 2.421 | 2.610 | 2.548 | |
| Minas Gerais | Jan | 4.393 | 4.555 | 4.809 | 4.729 | 3.123 | 2.960 | 3.291 | 3.239 |
| | Feb | 4.438 | 4.509 | 4.776 | 5.089 | 3.186 | 2.929 | 3.339 | 3.444 |
| | Jun | 4.860 | 4.744 | 4.104 | 5.918 | 3.087 | 2.953 | 2.699 | 4.427 |
| | Aug | 4.735 | 4.579 | 4.377 | | 2.841 | 2.856 | 2.840 | |
| Belo Horizonte (MG Capital) | Jan | 4.263 | 4.459 | 4.680 | 4.687 | 3.095 | 2.920 | 3.229 | 3.203 |
| | Feb | 4.327 | 4.398 | 4.667 | 5.039 | 3.187 | 2.900 | 3.281 | 3.465 |
| | Jun | 4.839 | 4.658 | 4.009 | 5.771 | 3.057 | 2.889 | 2.594 | 4.331 |
| | Aug | 4.663 | 4.505 | 4.292 | | 2.792 | 2.834 | 2.733 | |
| Rio Janeiro State | Jan | 4.647 | 4.780 | 5.041 | 5.017 | 3.624 | 3.595 | 4.214 | 4.031 |
| | Feb | 4.671 | 4.707 | 5.012 | 5.347 | 3.688 | 3.620 | 4.247 | 4.232 |
| | Jun | 4.974 | 4.946 | 4.492 | 6.236 | 3.592 | 3.810 | 3.598 | 5.325 |
| | Aug | 4.888 | 4.814 | 4.717 | | 3.279 | 3.775 | 3.727 | |
| Rio Janeiro Capital | Jan | 4.648 | 4.853 | 5.030 | 5.014 | 3.631 | 3.644 | 4.267 | 4.033 |
| | Feb | 4.651 | 4.679 | 4.978 | 5.334 | 3.693 | 3.637 | 4.261 | 4.244 |
| | Jun | 4.942 | 4.916 | 4.477 | 6.212 | 3.582 | 3.804 | 3.625 | 5.307 |
| | Aug | 4.857 | 4.799 | 4.726 | | 3.267 | 3.810 | 3.772 | |
| Porto Alegre (RS Capital) | Jan | 4.351 | 4.401 | 4.754 | 4.743 | 3.932 | 3.971 | 4.314 | 4.323 |
| | Feb | 4.357 | 4.155 | 4.597 | 5.045 | 3.996 | 3.872 | 4.388 | 4.506 |
| | Jun | 4.698 | 4.916 | 3.971 | 5.983 | 4.039 | 4.072 | 3.887 | 5.747 |
| | Aug | 4.576 | 4.380 | 4.121 | | 3.736 | 3.966 | 3.930 | |
| Goiania (GO Capital) | Jan | 4.464 | 4.387 | 4.780 | 4.815 | 2.890 | 2.974 | 3.423 | 3.326 |
| | Feb | 4.427 | 4.435 | 4.681 | 5.057 | 2.880 | 2.939 | 3.381 | 3.553 |
| | Jun | 4.840 | 4.668 | 4.033 | 5.954 | 2.935 | 2.943 | 2.851 | 4.447 |
| | Aug | 4.755 | 4.393 | 4.532 | | 2.847 | 2.768 | 2.874 | |
| Fortaleza (CE Capital) | Jan | 4.302 | 4.206 | 4.679 | 4.744 | 3.453 | 3.462 | 3.701 | 3.810 |
| | Feb | 4.066 | 4.184 | 4.657 | 5.100 | 3.420 | 3.477 | 3.716 | 4.034 |
| | Jun | 4.726 | 4.726 | 3.984 | 5.723 | 3.770 | 3.798 | 3.457 | 5.153 |
| | Aug | 4.370 | 4.576 | 4.333 | | 3.637 | 3.782 | 3.541 | |

Source: Petroleum, Natural Gas and Biofuels National Agency (ANP).

