

Required Report: Required - Public Distribution

Date: August 29, 2024

Report Number: CH2024-0100

Report Name: Biofuels Annual

Country: China - People's Republic of

Post: Beijing

Report Category: Biofuels

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Report Highlights:

The People's Republic of PRC (PRC) bio-based diesel (BBD) exports are expected to drop following the EU provisional antidumping duties of up to 36.4 percent on biodiesel and hydrogenation-derived renewable diesel (HDRD), though sustainable aviation fuel will provisionally be excluded from further duties. The PRC adopted a series of new policies to promote domestic biodiesel and HDRD consumption. At the same time, ethanol production and demand are forecast to increase by 17 percent on low feedstock/corn prices while capacity remains unchanged.

I. Executive Summary

The People's Republic of PRC's (PRC) fuel ethanol program primarily functions as a surplus corn management strategy, with limited emphasis on environmental benefits or rural income support. Despite ambitions for nationwide ethanol blending, such as the E10 mandate, implementation has been inconsistent and limited. The program faces challenges due to fluctuating corn prices, weak enforcement of blending mandates, and shifting government priorities towards renewable electricity and electric vehicles. Biodiesel production, particularly export-oriented hydrogenation-derived renewable diesel (HDRD), has seen some growth, but the domestic market remains underdeveloped. Recent policy adjustments aim to boost local biodiesel consumption, but significant increases are not expected until later years. Further, while improved air quality and the potential for climate change mitigation remain beneficial attributes of any biofuels program, these goals remain secondary considerations for the PRC. These goals are mainly accomplished through other means, mostly importantly in recent years through renewable electricity and development of the world's largest electric vehicles market. Biofuels can also support rural incomes but given the PRC's history of low national average blending for biofuels, this goal is clearly also not been set as a primary one for biofuels.

In 2024, low corn prices improved the profitability of domestic corn-based ethanol producers. Gasoline prices are lower than they were a year ago, boosting demand for ethanol-blended gasoline. At the same time, weak enforcement of the PRC's E10 blending mandate continues to dampen any import incentive. Imports only occur when the PRC actively supports ethanol imports. Over the past year, the PRC did not enact any significant new policies or provide support for the ethanol industry, further indicating a shift in government priorities from fuel ethanol development.

The story for renewable diesel is different. The export-oriented industry emerged in 2017 and has remained almost entirely export-focused thanks to policy incentives and product demand in Europe. Historically, PRC has had no national program for biodiesel due to the lack of a national-level mandate or financial support. Limited local use of biodiesel persists, and periodically palm-oil based biodiesel imports surge, responding to discretionary blending demand when palm oil biodiesel prices fall below fossil diesel prices. Recently, the PRC introduced policy support for biomass-based diesel (BBD), a term encompassing biodiesel and renewable diesel, has emerged allowing some market growth. The type of renewable diesel produced is HDRD, along with hydroprocessed esters and fatty acids (HEFA)-type SAF (sustainable aviation fuel) which is made with the same vegetable oils and animal fats. The relatively new HDRD industry remains export-oriented, with small volumes consumed domestically.

In late 2020, President Xi committed internationally to peak carbon dioxide emissions by 2030, but biofuels were noticeably absent as a directive or tool to meet these targets. There are rumors that the PRC may unofficially shift to an E5 mandate in the coming years, but the government insists E10 remains in force. While E10 remains the official policy, actual blend rates vary, and the national average blend rate has remained limited, ranging between 2 to 3 percent for more than two decades, with no upward momentum. However, the rapid growth of PRC's gasoline

market 15 years ago made it the world’s fastest growing market in absolute terms, so maintaining the blend rate, though modest, can be seen as an accomplishment when compared to other large fuel markets with ethanol programs.

Some provinces have implemented E10 programs and offered financial support, particularly those with feedstock surpluses to sustain the program. However, most provinces fall short of meeting these goals consistently. Most provinces lack a mandate program and are unlikely to establish one without surplus grain feedstock to support a local industry. The ethanol industry primarily uses corn, but industry also utilizes rice, wheat and cassava. Despite subsidies introduced in 2014 to support advanced cellulosic ethanol, industry has made little progress. Ethanol produced using microbe-converted industrial gases (flue-gas) remains limited to a single enterprise with very limited volume.

In 2017, the PRC declared that it would establish a nationwide E10 mandate by 2020, but this goal was never realistically achievable. The goal was unofficially suspended in late 2020, and ethanol blend rates in pilot areas have since declined. High corn prices pushed up the cost of fuel ethanol production while ethanol price gains were held in check using a formula tied to gasoline prices. As a result, provinces and cities that had announced E10 expansion plans in 2019 were forced to scale back implementation. The PRC has reportedly delegated E10 blending goals and decision-making authority to provincial governments, while requiring existing E10 pilot areas to continue to blend at E10 levels.

Fuel ethanol consumption in 2024 is estimated at 4.9 billion liters, up from 2023 as demand has recovered after the end of the “Zero Covid” policy. Fuel ethanol demand is expected to increase in the second half of 2024 in line with the recovery of the gasoline pool. Government agencies in charge of E10 increased their attention on localities with existing E10 pilots to ensure full compliance with blending mandates. As a result, pilot areas that were not strictly following mandates have increased actual blending, especially during the Covid-19 pandemic, although the pilot areas have remained unchanged. The PRC’s 2024 fuel ethanol production is forecast to increase to 4.9 billion liters due to improved profitability, as corn prices have slumped to a three-year low in early 2024. With international fuel ethanol prices high early in the year, the PRC will rely on domestic production to meet market demand in 2024.

The export of used cooking oil (UCO)-based biodiesel and HDRD slowed down in the first half of 2024. Following the announcement of the European Union’s (EU)’s anti-dumping duties, PRC’s BBD production¹ for exports to the EU will face further challenges. Fatty acid methyl esters (FAME) biodiesel producers maintain a relatively stable production capacity of around four billion liters per year. Export-oriented HDRD plants have expanded significantly in the last three years, with an expected combined capacity of 2.5 billion liters by the end of 2024 and an

¹ Exact trade figures for biodiesel vs HDRD remain uncertain ever since the PRC began producing HDRD (mainly for export) beginning in 2017. The BBD balance (Table 6) assumes HDRD is exported under biodiesel code 3826.00 and not under code 2710.19 used by the EU, US and Canada. Due to the uncertainty in trade codes used for HDRD, it is possible some of the product traded under the biodiesel code in chapter 38 is HDRD that should, when correctly categorized by chemical makeup, be reported under Chapter 27, code 2710.19. This would be consistent with treatment by US, Canadian, and European customs authorities. The accurate tracking of HDRD will be investigated in future publications.

additional three billion liters per year capacity planned. BBD production in 2024 is forecast at close to three billion liters, down 12 percent from 2023 due to anticipated export challenges. The PRC's 2024 BBD consumption is estimated at 900 million liters – 830 million liters of biodiesel and 70 million liters of HDRD – 20 percent higher than 2023. This increase follows the PRC's adoption of new policies to promote domestic biodiesel and HDRD consumption. The PRC domestic industry views these projects as a means to develop the domestic BBD industry and enhance market confidence, especially following the escalation of the EU-PRC BBD trade dispute. Industry projects the PRC's domestic BBD consumption will start in the shipping/maritime industry, but overall consumption increases will not be noteworthy until 2026.

Once the central government mandates the SAF use on airplanes to cut emissions, PRC biofuel firms are also pouring more than \$1 billion into building the PRC's first plants to turn UCO into aviation fuel for export and to meet domestic demand. In the near term, industry expects authorities may unveil pilot airports in cities such as Beijing, Shanghai, Chengdu, and Zhengzhou for initial SAF adoption of 2-5 percent.

II. Policy and Programs

General Policies

In May 2022, the National Development and Reform Commission (NDRC) issued the "14th Five-Year Plan for Bioeconomic Development," which established a national biotechnology framework to boost the bio-economy over the next five years. This plan calls on stakeholders to:

- Actively develop bioenergy, promote the development of biofuels, and support the integrated development of the biochemical industry.
- Establish biomass combustion and blending standards.
- Accelerate the key technology development and equipment manufacturing regarding bio-natural gas, cellulosic ethanol and algae-based biofuels.
- Actively promote the replacement, promotion and usage of advanced biofuels in municipal operation, transportation and other important areas.
- Promote the transformation of fossil energy to green, low-carbon and renewable energy.
- Implement demonstrations of cellulosic ethanol, biodiesel, and biogas industries pilots in urban and rural areas where organic waste is concentrated.
- Enhance important links such as biomass raw material collection, organic fertilizer production and use, and increase the scale of biofuel production.
- Launch pilot projects for the promotion of biodiesel in suitable areas and demonstrate and apply bio jet fuel.

In May 2022, the NDRC led nine ministries to publish the "[14th Five-Year-Plan for Renewable Energy](#)" (See [GAIN Report CH2022-0065](#)). This plan advocates for the development of non-grain biofuel ethanol, such as cellulosic biofuel – though this has been a long-standing announced goal that has led to no large-scale commercial industry. It encourages demonstration pilots of alcohol, electricity, gas, and fertilizer production. This plan also encourages promotion of clean liquid fuels such as fuel ethanol and biodiesel, although this is more of a reiteration of previous statements rather than a new initiative. Additionally, this plan supports research and development and the promotion of advanced technology and equipment in biodiesel and jet fuel.

However, no detailed implementation measures or policies were announced following the release of the two plans.

Renewable Energy and Greenhouse Gas (GHG) Emissions

At the Climate Ambition Summit in December 2020, President Xi committed the PRC to reducing its carbon dioxide emissions per unit of GDP by over 65 percent from its 2005 level. He also pledged to increase the share of non-fossil fuels in primary energy consumption to 25 percent by 2030, aligning with the goal of peak carbon dioxide emissions by 2030.

On May 23, 2024, the State Council unveiled a new [Action Plan for Energy Conservation and Carbon Emissions Reduction](#) (*link in Chinese*) spanning from 2024 to 2025. This initiative aims to reinforce energy conservation and carbon emissions reduction objectives, particularly as the PRC approaches the final stretch of the 14th Five-Year Plan period (2021 to 2025). The conclusion of this period also signifies the midpoint toward the PRC's first climate goal of achieving peak carbon emissions by 2030. The headline target is for the proportion of non-fossil fuel power generation to reach about 39 percent by the end of 2025. By the end of 2022, PRC's proportion of non-fossil energy power generation reached 36.2 percent. The Action Plan calls for increasing non-fossil fuel energy consumption and promotes the use of advanced bio-liquid fuels and sustainable aviation fuels.

