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Report Highlights:

India continues to make significant progress in its biofuels program, with ethanol blending advancing substantially due to major expansions in production capacity and successful feedstock diversification toward grain-based sources. The country has achieved a notable milestone in renewable energy, reaching its Paris Agreement non-fossil fuel capacity target years ahead of schedule and securing a leading global position. However, the biodiesel program faces considerable challenges from feedstock supply constraints that threaten to derail blending objectives. In the emerging areas space, India is taking important steps with sustainable aviation fuel for international flights and sustainable maritime fuel development, positioning itself as a regional leader in transportation fuel innovation.

THIS REPORT CONTAINS ASSESSMENTS OF COMMODITY AND TRADE ISSUES MADE BY USDA STAFF AND NOT NECESSARILY STATEMENTS OF OFFICIAL U.S. GOVERNMENT POLICY

I. Executive summary

India's biofuels program has achieved notable success in ethanol blending, driven primarily by energy security concerns. The country reached its E20 ethanol blending target ahead of schedule in summer 2025 and is projected to achieve a 23 percent blending rate in 2026. The government also proposed regulatory amendments to accommodate E85 and E100 fuels and is preparing infrastructure for flex-fuel vehicles.

Feedstock diversification has fundamentally transformed India's ethanol sector. Grain-based sources now supply 73 percent of total ethanol, with corn emerging as the dominant feedstock at 46 percent and damaged food grains and government rice stocks contributing 27 percent. This represents a dramatic shift from historical sugarcane-based production, a transition the government has actively encouraged through targeted pricing incentives — most notably, the highest procurement price of $0.86/liter (INR 71.86 per liter) for corn-based ethanol. Total ethanol production capacity expanded from 6 billion liters (BL) in 2021 to 22 BL in April 2026, though only an estimated 51.5 percent utilization is forecast for the 2026 calendar year.

Biodiesel blending in India is expected to remain below one percent in 2026, well short of the five percent target for 2030. Feedstock availability represents the critical constraint on further expansion. Yet, consumption grew 32 percent in 2025 and is projected to increase 18 percent in 2026, though this pace is insufficient to close the gap with the 2030 target. Used cooking oil (UCO) consumption is at a record high, but collection remains logistically difficult, and overall UCO availability is projected to increase only marginally due to a decline in edible oil availability. Additionally, palm stearin consumption is trending up in 2026 but remains below historical levels, reflecting reduced Indonesian exports. Overall, installed biodiesel capacity stands at 2 BL, with utilization at about one-third due to these feedstock limitations.

To address these challenges, India's Ministry of Road Transport and Highways (MoRTH) is pivoting toward isobutanol, a diesel substitute made from fermented natural sugars as a diesel blending solution. With higher energy density and direct diesel compatibility, isobutanol is considered a cost-effective pathway to bolstering India's energy security with an estimated annual production potential of 3 BL from existing ethanol infrastructure.

India is also advancing sustainable aviation fuel (SAF) development with mandatory blending targets of one percent for international flights by 2027, moving to five percent by 2030. Indian Oil Corporation (IOCL) received India's first international certification in December 2025 and currently produces 30,000 metric tons (MT) of SAF annually. Similarly, sustainable maritime fuel development is progressing, with a major Indian port achieving a standard that could support 500,000 MT of methanol availability by 2028/29. There is also growth in second-generation (2G) cellulosic ethanol projects, with twelve commercial bio-refineries under development targeting 5 to 10 BL of production by 2030 from agricultural residues.

The transportation landscape is also being reshaped by the acceleration in electric vehicle (EV) adoption, with EV penetration reaching 8.5 percent of total vehicle registrations in fiscal year 2025/26. India's gasoline pool is projected to contract by approximately 8 percent in 2026, driven by the combined effect of rising EV adoption and expanding compressed natural gas (CNG) infrastructure. This contraction is supported by near-term data: petroleum imports declined more than 6 percent in March and April amid geopolitical tensions and elevated crude oil prices. As the gasoline pool contracts, fuel ethanol volumes are expected to increase to sustain the 23 percent blend rate. Over the longer term, with the government's pursuit of E85 and E100 mandates, the goal will continue to be to reduce dependence on crude oil imports and strengthen energy security. Concurrently, India maintains strict trade restrictions on biofuels, prohibiting fuel ethanol and biodiesel imports while effectively halting biodiesel exports since 2024.

II. Policy and Programs

A. Renewable Energy and Greenhouse Gas (GHG) Emissions: India has positioned renewable energy as central to its strategy for energy independence, reduced fossil fuel dependence, and climate commitments. In December 2025, the country achieved third place globally in renewable energy capacity, surpassing Brazil according to the International Renewable Energy Agency. During Indian Fiscal Year (IFY) 2025/26 (April 2025–March 2026), India added 55.3 GW of non-fossil fuel capacity—the largest single-year increase on record.

Total renewable electricity capacity grew from 4 GW in IFY 2014/15 to 274 GW by IFY 2025/26, representing a 45 percent compound annual growth rate over the decade. This expansion encompasses solar, wind, hydroelectric, biomass, and small-scale hydro installations (see Table 1).

Table 1. Installed Generation Capacity (In Gigawatts) as of March 31, 2026

Renewable Energy	Wind Power	Solar Power	Small Hydro Power	Biomass (Bagasse) Cogeneration	Biomass (non-bagasse) Cogeneration	Waste to Power	Waste to Energy (off-grid)	Large Hydro Power	Total
Total (GW)	56	150	5.0	9.8	1.0	0.3	0.5	51	274

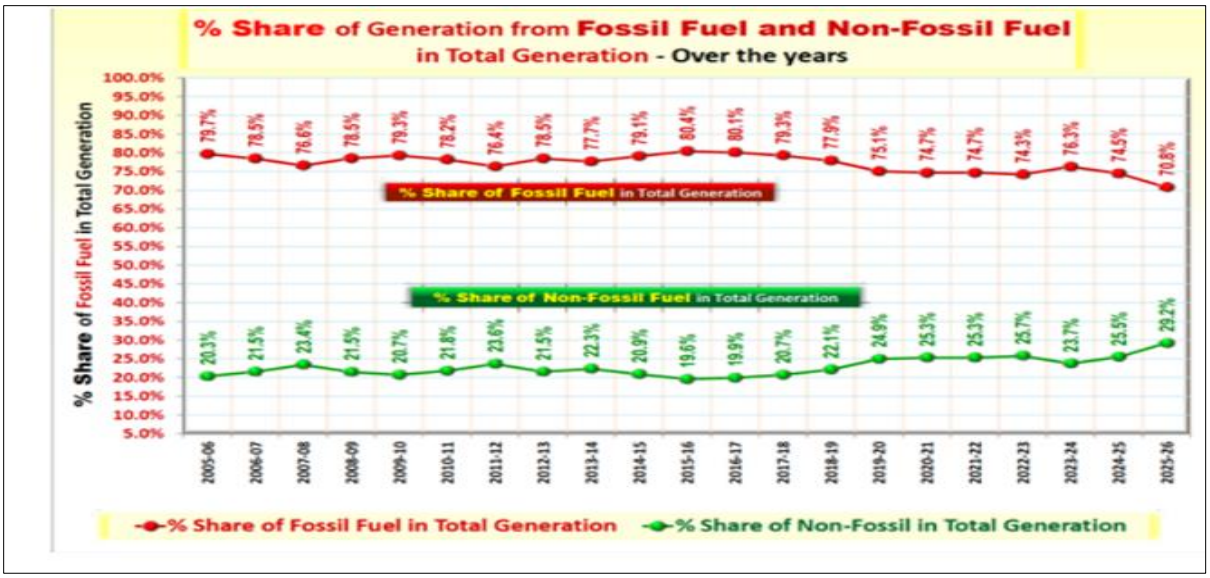
Source: Ministry of New and Renewable Energy (MNRE)

Additionally, India reached 50 percent non-fossil fuel capacity in June 2025—five years ahead of its 2030 Paris Agreement commitment. Throughout IFY 2025/26, non-fossil fuels generated 29.2 percent of total electricity (538.97 billion units out of 1,845.92 billion units). Power generation from fossil fuels dropped four percent while renewable generation increased one percent compared to the previous year. In July 2025, renewable sources supplied 52 percent of India's total electricity demand (203 GW)—the highest share ever achieved.

Solar capacity increased approximately 50 times since 2014 (from 3 GW to 150 GW) with two notable programs that distributed 16 GW of solar–the PM-KUSUM and Pradhan Mantri Rooftop Solar Schemes. Wind capacity increased nearly 3 times since 2014 (from 21GW to 56 GW),

adding 6 GW in 2025/26—the highest annual wind capacity addition on record. The Ministry of New and Renewable Energy (MNRE) continues working toward the Prime Minister's COP26 commitment of 500 GW of non-fossil fuel capacity by 2030 (see Figure 1).