| Ratio Ethanol/Gasoline Prices | | | | | |
|--|------------|-------------|-------------|-------------|-------------|
| | | 2018 | 2019 | 2020 | 2021 |
| Sao Paulo State | Jan | 71% | 65% | 69% | 71% |
| | Feb | 72% | 66% | 70% | 70% |
| | Jun | 64% | 62% | 65% | 77% |
| | Aug | 58% | 64% | 64% | |
| Sao Paulo City | Jan | 72% | 66% | 70% | 70% |
| | Feb | 72% | 66% | 70% | 70% |
| | Jun | 64% | 62% | 65% | 77% |
| | Aug | 58% | 65% | 63% | |
| Minas Gerais | Jan | 71% | 65% | 68% | 68% |
| | Feb | 72% | 65% | 70% | 68% |
| | Jun | 64% | 62% | 66% | 75% |
| | Aug | 60% | 62% | 65% | |
| Belo Horizonte (MG Capital) | Jan | 73% | 65% | 69% | 68% |
| | Feb | 74% | 66% | 70% | 69% |
| | Jun | 63% | 62% | 65% | 75% |
| | Aug | 60% | 63% | 64% | |
| Rio Janeiro State | Jan | 78% | 75% | 84% | 80% |
| | Feb | 79% | 77% | 85% | 79% |
| | Jun | 72% | 77% | 80% | 85% |
| | Aug | 67% | 78% | 79% | |
| Rio Janeiro Capital | Jan | 78% | 75% | 85% | 80% |
| | Feb | 79% | 78% | 86% | 80% |
| | Jun | 72% | 77% | 81% | 85% |
| | Aug | 67% | 79% | 80% | |
| Porto Alegre (RS Capital) | Jan | 90% | 90% | 91% | 91% |
| | Feb | 92% | 93% | 95% | 89% |
| | Jun | 86% | 83% | 98% | 96% |
| | Aug | 82% | 91% | 95% | |
| Goiania (GO Capital) | Jan | 65% | 68% | 72% | 69% |
| | Feb | 65% | 66% | 72% | 70% |
| | Jun | 61% | 63% | 71% | 75% |
| | Aug | 60% | 63% | 63% | |
| Fortaleza (CE Capital) | Jan | 80% | 82% | 79% | 80% |
| | Feb | 84% | 83% | 80% | 79% |
| | Jun | 80% | 80% | 87% | 90% |
| | Aug | 83% | 83% | 82% | |
| Source: Petroleum, Natural Gas and Biofuels National Agency (ANP). | | | | | |
| Gray Area means gasoline prices more attractive than ethanol | | | | | |

The size and composition of the Brazilian light vehicle fleet affect the opportunity for ethanol consumption depending on the ethanol/gasoline price ratio. The fleet is estimated at 37.5 million units in June 2021 and pure hydrous ethanol/flex fuel powered vehicles together represent roughly 81 percent (30.35 million units) of the total fleet.

The table below shows the licensing of flex fuel vehicles (FFV) and hydrous ethanol powered cars, as reported by the Brazilian Association of Vehicle Manufacturers (ANFAVEA). Sales of FFV represent over 95 percent of total monthly vehicle sales. The COVID-19 pandemic has sharply reduced the sales of new cars as seen in the table below.

| Licensing of Ethanol Powered Vehicles (pure ethanol & flex fuel units) | | | | | | | | |
|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|---------------|
| 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021/1 |
| 3,169,111 | 2,940,508 | 2,194,020 | 1,750,754 | 1,927,221 | 2,168,173 | 2,328,650 | 1,664,999 | 850,637 |
| Source: National Association of Vehicle Manufacturers (ANFAVEA) 1/ January-June | | | | | | | | |

Trade

Exports

ATO/Sao Paulo estimates total Brazilian ethanol exports for 2021 at 2 billion liters, a reduction of 669 million liters compared to the previous year, due to a likely lower overall supply and higher domestic market prices. South Korea became the major export destination for the Brazilian product in the first semester of 2021, surpassing the United States.

Brazilian ethanol exports reached 2.67 billion liters in 2020, the highest exported volume since 2014. Major export destinations were the United States, South Korea, and the Netherlands. The Brazilian product has been very competitive internationally due to the sharp depreciation of the Brazilian currency, the Real (*see Appendix – Exchange Rate for further information*). In addition, the COVID-19 pandemic increased ethanol demand for manufacturing health products to prevent the spread of the COVID-19 virus. The Brazilian product also took advantage of some market opportunities: the drop in the exportable surplus from Pakistan and certification issues faced by the U.S. product in South Korea.

The majority of ethanol shipped to the U.S. goes to California due to the favorable Carbon Intensity (CI) rating that Brazilian sugarcane ethanol receives under Californian Low Carbon Fuel Standard (LCFS). However, industry contacts report that California has put a temporary hold on Brazilian fuel ethanol imports until the CI classification for the Brazilian fuel is set under the program. Note that Brazilian ethanol is also frequently shipped to the Gulf Coast and converted to ethyl tertiary butyl ether (ETBE) for further shipment to Japan.

The tables below show ethanol exports (NCM 2207.10 through 2207.20.19) for 2018, 2019 and 2020 and 2021 (January through June), as reported by Trade Data Monitor based on figures provided by the Brazilian Secretariat of Foreign Trade (SECEX).

Brazilian Ethanol Exports (NCM 2207.10, 2207.20.11, 2207.2019, 000 Liters, US\$ 000 FOB)

| Country | CY 2018 | | CY 2019 | | CY 2020 | |
|---------------|---------|-----------|---------|-----------|-----------|-----------|
| | Value | Volume | Value | Volume | Value | Volume |
| United States | 511,703 | 933,179 | 626,761 | 1,211,725 | 428,629 | 994,829 |
| South Korea | 262,071 | 534,855 | 250,892 | 517,591 | 386,086 | 915,900 |
| Netherlands | 24,198 | 43,288 | 36,175 | 67,404 | 129,859 | 274,152 |
| UK | 87 | 72 | 1,346 | 2,596 | 27,921 | 58,456 |
| Turkey | - | - | 136 | 246 | 30,648 | 56,824 |
| Philippines | 3,106 | 5,945 | 6,521 | 11,937 | 23,459 | 46,289 |
| Colombia | 12,790 | 23,051 | 7,556 | 13,708 | 16,280 | 39,235 |
| Japan | 57,120 | 102,368 | 30,687 | 56,982 | 17,181 | 36,843 |
| Ghana | 1,551 | 2,381 | 5,474 | 9,405 | 20,759 | 34,851 |
| Mexico | - | - | 26 | 24 | 13,688 | 31,745 |
| Others | 21,615 | 39,365 | 32,504 | 49,259 | 97,014 | 179,848 |
| Total | 894,241 | 1,684,505 | 998,078 | 1,940,877 | 1,191,523 | 2,668,972 |