The PRC launched an emissions trading system (ETS) on July 16, 2021. Carbon emissions by companies covered in the first batch of trading are estimated to exceed four billion tons per year, or roughly 12 percent of global CO₂ emissions, making it the world's largest market in terms of the amount of greenhouse gas emissions due to heavy use of coal. The first compliance period of the national ETS ended on December 31, 2021, after 114 trading days. During this period, a cumulative trading volume of 179 million tons of carbon allowances and a cumulative turnover of \$1.1 billion (RMB 7.7 billion) were achieved. The second compliance period concluded at the end of 2023. The national ETS has traded a total of 442 million metric tons of carbon emission quota, worth \$3.5 billion (RMB 25 billion). Biofuels could benefit from the carbon trading system as a carbon emission reducer if the PRC Certified Emission Reductions (CCER) approves biofuels for carbon trade. This approval would add value to biofuels in the carbon market, support biofuel producers, and make the use of biofuel-blended gasoline more economical than traditional gasoline.

For information on the PRC's CO₂ and energy intensity reduction goals as well as the Energy Development Strategy Action Plan published in November 2015, the [Blue Sky Protection Plan](#) (*link in Chinese*) issued in July 2018, and PRC's Vehicle Emissions Standards, please see the [2021](#) and [2020 Annual Biofuels Reports](#).

The PRC's biofuels policy has never, nor does it today, set minimum environmental sustainability performance criteria related to water, soil, or air. Most importantly, regarding biofuels' role as a climate change mitigation tool, there are no maximum boundaries set on biofuel GHG emissions (gCO₂e/MJ) nor any certification requirements. Also, the PRC does not permit foreign authorities' on-site access to certify biofuels shipped to them. In the absence of such policy and requirements, the PRC fails to deliver incentives for GHG emissions reductions

in existing commercialized fuels, unlike U.S. West Coast states (and U.S. federal tax credit policy starting in 2025), Brazil, European countries, and now Canada. While all biofuels production could be incentivized to lower emissions, the PRC do not take full advantage of the potential that biofuels can deliver to mitigate climate change impacts.

There are also ongoing widespread concerns about the risk of mislabeled traded product, due to EU, UK, and U.S. policies that favor biofuel feedstocks and biofuels with lower carbon intensity values. For example, EU and U.S. imports of product from the PRC labeled as UCO may contain palm oil. Similarly, EU imports of BBD from the PRC certified as “UCO-based” may be wholly or partly made from palm oil.

Fuel Ethanol Policy Framework and Mandates

PRC law restricts fuel ethanol processing to licensed facilities that produce and supply fuel ethanol to national refiners and fuel marketing companies. Provincial Development and Reform Commissions (DRCs) are responsible for the distribution of licenses for fuel production, refining, and marketing. (See Section III. Ethanol Production).

The PRC is a top Methyl Tertiary Butyl Ether (MTBE) producer and consumer globally since 2013. The PRC’s MTBE production capacity is estimated at 25 billion liters. MTBE is considered as an important high-octane component in gasoline in the PRC, with an average blending rate of 8 percent in the PRC’s gasoline when used.

In February 2022, the State Council released its annual policy guidelines on agriculture and rural development known as the “[Number 1 Document](#),” which instructed officials to “strictly control the corn-based fuel ethanol processing industry.” (See also [GAIN Report CH2023-0026](#) and [CH2022-0029](#).) This likely indicates that corn-based ethanol production will remain at current capacity for the foreseeable future. Ethanol was not mentioned in the 2023 and 2024 Number 1 Document, an omission which again seems to indicate that it is no longer a priority issue.

On May 10, 2022, NDRC and Ministry of Commerce (MOFCOM) jointly released the 2022 Catalogue of Encouraged Foreign Investment in Industries, which includes fuel ethanol development and production. However, the catalogue specifically discourages foreign investment in grain-based ethanol production. This is a further signal that investments in expanding PRC’s corn (or other grain) based ethanol production capacity are unlikely in the short to near term.

In 2017, PRC government messaging called for the moderate development of grain-based fuel ethanol and an E10 mandate. However, by 2020, the focus had shifted to the “strict control of the expansion of fuel ethanol processing capacity.” This shift is reminiscent of 2008 when PRC, facing reduced surpluses and high corn prices following a phase of corn ethanol expansion, restricted the construction of new ethanol facilities. In 2022, the messaging was repeated, emphasizing the need to “strictly control the corn-based fuel ethanol processing industry.” This shift from 2017 to 2020, and its reinforcement in 2022, illustrates the gradual transition away from the original first-ever push for E10 nationwide. That said, the PRC will maintain E10 mandates in provinces and municipalities that have fully or partially adopted E10, while quietly

postponing (and likely eventually dropping altogether) any expansions of nationwide E10. Meanwhile, the PRC’s gasoline pool, which includes bioethanol, biomethanol, and Ethyl Tert-Butyl Ether (ETBE), is estimated at 213 billion liters by the International Energy Agency in 2024, surpassing the 2019 pre-pandemic level of 198 billion liters. The current estimated national average blend rate of 2.3 percent has also surpassed 2.2 percent that year.

Table 1. PRC: PRC’s Current E10 Mandate Area

	Province	Status
1	Henan	2002 Pilot in three cities 2004 province wide E10 mandate
2	Heilongjiang	2002 Pilot in two cities 2004 province wide E10 mandate
3	Jilin	2004 province wide E10 mandate
4	Liaoning	2004 province wide E10 mandate
5	Anhui	2005 province wide E10 mandate
6	Guangxi	2008 province wide E10 mandate
7	Hebei	2005 pilot in six cities 2019 province wide E10 mandate
8	Shandong	2006 pilot in seven cities 2016 province wide E10 mandate
9	Jiangsu	2005 pilot in five cities
10	Hubei	2005 pilot in nine cities
11	Inner-Mongolia	2014 pilot in three cities, now suspended
12	Guangdong	2016 pilot in four cities, now suspended
13	Tianjin	2018 city wide E10 mandate
14	Shanxi	E10 pilot in some cities announced in 2019
15	Shanghai	Plans to launch E10 in 2019

E10 is Unachievable in the Short Term, Even More So Long-Term

Post forecasts the PRC to produce 4.9 billion liters of fuel ethanol and (with no trade) consume the same amount in 2024 - 17 percent higher than 2023 production and consumption levels. Demand bounced after the end of “Zero Covid” policy, and fuel ethanol demand is still expected to increase in the second half of 2024 in line with the recovery of gasoline and low input prices. Government agencies in charge of E10 are paying increased attention on localities with existing E10 pilots with expectations that they will meet their full blend mandate. Consequentially, pilot areas which were not strictly following the mandate during the COVID period have increased blending though there was no change in area(s). Stagnant policy and limited surplus grain stocks continue to limit fuel ethanol consumption and, as such, the average blend rate is not expected to change significantly.

If PRC were to fully implement a national E10 blending program, based on the International Energy Agency (IEA) and PRC’s National Energy Administration (NEA) figures, the PRC would need to consume about 21 billion liters of fuel ethanol in 2024, or four times greater than actual consumption. Even if all existing approved fuel ethanol projects begin operation in 2024, the total output would only allow an E4 blend rate. However, this assumes PRC’s corn stocks

could support the expansion and that expansion would have to grow further with PRC's growing fuel pool to maintain E10. Climate change impacts such as water scarcity and extreme weather including widespread floods, drought, and periods of high heat pose further challenges. It seems equally unlikely that a program will be fully implemented in the current political climate considering the PRC's frequent emphasis on the importance of agricultural self-sufficiency. In addition, 64 percent of the PRC's fuel ethanol production capacity is concentrated in the Northeast, while most gasoline consumption areas are in the South, and it remains cost restrictive or unfeasible without greater subsidy to transport fuel ethanol from production areas to consumption regions. The assumption here is that cellulosic ethanol will never achieve cost breakthroughs needed to realize large-scale commercial production that could make a meaningful and growing contribution to overall supply.

For more historical information on blend mandates, please see the [2020 Biofuels Report](#).

Government Financial Support for Ethanol Production

Past PRC government subsidies for fuel ethanol production supported both feedstocks and production inputs to make the industry viable. Starting in 2009, central government production subsidies for grain-based conventional ethanol were as high as \$0.25/liter but were eliminated in 2016. From 2016 to 2018, provinces in Northeast PRC offered corn processors and ethanol facilities generous subsidies. Provincial authorities have not renewed processing subsidies since 2019 as government commitment to supporting the biofuels industry has waned with corn stocks depleted. The advanced cellulosic ethanol production subsidy was set at \$0.07 per liter (600 RMB per metric ton) in 2018 and there have been no additional announcements or updates to the original subsidy program. Such a low subsidy remains ineffective in incentivizing the building of an industry. The PRC is unlikely to reintroduce support for corn until significant oversupply returns.

On November 13, 2023, the National Energy Administration (NEA) solicited proposals through its *Notice on Organizing Pilot Demonstrations for the Promotion and Application of BBD* ([GAIN report GH2024-0030](#)) encouraging governments at all levels, enterprises, and other entities to apply for biodiesel pilot demonstration projects for the promotion and application of BBD. On March 29, 2024, the NEA issued the "[Notice of the General Office of the National Energy Administration on Publicizing the Pilot Projects for the Promotion and Application of BBD](#)" ([GAIN report CH2024-0065](#)) announcing the selected pilot projects. The Chinese domestic industry sees these projects to develop the domestic BBD industry and enhance market confidence, especially following the escalation of EU and PRC's BBD trade dispute between the EU and PRC.

Biodiesel Policy Framework and Mandates

To prepare for the BBD consumption transition from export-oriented to domestic-oriented, the PRC launched a process to modify B5 biodiesel national standards in March 2024. The International Sustainability and Carbon Certification's (ISCC) accreditation of B24 biodiesel for shipping use has also accelerated. Shipping and maritime companies widely recognize BBD as a "ready-to-use" clean fuel and use BBD in major refueling ports around the world. NEA's *Notice on Organizing Pilot Demonstrations for the Promotion and Application of BBD* instructs local governments to promote biodiesel (fuel oil) such as B5 and B24 for ships in bonded zones, free

trade zones, and other areas. Among the three NEA-endorsed pilot projects led by State-owned Enterprises (SOEs), the BBD promotion and application pilot projects of PRC Marine Bunker Co., Ltd. and Sinopec Fuel Oil Sales Co., Ltd. are expected to focus on BBD use in the shipping industry. The two companies have reportedly explored the domestic biofuel refueling business. PRC's B24 shipping refueling is still in early development stage. It's reported by June 2024, the PRC has refueled 6 million liters of B24 biodiesel, mostly in Guangzhou and Shenzhen ports. Industry projects the PRC's domestic BBD consumption will begin in the shipping/maritime industry, but overall consumption increases will not be noteworthy until 2026.