Figure 1: Generation of Electricity from Renewable and Non-Renewable Sources of Energy



Source: MNRE

Additionally, a few other initiatives were implemented in 2025. The government reduced the Goods and Services Tax (GST) on renewable energy equipment from 12 percent to 5 percent effective September 22, 2025, lowering costs for project developers, distribution companies, rooftop solar installers, and industrial users. The Renewable Energy Equipment Import Monitoring System portal launched in October 2025 to enable real-time monitoring of renewable equipment imports. The Ministry of Power also updated the Renewable Consumption Obligation framework on June 26, 2025, establishing a phased waiver schedule for interstate transmission charges for renewable energy and battery storage projects.

Bioenergy Policy Initiatives: According to MNRE, as of February 2026, the co-firing of carbon-neutral biomass pellets with coal in thermal power plants has prevented approximately 5.7 MMT of CO_2 emissions since the program launched in IFY 2019/20. In addition to this, the government has established robust financial support mechanisms across multiple ministries to accelerate bioenergy development.

Specifically, MNRE provides financial assistance through the National Bioenergy Programme for non-bagasse biomass power generation facilities, briquette and pellet production plants, and compressed biogas (CBG) manufacturing units. Relatedly, MNRE reported increased installed capacity and power generation from bioenergy sources between IFY 2020/21 and IFY 2024/25 (see Table 2).

Table 2. Installed Capacity and Power Generation from Bio-Energy as of March 24, 2026

Indian Fiscal Year	Installed Capacity (MW)			Annual Generation (Million Units)	
	Biomass	Waste To Energy	Biogas (Numbers)	Biomass	Bagasse
2020/21	7.05	41.75	23,019	3,512	11,303
2021/22	60	80.16	0	3,482	12,574
2022/23	42.4	75.69	9,627	3,161	12,863
2023/24	107.3	35.37	13,219	3,417	10,826
2024/25	387.8	254.41	12,067	3,738	9,335

Source: MNRE

The Ministry of Agriculture and Farmers' Welfare administers the Crop Residue Management Scheme with tiered subsidies: individual farmers receive 50 percent subsidies for purchasing crop residue management equipment, while rural entrepreneurs, cooperatives, self-help groups, and farmer organizations receive 80 percent subsidies. Supply chain projects covering machinery costs for certain crops like rice can receive up to 65 percent financial support, capped at $166,667.

On May 7, 2026, MNRE issued a white paper in which the Indian Biogas Association advocates for mandatory 10 percent integration of fermented organic manure (FOM) with synthetic fertilizers by 2030. This initiative could reduce annual fertilizer import costs by $2 billion while addressing India's deteriorating soil quality and accelerating the shift toward sustainable farming practices.

The Ministry of Petroleum and Natural Gas (MoPNG) also plays a crucial role through multiple initiatives. The Biomass Aggregation Machinery Scheme helps CBG producers acquire collection equipment, reducing agricultural residue burning and improving feedstock availability. Under the Sustainable Alternative Towards Affordable Transportation (SATAT) initiative, 126 operational CBG plants currently generate approximately 860 metric tons per day (MT/day) of clean fuel. An additional 82 plants under construction will add 660 MT/day capacity, and over 1,000 additional plants are planned nationwide. MoPNG also implemented the Development of Pipeline Infrastructure Scheme, which is valued at $100 million and connects CBG facilities directly to City Gas Distribution networks. Currently, 17 plants are connected and delivering over 100 MT/day to the grid.

Despite the aforementioned advancements, two primary challenges constrain bioenergy project scaling. Feedstock supply constraints remain persistent, with difficulties in collecting and aggregating biomass materials compounded by limited year-round storage infrastructure. According to industry sources, high capital requirements present a significant barrier, as bioenergy projects require substantially greater capital investment per megawatt than solar or wind installations.

Greenhouse Gas Emissions: This year India transitioned from the Perform, Achieve, and Trade (PAT) scheme to the Indian Carbon Market (ICM) and full ICM operationalization is planned for this summer. The official portal launched in March 2026. The market will operate a mandatory Credit Trading Scheme (CCTS) to replace Energy Saving Certificates focusing on intensity-based targets across nine industrial sectors to support India's Nationally Determined Contributions (NDCs). The Bureau of Energy Efficiency manages this compliance mechanism. ICM is currently valued at $1.2 billion and is projected to reach $50 billion by 2030.

On October 8, 2025, the government issued a notification establishing final greenhouse gas (GHG) emission intensity targets for the first industrial sectors covered under CCTS compliance, marking a pivotal milestone in operationalizing the domestic carbon market. The Ministry of Environment, Forest and Climate Change implemented this framework through a phased approach during 2025. On April 16, 2025, the ministry released draft GHG Emission Intensity Target Rules covering four initial sectors: aluminum, cement, chlor-alkali, and pulp and paper, encompassing 282 industrial entities. A second notification issued on June 23, 2025, established targets for five additional sectors: iron and steel, fertilizer, petroleum refining, petrochemicals, and textiles, bringing over 460 additional industrial installations under the scheme.

CCTS functions as an intensity-based baseline-and-credit system, with targets defined as tons of CO_2 equivalent per unit of product output. This approach allows economic growth while incentivizing emissions efficiency improvements. Industrial entities that reduce their GHG emission intensity beyond assigned targets receive Carbon Credit Certificates (CCCs), which can be traded on designated power exchanges. Entities failing to meet mandated targets must purchase and surrender equivalent CCCs to demonstrate compliance.

Green Hydrogen Programs: MNRE estimates that India's green hydrogen production capacity will reach 5 MMT per annum by 2030, supported by approximately $2 billion in subsidies. The country has reduced green hydrogen production costs to $3 per kilogram from approximately $5 in 2023, with further targets to reduce costs to nearly $2 by 2032, as technological advancements improve production efficiency.

In March 2026, fertilizer companies signed agreements for 724,000 MT of green ammonia, satisfying one third of India's hydrogen requirements if fully realized. The sector has attracted international technology partnerships, including the University of Delaware. There are plans for expansion across India through strategic collaboration with InSolare Energy Limited.

B. Policy and Program Mandates Aimed at Biofuels

1) Ethanol and the Gasoline Market

India introduced its National Policy on Biofuels in 2018 to reduce fossil fuel reliance, promote sustainable development, and address environmental concerns. The policy established a comprehensive framework to strengthen the ethanol industry. The government made biofuels a national priority to diversify energy sources and increase farmer incomes. The program converts agricultural waste and surplus crops—including sugarcane juice, molasses, broken rice, damaged grains, and corn—into fuel, creating new revenue opportunities for farming communities. To meet its goals, the government provided financial incentives and soft loans to encourage sugar mills and grain-based distilleries to expand production capacity**.** The Oil Marketing Companies (OMCs), also play a role in overseeing the nationwide distribution of ethanol-blended fuel.

India reached its E20 target in May 2025. This milestone represented a major advancement toward cleaner energy, reduced oil imports, and stronger rural economies. In April 2026, India's installed ethanol production capacity reached 20 BL. According to a government notification, all OMC retail outlets across the mainland of India now supply E20 fuel.[1]

Mandate Evolution and Future Targets: Late in April 2026, India's MoRTH proposed amendments to the Central Motor Vehicles Rules to accommodate higher ethanol blends. The draft regulations include provisions for E85 fuel (85 percent ethanol) and E100 (nearly pure ethanol). These proposed rules have been opened for public comment and represent a preparatory regulatory step rather than immediate rollout, allowing for future testing and readiness for flex-fuel vehicles. This is driven by energy security concerns that have pushed the government to accelerate deployment of vehicles capable of using higher ethanol concentrations.

However, adopting E85 presents significant challenges: while infrastructure upgrades are manageable requiring only additional dispensers at existing fuel stations, the main obstacles are higher vehicle costs and reduced fuel efficiency. Ethanol's lower energy content means Indian consumers must burn 25 percent more fuel to achieve the same performance as gasoline, necessitating government incentives to make flex-fuel vehicles (FFVs) economically attractive. Currently all vehicles manufactured from April 2023 onwards are E20-compliant, though higher ethanol concentrations (E85, E100) will require significant engine modifications.

Financial Support Programs: Between 2018 and 2022, the Indian government introduced several Ethanol Interest Subvention Schemes designed to encourage establishment of ethanol production facilities nationwide. These schemes provided financial incentives to make ethanol plant investments more attractive to private and cooperative sector participants. The government allocates budgetary assistance to sugar mills to support expansion of ethanol production capacity.

[1] Ministry of Petroleum and Natural Gas – Ethanol Blending (E20) and Global Biofuel Alliance

Funding allocations have remained consistent across IFYs from 2024/25 through 2026/27, providing stability and predictability for industry planning (see Table 3).

Table 3. Indian Government Budget Allocation-Sugar Industry (USD million/INR billion)

Allocation	IFY 2023/24 Realized Outlays	IFY 2024/25 Realized Outlays	IFY 2025/26 Budget	IFY 2026/27 Budget
Scheme for extending financial assistance to sugar mills to enhance and augment ethanol production capacity	INR 4 billion	INR 6 billion	INR 6 billion	INR 6 billion

Source: Notes on Demands for Grants, 2026/27, Department of Food and Public Distribution

Starting in 2020, India focused on expanding ethanol production using multiple generations of biofuel feedstocks. To support this expansion, the government introduced the Pradhan Mantri JI-VAN Yojana (Prime Minister's Scheme for Accelerating Second-Generation Ethanol Production). The program provided viability gap funding to make second-generation ethanol projects financially feasible. In August 2024, this scheme was updated to reflect recent technological advances and attract more investment. The implementation period was extended by five years, now running through 2028-29. The scheme now covers a wider range of advanced biofuels produced from lignocellulosic materials, including agricultural residues, industrial waste, synthesis gas, and algae.