Data Source: Trade Data Monitor (TDM) based on the Brazilian Secretariat of Foreign Trade (SECEX). Note: Numbers may not add due to rounding

Brazilian Ethanol Exports (NCM 2207.10, 2207.20.11, 2207.2019, 000 Liters, US\$ 000 FOB)

| Country | CY 2019 1/ | | CY 2020 1/ | | CY 2021 1/ | |
|---------------|------------|---------|------------|---------|------------|-----------|
| | Value | Volume | Value | Volume | Value | Volume |
| South Korea | 58,911 | 126,299 | 141,857 | 290,337 | 171,346 | 382,718 |
| United States | 218,978 | 408,116 | 139,186 | 323,609 | 120,079 | 231,939 |
| China | - | - | 1 | 0 | 28,241 | 65,257 |
| India | 0 | 0 | 35 | 72 | 26,543 | 55,186 |
| Netherlands | 22,184 | 41,279 | 39,284 | 68,350 | 25,961 | 52,415 |
| Japan | 25,757 | 47,022 | 12,457 | 26,857 | 17,332 | 37,937 |
| Nigeria | 3,389 | 5,341 | 1,140 | 1,735 | 15,104 | 27,560 |
| Ghana | 506 | 794 | 1,259 | 1,910 | 16,564 | 26,239 |
| Turkey | 136 | 246 | 4,913 | 8,295 | 7,396 | 20,458 |
| Philippines | 1,559 | 2,984 | 2,310 | 5,058 | 12,469 | 19,475 |
| Others | 13,252 | 21,502 | 46,039 | 86,908 | 57,552 | 96,250 |
| Total | 344,671 | 653,582 | 388,480 | 813,130 | 498,585 | 1,015,433 |

Data Source: Trade Data Monitor (TDM) based on the Brazilian Secretariat of Foreign Trade (SECEX). Note: Numbers may not add due to rounding 1/Jan-June

Imports

ATO/Sao Paulo estimates total Brazilian ethanol imports for 2021 at 485 million liters, a reduction of 503 million liters compared to the revised figure for 2020 (988 million liters). Ethanol imports are mostly for fuel use and originate mainly from the United States, followed by Paraguay. Brazilian imports from the United States have dropped significantly in 2021 since the end of the free tariff-rate quota (TRQ) in mid-December 2020, when Brazil reestablished the 20 percent import duty on all ethanol imports, except from the Mercosul trade block, which includes Paraguay.

The U.S. ethanol import arbitrage remains closed since April 2021. According to current data from industry contacts, anhydrous ethanol imported from the U.S., including the 20 percent import tariff, could land in Pernambuco (Port of Suape), one of the major ports in the Northeast, at nearly R\$ 4.9-5.0/liter, whereas domestic transfers from other northeastern and center-western producing states such as Paraiba and Goias, respectively, are estimated at R\$ 4.2-4.3/liter. The sharp depreciation of the Real against the U.S. Dollar (*see Appendix – Exchange Rate for further information*) explains the majority of the cost increased for U.S. ethanol deliveries in Brazil. The industry estimates that imports should resume in November.

Imports from Paraguay have increased significantly since 2019. According to Post contacts, Paraguayan ethanol plants such as Inpasa started to export approximately 40 percent of their local ethanol production to Brazil, Chile, and Colombia to cope with local fuel demand issues. The Paraguayan product can be shipped either by land or by “Rio da Prata” (Prata River), reaching the Northeast ports.

The tables below show ethanol imports (NCM 2207.10 through 2207.20.19) for 2018, 2019 and 2020 and 2021 (January through June), as reported by Trade Data Monitor based on figures provided by the Brazilian Secretariat of Foreign Trade (SECEX).

| Brazilian Ethanol Imports (NCM 2207.10, 2207.20.11, 2207.2019, 000 Liters, US\$ 000 FOB) | | | | | | |
|--|----------------|------------------|----------------|------------------|----------------|----------------|
| | CY 2018 | | CY 2019 | | CY 2020 | |
| Country | Value | Volume | Value | Volume | Value | Volume |
| United States | 741,071 | 1,772,588 | 543,044 | 1,321,216 | 337,092 | 826,099 |
| Paraguay | 973 | 2,336 | 58,551 | 136,012 | 65,173 | 152,321 |
| Argentina | - | - | 60 | 63 | 3,925 | 8,183 |
| UK | 1 | 0 | 3 | 0 | 23 | 1,112 |
| Canada | 0 | 0 | 0 | 0 | 216 | 149 |
| Germany | 636 | 142 | 460 | 104 | 328 | 112 |
| Poland | 148 | 116 | 188 | 135 | 60 | 44 |
| Hong Kong | - | - | - | - | 30 | 21 |
| China | - | - | - | - | 27 | 10 |
| Spain | 15 | 3 | 14 | 2 | 14 | 2 |
| Others | 435 | 148 | 104 | 69 | 8 | 2 |
| Total | 743,281 | 1,775,333 | 602,424 | 1,457,602 | 406,896 | 988,055 |
| Data Source: Trade Data Monitor (TDM) based on the Brazilian Secretariat of Foreign Trade (SECEX). Note: Numbers may not add due to rounding | | | | | | |