BBD products carry a 70 percent value-added tax refund and consumption tax exemption. PRC's regular biodiesel consumption is closely positively correlated to imports of palm-oil-based biodiesel from Indonesia and Malaysia. PRC's discretionary demand for biodiesel imports triggers when the palm oil to fossil diesel (PO-GO) price spread falls below \$-70-80/metric ton (i.e., negative). In the first five months of 2024, PRC's biodiesel imports plummeted by 97 percent. Domestic biodiesel prices have declined from \$1,250 (RMB 9,000) last year to \$1,069 (RMB 7,700) this June. In contrast to most other countries, biodiesel in PRC is mainly used for environmentally friendly plasticizer, electric power generation, fishing vessels, and farm equipment. Post contacts report that on-road transport accounts for over one-third of total biodiesel demand. UCO is the main feedstock for PRC's biodiesel production. In 2010, NDRC launched a UCO reutilization and disposal pilot program and over 100 pilot cities were identified but little was achieved. Supply chains to collect, process, and deliver UCO remain underdeveloped.

Shanghai municipal government remains the only local authority with a biodiesel program. In 2021, Shanghai revised the [*Administrative Measures on Promoting and Using Gutter Oil to Produce Biodiesel*](#), which took effect March 1 and lasts for two years. In early 2023, Shanghai issued [*Implementing Plan to Coordinatively Reduce Pollution and Lower Carbon*](#), calling for feasibility study to use UCO-produced B10 biodiesel and encourage use of B10 biodiesel in inland river ships.

Shanghai is still the only municipality or province supporting a biodiesel market. The Shanghai government subsidizes biodiesel blenders based on the amount of biodiesel sold to gasoline stations. The government also subsidizes producers when diesel prices drop below \$902 (RMB 6,000) per ton. The city published the *Industry Standard of B10 Diesel produced by UCO* in 2021. In January 2021, Hainan provincial officials proposed resuming the B5 mandate the province adopted 10 years ago, but officials have yet to act.

In October 2017, Sinopec Shanghai began offering B5 diesel at a \$0.05 per liter (RMB 0.3) discount to regular diesel as part of a pilot program. The Shanghai program aims to buck a historical precedent where previous efforts to adopt local and provincial biodiesel blending mandates failed. Shanghai produces about 40,000 metric tons of UCO each year. There are 18 designated companies collecting UCO daily. Shanghai currently has three blending centers with an annual distribution capacity of B5 diesel of over 600,000 metric tons (equivalent to 30,000 metric tons or 34 million liters of B100 biodiesel) to over 300 gas stations, which accounts for half of Sinopec Shanghai's total gas stations in the city. By the end of 2023, Shanghai offered

close to 36 million cars a total of 3 billion liters of B5 biodiesel, an equivalent of 177 million liters of B100 biodiesel.

Sustainable Aviation Fuel (SAF) Policy

The Chinese government considers sustainable aviation fuel (SAF) a crucial part of its efforts to realize its carbon emissions goals. The country's SAF development started as early as 2009 when state-owned Petroleum & Chemical Corporation (Sinopec) launched SAF technology research and established its first ever SAF production line in 2013. Sinopec suspended the line in 2015 due to high costs. Following this set back PRC has refocused and expedited its research and development. SAF plants have emerged quickly in recent years, especially after 2022. As the world's second largest domestic civil aviation market and as one of the largest destinations and source of international air travel, PRC's SAF market offers considerable opportunity.

The first test flight using Sinopec SAF was successfully completed in Shanghai in 2013. The first passenger flight was Hainan Airlines' HU7604 using SAF in a Boeing 737-800, which successfully completed a 2.5-hour flight from Shanghai to Beijing in 2015. The first international passenger flight, Hainan Airline's HU497 using SAF on a Boeing 787, successfully landed in Chicago in 2017. Sinopec Zhenhai Refinery established PRC's first commercial scale SAF production facilities in 2020. The company's HEFA (Hydroprocessed Esters and Fatty Acids) products passed Roundtable on Sustainable Biomaterials (RSB)'s certification in 2022. On June 28, 2022, Sinopec Zhenhai Refinery produced the first test batch of SAF products.

Companies such as Junheng Industry Group Biotech, Zhejiang Jia'ao Enprotech and Tianzhou New Energy plan to start up plants over the next 18 months to produce more than 1.3 billion liters per year of SAF combined. That figure would be equivalent to 2.5 percent of PRC's current annual demand for aviation fuel.

Import Tariffs

Tariffs on ethanol remain unchanged in 2024.

Denatured Ethanol (HS 220720) (ethanol used as fuel falls under this code in PRC import stats)

On January 1, 2017, the tentative tariff rate for denatured ethanol (HS 22072000) rose from 5 percent to the World Trade Organization (WTO) Most-Favored Nation (MFN) bound rate of 30 percent. Subsequently, on April 2, 2018, the PRC levied an additional 15-percent retaliatory tariff on U.S.-origin denatured ethanol in response to the U.S. 232 Action, raising the tariff from 30 percent to 45 percent. Later, on July 6, 2018, the PRC imposed an additional 25-percent retaliatory tariff on imports of U.S. denatured ethanol in response to the U.S. 301 Action, raising the effective tariff to 70 percent. Importers may apply for an exclusion of the retaliatory 301 tariff and effectively reduce the total tariff to MFN plus retaliatory Section 232 tariffs.

Undenatured Ethanol (HS 220710)

MFN tariff rates on undenatured ethanol were raised to 40 percent on January 1, 2017. On August 3, 2018, MOFCOM announced a retaliatory tariff on U.S.-origin undenatured ethanol, raising the tariff by 25 percent from 40 to 65 percent.

On February 18, 2020, the PRC announced a new round of tariff exclusions for U.S. agricultural commodities impacted by the retaliatory Section 301-tariffs. Denatured ethanol (HS Code:

22072000) is included in the list with the announcement effectively lowering the duty on U.S. fuel ethanol from 70 percent back to 45 percent for those importers who apply for the exclusion. Tariff exclusions are approved for individual importers and will not automatically extend to all importers. Undenatured ethanol (HS Code: 22071000) is not on the list, but eligible importers can also apply for an exclusion on the Section 301 retaliatory tariffs for this product. The application process through the PRC's Ministry of Finance (MOF) website opened on March 2, 2020. See Post's February 26, 2020 report "[PRC Announces a New Round of Tariff Exclusions](#)" for more information.

Table 2. PRC: Import Tariffs on Ethanol

HS Code		MFN	232 Retaliation	301 Retaliation
22072000	Ethyl Alcohol & Other Spirits, Denatured of Any Strength	30%	15%	25%
22071000	Undenatured Ethyl Alcohol, Of Alcohol V. ≥80%	40%	-	25%

Source: PRC Ministry of Finance

Biodiesel (HS382600) and Petroleum Oils Containing Biodiesel (HS27102000)

On August 23, 2018, the PRC imposed an additional 25 percent tariff on U.S.-origin petroleum oils containing 1 to 30 percent biodiesel by volume (HS27102000) which effectively raised the tariff from 6 to 31 percent. At the same time, the duty for U.S.-origin biodiesel-blended petroleum containing more than 30 and up to 99 percent biodiesel by volume as well as pure (B100) biodiesel was raised from 6.5 to 31.5 percent (HS38260000). See GAIN report [CH18034](#). Regardless of the duty rates on U.S. biodiesel, the PRC has never imported U.S. biodiesel even when rates were low because palm-oil based biodiesel from Southeast Asia is priced consistently lower.

For more historical information on the PRC's biofuel policies, please see [2022 Biofuels Annual](#) and [2023 Biofuels Annual](#) Reports.

III. Ethanol

Fuel Ethanol Consumption

In 2024, fuel ethanol consumption is estimated at 4.9 billion liters, up by 17 percent from 2023. PRC's national average fuel ethanol blend rate is estimated at 2.3 percent, increased slightly from the previous two years, while still lower than the 2.8 percent peak blend rate achieved in 2009. PRC's E10 mandate area has not been expanded since 2019.

International petroleum prices remained at high levels, encouraging oil companies to blend more ethanol into gasoline. Government agencies in charge of E10 increased attention on localities with existing E10 pilots to meet their full blend mandate, so pilot areas that were not strictly following mandate especially during COVID period increased actual blending, although the pilot areas remain unchanged. Stagnant policy and limited surplus grain stocks continue to limit fuel

ethanol consumption and, as such, the average blend rate is not expected to see significant change.

The State Council called for controlling the expansion of fuel ethanol processing capacity in 2020, while the NEA in early 2021 urged local governments and companies to support the development of liquid biofuels, regulate ethanol gasoline promotion, and urge gasoline companies to sell liquid biofuel in line with existing regulations. The most recent Action Plan for Energy Conservation and Carbon Emissions Reduction 2024 to 2025 (linked above) in May 2024 also calls for increasing non-fossil fuel energy consumption and promote the use of advanced bio-liquid fuels and sustainable aviation fuels. However, these guidelines from both the State Council and the NEA so far had little effect on biofuel consumption.

Fuel Ethanol Production

PRC's 2024 fuel ethanol production is forecast to increase to 4.9 billion liters, up 17 percent from the previous year. Fuel ethanol prices are fixed at 91.1 percent of the retail gasoline price, which is set by the NDRC according to a basket of global benchmark crude prices. The Brent crude oil prices rebounded to an average of \$71/barrel in 2021, then soared to peaks near \$130/barrel in 2022 and stayed at around \$81/barrel over the past two years until the first half of 2024. Chinese fuel ethanol prices have been fluctuating with gasoline with no change in the pricing mechanism, while corn prices have slumped since the end of 2023 to a three-year record low in the first few months of 2024. Lower corn prices encouraged the use of more corn in the processing sector than in previous years. Operational profits in the first half of 2024 rebounded to 64 percent from 52 percent for the same period last year. Industry sources expect the corn processing industry will improve profitability as well in MY2024/25 benefiting from lower corn prices.