Feedstock Diversification and Pricing: In May 2021, India revised the Sugarcane Control Order to achieve two primary objectives. First, the amendment enabled standalone ethanol plants to expand production capacity by removing previous restrictions that had limited operational scale. Second, the reform strengthened quality control by comprehensively regulating both the sugar and ethanol sectors, restricting procurement to authorized formal sources, and enhancing consumer protections.

Building on this reform, the government launched the Multi-Feed Conversion Scheme on March 6, 2025. The scheme converts existing sugarcane-based plants operated by Cooperative Sugar Mills into multi-feed ethanol facilities, allowing them to process diverse feedstocks rather than relying solely on sugarcane-derived materials. This increases operational flexibility and production efficiency.

India's 2018 National Biofuels Policy further supports this diversification by promoting ethanol production from multiple feedstock sources, including B-heavy and C-heavy molasses, broken

rice, damaged grains, corn, sugarcane juice, and syrup. This approach reduces dependence on any single agricultural input and builds resilience against supply disruptions and price volatility across commodity markets.

This diversified feedstock strategy is already reflected in current production projections. FAS New Delhi projects India’s total sugar production for marketing year 2026/27 at 33.6 million metric tons (MMT) on a raw value basis, of which approximately 3.5 MMT is expected to convert to ethanol. This allocation demonstrates the government's continued commitment to biofuel objectives while maintaining adequate sugar supplies for domestic consumption. Grain distilleries using corn and broken rice will fill the remaining ethanol allocation.

Grain-based feedstocks are playing an increasingly prominent role in meeting these targets. The Food Corporation of India allocated 5.2 MMT of rice exclusively for ethanol production — a substantial increase from the previous year's 2.3 MMT. Corn-based ethanol has received particular attention through targeted pricing incentives: the government raised the corn-based ethanol price to INR 71.86 per liter in Ethanol Supply Year (ESY) 2025 and maintained this rate through ESY 2026 (see Table 4). The government deliberately set the corn-based ethanol price higher than ethanol derived from other feedstocks to encourage corn usage and further diversify the feedstock base.

The government also broadened the role of sugarcane in the ethanol supply chain. On November 1, 2025, the government authorized the use of all sugarcane-derived materials for ethanol production — including cane juice, syrup, B-heavy molasses, and C-heavy molasses — removing previous restrictions that had limited which sugarcane products producers could divert to ethanol.

Together, these policy actions have significantly expanded India's ethanol production capacity. According to industry contacts, India now has the capacity to achieve a new E-30 benchmark by the end of the current ESY — a milestone that would mark a major step forward in the country's biofuel ambitions.

Table 4: Ethanol Price for ESY 2022/23, 2023/24, 2024/25 and 2025/26 (INR per Liter)

Feedstock	ESY 2022/23	ESY 2023/24	ESY 2024/25	ESY 2025/26
Sugarcane Juice / Sugar Syrup / Sugar	65.61	65.61	65.61	65.61
B-Heavy Molasses	60.73	60.73	60.73	60.73
C-Heavy Molasses	49.41	56.28	57.97	57.97
Damaged Food Grains	55.54	64	64	64
Corn	-	66	71.86	71.86
Surplus Rice (from Food Corporation of India)	58.5	58.5	58.5	60.32

Source: MoPNG

Policies Impacting Gasoline Pool Size:

Vehicle Fleet Efficiency and Alternative Vehicles: The Indian EV market is projected to grow from $5.3 billion in 2025 to $17.9 billion by 2032 at a 19 percent CAGR, with penetration projected to reach 9.5-10 percent in IFY 2026/27. The PM E-DRIVE Scheme notified on September 29, 2024, with an outlay of $1.2 billion supports purchase incentives for approximately 2.8 million EVs and includes allocation of nearly half a billion for deployment of 14,028 e-buses. Similarly, under the PM e-Bus Sewa-Payment Security Mechanism, there is an outlay of half a billion U.S. dollars and aims to support deployment of more than 38,000 electric buses.

The government has reduced taxes (GST) on EVs from 12 percent to 5 percent and on chargers and charging stations from 18 percent to 5 percent, while states have been advised to waive road tax and registration fees. Effective February 2, 2026, through March 31, 2028, the Basic Customs Duty has been waived on capital equipment for lithium-ion battery cell production used in energy storage systems.

India's EV market recorded strong growth in IFY 2025/26 with passenger vehicle registrations surpassing 2.5 million units marking a 24 percent year-on-year increase, with EV penetration reaching 8.5 percent of total vehicle registrations up from 7.7 percent in the previous year. Electric two-wheelers remained the largest contributor, accounting for 58 percent of sales. EV four-wheel vehicles saw the sharpest rise with 172 percent growth and penetration climbing to 1.4 percent from 0.6 percent, aided by inclusion of medium and heavy trucks under PM E-Drive, adoption of light goods vehicles for logistics, and fleet conversions by e-commerce firms. There is also an emphasis on electrification of public transportation, with over 38,000 electric buses planned for deployment. Additionally, the expansion of CNG infrastructure and vehicles continues to provide an alternative to diesel in commercial applications.

In FY2026, a total of 4,839,508 cars were registered, of which 219,484 were electric, representing a 4.5 percent EV share of new car sales – with EV sales marking an 83.6 percent year-on-year growth. Buyers showed preference for EVs, CNG, and hybrids, which together crossed 1.358 million units accounting for nearly 30 percent of total passenger vehicle sales. The charging network also expanded to over 27,000 public stations in March 2026.

2) Biodiesel and the Diesel Market

India established an ambitious target to achieve a five percent biodiesel blending rate for on-road transportation by 2030, necessitating approximately 4.5 BL of biodiesel annually. Despite this goal, India's biodiesel program has encountered significant challenges and has not replicated the success observed in its ethanol blending initiatives.

Mandate Performance: The national average biodiesel blend rate has demonstrated only marginal improvement over recent years. The blending rate increased gradually from 0.1 percent in IFY 2023 to 0.5 percent in IFY 2024. According to FAS research, the blend rate is estimated to have reached approximately 0.6 percent in IFY 2025 and is projected to rise modestly to 0.63 percent in IFY 2026, indicating steady but gradual progress toward the established target.

Feedstock Challenges: India's biodiesel production relies on diverse feedstocks, including animal fats, non-edible oils, UCO, and imported palm oil and palm stearin. However, the program's advancement has been constrained by several critical factors. Restrictions on feedstock imports have limited raw material availability, while the absence of an economically viable and large-scale collection system for UCO has hindered efficient sourcing of this important feedstock. Despite these obstacles, India's UCO market, one of the largest globally, has grown from 3.2 MMT in 2023 to 3.4 MMT in 2024 and is projected to reach 4.5 MMT by 2030.

Isobutanol: On May 29, 2026, MoRTH highlighted the country's strategic shift toward isobutanol as a diesel blending solution.[2] While India has successfully met its ethanol blending goals, biodiesel blending lags far behind the five percent target. Current feedstock availability, including UCO, are insufficient to close this gap, prompting focus on isobutanol as a promising alternative. Bio-isobutanol production uses a process like ethanol manufacturing, using specific microorganisms to ferment natural sugars into isobutanol. With an ethanol nameplate capacity of 22 BL, a total 3 BL of isobutanol can be produced yearly (which is roughly 13.5 percent of total ethanol output), making isobutanol-diesel blends feasible and cost-effective.

[2] "Notification on blending isobutanol with diesel this year: Road secretary V Umashankar", Economic Times. Published on May 29, 2026.

Isobutanol offers higher energy density than ethanol, direct compatibility with diesel without requiring additives, and improved engine performance. Industry sources anticipate a mandated 10 percent blending requirement by the end of 2026. Given that diesel consumption in India is double that of petrol, advancing diesel blending initiatives could significantly enhance energy security beyond gains from petrol blending alone.

3) Sustainable Aviation Fuel (SAF) and the Jet Fuel Market

On April 23, 2026, MoPNG amended regulations to bring Aviation Turbine Fuel (ATF) blended with SAF under the scope of the ATF Control Order. Previously, ATF was defined exclusively as petroleum-based fuel meeting Bureau of Indian Standards specifications. The amendment expands this definition to include SAF. This regulatory change represents a significant advancement in efforts to reduce aviation emissions and supports India's ambitious blending targets of one percent SAF by 2027, two percent by 2028, and five percent by 2030. The regulation applies to international flights and aligns with the global Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) framework, which aims to reduce aviation emissions worldwide.