| Brazilian Ethanol Imports (NCM 2207.10, 2207.20.11, 2207.2019, 000 Liters, US\$ 000 FOB) | | | | | | |
|---|-------------------|----------------|-------------------|----------------|-------------------|----------------|
| | CY 2019 1/ | | CY 2020 1/ | | CY 2021 1/ | |
| Country | Value | Volume | Value | Volume | Value | Volume |
| United States | 340,674 | 846,458 | 297,982 | 729,511 | 60,549 | 133,389 |
| Paraguay | 20,861 | 48,778 | 33,563 | 73,495 | 43,948 | 93,405 |
| Canada | - | - | 89 | 67 | 91 | 55 |
| Germany | 241 | 49 | 168 | 51 | 147 | 42 |
| Argentina | 22 | 24 | 3,899 | 8,157 | 16 | 13 |
| UK | 0 | 0 | 17 | 2 | 9 | 4 |
| France | 49 | 38 | 2 | 1 | 3 | 1 |
| Spain | 10 | 2 | 6 | 1 | 4 | 1 |
| Mexico | 0 | 0 | 2 | 0 | 6 | 1 |
| South Africa | - | - | 0 | - | 1 | 0 |
| Others | 98 | 67 | 90 | 65 | 149 | 0 |
| Total | 361,955 | 895,415 | 335,817 | 811,350 | 104,922 | 226,911 |
| Data Source: Trade Data Monitor (TDM) based on the Brazilian Secretariat of Foreign Trade (SECEX). Note: Numbers may not add due to rounding 1/Jan-June | | | | | | |

IV. Biodiesel

Brazilian Biodiesel Production, Supply and Demand (PS&D) Table

The table below shows Brazil's biodiesel supply and demand (PS&D) table for calendar years 2012 through 2021.

| Biodiesel (Million Liters) | | | | | | | | | | |
|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Calendar Year | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 f |
| Beginning Stocks | 132 | 137 | 105 | 85 | 89 | 90 | 99 | 111 | 112 | 113 |
| Production | 2,800 | 2,935 | 3,430 | 4,020 | 3,801 | 4,310 | 5,410 | 5,925 | 6,500 | 6,900 |
| Imports | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Exports | 0 | 39 | 40 | 12 | 0 | 0 | 0 | 0 | 4 | 0 |
| Consumption | 2,795 | 2,928 | 3,410 | 4,004 | 3,800 | 4,301 | 5,398 | 5,924 | 6,496 | 6,888 |
| Ending Stocks | 137 | 105 | 85 | 89 | 90 | 99 | 111 | 112 | 113 | 126 |
| Production Capacity (Million Liters) | | | | | | | | | | |
| Number of Biorefineries | 65 | 64 | 58 | 57 | 51 | 51 | 51 | 51 | 51 | 50 |
| Nameplate Capacity | 7,400 | 7,900 | 7,722 | 7,860 | 7,191 | 8,140 | 8,500 | 8,500 | 9,792 | 11,190 |
| Capacity Use (%) | 37.8% | 37.2% | 44.4% | 51.1% | 52.9% | 52.9% | 63.6% | 69.7% | 66.4% | 61.7% |
| Feedstock Use (1,000 MT) | | | | | | | | | | |
| Soyoil, crude | 1,947 | 2,015 | 2,369 | 2,807 | 2,703 | 2,774 | 3,363 | 3,638 | 4,159 | 4,650 |
| Animal Fat | 452 | 557 | 651 | 723 | 594 | 695 | 834 | 799 | 718 | 794 |
| Market Penetration (Million Liters) | | | | | | | | | | |
| Biodiesel, on-road use | 2,029 | 2,125 | 2,458 | 2,927 | 2,759 | 3,122 | 3,918 | 4,300 | 4,715 | 5,001 |
| Diesel Pool-on-road use 1/ | 40,578 | 42,518 | 43,283 | 41,813 | 39,402 | 39,759 | 40,381 | 41,593 | 41,719 | 43,471 |
| Blend Rate (%) | 5.0% | 5.0% | 5.7% | 7.0% | 7.0% | 7.9% | 9.7% | 10.3% | 11.3% | 11.5% |
| Diesel Pool, total 1/ | 55,900 | 58,572 | 60,032 | 57,211 | 54,279 | 54,772 | 55,629 | 57,298 | 57,472 | 59,886 |

Source: ATO/Sao Paulo based on ANP and SECEX. Note 1/ Fuel pools are defined as fossil fuels plus all "bio-components" (biofuels) blended with fossil diesel. f/ forecast

Production

Brazil one of the world's largest producers and consumers of biodiesel, but unlike other major markets in Europe and the United States, Brazil has yet to commercialize renewable diesel, more specifically hydrogenation-derived renewable diesel (HDRD), the only type of renewable diesel commercially available at scale.