Profitability of corn-based ethanol producers increased from an average of U.S. \$ -42 (RMB -300) (i.e., negative) in the first three quarters of 2023 to U.S. \$28 (RMB 200) per ton since the last quarter of 2023. Profitability of cassava-based fuel ethanol plants suffered negative returns throughout the year due to high prices of imported dried cassava chips from Southeast Asian countries and an appreciating U.S. dollar. Industry sources report that sugar- and molasses-based ethanol producers continue to struggle with low margins due to limited supplies of sugarcane and high molasses prices. Fuel ethanol plants also used less old stock paddy rice as a feedstock. Fuel ethanol plants are operating at above 60 percent of capacity in 2024.

Industry sources report the number of fuel ethanol facilities (21) and their combined production capacity of 7.7 billion have remained largely unchanged since 2021. Industry sources report that the PRC's fuel ethanol production was over 80 percent grain-based (i.e., corn, wheat, and rice) in 2024 and 10 percent cassava or sugarcane-based. Corn ethanol is mostly in the Northeast, cassava ethanol is mostly in the East and molasses ethanol is mostly in the South. From 2018 to 2021, essentially all fuel ethanol expansion was attributed to higher production from PRC's eight major grain-based ethanol production facilities. Ethanol was transported to consumption areas via truck (87 percent), barge (8 percent), and rail (5 percent).

Table 3. PRC: Production Capacity of Fuel Ethanol Plants (2023 estimates)

	Producers	Production Capacity	Feedstock
1	SDIC Jilin Alcohol	887 million liters	Corn
2	Henan Tianguan	887 million liters	Wheat, Corn, Cassava
3	COFCO Biochemical (Anhui)	798 million liters	Corn, Cassava
4	COFCO Bioenergy (Zhaodong)	507 million liters	Corn, Cellulosic
5	SDIC (Zhanjiang)	190 million liters	Cassava
6	Shandong Longlive	65 million liters	Cellulosic
7	COFCO Bioenergy (Guangxi)	253 million liters	Cassava
8	Zonergy (Inner Mongolia)	38 million liters	Sweet Sorghum
9	SDIC (Tieling)	380 million liters	Corn
10	Liaoyuan Jufeng Biochemical	380 million liters	Corn
11	Jilin Boda Biochemistry	507 million liters	Corn
12	Jiangsu Lianhai Biotechnology	152 million liters	Corn
13	Shandong Fu'en Biochemical	152 million liters	Cassava
14	Jiangxi Yufan	127 million liters	Cassava
15	Shougang Lanza Tech	58 million liters	Industrial Flue Gases
16	SDIC (Hailun)	380 million liters	Corn
17	Wanli Runda (Baoqing)	380 million liters	Corn
18	Hongzhan (Nehe)	380 million liters	Corn
19	Hongzhan (Huanan)	380 million liters	Corn
20	Hongzhan (Bayan)	380 million liters	Corn
21	SDIC (Jidong)	380 million liters	Corn

Source: Post Industry Sources for licensed plants.

Table 4. PRC: Cellulosic Fuel Ethanol Pilot Plants (2023 estimates)

	Producers	Production Capacity	Feedstock
1	Henan Tianguan	38 million liters	Wheat and corn stalks Reportedly not operational
2	Songyuan Guanghe	25 million liters	Corn cobs and stalks
3	Shandong Longlive	65 million liters	Corn cobs Reportedly not operational
4	Jinan Shengquan	25 million liters	Corn stalks
5	Anhui Guozhen	64 million liters	Corn stalks, under construction
6	COFCO Zhaodong	0.6 million liters	Corn stalks
7	Zhongdan Jianye	32 million liters	planned
8	SDIC Hailun	32 million liters	Under construction

Source: Post Industry Sources.

Post estimates 2024 synthetic ethanol production will not change from 2023 levels. Currently, Lanza Tech is the leading synthetic fuel ethanol producer in PRC. It has four joint venture subsidiaries with Beijing Capital Steel and Iron Group in Hebei, Yunnan, Guizhou and Ningxia. Among these four subsidiaries, only the one in Hebei is a designated fuel ethanol producer approved by the PRC's NEA. The other three can only supply ethanol for industrial use. The four

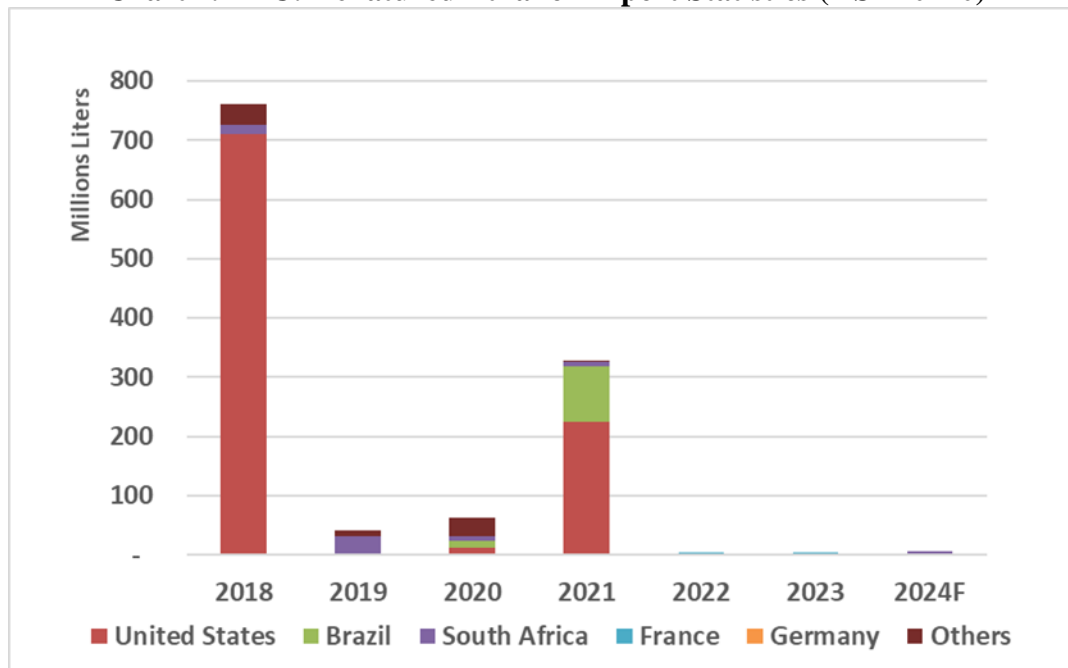
subsidiaries reportedly produce a total of 190 million liters of ethanol each year. As E10 is stagnant, fuel ethanol production suffers from overcapacity, and the prices of waste gas keep growing, their ethanol has no price advantage in the PRC’s market. Over the past few years, industry contacts report the firm marketed byproducts—pure protein feed powder, a total of 60,000 metric tons per year, to support the business.

In September 2022, the “world’s largest” coal-based 633 million liters (500,000 metric tons) ethanol project reportedly started production in Shaanxi’s Yulin City. Once operational, the plant is expected to produce 76 million liters (60,000 metric tons) of fuel ethanol per year but has not yet come to fruition. While the PRC press and industry contacts report that the PRC’s Syngas ethanol production capacity is expected to reach 2.5 billion liters by the end of 2022, Post does not expect this production capacity to be achievable within this timeframe.

Trade

The only ethanol used for blending in gasoline that the PRC has imported in past years came from the United States, and only when prices were highly competitive, duties were low, and the PRC authorities permitted. Post analysis and industry sources suggest the PRC’s political will and endorsement is necessary for significant purchases of U.S. ethanol, regardless of tariff level. The PRC reportedly waived import tariffs for an unknown volume of U.S. ethanol in 2021. Industry members believe the tariff waiver was a limited action and not a significant development or endorsement for greater imports of U.S. ethanol. Imports expected for the remainder of 2024 are minimal.

Chart 1. PRC: Denatured Ethanol Import Statistics (HS 220720)



Sources: Trade Data Monitor, General Administration of PRC Customs, and Post estimates

Note: News reports indicate that shipments from Indonesia and Malaysia in 2018 were U.S.-origin product. Imports from all countries were 169,000 liters (2022), 130,000 liters (2023) and forecast at 5 million liters in 2024.

Table 5. PRC: Ethanol Production, Supply, and Distribution

Ethanol Used as Fuel and Other Industrial Chemicals (Million Liters)										
Calendar Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024f
Beginning Stocks	0	0	0	0	0	0	0	0	0	0
Fuel Begin Stocks	0	0	0	0	0	0	0	0	0	0
Production	7,868	8,071	9,211	9,770	10,740	10,830	10,580	11,850	12,911	14,000
Fuel Production	2,914	2,534	3,041	2,914	4,300	3,801	3,421	3,804	4,200	4,900
>of which fossil-based synthetic	0	0	0	0	0	30	30	40	60	60
>of which biobased	2,914	2,534	3,041	2,914	4,339	3,771	3,391	3,764	4,140	4,840
>of which biobased cellulosic	38	40	30	20	0	0	0	0	0	0
Imports	687	890	24	1,035	104	69	824	0	0	5
Fuel Imports	477	871	8	759	42	63	550	0	0	5
Exports	25	34	135	79	21	367	13	10	34	16
Fuel Exports	0	1	3	35	7	21	4	3	1	0
Consumption	8,530	8,927	9,100	10,726	10,823	10,532	11,391	11,840	12,877	13,989
Fuel Consumption	3,391	3,404	3,046	3,638	4,335	3,843	3,967	3,801	4,199	4,905
Ending Stocks										
Fuel Ending Stocks										
Refineries Producing First Generation, Bio-based Fuel Ethanol (Million Liters) 1/										
Number of Refineries	7	10	11	12	14	20	22	22	22	21
Nameplate Capacity	3,200	3,600	4,200	5,000	5,257	6,578	7,720	7,720	7,720	7,720
Capacity Use (%)	90%	69%	72%	58%	83%	57%	44%	49%	54%	63%
Refineries Producing Cellulosic Fuel Ethanol (Million Liters) 2/										
Number of Refineries	3	1	1	1	1	1	1	1	1	5
Nameplate Capacity	129	65	65	65	65	65	65	65	65	65
Capacity Use (%)	29%	62%	46%	31%	0%	0%	0%	0%	0%	0%
Co-product Production (1,000 MT)										
DDGs	1,640	1,427	1,598	1,536	2,796	2,436	2,279	2,471	2,642	2,933
Feedstock Use for Fuel Ethanol (1,000 MT)										
Corn Kernals	5,241	4,558	5,105	4,542	6,763	5,426	4,229	4,694	5,957	8,125
Rice Kernals				364	2,170	2,357	3,052	3,199	2,484	1,210
Cassava (dried chips)	2,188	1,902	2,283	2,188	1,303	1,132	1,018	1,469	1,243	1,453
Wheat	na	na	387	371	552	480	173	96	632	739
Molasses	na	na	na	na	na	na	na	na	na	na
Fossil Fuels/Waste Gas	na	na	na	na	na	na	na	na	na	na
Market Penetration (Million Liters)										
Fuel Ethanol Use	3,391	3,404	3,046	3,638	4,335	3,843	3,967	3,801	4,199	4,905
Gasoline Pool 1/	157,490	164,502	170,477	189,899	197,745	184,773	204,395	187,986	204,041	212,816
Blend Rate (%)	2.2%	2.1%	1.8%	1.9%	2.2%	2.1%	1.9%	2.0%	2.1%	2.3%