Industry Development: Indian airlines have commenced trial flights using SAF mixed with conventional ATF, and several domestic companies are actively developing SAF technologies. Air India has signed a memorandum of understanding with IOCL for SAF supply to support India's five percent blend rate, with IOCL becoming the first Indian company to receive a CORSIA certification for SAF production at its largest refinery in the northeast state of Haryana.

While SAF use is not yet mandatory, industry experts expect implementing regulations to be introduced once production scales up. SAF remains significantly more expensive than traditional jet fuel—typically 3 to 5 times higher in cost. The biggest challenge is the high capital required to establish SAF production facilities, especially in early development stages.

C. Environmental Sustainability and Certification

India achieved 50 percent non-fossil fuel capacity in June 2025, five years ahead of its 2030 Paris Agreement target, and ranks third globally in renewable energy installed capacity. The mandatory nationwide rollout of E20 fuel with a minimum 95 Research Octane Number (RON) from April 2026 aims to reduce carbon emissions and crude oil imports, having already replaced approximately 27 MMT of imported crude and avoided 81 MMT of CO_2 emissions by early 2026.

Environmental Benefits and Concerns: E20 is expected to cut carbon monoxide emissions by up to 50 percent and hydrocarbon emissions by nearly 20 percent, though it may reduce fuel efficiency by six to eight percent in older vehicles. India's push for renewable energy and ethanol blending is driven by energy security and environmental sustainability goals as well as the need to address severe air pollution from vehicle emissions in cities.

The National Biofuels Policy prioritizes energy security and climate change mitigation, recognizing ethanol as a cleaner-burning fuel that reduces particulate matter and air toxins. However, critics question the program's overall environmental benefit, arguing that pollution from biofuel production processes—with all ethanol facilities rated as highly polluting by the Central Pollution Control Board—may offset the gains from cleaner vehicle emissions.

Certification Requirements: Currently, India does not have mandatory carbon intensity (CI) certification requirements for biofuels placed on the domestic market. There are no policies in place requiring biofuel plants to certify the CI of their fuels through their own systems or third-party certification for domestic consumption.

However, for export markets and international aviation fuel standards (CORSIA), Indian Oil Corporation Limited has obtained the CORSIA certification for SAF production, indicating that certification capabilities exist when required for international compliance.

Incentives for Lower CI Scores: India does not currently have specific policy incentives designed to drive existing biofuel producers to lower the CI of the fuels they market. The government's support mechanisms focus primarily on production volume targets and feedstock diversification rather than CI reduction. There are no producer tax credits structured to reward lower CI scores, no carbon market exchange specifically for biofuels, and no minimum GHG reduction factor that qualifies biofuels to count toward mandate fulfillment.

The existing policy tools—such as differential pricing for various feedstocks and lower taxes on biofuels compared to fossil fuels—have not been structured to effectively motivate CI reduction. The focus remains on achieving volumetric blending targets rather than optimizing the carbon footprint of biofuels produced.

D. Trade Policy

Bilateral Trade Framework: On February 6, 2026, the United States and India announced a framework for an Interim Agreement on reciprocal trade, reaffirming their commitment to the broader U.S.-India Bilateral Trade Agreement (BTA) launched by President Trump and Prime Minister Modi on February 13, 2025.

In 2025, both nations launched the COMPACT (Catalyzing Opportunities for Military Partnership, Accelerated Commerce & Technology) and TRUST (Transforming the Relationship Utilizing Strategic Technology) initiatives, emphasizing structured collaboration in energy security, innovation, and technology. The countries restarted the U.S.-India Energy Security Partnership dialogue, with the U.S. positioning itself as a major supplier of crude oil, petroleum products, natural gas, and ethane to India, while supporting India's expansion of strategic oil reserves and full membership in the International Energy Agency.

India aims to increase e-fuel production to reduce emissions in aviation, shipping, and heavy industries. Both countries are advancing India's ethanol blending and SAF mandates through policy support and international partnerships, focusing on developing biofuel clusters, decentralized production facilities, biomass hubs, and digital tracking systems. Efforts also include improving feedstock processing innovation and aligning biofuel certification with global standards to enhance export potential.

Import Policies: India prohibits importation of biofuels intended for blending with its domestic fuel supplies, including both fuel ethanol and biodiesel. Additionally, certain products classified under specific Harmonized System codes are subject to import licensing requirements. These classifications encompass undenatured ethyl alcohol with 80 percent or higher alcohol content (HS 220710), denatured ethyl alcohol of all concentrations (HS 220720), petroleum oil with biodiesel content up to 30 percent (HS 271020), and pure biodiesel as well as biodiesel blends exceeding 30 percent biodiesel content (both under HS 382600). Import duties for both denatured and undenatured ethanol have not changed since April 2023 (see Table 5). Likewise, biodiesel import duties have remained constant since 2022 (see Table 6).

Table 5. India: Ethanol Import Duty (Percent ad valorem on Customs Insurance, and Freight [CIF] Value)

ITC HS Tariff Number	Total Import Duty
Ethyl alcohol and other spirits, denatured, of any strength; denatured ethanol; and denatured spirits [2207 2000]	Basic customs duty (BCD) on denatured ethanol for manufacture of excisable goods is zero percent. However, denatured spirits assessed five percent duty for all goods except above.*
Undenatured Ethanol [2207 1000] of an alcoholic strength by volume of 80 percent or higher	150 percent {Social Welfare Surcharge (SWS) of 10 percent on BCD exempted; State excise/value added tax as applicable}

Source: Central Board of Indirect Taxes and Customs (Updated as of May 1, 2026)
**Note: If the importer follows the procedure set out in the Customs Rules, 2017 (import of goods at concessional rate of duty), the central excise duty is a fixed amount and not a percentage on price.*

Table 6. India: Biodiesel Import Duty (percent ad valorem on CIF value)

ITC HS Tariff Number	Total Import Duty
Biodiesel and mixtures thereof, not containing or containing less than 70 percent by weight of petroleum oils and oils obtained from Bituminous minerals (greater than B30 to B100) [3826 0000]	10 percent BCD per KG
Petroleum oil and oils obtained from Bituminous minerals (other than crude), containing by weight more than 70 percent or more of petroleum oils, contain biodiesel, other than waste oils (B1-B30), [2710 2000]*	5 percent BCD per KG
Automotive diesel fuel, containing biodiesel, conforming to standard IS 1460 (2710 2010)	2.5 percent BCD per KG

Source: CBIC (Updated as of May 1, 2026)

Note: For the purposes of the sub-headings of 2710, the term "biodiesel" means mono-alkyl esters of fatty acids of a kind used as a fuel, derived from animal, vegetable or microbial fats and oils, whether or not used.

Export Policies: In 2025, the Indian government maintained a 50 percent export duty on two key biofuel feedstocks—B-heavy and C-heavy molasses—the same rate as the previous year. This policy ensures sufficient availability of feedstocks for domestic ethanol production. The export duty was raised from zero to 50 percent in January 2024. Before the duty hike, the country was one of the world's largest molasses exporters.

III. Ethanol

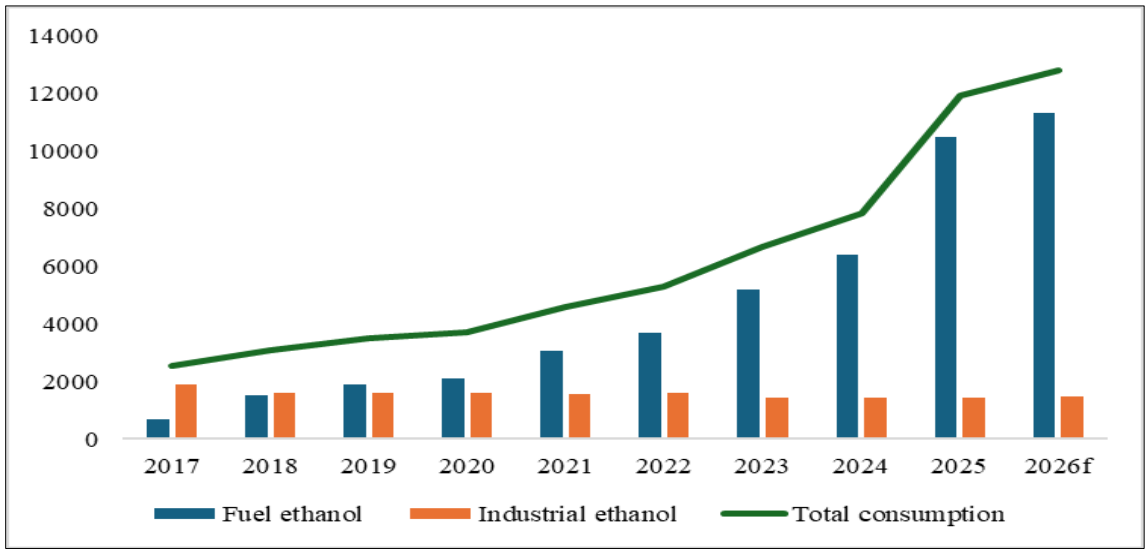
Table 7. India: Ethanol Used as Fuel and Other Industrial Chemicals (Million Liters)