Feedstock

Biodiesel is a transesterified vegetable oil, also known as Fatty Acid Methyl Ester (FAME), produced from plant and animal oils and fats. According to updated information reported by the Petroleum, Natural Gas and Biofuels National Agency (ANP), about 75 percent of biodiesel produced is made from soybean oil and 6.5 percent is made from animal fat (tallow). In addition, 12 percent of the production is generated from other fatty materials such as different raw materials blended in tanks and co-products from biodiesel production. The remaining feedstock is palm oil (2 percent), cooking oil (1.4 percent), cottonseed oil (1.7 percent) and others.

Biodiesel production remains tightly regulated by the government. Total Brazilian biodiesel production in 2021 is estimated at 6.9 billion liters, increasing 400 million liters compared to the previous year (6.5 billion liters). Despite the relevant projected growth in diesel consumption for 2021, ANP has been reducing the mandatory blend since 2020 to cope with the escalated prices of soybeans, major biodiesel feedstock (*Refer to Section IV: Biodiesel Consumption for further reference*). According to ANP, cumulative January through June 2021 production is approximately 3.35 billion liters. Biodiesel production by month, as reported by ANP is shown below. Biodiesel production by month as reported by ANP is shown below.

| Brazilian Biodiesel Monthly Production/Deliveries (000 liters) | | | | | |
|---|-------------|-------------|-------------|-------------|-------------|
| Month | 2017 | 2018 | 2019 | 2020 | 2021 |
| January | 255,361 | 337,256 | 446,508 | 467,596 | 503,815 |
| February | 259,812 | 338,321 | 415,249 | 483,199 | 524,921 |
| March | 335,069 | 455,039 | 462,134 | 550,298 | 639,984 |
| April | 347,603 | 448,706 | 464,902 | 439,527 | 628,338 |
| May | 369,316 | 382,497 | 448,352 | 481,494 | 537,880 |
| June | 359,236 | 466,892 | 461,613 | 533,311 | 512,775 |
| July | 387,236 | 489,079 | 495,344 | 602,029 | -- |
| August | 399,997 | 485,843 | 503,146 | 623,118 | -- |
| September | 398,707 | 479,745 | 558,226 | 594,002 | -- |
| October | 409,344 | 500,376 | 583,725 | 587,708 | -- |
| November | 386,930 | 479,105 | 539,820 | 554,071 | -- |
| December | 381,228 | 473,671 | 523,443 | 515,656 | -- |
| Total | 4,289,840 | 5,336,529 | 5,902,461 | 6,432,008 | 3,347,714 |

Source: ANP.

Brazil currently has 50 plants authorized to produce biodiesel. The map below shows the location of the biodiesel plants in the country. Note that over 50 percent of the plants are located in the Center-West region, with an abundant soybean supply. According to ANP, the authorized industrial capacity for 2021 is estimated at 31.092 million liters of biodiesel per day or 11.19 billion liters per year, based on a 360-day operational cycle, increasing 14 percent compared to the estimated industrial capacity for 2020 (9.79 billion liters). This represents approximately 1.6 times the mandatory biodiesel production to be blended in mineral diesel in 2021.

Distribution of Biodiesel Plants in Brazil



Source: ANP

Market Prices

The biodiesel market remains regulated by the government through a public auction system which sets the volume of biodiesel that should be produced and delivered to fuel distributors in a particular period of the year as well as the average sales price. The auction system gives preference to producers with the Social Fuel Stamp (SFS). The SFS provides incentives for more impoverished farmers (family farmers) in disadvantaged areas.

The new market model set by CNPE to be regulated by ANP should change the market dynamics and provide more flexibility, given that it will allow biodiesel producers and distributors to settle over-the-counter (OTC) contracts (*Refer to Section II: Policy and Programs - A New Model for the Biodiesel Market for further reference*). The tables below update the results of the 75th through the 80th auctions from Aug 2020 to June 2021, as published by ANP.

| Biodiesel Auctions | | | | |
|--|------------------|------------------|------------------|------------------|
| Auction | 75th Auction | 75th Auction C/ | 76th Auction | 77th Auction |
| Date | Aug-2020 | Sep-2020 | Oct-2020 | Dec-2020 |
| Number of Suppliers | 42 | 5 | 41 | 43 |
| Offered Quantity (000 Liters) | 1,189,020 | 9,500 | 1,208,200 | 1,410,300 |
| Purchased Quantity (000 Liters) | 1,189,020 | 8,500 | 1,105,300 | 1,176,958 |
| Opening/Reference Price (R\$/000 Liters) 1/ | 4,180.00 | 4,144.00 | 5,748.00 | 5,912.00 |
| Average Price (R\$/000 Liters) 2 / | 5,043.00 | 5,723.00 | 5,552.00 | 4,425.00 |
| Delivery Date | Sep- Oct/2020 | Sep- Oct/2020 | Nov- Dec/2020 | Jan- Feb/2021 |
| Source: ANP. 1/ Weighted Average Reference prices (all producing regions). 2/ Price FOB, including PIS/PASEP and COFINS, excluding ICMS, including Petrobras margin. C/ Additional Auction | | | | |