Note 1: Gasoline/ethanol pool overs gasoline and all biocomponents (ethanol, some methanol) and MTBE. PRC does not produce ethanol derived ETBE in commercial volumes. Fuel blends incorporating ETBE require additional processing and have not been adopted in PRC. Fossil fuel derived MTBE is the alternative oxygenate used across much of PRC along with methanol in certain areas. Both are included in the gasoline/ethanol fuel pool series.

Feedstock-to-ethanol yield rates (liters/MT) used:

Corn kernels: 1 MT = 402 (before 2014) to 417 liters (after 2014).

Rice: 1 MT = 400 liters.

Wheat kernels: 1 MT = 393 liters

Cassava (dried chips): 1 MT = 333 to 400 liters (15 to 65% starch content).

Sources: Fuel pool is from IEA (Paris), June 2024 updated series. Post estimates and industry sources.

IV. Biodiesel / Renewable Diesel (HDRD)

Consumption

Biodiesel

PRC's 2024 BBD consumption is estimated at 900 million liters, 20 percent higher than 2023. This figure remains just under half of record biodiesel-only consumption set in 2013-14 but approaches the more recent peak biodiesel-only consumption in 2018 and 2019 when domestic production and discretionary demand for imports were also elevated, as the PRC has adopted a series of new policies to promote domestic biodiesel and HDRD consumption.

Renewable Diesel (HDRD)

PRC's 2024 HDRD consumption is estimated at 70 million liters, almost double the volume consumed in 2022 which itself was double the volume in 2012 when consumption began. Lacking domestic incentives, the industry remains nearly entirely export- focused. Industry believes the PRC's new efforts to promote domestic consumption of biodiesel and HDRD won't see any notable deliverables until 2026.

Production

PRC's 2024 BBD production is forecast at close to 3 billion liters, down 12 percent from 2023 due to foreseeable export headwinds. FAME production is estimated at 1.9 billion liters in 2024, 13 percent lower than the previous year. The same issue likely affects HDRD shipments to Europe that directly support most HDRD production. HDRD production is estimated at 0.9 billion liters in 2024, 9 percent lower than the previous year. PRC's total operational BBD production capacity at the end of 2023 reached an estimated 6.5 billion liters, of which 4 billion liters or 65 percent of the capacity is FAME, while around 2.5 billion liters or 35 percent of the total production capacity is HDRD/SAF.

Following five years and beginning in 2020, PRC's biodiesel production capacity grew for 2.7 billion liters to an estimated 4 billion liters this year. These facilities are located mainly in Hebei, Shandong, Guangdong, Fujian, and Zhejiang. HDRD plants in operation have a combined annual capacity of around 2.5 billion liters with an additional 3 billion liters capacity planned. Nearly all plants are export-oriented to take advantage of foreign demand and are aided by EU tax policies. HDRD production capacity (including both operational and planned capacity) is estimated to have grown 1 billion liters every year starting in 2021, and the same is expected in 2024.

In the first six months of 2024, PRC produced and exported lower volumes despite very competitive prices. Industry sources report that FAME producers are operating at 20 percent of capacity while HDRD producers are operating at 22 percent capacity. More plants reported suspension of production in June. This declining trend may continue in the second half of 2024 as the EU announced it would impose anti-dumping duties on PRC biodiesel. Importers are also likely to be more reluctant to take Chinese product following the ISCC's withdrawal or temporary suspension of seven certificates from Chinese companies over concerns about

potentially fraudulent behavior regarding unusual trade volumes” (See ISCC [Press Release 27 July 2023](#)).

Many of the cities and locations that the NEA awarded pilot projects already have BBD production capacity, and existing BBD producers have already announced participation with several of the recently announced pilot projects. For example, top BBD producer Zhuoyue New Energy in early April announced participation in Xiamen’s BBD promotion and application pilot project. In addition, Rongguang Biotechnology and Jinlihai Biofuel reportedly will join other local pilot projects. Although some cities, such as Qingdao and Foshan, do not currently have large BBD production capacity, industry contacts expect to see new or expanded capacity built soon in these cities.

PRC’s BBD production capacity expanded rapidly over the past year due to strong export demand. Contacts report that since 2021, biodiesel production profits averaged \$122 (RMB 880) per ton, up 75 percent. Zhuoyue New Energy is the leading FAME biodiesel producer, with a new 114 million liters per year production line that started in October 2022. The company plans to expand capacity to 925 million liters (including more than 130 million liters of HDRD capacity) from the current 570 million liters in 3 to 5 years. Zhejiang Jia’ao also plans to expand capacity to 1,534 million liters from current capacity of 570 million liters. Another emerging giant, Shangao Huanneng, also plans to build 1,480 million liters of biodiesel production capacity (including 1,026 million liters of HDRD and 454 million liters of FAME) on top of their existing UCO business. Availability of UCO will at some point limit biodiesel production as PRC’s UCO export rebate policies incentivize UCO exports.

Table 6. PRC: Major Biodiesel/FAME (Fatty Acid Methyl Esters) Producers

Producer	Production Capacity
Zhuoyue New Energy	570 million liters
Hebei Jingu Group	284 million liters
Bimei New Energy	341 million liters
Tangshan Jinhai Biodiesel	180 million liters
Hebei Longhai Biofuel	68 million liters
Shandong Fenghui	68 million liters
Zhejiang Jia’ao Environment Protection (Dongjiang)	570 million liters
Jingzhou Dadi Biotechnology	57 million liters
Shanghai Zhongqi Environment Protection	125 million liters
Shangao Environmental	454 million liters

Source: Post Industry Contacts. 1 MT Biodiesel= 1,136 liters of Biodiesel.

Table 7. PRC: Major HDRD Producers

Producer	Production Capacity	Status
Hainan Huanyu	256 million liters	newly built, in operation
Yangzhou Jianyuan	256 million liters	newly built, in operation
Sanju Rizhao	512 million liters	modified, in operation
Zhenhai Refinery	128 million liters	modified, in operation
Henan Junheng	230 million liters	modified, in operation
Shandong Huidong	230 million liters	modified, in operation
Sanju Hebi	237 million liters	in operation
Shandong Linyi Huibang	256 million liters	modified, in operation
Zhangjiagang Eco Biochemical Technology	128 million liters	modified, in operation
Shandong Zhonghai Jingxi	512 million liters	modified, not in operation
Shandong Binyang Ranhua	512 million liters	modified, not in operation
Shandong Shangneng	512 million liters	modified, not in operation
Zhejiang Jia'ao Huanbao	641 million liters	UOP, not in operation
Sichuan Jinshang	256 million liters	UOP, not in operation
Zhuoyue New Energy	128 million liters	not in operation
Jiangxi Zunchuang	256 million liters	not in operation
Anhui Yisheng	256 million liters	not in operation
Liaoning Pengyao	256 million liters	not in operation
Hebei Huiyuan	256 million liters	not in operation
Shenzhen Langkun	256 million liters	not in operation
Shandong Qingdao Lidong	N/A	N/A
Shandong Dongying Aoxing	1,282 million liters	N/A
Shandong Zhande	512 million liters	N/A
TOTAL CAPACITY	5,826 million liters	
TOTAL CAPACITY in Operation	2,237 million liters	

Source: Post Industry Contacts. 1 MT HDRD = 1,282 liters of Biodiesel.

Trade

Biodiesel imports in 2024 are estimated at 50 million liters, 83 percent lower than 2023. PRC does not import HDRD. From January to May 2024, PRC's biodiesel imports declined 97 percent year-on-year. More than 90 percent of imports are palm oil-based biodiesel from Malaysia and Hong Kong. The PO-GO price spread shows the import window for PRC was mostly closed for all of 2020 and 2021 but opened in the second half of 2022. From July 2022 to April 2023, PRC's BBD imports soared by 56 percent. Over the past one year, the PO-GO

spread fluctuated between negative \$200/MT in 2023 end to over \$100/MT in May 2024, import profit margins still exist.

BBD exports in 2024 are estimated at 2 billion liters, down 40 percent from 2023. PRC replaced Argentina as the primary export supplier of biodiesel to the EU in the fourth quarter of 2022, as exports boomed from 2020 to January 2023 due to high euro/mtCO_{2e} value of German GHG reduction obligations for UCO-based biodiesel and HDRD and supported by member states who apply the EU's Renewable Energy Directive's (RED) double-counting provisions for UCO-based biodiesel and HDRD as well as PRC's 70 percent VAT rebate. Average biodiesel export prices fell from \$1,500 (RMB 10,500) per metric ton in early 2023 to \$1,070 (RMB 7,700) in early 2024. Current biodiesel prices are not competitive for domestic market consumption, but exports remain competitive to Europe. However, the export surge stopped in 2024 as biodiesel exports dropped by 40 percent year-on-year in the first five months of 2024 due to trade uncertainties such as anti-circumventing investigations and anti-dumping duties from the EU.

In August 2023, the European Commission (EC) began investigating whether biodiesel from Indonesia was circumventing EU duties via transshipments through PRC and the United Kingdom. It goes beyond the suspicion that disguised shipments of Indonesian biodiesel linked to deforestation were passing through PRC. Investigators are also examining possible discrepancies in pricing. The investigation covers the period from October 2022 to September 2023.