Ethanol Used as Fuel and Other Industrial Chemicals (Million Liters)										
Calendar Year	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026f**
Beginning Stocks	128	150	200	112	190	150	205	250	235	240
Fuel Begin Stocks	20	50	50	80	100	60	10	70	150	72
Production	1,990	2,672	2,792	3,232	4,047	5,175	6,417	7,127	11,189	12,350
Fuel Production	705	1,500	1,920	2,120	3,000	3,650	5,260	6,480	10,402	11,334
Imports	722	607	670	669	600	289	410	777	792	560
Fuel Imports	0	0	0	0	0	0	0	0	0	0
Exports	140	129	50	133	87	109	132	89	52	100
Fuel Exports	0	0	0	0	0	0	0	0	0	0
Consumption	2,550	3,100	3,500	3,690	4,600	5,300	6,650	7,830	11,924	12,800
Fuel Consumption	675	1,500	1,890	2,100	3,040	3,700	5,200	6,400	10,480	11,310
Ending Stocks	150	200	112	190	150	205	250	235	240	250
Fuel Ending Stocks	50	50	80	100	60	10	70	150	72	96
Refineries Producing Fuel Ethanol (Million Liters)										
Number of Refineries	161	166	170	220	231	252	263	270	1,212	1,300
Nameplate Capacity	2,215	2,300	3,000	3,500	4,300	5,700	10,820	16,150	17,000	22,000
Capacity Use (%)	31.8%	65.2%	64.0%	60.6%	69.8%	64.0%	48.6%	40.1%	61.2%	51.5%
Co-product Production (1,000 MT)										
DDGs	0	0	0	0	0	0	10	2,492	4,047	4,283
Corn oil	0	0	0	0	0	0	1	231	375	397
Bagasse	79,176	118,784	99,942	126,976	139,264	135,168	131,072	132,259	135,000	136,000
Feedstock Use for Fuel Ethanol (1,000 MT)										
Corn kernel	0	0	0	0	0	0	32	7,961	12,931	13,684
Molasses (C-heavy)	3,245	5,500	4,500	1,200	785	800	600	2,701	795	650
Molasses (B-heavy)	0	750	2,271	3,550	5,150	6,079	9,250	5,060	4,591	4,014
Sugarcane syrup	0	0	1,951	5,263	9,200	10,800	15,000	3,539	20,717	23,138
Damaged food grains	0	350	603	1,600	2,000	1,759	2,100	4,064	3,132	2,120
Rice	0	0	0	118	395	1,125	1,890	3	3,592	5,682
Market Penetration (Million Liters)										
Fuel Ethanol Use	675	1,500	1,890	2,100	3,040	3,700	5,200	6,400	10,480	11,310
Gasoline Pool	37,098	40,367	42,496	40,741	37,926	41,831	45,427	48,400	52,500	48,260
Blend Rate (%)	1.8%	3.7%	4.4%	5.2%	8.0%	8.8%	11.4%	13.2%	20.0%	23.4%

Source: FAS New Delhi Research and historical data series, industry sources, and official government trade data as compiled and reported by Trade Data Monitor, LLC. f =Year 2026 is projected; # Excess rice supplied by the Food Corporation of India (FCI); * Leftover sugarcane residue after juice extraction. HS codes include (a) denatured, fuel 2207.20.0010, (b) ethanol denatured, other 2207.20.0090, (c) ethanol undenatured, fuel 2207.10.6010 and (d) ethanol undenatured, other 2207.10.6090.

A. Consumption: India's total ethanol consumption is projected to increase by approximately seven percent to 12.8 BL in 2026, with fuel ethanol accounting for most of this growth—a trend consistent since 2019. Fuel ethanol consumption is estimated to reach 11.3 BL this year, representing an eight percent increase from 10.5 BL in 2025 (see Figure 2).

Figure 2: Industrial and Fuel Ethanol Consumption (2017-2026f) (In Million Liters)



Source: FAS New Delhi Research

FAS New Delhi projects India will achieve a 23.4 percent ethanol blending rate in 2026, with industry sources indicating that E30 is attainable by year-end. On April 1, 2026, E20 petrol became the mandatory national standard following a February 17 directive from MoPNG. OMCs are directed to sell petrol blended with 20 percent ethanol that meets Bureau of Indian Standards specifications and maintains a minimum RON of 95—higher than the previous RON 91 standard for regular petrol. Ethanol's inherent octane rating of around 108 enables this quality upgrade at no additional cost. Regional exemptions may be granted temporarily under special circumstances. Having achieved the E20 blending target ahead of the original November 2025 deadline, the government is now considering E85 and E100 mandates to ensure energy security and independence. Yet despite government initiatives and incentives, vehicles purchased since 2022 have experienced reduced fuel efficiency and escalating maintenance expenses in engines and fuel tanks—issues which increased sharply from 2025 onwards.

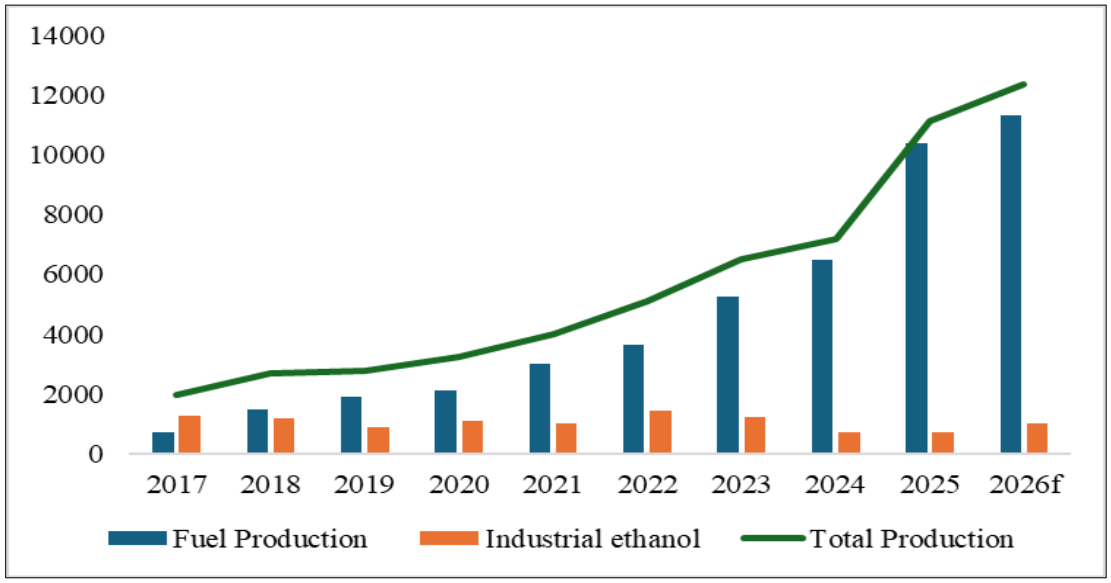
Industrial ethanol consumption is expected to reach approximately 1.5 BL in 2026, representing a three percent increase from 2025. This growth reflects an increased demand in food and beverage industry.

Revisions: FAS New Delhi has revised total ethanol consumption upward for 2025 by five percent from the initial estimate and fuel ethanol consumption by nine percent. An adjustment has also been made to account for the increased blending rate from the initial estimate of 19.3 percent to 20 percent.

B. Production: For 2026, total annual ethanol production for fuel and industrial purposes is projected at 12.4 BL, representing a 10 percent year-over-year increase. Fuel ethanol accounts for 11.3 BL of this total, marking a nine percent rise from 2025. Industrial ethanol production is expected to grow significantly, reaching approximately 1.0 BL—a 29 percent increase compared to the previous year and representing two consecutive years of growth since 2024.

This substantial increase in domestic industrial ethanol production stems from several factors. Rising freight costs have made U.S. industrial ethanol—traditionally one of India's largest suppliers—more expensive in 2026. Additionally, tensions in West Asia affected India's economic conditions, driving greater emphasis on domestic industrial ethanol production to reduce import dependence. Lastly, as domestic production capacity gains outpace fuel consumption expansion in 2026, India will produce a greater share of industrial ethanol domestically, displacing import demand.

Figure 3: Industrial and Fuel Ethanol Production (2017-2026f) (In Million Liters)



Source: FAS New Delhi Research

Since 2018, production has primarily focused on fuel ethanol to support the country's E20 blend target. While fuel ethanol production is expected to continue growing in 2026, the rate of increase will likely decelerate. Previous years' robust growth was driven by surplus sugar production, favorable weather, abundant corn supplies, and government incentives.