| Biodiesel Auctions | | | | |
|---|------------------|------------------|------------------|------------------|
| Auction | 78th Auction | 79th Auction | 80th Auction | 81th Auction |
| Date | Feb-2021 | Apr-2021 | Jun-2021 | Aug-2021 |
| Number of Suppliers | 43 | 45 | 43 | --- |
| Offered Quantity (000 Liters) | 1,503,480 | 1,501,700 | 1,457,780 | --- |
| Purchased Quantity (000 Liters) | 1,305,680 | 1,050,349 | 1,102,242 | --- |
| Opening/Reference Price (R\$/000 Liters) 1/ | 5,939.00 | 7,529.00 | 7,907.00 | --- |
| Average Price (R\$/000 Liters) 2 / | 4,708.00 | 5,536.00 | 5,485.00 | --- |
| Delivery Date | Mar- Apr/2021 | May- Jun/2021 | Jul- Aug/2021 | Sep- Oct/2021 |
| Source: ANP. 1/ Weighted Average Reference prices (all producing regions). 2/ Price FOB, including PIS/PASEP and COFINS, excluding ICMS, including Petrobras margin. | | | | |

The public auction system determines biodiesel prices received by producers (see Average Price in the tables above). The government sets the reference price for different Brazilian regions and biodiesel producers bid for the lowest price. Producers are not allowed to change the sales price set at the auctions and consequently must search for low-cost raw material and hedge their activities to offset risk.

Raw materials represent approximately 75 to 80 percent of the biodiesel production cost, whereas other inputs such as methanol and additives represent 10 percent of the total cost. Soybeans prices, which represent over 70 percent of feedstock used for biodiesel production, have escalated in 2020 and 2021 due to steady demand for the product, mainly China, imbalances between world supply and demand, and the strong devaluation of the Brazilian currency, the real.

The tables below show the price for soybean oil in 2020 and 2021 (January through June). Note that the average crude price in the state of Sao Paulo almost doubled from June 2020 (US\$621 per ton) to June 2021 (US\$1,260 per ton). This has strongly affected the price of biodiesel set by the auctions. Indeed, prices more than doubled from R\$2,713 per metric ton in April 2020 (72nd Auction) to R\$5,485 per metric ton in June 2021 (80th Auction).

| Soybean Oil, Crude - Prices (2020) | | | | | | |
|--|-----|-----|-----|-----|-----|-----|
| Location | Jan | Feb | Mar | Apr | May | Jun |
| Chicago (US\$/ton) | 732 | 669 | 602 | 580 | 588 | 617 |
| Premium (US\$/ton) | 44 | 52 | 11 | 11 | 3 | 45 |
| Port of Paranaguá - Fob (US\$/ton) | 776 | 722 | 613 | 591 | 591 | 662 |
| São Paulo - (US\$/ton com ICMS 12%) | 757 | 700 | 578 | 580 | 615 | 621 |
| Elaborated by ABIOVE based on several sources. | | | | | | |

| Soybean Oil, Crude - Prices (2020) | | | | | | |
|--|-----|-----|-----|-----|-----|-----|
| Location | Jul | Aug | Sep | Oct | Nov | Dec |
| Chicago (US\$/ton) | 641 | 698 | 738 | 736 | 817 | 872 |
| Premium (US\$/ton) | 79 | 79 | 115 | 154 | 148 | 74 |
| Port of Paranaguá - Fob (US\$/ton) | 720 | 777 | 853 | 890 | 965 | 946 |
| São Paulo - (US\$/ton com ICMS 12%) | 735 | 778 | 821 | 867 | 981 | 934 |
| Elaborated by ABIOVE based on several sources. | | | | | | |

| Soybean Oil, Crude - Prices (2021) | | | | | | |
|--|-----|-------|-------|-------|-------|-------|
| Location | Jan | Feb | Mar | Apr | May | Jun |
| Chicago (US\$/ton) | 944 | 1,019 | 1,183 | 1,292 | 1,457 | 1,461 |
| Premium (US\$/ton) | 45 | 29 | 10 | -22 | -118 | -237 |
| Port of Paranaguá - Fob (US\$/ton) | 989 | 1,048 | 1,193 | 1,270 | 1,340 | 1,223 |
| São Paulo - (US\$/ton com ICMS 12%) | 976 | 1,041 | 1,178 | 1,257 | 1,354 | 1,260 |
| Elaborated by ABIOVE based on several sources. | | | | | | |

Consumption

Biodiesel domestic consumption in Brazil remains regulated by the government and is a function of two variables: 1) the mandatory biodiesel blend rate and 2) overall diesel consumption. Diverging from CNPE's Resolution #16, from 2018 which recommends the annual increase of the biodiesel blend by one percent from B11 in 2019 to B15 by March 2023, ANP has adjusting the biodiesel blend below recommended levels since 2020., in an attempt to control the high cost of biodiesel stocks, mostly

soybeans (Refer to Section II – Policy and Programs: Biodiesel Blend Mandate and Section IV – Biodiesel: Market Prices for further information).