In December 2023, the EC also launched an anti-dumping investigation following a complaint from the European Biodiesel Board that low-priced imports from PRC, exceeding initial estimates, are harming the European biofuel industry valued at 31 billion euros (\$33.2 billion) annually. On July 19, the EU proposed provisional antidumping duties on imports of Chinese BBD, while sustainable aviation fuel was provisionally excluded. Proposed measures would impose a provisional 36.4 percent duty on Chinese producers, while 39 other cooperating companies will benefit from a lower 23.7 percent duty. Two other companies -- EcoCeres Group and Zhuoyue Group -- will also be subject to specific duties of 12.8 percent and 25.4 percent, respectively. The proposed provisional duties are expected to be formalized Aug. 16, with definitive measures expected to be introduced from Feb. 14, 2025.

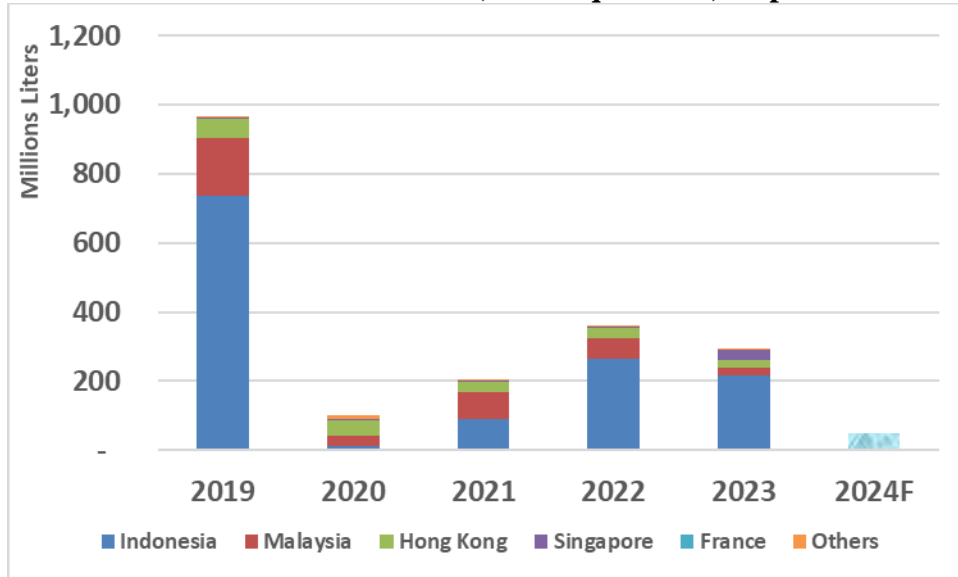
In addition, the United Kingdom's Trade Remedies Authority in June 2024 launched an anti-dumping investigation into biodiesel from PRC. Sources report the investigation will likely be 6 to 12 months long and analysts estimate this may lead to lower imports of Chinese biodiesel in the medium- to long-term, depending on the investigation outcome.

Industry estimates that with the imposition of anti-dumping duties, PRC's BBD exports to the EU will be greatly impacted. Sources think that only Chinese producers receiving less than a 20 percent anti-dumping duty will be able to continue exporting profitably to the EU. Therefore, top Chinese producers are expected to streamline operations and reduce costs or expand scale to maintain profits. Other small producers reportedly will turn to the UCO export business which could result in more UCO exported to the EU, or to the United States. Other contacts believe that PRC's UCO may be exported to Southeast Asia and Singapore to produce BBD and then exported to the EU, potentially even as POME. It is possible that some producers may also blend

palm oil with UCO when it makes financial sense to reduce feedstock costs and then export that to the EU as UCOME products.

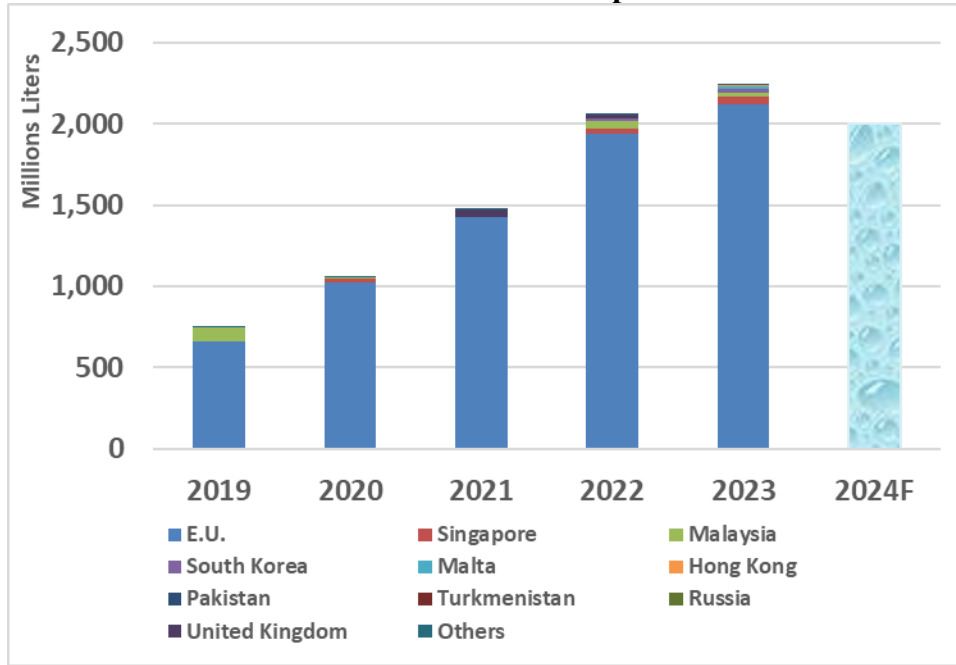
Industry contacts report PRC’s HDRD exports mainly fall under HS 15162000 (Vegetable fats & oils & their fractions) and HS 27101994 (Liquid paraffin and heavy liquid paraffin, without biodiesel), or sometimes HS 27101929 (Other diesel oils and other fuel oils, without biodiesel). Proportions of HDRD remain unknown. In the first five months of 2024, the exports amount of the three HS codes combined stayed similar to last year.

Chart 2. PRC: Biodiesel (B100 Equivalent) Imports



Sources: Trade Data Monitoring and General Administration of PRC Customs.

Chart 3. PRC: BBD Exports



Sources: Trade Data Monitoring and General Administration of PRC Customs.

Note: All products traded under HS 3826.00 are assumed to be pure B100 biodiesel; All product under HS 271020 is petroleum oil, containing biodiesel up to 30 percent, is assumed to contain on average 10 percent biodiesel by volume, converted and reported as B100 equivalent.

Due to uncertainty in trade codes used for HDRD, it is possible some of the product traded under the biodiesel code in chapter 38 is HDRD that should when correctly categorized by chemical makeup be reported under Chapter 27, code 2710.19. This would be consistent with treatment by US, Canadian and European customs authorities. The accurate tracking of HDRD will be investigated in future publications.

Used Cooking Oil (UCO)

PRC's domestic BBD production uses UCO as its major feedstock, and this has been the case even since the early days of the commercial-scale biodiesel industry more than two decades below. PRC's UCO industry has large capacity, but the collection system remains much less organized unable to distribute a majority of total supply to the renewable fuels industry as it does in Europe and the United States. PRC's initial purpose for developing BBD was to prevent UCO reuse in cooking, food, and feed use. Industry estimates PRC's UCO supply capacity around 11 billion liters Industry estimates PRC collected around 5.2 billion liters of UCO each year for various purposes, among which close to 3 billion liters is used to produce BBD, assuming only UCO is being used as BBD feedstock which seems unlikely according to widespread belief. The PRC uses close to 3 billion liters of UCO for domestic BBD production. The maximum potential for UCO collection and for further expansion of biodiesel production capacity is enormous.

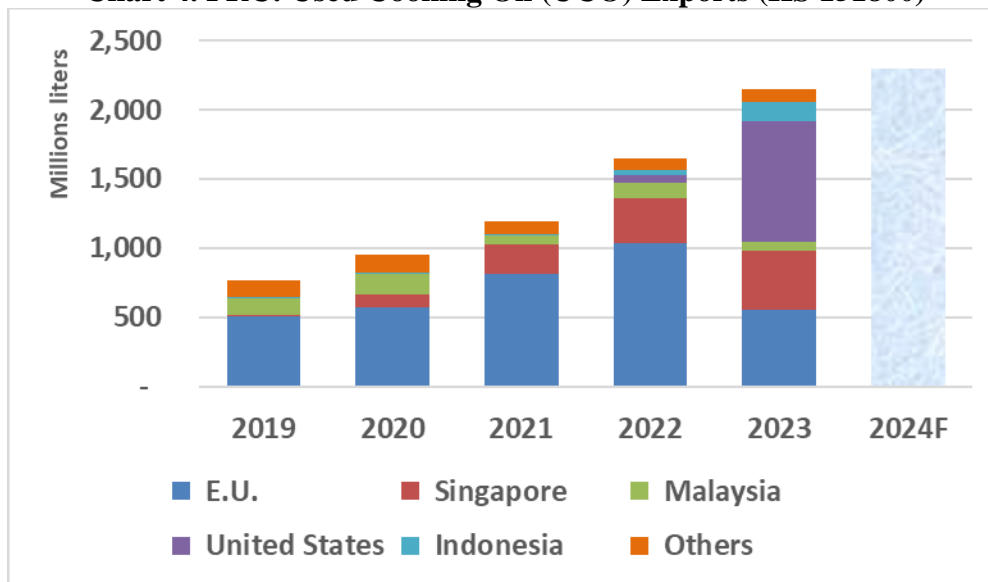
PRC is the largest known exporter of UCO and sales in recent years have grown exponentially. Shipments destined for Europe account for the highest percentage of sales by far and most of the growth until 2023 when PRC UCO exports began shifting to the United States and surged further in 2024. The U.S. surge in HDRD production over the past 2 years that has eclipsed already large biodiesel production has greatly expanded the demand for all eligible vegoils and fats feedstock,

including increased import demand for UCO, tallow and rapeseed oil. Shipments to the Neste Singapore HDRD plant, which recently finished a major expansion and now includes SAF production capacity, account for most of the remaining sales and sales growth. Has as already occurred in Europe, American oilseed industry groups have become increasingly worried that a significant number of imports from PRC arriving under the code used for UCO may contain large amounts of palm oil and are urging the United States government to tighten scrutiny on those imports.