Projected Decline in India's Gasoline Pool (2026): The 2026 forecast reflects an eight percent contraction in India's gasoline pool, declining from 52.5 BL in 2025 to 48.3 BL in 2026. This reduction is expected to occur against a backdrop of tightening petroleum supplies, with petroleum imports during March and April 2026 falling by more than six percent year-over-year (Petroleum Planning & Analysis Cell). The decline is consistent with supply-chain disruptions and market uncertainties arising from geopolitical tensions in West Asia, a region that supplies a

substantial share of India's crude oil requirements. Elevated crude oil prices, higher freight and insurance costs, and concerns over supply security have collectively contributed to the projected compression in gasoline availability. Despite the shrinking gasoline pool, India's fuel ethanol demand is expected to continue expanding. The 2026 forecast projects an ethanol blending rate of 23.4 percent, up from 20.0 percent in 2025, while fuel ethanol consumption rises from 10.5 BL to 11.3 BL. This increase demonstrates the government's commitment to maintaining progress toward higher ethanol blending targets even under conditions of constrained petroleum supply. As the volume of gasoline consumption decreases, higher ethanol blend rates are required to maintain or grow overall ethanol consumption volumes. Looking beyond conventional E20 and E23 blending programs, the government has signaled interest in expanding the use of higher ethanol blends, including E85 and E100 fuels.

Feedstock Dynamics: In the current ethanol year, grain feedstocks represent 73 percent of total ethanol supplies (corn accounts for 46 percent and Food Corporation of India [FCI] rice for 22 percent), with the remaining 27 percent from sugarcane feedstocks. This marks a substantial change from the previous year, when corn contributed 47 percent and FCI rice just 15 percent. Ethanol conversion from corn, FCI rice, and sugar syrup is projected to increase in 2026 due to expanded rice and corn planting and moderate sugarcane production. Conversely, B and C heavy molasses shares for fuel ethanol will decline to prioritize industrial ethanol production.

The forecasted increase in ethanol production for 2026 is also attributed to anticipated normal sugarcane yields and the removal of previous restrictions on converting molasses to ethanol, which had been imposed during periods of low sugar supply. Additionally, on May 13th, 2026, the Indian government imposed a ban on sugar exports with immediate effect until September 2026 as sugar production dropped below anticipated figures. For all these reasons, there should be greater supplies of sugarcane-based feedstocks for ethanol production in 2026.

Declining sugarcane production since 2023—driven by adverse weather conditions—has reduced the contribution of sugar molasses and sugarcane juice to fuel ethanol output over the past two years. Sugarcane feedstock availability for fuel ethanol in 2026 faces constraints from limited fertilizer supplies stemming from the West Asia conflict and forecasted moderate sugar production in 2026/27. While sugarcane production is expected to grow from sugar marketing year (MY) 2025/26 to 2026/27, the increase may be insufficient to satisfy both domestic food consumption demands and higher fuel ethanol blending targets (India: Sugar Annual 2026)

Production Capacity: Currently, there are more than 1,300 refineries with an installed nameplate capacity of 22.0 BL, with only 52 percent of production capacity being utilized. Molasses-based distillery capacity is projected to increase from 9.0 BL to 10.0 BL, while grain-based capacity is expected to surge from 6.0 BL to 10.0 BL. Dual-feedstock capacity is anticipated to reach 1.3 BL. According to industry sources, current ethanol production capacity has reached 16.0 BL, comprising 9.8 BL from grain-based distilleries and 9.7 BL from molasses/dual-feed facilities.

Grain-based distilleries became the dominant production source, supplying approximately 3 BL from November 2025 through April 2026. As of April 2026, corn has emerged as the country's largest ethanol feedstock, contributing 2 BL. Surplus food grains added 1.2 BL, while damaged food grains provided 0.3 BL. Industry sources highlight that corn offers superior long-term scalability and requires significantly less water than traditional feedstocks. Additionally, there is potential to expand production capacity further, though availability of feedstock during erratic weather conditions and the focus on only three primary crops could be a challenge.

Feedstock Pricing and Co-Products: To stimulate ethanol production, the Cabinet Committee on Economic Affairs (CCEA) established procurement prices for feedstock as detailed in Table 8. For 2025, the CCEA raised the FCI rice price from INR 58.5 to INR 60.32 per liter for the current Ethanol Supply Year (ESY), while other feedstock prices remained unchanged. Corn has the highest procurement price at INR 71.86 per liter and produces more ethanol per unit than FCI rice, followed by B heavy molasses, making grain-based ethanol economically more attractive than molasses-based alternatives. Government promotion of corn cultivation since late 2023 has driven average corn prices from INR 14,500 per MT in 2023 to INR 25,500 per MT in 2026. The expansion of grain ethanol production also increased output of co-products such as Distiller's Dried Grains with Solubles (DDGS) from rice and corn.

During the first six months of ESY 2025/26, approximately 51 percent of ethanol demand was fulfilled. Although an additional 2 BL tender was anticipated for August 2026, OMCs may not proceed with it if gasoline demand falls due to government-promoted work-from-home policies and reduced travel stemming from higher petroleum prices caused by the West Asia conflict.

Table 8: Production Ethanol and Distiller's Dried Grains with Soluble in 2026 (January – December)

Feedstocks	Feedstock used (MMT)	Conversion to ethanol (BL)	Ethanol procurement price (INR/Liter)	DDG average price (INR[BL]/MT)
Cane Juice	23,138	0.27	65.61	Nil
B heavy Molasses	4,014	1.52	60.73	Nil
C heavy Molasses	650	0.59	57.97	Nil
Damaged Food Grains	2,120	1.02	64	26
Surplus FCI Rice	5,682	0.0013	60.3	26
Corn	13,684	3.03	71.86	24.5
Total	49,288	6.42	-	-

Source: FAS New Delhi Research

Ethanol-based incentives in 2025 prompted farmers to shift acreage from soybeans and pulses to corn cultivation, leading to a shift in cropping patterns. Relatedly, in 2025, the government significantly increased FCI rice allocation for ethanol production to 5.2 MMT, up from just 0.25

MMT in 2024, though this decision sparked concerns about diverting essential food grains to industrial applications.

Revisions: Based on market realities, increased feedstock availability for fuel blending, and a revised gasoline pool, FAS New Delhi has revised total ethanol production upward for 2025 by six percent from the initial estimate and fuel ethanol production by seven percent. Subsequently, the blend rate has increased from 19.3 percent to 20.0 percent.

C. Trade:

Imports: India prohibits fuel ethanol imports but continues to import ethanol for medical, industrial, and beverage applications. FAS New Delhi projects industrial ethanol imports will decline approximately 35 percent — from 858 ML in 2025 to 560 ML in 2026 — driven primarily by escalating freight costs and higher U.S. ethanol prices, which are expected to erode demand from India's two primary suppliers, the United States and Brazil. Additionally, stabilizing fuel ethanol targets and domestic industrial production expansion will reduce import dependence to satisfy industrial ethanol consumption. Early trade data supports this trend: between January and March 2026, India imported only 169 ML of industrial ethanol from the United States, a 19 percent decrease compared to the same period in 2025.

Exports: Ethanol exports are projected to reach 100 ML in 2026, with Congo, Tanzania, and Kenya as the primary importers — up from 53 ML in 2025. The Indian government clarified that biofuels produced from imported raw materials and exported from special economic zones — whether for fuel or non-fuel use — are exempt from tariff restrictions.

India was previously among the world's leading molasses exporters. However, in January 2024, the government imposed a 50 percent export duty on molasses due to low sugarcane production, aiming to ensure adequate domestic molasses supply for ethanol production.

IV. Biodiesel

Table 9. India Biodiesel Production from Multiple Feedstocks (Million Liters)

Biodiesel (Million Liters)										
Calendar Year	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026f**
Beginning Stocks	13	18	24	25	53	63	58	67	65	70
Production	170	185	230	200	180	185	201	358	556	640
Imports	7	24	0	0	0	0	0	0	0	0
Exports	7	23	44	32	5	4	2	0	76	110
Consumption	165	180	185	140	165	186	190	360	475	560
Ending Stocks	18	24	25	53	63	58	67	65	70	40
Production Capacity (Million Liters)										
Number of Biorefineries	6	6	6	6+	6+	20+	50+	70+	80+	90+
Nameplate Capacity	600	650	670	580	520	700	950	1,020	1,200	2,000
Capacity Use (%)	28.3%	28.5%	34.3%	34.5%	34.6%	26.4%	21.2%	35.1%	46.3%	32%
Feedstock Use (1,000 MT)										
Animal fats	6	7	10	6	12	7	10	12	5	10
Recycled oils (UCO)	56	60	70	45	65	65	70	180	437	515
Other (mostly palm stearin)	100	110	140	140	95	105	112	150	90	88
Market Penetration (Million Liters)										
Biodiesel, On-road use	72	83	100	50	10	40	40	350	470	510
Diesel Pool, On-road use !/	75,619	78,960	76,433	67,610	65,079	72,981	76,141	77,314	78,163	81,562
Blend Rate (%)	0.1%	0.1%	0.1%	0.1%	0.0%	0.1%	0.1%	0.5%	0.6%	0.63%
Diesel Pool 1/	94,524	98,700	95,541	84,512	81,349	91,226	95,176	96,642	97,704	101,952

Source: FAS New Delhi Research and historical data series, and official government trade data as compiled and reported by Trade Data Monitor, LLC. f =Year 2026 is projected; *Indicates theoretical estimate. To adjust with the market realities and the total diesel pool, *diesel Pool, On-road use use* has been adjusted from 2021 through 2025 due to correction in the actual consumption data sourced from MoPNG.