On the other hand, despite the COVID-19 pandemic and the resulting overall slowdown of the Brazilian economy, the diesel demand has remained steady and even expected to see growth in 2021. The table below shows ANP diesel consumption figures up to 2021 (January through June).

| Brazilian Diesel Consumption Matrix (million Liters) | | | | | | |
|---|-------------|-------------|-------------|-------------|-------------|----------------|
| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 1/ |
| Diesel * | 54,279 | 54,772 | 55,629 | 57,298 | 57,472 | 29,682 |
| Source: ANP. * Diesel includes Bx Biodiesel as of 2008. 2021 1/ refers to January-June. | | | | | | |

Consumption has been leveraged by the intensive use of diesel in the agricultural sector, which remains strong and is expected to yield a record crop of 260.8 million tons of grains for 2020/21, vis-à-vis 257 million tons during the previous season. Diesel demand is also supported by the transportation of agricultural products and manufactured goods. Note that the pandemic has changed consumer buying habits with the increase of e-commerce trade, online shopping and home delivery. As a consequence, the diesel pool grew slightly year-over-year in 2020 and MME/Energy Research Enterprise (EPE) forecasts a 4.2 percent growth in diesel consumption for 2021.

ATO/Sao Paulo forecasts biodiesel consumption for 2021 at 6.89 billion liters, an increase of six percent relative to 2020 (6.5 billion liters), based on the several biodiesel blends set by ANP for 2021 and the projected diesel consumption of 59.89 billion liters relative to 57.47 billion liters in 2020.

Trade

Brazil's biodiesel exports remain virtually zero because it is not cost-competitive. Biodiesel imports are nearly zero as well. The National Biodiesel Production Program (PNPB) created in 2004 requires that only domestically produced biodiesel be eligible to participate in the auction system. The new market model set by CNPE to be regulated by ANP might change the market dynamics making imports more competitive (Refer to Section II: Policy and Programs - Biodiesel and Biodiesel Feedstock Import Policy for further reference). The tables below show biodiesel exports and imports as reported by Trade Data Monitor (TDM) based on the Brazilian Secretariat of Foreign Trade (SECEX).

| Brazilian Biodiesel Exports by Country of Destination (000 Liters, US\$ 000 FOB) | | | | | | | | |
|--|-----------------|--------------|-----------------|--------------|---------------------|--------------|---------------------|--------------|
| | CY 2019 | | CY 2020 | | YTD 2020 / 1 | | YTD 2021 / 1 | |
| Country | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value |
| USA | 293 | 517 | -- | -- | -- | -- | -- | -- |
| Israel | 38 | 48 | 151 | 179 | 78 | 90 | -- | -- |
| Belgium | -- | -- | 3,586 | 2,995 | 3,586 | 2,995 | -- | -- |
| Total | 332 | 566 | 3,737 | 3,174 | 3,661 | 3,084 | -- | -- |
| Source: Trade Data Monitor (TDM) based on the Brazilian Secretariat of Foreign Trade (SECEX) Note NCM: 3826.00.00 / 1/ Year to Date - Jan-June | | | | | | | | |

| Brazilian Biodiesel Imports by Country of Origin (000 Liters, US\$ 000 FOB) | | | | | | | | |
|--|-----------------|--------------|-----------------|--------------|---------------------|--------------|---------------------|--------------|
| | CY 2019 | | CY 2020 | | YTD 2020 / 1 | | YTD 2021 / 1 | |
| Country | Quantity | Value | Quantity | Value | Quantity | Value | Quantity | Value |
| Belgium | 10 | 15 | 10 | 16 | - | - | 10 | 16 |
| Germany | 2 | 1 | 3 | 2 | 3 | 2 | - | 1 |
| France | - | - | 702 | 6 | 2 | 4 | 1,050 | 4 |
| Total | 12 | 16 | 715 | 23 | 5 | 6 | 1,060 | 21 |

Source: Trade Data Monitor (TDM) based on the Brazilian Secretariat of Foreign Trade (SECEX) Note NCM: 3826.00.00 / 1/ Year to Date - Jan-June

Trade under NCM 2710.20 remains insignificant. In 2020, Brazil exported only 4.8 metric tons of biodiesel, down 2.5 mt from 2019 (7.35 mt). Imports for 2020 were 7.05 metric tons (mt), a decrease of 7.05 mt compared to 2019 (14.1 mt). Given that petroleum oils may contain biodiesel up to and including 30 percent by volume, ATO/Sao Paulo considers an average of 15 percent of biodiesel included under NCM 2710.20. It is assumed all trade occurring under 3826.00 is pure biodiesel (B100).

V. Advanced Biofuels

No significant changes have been made to the current status of advanced biofuels research, development, and production in Brazil. Please refer to [“Brazilian Biofuels Annual Gain Report 2020”](#) for additional information.

Total cellulosic ethanol production is still an insignificant fraction of total ethanol production in Brazil. There are currently two commercial scale and one demonstration cellulosic ethanol (second-generation ethanol - E2G) plants in Brazil: (1) Bioflex in the state of Alagoas from Granbio (updated production capacity at 30 million liters); (2) Raízen – Costa Pinto Unit in the state of Sao Paulo (42.2 million liter production capacity); and (3) Centro de Tecnologia Canavieira (CTC) demonstration plant in the state of Sao Paulo (3 million liters production capacity). Advanced ethanol production capacity from cellulosic ethanol is currently estimated at 75 million liters.