PRC’s domestic BBD producers are concerned about the amount of domestic UCO being exported rather than available for use as feedstock. UCO enjoys a 100 percent refund of its 13 percent export tax, and the PRC no longer has a tax refund for BBD exports. Leading BBD producers reported they will “join hands” to complain to supervising government authorities that the tax policy on UCO and BBD exports is not in the country’s best interests. In contrast to weak BBD exports, Post expects PRC’s UCO export will continue to soar in 2024.

PRC’s UCO exports to all destinations for the first five months of 2024 were up 50 percent year-on-year. The United States remains the top destination, followed by Singapore and the EU (mainly to Spain, the Netherlands, and Germany).

Chart 4. PRC: Used Cooking Oil (UCO) Exports (HS 151800)



Sources: Trade Data Monitor and General Administration of PRC Customs
Note: Used cooking oil (UCO): 1 MT = 1,043 liters of UCOME (UCO-based biodiesel)

Table 8. PRC: Biodiesel and Renewable Diesel Production, Supply, and Distribution

Biodiesel (FAME) & Renewable Diesel (HDRD), Million Liters										
Calendar Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024f
Beginning Stocks		0	0	0	0	0	0	0	0	0
Production	787	909	1,043	834	939	1,455	1,835	2,430	3,235	2,850
>HDRD Production	na	na	42	146	332	300	620	940	1,000	910
Imports	33	8	18	853	953	102	204	358	291	50
Exports	27	76	194	357	752	1,035	1,475	2,054	2,776	2,000
>HDRD Exports	na	na	42	146	332	300	600	900	900	840
Consumption	793	841	867	1,330	1,140	522	564	734	750	900
>HDRD Consumption	na	na	na	na	na	na	20	40	60	70
Ending Stocks	0	0	0	0	0	0	0	0	0	0
Production Capacity, Biodiesel (Million Liters)										
Number of Biorefineries	53	48	46	44	40	42	44	46	48	48
Nameplate Capacity	4,000	2,680	2,680	2,680	2,680	2,726	3,300	3,500	3,700	4,000
Capacity Use (%)	20%	34%	39%	31%	35%	53%	37%	43%	60%	49%
Production Capacity, Renewable Diesel (HDRD) (Million Liters)										
Number of Biorefineries	na	na	na	na	na	2	9	11	12	14
Nameplate Capacity	na	na	na	na	na	500	1,000	2,000	2,200	2,500
Capacity Use (%)	na	na	na	na	na	60%	62%	47%	45%	36%
Feedstock Use for Biodiesel (1,000 MT)										
Used Cooking Oil (UCO)	771	891	955	655	580	1,100	1,188	1,457	2,186	1,897
Feedstock Use for Renewable Diesel (HDRD) (1,000 MT)										
Used Cooking Oil (UCO)	na	na	41	143	325	293	606	919	939	890
Market Penetration, Biodiesel (Million Liters)										
Biodiesel, on-road	236	273	313	410	430	250	260	284	315	400
Diesel Pool, on-road us	134,375	130,564	130,538	139,622	122,447	118,238	132,433	136,579	141,277	145,900
Blend rate (%)	0.2%	0.2%	0.2%	0.3%	0.4%	0.2%	0.2%	0.2%	0.2%	0.3%
Diesel Pool, Total 1/ 2/	206,816	200,418	199,951	206,041	186,509	177,679	188,671	194,273	212,342	217,644
Jet Fuel/Other Kerosene	33,625	37,508	42,002	48,962	52,714	44,321	45,794	27,199	46,964	53,417

Note: 1/Diesel pool covers diesel and all biocomponents.

2/ Covers all on/off-road uses plus rail & heavy marine diesels and stationary power. Source: IEA.

3/ Covers all private-commercial-military kerosene-type jet fuels (fossil and bio-based, both Jet A-1 and naphtha-kerosene blend Jet B) + other fuel applications (e.g., cooking). Source: IEA.

f = forecast; All PSD data are B100 or B100-equivalent (see statistical info section of Reporting Instructions).

Used cooking oil (UCO): 1 MT = 1,043 liters of UCOME (UCO methyl ester, i.e. UCO-based biodiesel).

Source: Post and Industry sources.

V. Advanced Biofuels

Sustainable Aviation Fuel (SAF) Production

With almost no near-term domestic demand, SAF refiners are initially targeting exports, which industry executives expect will eventually manage through a system of quotas. The table below shows that there are several facilities that should start producing SAF in the next few years resulting in an increase in SAF production by 2026.

Table 9. PRC: SAF Production Capacity (2024 estimates)

Producers	Production Capacity	Status
Jiangsu's Zhangjiagang Eco Biochemical Technology	63 million liters	Under construction
Sinopec Zhenhai Refinery	125 million liters	The company's HEFA products passed Roundtable on Sustainable Biomaterials (RSB)'s certification in 2022. On June 28, 2022, the company produced the first test batch of SAF. On December 18, 2023 the plant produced second batch of 3 billion liters of SAF. Production period is around 50 days.
Guangdong's Donghua Energy	938-1,250 million liters	Trial I planned to operate in 2023
Henan Haixin Nengke	19 million liters	Planned to operate in 2024
Zhejiang Jia'ao Environmental Protection in Lianyungang	1,250 million liters	Trial I planned to operate in 2024
Sichuan's Jinshang	375 million liters	Project announced in May 2023
Guangxi Hongkun in Guangxi FTZ	375 million liters (313 million liters for Trail I)	Start construction in May 2024 and plan to produce in early 2026
Longyan Zhuoyue New Energy	100 million liters	Announced
Sinopec-TotalEnergies	289 million liters	In May 2024, Sinopec has signed a strategic cooperation agreement with TotalEnergies to deepen collaboration on SAF.
Junheng Industry Group Biotechnology	500 million liters	It started producing first SAF last December running at full capacity in the central city of Puyang
Tianzhou New Energy	250 million liters	Start up at full capacity towards the end of 2024 in Sichuan

State Power Investment Corp (SPIC)	13 million liters	Last December, SPIC announced a plan to build a 3.5-gigawatt wind power plant, a 164,000 tpy hydrogen-making facility and two 400,000 tpy plants, one each to make SAF and methanol. SPIC will first build a pilot plant making SAF from wind power-based hydrogen, applying technology from Tsing Energy Development Co, the first plant of its kind in PRC.
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Source: Post Industry Contacts.

1 MT SAF, HEFA-type = 1,250 liters of Biodiesel.

Despite a few test flights, PRC does not produce SAF in commercial volumes. The Civil Aviation Authority of PRC (CAAC) reported the launch of the country's first technical center for SAF that focuses on standard setting and product research. The new center, based in Chengdu, will lead the mapping out of industry policy and product and quality control standard setting along with certification.

Synthetic Fuel Ethanol

PRC's efforts to reduce air particulate matter and other fossil fuel toxins include projects to convert coal and industrial waste gas into synthetic ethanol. At the same time, PRC's adoption of more stringent environmental standards at industrial plants further constrains expansion of existing coal-to-syngas-to-ethanol processing facilities. In 2019, several non-fuel, industrial chemical ethanol producers in Jiangsu province that use coal and synthetic gasification technology ceased operations in the wake of weakening demand for industrial chemicals and the implementation of new environmental and safety requirements.

In September 2022, the then "world's largest" coal-based (633 million liters /500,000 metric tons) ethanol project reportedly started producing in Shaanxi's Yulin city. While the PRC press and industry contacts report that PRC's Syngas ethanol production capacity was expected to reach 2.5 billion liters by the end of 2022, this was clearly not attained and future progress remains uncertain. According to local media, in January 2024, the current "world's largest" plant that converts coal into ethanol began its test runs at a facility in Anhui province. The technology developed by the Dalian Institute of Chemical Physics (DICP) is the only in the world to have reached the industrial level so far.

Currently, Lanza Tech is the leading synthetic fuel ethanol producer in PRC. It has four joint venture subsidiaries with Beijing Capital Steel and Iron Group in Hebei, Yunnan, Guizhou and Ningxia. Among these four subsidiaries, only the one in Hebei is the designated fuel ethanol producer approved by NEA. The other three can only supply ethanol for industrial use. As E10 is stagnate, fuel ethanol production suffers from overcapacity, and the prices of waste gas keep growing, their ethanol has limited to no price advantage in PRC. Over the past few years, industry contacts report the firm marketed byproducts—pure protein feed powder, a total of 60,000 metric tons per year, to support the business.

VI. Notes on Statistical Data

Ethanol

Production capacity, production and consumption figures are based on statistics of industry and FAS post. Ethanol import figures are based on Trade Data Monitor, LLC (TDM) data, which are sourced from General Administration of Customs of the People's Republic of PRC (GACC). Feed stock and co-product figures represent FAS posts estimates and are based on the conversion and yield rates listed in the Appendix.

Biodiesel

Biodiesel estimates are based on trade reported under the Chapter 38 Chapter code, though it is unclear if some or all of PRC's HDRD exports to Europe fall under the designated Chapter 38 code for biodiesel or if they fall under Chapter 27 (2710.19). Some of this product, when misclassified, could be HDRD since sales of HDRD to Europe have been documented by market analysts. HDRD cannot be accurately tracked at this time due to tariff code uncertainties that Post will investigate further.

Biomass-based Diesel (BBD)

This term refers encompasses biodiesel and HDRD. Production capacity, production and consumption figures are based on statistics of industry and FAS post. Feed stock and co-product figures represent FAS posts estimates and are based on the conversion and yield rates listed in the Appendix.

Trade estimates are based on trade reported under the Chapter 38 Chapter code, though it is unclear if some or all of PRC's HDRD exports to Europe fall under the designated Chapter 38 code for biodiesel or if they fall under Chapter 27 (2710.19). Some of this product, when misclassified, could be HDRD since sales of HDRD to Europe have been documented by market analysts. HDRD cannot be accurately tracked at this time due to code uncertainties which will be investigated further.

All product trade under HS 3826.00 is assumed to be pure B100 biodiesel; All product under HS 271020 as petroleum oil, containing biodiesel up to 30 percent, is assumed to contain on average 10 percent biodiesel by volume, converted and reported as B100 equivalent. Due to uncertainty in trade codes used for HDRD, it is possible some of the product traded under the biodiesel code in chapter 38 could be HDRD that should be reported under Chapter 27 (according to NesteOil) or Chapter 15.