A. Consumption: India's biodiesel consumption is projected to increase by approximately 18 percent to 560 ML in 2026, up from the revised 2025 estimate of 475 ML. FAS New Delhi projects that India's national average biodiesel blending rate will rise marginally to 0.63 percent in 2026, representing a modest increase from the 0.6 percent blend rate achieved in 2025. This growth trajectory is not at pace to meet the 5 percent biodiesel blend rate by 2030, as progress remains constrained by feedstock availability challenges. Off-road biodiesel consumption plummeted since 2024 as biodiesel was redirected to on-road use. For non-transport applications, demand is generally met by petroleum-based alternatives or conventional palm stearin, depending on relative cost competitiveness.

The biodiesel blending program targets on-road diesel consumption, which is projected to reach approximately 81.6 BL in 2026. Among the three major OMCs, IOCL continues to lead in biodiesel blending performance. In 2025, IOCL achieved a blending rate of almost 0.7 percent,

followed by Hindustan Petroleum Corporation Limited (HPCL) and Bharat Petroleum Corporation Limited (BPCL).

The primary driver of consumption growth in 2026 is the expanding demand for cleaner fuels in both the transportation and stationary power sectors, supported by consumer tax incentives and government mandates. However, the rate of consumption growth is expected to decelerate compared to previous years due to persistent feedstock supply constraints. The availability of used cooking oil (UCO), the principal feedstock for biodiesel production—faces significant challenges stemming from reduced domestic edible oil consumption and limited collection infrastructure.

India's domestic edible oil production is anticipated to decrease in 2026, with imports also expected to decline due to geopolitical instability in West Asia. The resulting reduction in edible oil consumption will likely diminish UCO availability for biodiesel conversion. As seen in Table 9, the UCO share in biodiesel production is expected to increase at a decreasing rate compared to previous years.

Revisions: 2025 consumption was adjusted downward from the initial forecast of 700 ML to 475 ML owing to reduced feedstock supply. The decline in palm stearin and animal fats contributes to this decline. Additionally, UCO availability was not as expected and it corresponds with decreased domestic edible oil consumption during the 2025/26 period, as detailed in India: Oilseeds and Products Annual.

B. Production: FAS New Delhi projects India's biodiesel production to reach 640 ML in 2026, representing a fifteen percent increase compared to the 2025 revised estimate of 556 ML. Domestic demand and exports are driving production growth, as India maintains restrictions on fuel biodiesel imports and has recently seen elevated biodiesel exports to the EU. Production growth in 2026 is expected to moderate compared to the substantial 55 percent increase achieved in 2025, primarily due to feedstock availability constraints.

Feedstock Dynamics: Biodiesel production relies heavily on UCO, animal fats, and tallows. However, the availability of these materials varies considerably, resulting in inconsistent production patterns. India consumes approximately 24 BL of cooking oil annually, with roughly six percent being improperly reused in food preparation, creating potential health hazards. This recycled oil from the hospitality and food service industries represents a potential resource for biodiesel conversion—theoretically yielding approximately 1.3 BL of biodiesel annually if fully captured.

In 2026, UCO is projected to account for 515,000 MT of feedstock use, representing an eighteen percent increase from 437,000 MT in 2025 and comprising the dominant share of biodiesel feedstock. Palm stearin is expected to contribute approximately 88,000 MT, while animal fats will supply around 10,000 MT. The modest growth in UCO availability reflects ongoing

challenges in supply chain and reduced edible oil consumption due to economic conditions and geopolitical factors affecting imports.

Production Capacity and Infrastructure: The biodiesel sector currently includes over 90 certified producers with a collective annual nameplate capacity of 2.0 BL. This represents a substantial increase in installed capacity from 1.2 BL in 2025, driven by continued government support and investment incentives. However, capacity utilization is expected to decline in 2026, reflecting the persistent gap between installed capacity and feedstock availability.

To achieve the targeted five percent blending rate by 2030, India would require a total of approximately 5 BL of biodiesel in the on-road diesel pool—nearly ten times current production levels. This ambitious target necessitates significant improvements in feedstock collection infrastructure and potentially the development of alternative feedstock sources.

Collection Infrastructure and Industry Initiatives: To combat the unsafe reuse of cooking oil and promote biofuel production, the Food Safety and Standards Authority of India (FSSAI) launched the Repurpose Used Cooking Oil (RUCO) program in 2018. The government supports establishing collection facilities for UCO and alternative feedstocks, offering incentives to optimize the collection infrastructure through RUCO to facilitate the gathering and processing of UCO into biodiesel.

Industry advancement faces ongoing obstacles related to UCO collection logistics. Fast-Moving Consumer Goods (FMCG) companies are increasingly partnering with biorefineries to improve the conversion process of food waste into biofuel. Notably, U.S.-based FMCG company Humankind has entered into a memorandum of understanding with an Indian compressed biogas (CBG) facility to boost biofuel production while maintaining supply chain efficiency. There has been a marked increase in the acquisition of diverse feedstocks for CBG operations, which may create additional competition for UCO supplies.

Revisions: Production in 2025 was revised downward from the initial forecast of 718 ML to 556 ML due to lower-than-expected UCO feedstock availability at 437,000 MT (earlier estimate was 457,000 MT in 2025). The reduction was primarily driven by constrained supplies of UCO, which stemmed from lower domestic edible oil consumption during the 2025/26 period, as detailed in India: Oilseeds and Products Annual.

C. Trade: There were virtually no biodiesel imports in 2025, and this trend is expected to continue throughout the current year. 76 ML of biodiesel was exported in 2025. Exports are forecast up in 2026 to 110 ML on greater demand from the European Union, looking to offset lower biodiesel imports from Argentina.

V. Advanced Biofuels

Sustainable Aviation Fuel (SAF): India has committed to ambitious SAF blending targets: one percent for international flights by 2027, two percent by 2028, and five percent by 2030, aligned with the international CORSIA framework. As mentioned in Section II, the Indian government amended the blending of Aviation Turbine Fuel (ATF) with SAF under the ATF Control Order. Additionally, SAF must meet Bureau of Indian Standards specifications as well as guidelines to qualify as eligible CORSIA fuel. According to industry sources, this directive coupled with the SAF targets could potentially reduce India's crude oil import bill by $7 billion annually and create over 1.5 million green jobs across the SAF value chain.

Feedstock Potential and Production Pathways: India possesses significant feedstock capacity, with more than 600 MMT of agricultural waste and biomass—including corn, rice, sugarcane bagasse, and other crop residues—available each year, along with 4 MMT of UCO. Currently the Hydrotreated Esters and Fatty Acids (HEFA) process, which converts fats and oils like UCO, animal fats, palm oil, and palm fatty acid distillate, accounts for virtually all commercial SAF production. As one of the largest consumers of edible oils globally, India holds a strategic advantage for HEFA-based SAF production from UCO. Nevertheless, the supply chain presents difficulties, particularly in collecting UCO from both industrial facilities and residential households.

Alternative pathways like Alcohol-to-Jet (AtJ) and Fischer-Tropsch (FT), which convert agricultural waste and residues, sugar and starchy biomass from corn and sugarcane, are also being explored globally. As the supply chain is already in place for conversion of ethanol from sugarcane feedstocks and corn for on-road fuel use, AtJ could be more economically viable than HEFA SAF in India in the future. According to industry contacts, the SAF supply chain is likely to be governed by the OMCs for the refining process as is presently done for blended ethanol.

Commercial Development and Challenges: SAF remains 3 to 5 times more expensive than traditional jet fuel, with high capital requirements for production facilities posing the biggest challenge. Despite these barriers, Indian airlines have begun conducting trial flights using SAF blended with conventional Aviation Turbine Fuel. In December 2025, IOCL received India's first certification to produce SAF at its Haryana refinery, which currently produces 30,000 MT annually representing India's current total SAF production capacity. Relatedly, IOCL also partnered with Akasa Airlines to explore feedstock sourcing and delivery opportunities in India.

Cellulosic Ethanol: To reduce fossil fuel dependence and boost ethanol production, the Indian government launched the Pradhan Mantri JI-VAN Yojana (Jaiv Indhan–Vatavaran Anukool fasal awashesh Nivaran), providing financial assistance for establishing Second-Generation (2G) bioethanol plants utilizing cellulosic and lignocellulosic biomass from agricultural residue and non-food feedstocks. The scheme has approved six commercial and four demonstration 2G

ethanol plants, with total financial allocation including INR 18 billion for 12 integrated bioethanol projects, INR 1.5 billion supporting 10 demonstration plants, and INR 195 million for establishing a Center for High Technology. OMCs are investing INR 140 billion to construct 12 2G bio-refineries that will convert renewable feedstocks into ethanol, substantially expanding India's renewable fuel capacity.

Production Targets and Feedstock Availability: Under the 2018 National Biofuels Policy, India targets blending 5 to 10 BL of cellulosic ethanol into its fuel mix by 2030. The country produces 120 to 160 MMT of biomass annually, which could theoretically yield 30 BL of cellulosic ethanol each year. India's pilot and demonstration-level advanced biofuel plants currently have a combined production capacity of 32 ML of cellulosic ethanol per year.