CTC has not produced any cellulosic ethanol and later in 2020, the company offered to the market the sale of its demonstration plant. On the other hand, in June 2021, Raízen, announced that the company will invest in the construction of a second cellulosic ethanol plant in Brazil with the capacity to produce 82 million liters of second-generation ethanol per year. The new facility will be integrated with the Bonfim sugar-ethanol unit in the state of São Paulo state, which also produces biogas. The new E2G plant is expected to start operations in 2023 and should have almost double Raízen’s E2G plant capacity at the Costa Pinto plant in Piracicaba.

Hydrogenation-derived Renewable Diesel (HDRD) production and commercialization in the Brazilian market has been recently regulated by ANP. (Refer to Section II: Policy and Programs - Government Support for Advanced Biofuels for further reference).

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 historical average use of bioethanol for fuel/other uses. On average, ethanol for fuel has represented 87 percent of the total ethanol disappearance (use).

ATO/Sao Paulo historically reported all figures related to the sugar-ethanol industry in marketing years and made necessary adjustments to convert from marketing to calendar years. The official Brazil marketing year for sugarcane, sugar, and ethanol production as determined by the Brazilian Government is April through March for the center-south producing states. The official marketing year for the north-northeast region is September through August.

Ethanol production estimates for Fuel and Other Industrial Chemicals are provided by MAPA. Given that all Brazilian official publications and industry sources report production in hydrous/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).

Trade figures were based on the Brazilian Secretariat of Foreign Trade (SECEX). SECEX breaks down trade numbers in four categories as described below:

- 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 figures for ethanol exports for fuel and/or other uses. Post estimated ethanol “for fuel” based on industry sources.

Domestic consumption figures were taken from information provided by Datagro, the National Agency for Petroleum, Natural Gas and Biofuels (ANP), the Sugarcane Industry Union (UNICA) and other Post contact information.

The number of biorefineries is taken from MAPA and UNICA up to 2013. As of 2014, ANP started to report the total number of units. UNEM has provided the figures for corn-based ethanol plants.

Ethanol production capacity was based on production figures as reported by UNICA up to 2013. Using UNICA's source material, Post took the highest ethanol production figure in a given 15-day period, as reported by the institution, and extrapolated it to the entire center-south crushing season. A similar procedure was performed for northeast production based on MAPA reports. As of 2014, ANP became the source, with no adjustments needed. ANP provides the daily industrial capacity for hydrated ethanol production and ATO/Sao Paulo multiplies it by 185 through 240 days, depending on the estimate for the sugarcane crushing period in a given year.

Sugarcane crushed for ethanol production was calculated based on the actual production breakdown for sugar/ethanol as described in previous GAIN reports. 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
- 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

Biodiesel

Historical production numbers are based on figures reported by ANP and forecasts are based on projections for diesel consumption and the results from the public auctions. Consumption figures are based on mineral 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 and production capacity are based on ANP reports. Feedstock use data are consistent with biodiesel production figures and based on the following conversion rates:

- 1 metric ton of soy oil, crude = 1,113 liters of biodiesel
- 1 metric ton of animal fat/grease = 1,043 liters of biodiesel

- 1 metric ton of biodiesel = 1,143 liters of biodiesel

APPENDIX

Brazil's Geographic Division

The map below shows Brazil's division by regions and states.



Exchange Rate

| Exchange Rate (R\$/US\$1.00 - official rate, last day of period) | | | | | | | |
|--|------|------|------|------|------|------|------|
| Month | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
| January | 2.66 | 4.04 | 3.13 | 3.16 | 3.65 | 4.25 | 5.48 |
| February | 2.88 | 3.98 | 3.10 | 3.24 | 3.74 | 4.50 | 5.53 |
| March | 3.21 | 3.56 | 3.17 | 3.32 | 3.90 | 5.20 | 5.70 |
| April | 2.98 | 3.45 | 3.20 | 3.48 | 3.94 | 5.43 | 5.40 |
| May | 3.18 | 3.60 | 3.26 | 3.74 | 3.94 | 5.43 | 5.23 |
| June | 3.10 | 3.21 | 3.30 | 3.86 | 3.83 | 5.48 | 5.00 |
| July | 3.39 | 3.24 | 3.13 | 3.75 | 3.76 | 5.20 | 5.12 |
| August 1/ | 3.65 | 3.24 | 3.15 | 4.14 | 4.14 | 5.47 | 5.15 |
| September | 3.98 | 3.25 | 3.17 | 4.00 | 4.16 | 5.64 | |
| October | 3.86 | 3.18 | 3.27 | 3.72 | 4.00 | 5.77 | |
| November | 3.85 | 3.40 | 3.26 | 3.86 | 4.22 | 5.33 | |
| December | 3.90 | 3.47 | 3.31 | 3.87 | 4.03 | 5.20 | |

Source: Brazilian Central Bank (BACEN). 1/August 2021 refers to August 5.

Attachments:

No Attachments