Industry contacts report PRC's HDRD exports mainly fall under HS 15162000 (Vegetable fats & oils & their fractions) and HS 27101994 (Liquid paraffin and heavy liquid paraffin, without biodiesel), or sometimes HS 27101929 (Other diesel oils and other fuel oils, without biodiesel). The amount of HDRD proportions remain unknown. In the first five months of 2024, the exports amount of the three HS codes combined stays similar to last year. The accurate tracking of HDRD will be investigated in future publications.

Appendix A: Energy Content and Conversion Rates

1 MT Gasoline = 1,256 Liters

1 MT Ethanol = 1,267 Liters

1 MT Biodiesel = 1,136 Liters

1 MT of HDRD = 1,282 Liters

1 MT of SAF, HEFA-type = 1,250 Liters

Yields Ethanol

Corn kernels: 1 MT = 402 (before 2014) to 417 liters (after 2014)

Wheat kernels: 1 MT = 393 liters

Cassava (dried chips): 1 MT = 333 to 400 liters (15 to 65% starch content)

Rice: 1 MT = 400 liters

Yields Biomass-based Diesel

Used cooking oil (UCO): 1 MT = 1,043 liters of UCOME (UCO methyl ester)

Ethanol Feedstock-to-Co-product Yield Rates

Corn kernels: 1 MT = 313 kg of DDGs + up to 29 kg of corn oil

Other grain kernels: 1 MT = 313 kg of DDGs (negligible vegetable oil)

Appendix B: PRC's Biofuels Program: Development of Production/Use Targets & Feedstock Priorities

Over two decades old, PRC's biofuels program remains in essence a surplus corn disposal program. Changes over many years to support the introduction of biofuels have focused almost entirely on ethanol, neglected use of renewables in the diesel pool (except for one city program), and SAF has only recently received attention. Despite years of stated intent, the program has failed to commercialize cellulosic and or any other advanced ethanol industry based on a technology platform other than the fermentation of starch or sugars with the minor exception of coal-to-ethanol.

There has never been a sustained effort or realistic plan to build the average national blend rate for ethanol in gasoline above roughly two percent (E2) despite continually setting higher goals. This is because to do so with existing production technologies and feedstock would have required significant imports for feedstock or fuel-grade ethanol. No effective carbon tax scheme or environmental sustainability criteria for biofuels were ever established to help drive the carbon intensity of all existing biofuels lower. All this means that biofuels' potential to drive climate change mitigation and reduce the health costs of a fossil fuel driven economy remains mostly undeveloped in PRC. It is understandable that PRC has failed to commercialize large-scale production of cellulosic biofuels including ethanol even though there is considerable domestic supply of waste agricultural and forest products. Despite large investments and significantly more program support in the United States, Europe and Brazil, cellulosic fuels have mostly failed to achieve widespread commercialization. PRC looks toward other means to achieve these nationwide GHG emission reduction goals focused on renewable electricity and increasingly hydrogen.

10th Five-Year Plan for Economic and Social Development (FYP) (2001-2005) – Corn Surplus Period

PRC implemented a fuel ethanol program, one of the world's earliest, starting in the early 2000's to create additional demand for then abundant grain supplies. In MY1998/99, USDA ending stocks estimates for PRC reached record highs at 123.8 million tons. During these early years, the vast majority of domestic ethanol production relied on existing corn surpluses and was in essence a corn disposal program. Beginning in 2005, as global grain prices soared, PRC began its initial promotion of nongrain, conventional fuel ethanol production known as Generation 1.5 ethanol.

11th Five-Year Plan (2006-2010) – Corn Surplus Moderated

PRC's 11th Five-Year Plan (2006-2011) was the first targeting the production of biofuel from non-grain materials, including sweet sorghum, potatoes, and cassava root for ethanol, and jatropha trees for biodiesel.

Beginning in 2006, 11 provinces (Heilongjiang, Henan, Jilin, Liaoning, Anhui, Guangxi, Hebei, Shandong, Jiangsu, Inner Mongolia and Hubei) were selected as pilot zones for fuel ethanol production and 'mandatory' E10 blend use. Many fuel retailers argued in courts and protested against state-owned petroleum giants that PRC's implementation of biofuels blending targets restrict their ability to respond to market prices, undercutting their profitability and the long-term

sustainability of their businesses. As a result of these concerns, some provinces with blending requirements do not fully enforce province wide E10 blending. Many provinces remain with no blend mandate and use MTBE instead (then and today) since they have no major corn growing areas and thus little economic interest in an ethanol program.

In August 2007, NDRC published a “Mid- to Long-term Renewable Energy Development Plan” that targets annual fuel ethanol use to exceed 12.670 billion liters by 2020, effectively expanding production by five-fold from 2017 to 2020.

During a period of high corn prices in 2008, PRC restricted construction of new ethanol facilities. Starting in 2010, phase out of the PRC government subsidies for conventional ethanol plants began, falling from \$0.03 per Liter (RMB 2,000 per ton) in 2009 to zero in 2016. Ethanol production subsidies using non-food grain feedstocks to produce conventional ethanol were also phased out by 2018. Afterwards, PRC limited the growth of corn use for fuel ethanol when rising domestic grain prices triggered food price concerns. During this same period, PRC became a net corn importer.

12th Five-Year Plan (2011-2015) – Corn Surplus Period

In 2010, the government set ambitious targets for ethanol and biodiesel in its 12th FYP, including a goal of producing 5.068 billion liters of fuel ethanol and 1.136 billion liters of biodiesel by 2015.

Despite significant investments in research and development, government efforts to expand production of non-grain conventional fuel ethanol never materialized into commercial-scale projects.

The 12th FYP goal for biodiesel was met early in 2014. However, both biofuel production targets fell short in 2015. In 2015, fuel ethanol production reached just 2.9 billion liters, or less than two-thirds of the original 5.1-billion-liter 12th FYP goal.

13th Five-Year Plan (2016-2020) – Corn Stocks Drawdown

On October 24, 2016, PRC’s State Council announced its 13th FYP goal to produce 5.1 billion liters of ethanol and 2.3 billion liters of biodiesel by 2020. While the goal requires ethanol production to rise four-fold from 2016 levels, underlying economic fundamentals and the lack of national or provincial government support undermined large-scale efforts to expand production.

Government policies introduced in 2016 paved the way for a fuel ethanol industry revival through the elimination of the temporary reserve policy for corn; reinstatement of the VAT refund on ethanol products added further support. Industry sources reported at the time that PRC’s provincial corn processing subsidies and a nationwide effort to expand E10 effectively supported margins for ethanol producers.

On September 13, 2017, NDRC, NEA, Ministry of Finance (MOF) and 12 other ministries jointly announced a plan to expand ethanol production and promotion for transportation fuel. This included a nationwide target of 10-percent ethanol blending into gasoline fuel by 2020, and a proposed shift to commercial-scale cellulosic ethanol by 2025. To date, the PRC has not

proposed an updated volumetric target for commercial-scale cellulosic ethanol production. On August 22, 2018, Chinese Premier Li Keqiang addressed PRC's State Council, and reiterated the central government's commitment to expand ethanol use nationwide.

In December 2019, media reported that PRC will suspend the expansion of its E10 mandate, essentially confining it to regions where it had already been introduced as corn stocks were too low and ethanol production capacity too small to implement E10 properly nationwide. The expressed use of imports as a vehicle to advance the E10 goal remained off the table.

Biodiesel remains unsupported for the most part in the domestic market and grows to become and more export oriented; no significant change in production capacity but capacity use rises. HDRD production emerges as a new fuel but almost entirely export market oriented with not programs in incentivized domestic use.

14th Five-Year Plan (2021-2025) – Corn Stocks Remain Lower

The outline of the 14th FYP (2021-2025), published in March 2021, sets an 18 percent reduction target for "CO2 intensity" and 13.5 percent reduction target for "energy intensity" from 2021 to 2025. Biofuels are not expected to realistically contribute to progress on these goals in any meaningful way under any existing plausible scenario.

In May 2022, the NDRC issued the "14th Five-Year Plan for Bioeconomic Development" establishing a national biotechnology framework to boost the bio-economy during the next five years. In June 2022, the NDRC led nine ministries to publish the "[14th Five-Year-Plan for Renewable Energy](#)." The plan calls for the development of non-grain biofuel ethanol and encourages promotion of fuel ethanol and biodiesel. Both are considered rather empty statements and nothing new given such statements have been repeated for the past two decades with no new trajectories established for any existing biofuel markets and no record of success commercializing advanced biofuels at scale for use in the domestic market. The Plan also called to support research and development and promote the use of advanced technology and equipment in BBD and jet fuel. However, no detailed implementing measures or policies were announced following the release of the two plans.

Appendix C: Commonly Used Acronyms

BBD	Biomass-based Diesel (biodiesel plus renewable diesel (aka HDRD))
CAS	Chinese Academy of Sciences
CEF	Carbon Emission Footprint
ETS	Carbon Emissions Trading System
CAAM	PRC Association of Automobile Manufacturers
COFCO	PRC National Cereals, Oils and Foodstuffs Corporation
CNOOC	PRC National Offshore Oil Company
CNPC	PRC National Petroleum Corp
PetroPRC	PRC National Petroleum Corp, publicly listed arm
PRCoilPRC	PRC National United Oil Corp, CNPC Trading arm
Sinopec	PRC Petroleum and Chemical Corporation
Unipecc	PRC Petroleum and Chemical Corporation, Trading arm
CPPCC	Chinese People's Political Consultative Conference
DDGs	Dried Distiller's Grains with Solubles
EV	Electric Vehicle
ETBE	Ethyl Tert-Butyl Ether
FYP	Five-Year Plan
GACC	General Administration of Customs of the People's Republic of PRC
GHG	Greenhouse Gas
HDRD	Hydrogenation-derived Renewable Diesel (world's only renewable diesel commercialized at scale)
HEFA	Hydroprocessed Esters and Fatty Acids
MTBE	Methyl tert-butyl ether
MEE	Ministry of Ecology and Environment
MEP	Ministry of Environmental Protection
MOF	Ministry of Finance
MPS	Ministry of Public Security
NDRC	National Development and Reform Commission
NEA	National Energy Administration
NPC	National People's Congress
NEV	New Energy Vehicles
PM	Particulate Matter
RMB	Renminbi
SCTC	State Council Tariff Committee
SAF	Sustainable Aviation Fuel
UCO	Used Cooking Oil

Attachments: [2024 China Biofuel Report Tables.xlsx](#)