Technology and Environmental Benefits: 2G ethanol is a biofuel produced from non-food resources and agricultural residues, often referred to as lignocellulosic biomass. Unlike first-generation (1G) ethanol derived from food crops like sugarcane or corn, 2G technology utilizes more complex plant materials composed of cellulose, hemicellulose, and lignin. Common feedstocks include rice straw, wheat straw, corn cobs, bamboo, and woody biomass. This technology is viewed as more environmentally benign because it reduces demand for water-intensive crops and allows industrial-scale utilization of agricultural waste that might otherwise be burned in fields. Using residual materials results in significantly lower impact on land-use change compared to primary crops, as shifting forests or grasslands to fuel crops can increase greenhouse gas emissions, whereas utilizing biomass residues avoids these negative environmental trade-offs.

According to NITI Aayog's 2021 Expert Committee Report, a primary focus is encouraging farmers to shift from water-intensive sugarcane and rice to more environmentally sustainable crops like corn. The government's investment of $214 million through the PM-JIVAN scheme ensures fuel production does not compete with human food consumption. To manage the national water crisis, the government is promoting Zero Liquid Discharge systems in distilleries to minimize pollution and water waste, while exploring pricing mechanisms that incentivize the use of diverse feedstocks to reduce the ecological burden on water-stressed regions.

Recent Developments and Co-Products: In a notable advancement, Hindustan Petroleum Corporation Limited, one of the OMCs, is fast-tracking its 2G bio-ethanol project in Punjab, expected to be completed by 2026, which will convert rice straw into ethanol and help curb stubble burning (see Table 10). Relatedly, Amul has successfully developed bioethanol from acid whey, a byproduct typically discarded during cottage cheese production. This lactose-rich liquid proves ideal for ethanol fermentation due to its high sugar content, offering a sustainable solution for waste management and energy production. Additionally, Balrampur Chini Mills Limited is establishing India's first Polylactic Acid (PLA) plant in Uttar Pradesh to produce bioplastic materials based on circular economy principles, with potential to replace a substantial portion of India's existing plastic consumption. Bio-CNG, a potential byproduct of 2G ethanol plants, adds

another dimension to sustainable energy production, with OMCs offering financial guarantees to enhance commercial viability.

Table 10. India: Operating and Announced 2G Ethanol Facilities

Company	Location	Fuel Type	Production Capacity	Feedstock	Status/Start Date
Indian Oil Corporation Limited (IOCL)	Panipat, Haryana	2G Ethanol	Included in 32 ML total	Crop residue, rice straw	Operational
Bharat Petroleum Corporation Limited (BPCL)	Bargarh, Odisha	2G Ethanol	Included in 32 ML total	Agricultural residue	Operational
Hindustan Petroleum Corporation Limited (HPCL)	Punjab	2G Ethanol	TBD	Paddy straw	Expected 2026
Numaligarh Refinery Limited	Assam	2G Ethanol	Included in 32 ML total	Bamboo, agricultural waste	Operational
Multiple OMC Projects	Various locations	2G Ethanol	Target: 5-10 BL by 2030	Lignocellulosic biomass	Under development (12 facilities planned)

Sustainable Marine Fuel (SMF): The International Maritime Organization's (IMO) Marine Environment Protection Committee concluded its 84th session with a renewed commitment to address greenhouse gas emissions from global shipping. Nearly 100 delegations participated in discussions on the IMO Net-Zero Framework, presenting multiple proposals for advancing negotiations on mid-term measures to reduce emissions from ships. To resolve outstanding concerns and build broader consensus, the Committee established an intersessional Working Group ahead of MEPC 85, scheduled for six months later. Member States, including India, will have the opportunity to submit new amendments and adjustments to previously approved draft measures.

Methanol Bunkering Infrastructure: On April 9, 2026, the Indian government announced significant progress in maritime sector decarbonization through the Deendayal Port Authority — commonly known as Kandla Port — one of India's major port authorities. Kandla Port has advanced its methanol bunkering capabilities, positioning itself as a strategic asset in India's energy transition and the development of global green shipping corridors. This initiative aligns with the maritime industry's objective of achieving net-zero emissions by 2050 and focuses on adopting low-carbon alternative fuels such as e-methanol and e-ammonia to reduce greenhouse gas intensity in shipping operations. Following a comprehensive assessment, Kandla Port

achieved a Level 6 rating on the International Association of Ports and Harbors (IAPH) Port Readiness Level scale for methanol bunkering.

Building on this milestone, on April 2, 2026, Kandla Port successfully conducted a trial shore-to-ship methanol bunkering operation designed to validate infrastructure and operational protocols.[3] The exercise was executed in collaboration with industry partners including Stolt Tankers, J M Baxi, Aegis Vopak, Indian Oil Corporation Ltd., and the Deendayal Port Authority. The trial validated critical elements such as bunker transfer processes, safety systems, and regulatory compliance. Kandla Port is currently working toward ensuring the availability of approximately 500,000 MT of renewable fuels of non-biological origin (RFNBO)-compliant e-methanol by 2028/29 — supply expected to support deep-sea dual-fuel vessels operating along the Asia-Europe trade corridor.

Table 11. India: Biofuel Research and Development Classification

Fuel	Substitute	Technologies Deployed
Diesel	*Biodiesel, **HDRD (Green Diesel), Bio-based oxygenates (alcohols and ethers)	Esterification, Hydroprocessing, Fermentation, Syngas conversion
Aviation Turbine Fuel (ATF)	**Sustainable Aviation Fuel (or, Bio-ATF)	Hydroprocessing, Sugar conversion, alcohol-to-jet, Fischer–Tropsch process
Gasoline (Petrol/Motor Spirit)	*Ethanol (1G), **Ethanol (2G), **Methanol, Green (drop-in) gasoline	Fischer–Tropsch process, Gas Fermentation, Alcohol-to-gasoline, Hydroprocessing, Pyrolysis/Catalytic Cracking
Compressed natural gas (CNG)/piped natural gas (PNG)	*Bio-CNG/Bio-PNG, HCNG, Bio-H2	Waste Fermentation
Marine Fuel/Industrial Fuel Oil	**Green heavy distillate, biomass-derived oils	Hydroprocessing, Pyrolysis/Fluid catalytic cracking, Hydrothermal Liquefaction, MSW-thermochemical processing

[3] Kandla Port Advances Methanol Bunkering.

VI. Notes on Statistical Data

Conversion Table: Ethanol

Damaged Food Grains – 1 MT = 250 liters
Broken Rice – 1 MT = 440 liters
Sugarcane Juice – 1 MT = 76 liters
B-Heavy Molasses – 1 MT = 300 liters
C-Heavy Molasses – 1 MT = 217 liters
Corn/Maize – 1 MT = 380 liters
Ethanol – 1 MT = 1,270 liters

Ethanol Co-Product Conversion Rates

DDGs production = 0.313 MT per 1 MT of grains
Corn oil production = 0.029 MT per 1 MT of corn
Bagasse production = 0.275 MT per 1 MT of sugarcane (ranges 25-30%)

Conversion Table: Biodiesel

Animal Fats – 1 MT = 1,043 liters
Recycled Oils (UCO) – 1 MT = 1,043 liters
Other (mostly palm stearin) – 1 MT = 1,050 liters
Biodiesel – 1 MT = 1,136 liters

Trade Data: All trade data in this report is sourced from Indian government websites and accessed via Trade Data Monitor unless otherwise specified. For ethanol, exports are based on reported India trade of HS codes 2207.10 and 2207.20. For imports, U.S. Census Bureau data is used to estimate imports from the United States, imports from all other markets are based on reported India import data. There is no trade of fuel ethanol in India.

For biodiesel, all trade under HS code 3826.00 is assumed to be B100. All trade under HS code 2710.20 is assumed to be B5 and is converted to B100 equivalent in our estimates and forecasts.

Gasoline and Diesel Pool Methodology: The gasoline pool figures reported in Table 7 are calculated using the following methodology: FAS New Delhi's blending rate is attributed to the calculation of total gasoline pool which includes blended ethanol (gasoline and all additives including any biocomponents and biofuels). Gasoline fuel pool estimates are calculated based on Indian government's motor spirit consumption data.

The diesel pool figures reported in Table 9 are calculated using the following methodology: FAS New Delhi's blending rate is attributed to the calculation of total High-Speed Diesel (HSD) pool which includes blended biodiesel. Diesel pool estimates are calculated based on Indian government's HSD consumption data.

FAS New Delhi is using India's gasoline and High-Speed Diesel (HSD) pool data from the MoPNG website rather than other sources. The estimated pool for this year is derived from averaging actual monthly consumption figures for past months. Unlike other sources, MoPNG's PPAC cell publishes month-wise actual consumption data. This approach is consistent with the methodology applied in the 2025 annual report for ethanol and biodiesel on road use, and has been carried forward into the 2026 report**.**

Attachments:

No Attachments