



# ETHANOL BLENDING PROGRAMME – NEW HOPE FOR INDIA’S ECONOMY

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**ABSTRACT:** India is taking path breaking measures toward securing its energy future by embracing sustainable practices like ethanol blending. Being one of world’s major energy consumer, the country has traditionally depended on oil imports to meet its growing energy needs. This dependence poses challenges to energy security and leads to a substantial outflow of foreign currency. However, with ethanol blending, India has a defining opportunity to reduce its dependence on imported oil while addressing environmental concerns.

Ethanol, a byproduct of sugarcane processing when blended with petrol, cuts down on fossil fuel consumption and reduces harmful carbon emissions which adversely affects climate change and causes public health issues.

The practice of blending ethanol with petrol began in 2001 on a pilot mode. Yet, for many years, progress was slow, and ethanol production remained stagnant. In recent years the Govt. Of India initiated a series of comprehensive reforms , as a result of which India has been able to unlock the full potential of this initiative. These reforms are now driving substantial outcomes, not just by enhancing energy security, but also by revitalizing rural economies. Ethanol production offers a new source of income for farmers, supporting the agricultural sector and fostering economic growth in rural areas.

The Government’s has taken ambitious target of increasing the ethanol blending to 20% from earlier set target of year 2030 to year 2025, demonstrating a strong commitment. During the 7th G-STIC Delhi Conference, Shri Hardeep Singh Puri, Minister of Petroleum and Natural Gas, emphasized India’s growing success in ethanol blending and its broader commitment to sustainable energy solutions. This forward-looking approach indicates that India is not only focused on meeting its immediate energy needs but is also preparing for long-term sustainable energy solutions to address future demands.

**INDEX TERMS** - Ethanol Blending , Fossil Fuel, Feedstock , Biofuel , Interest Subvention

## INTRODUCTION

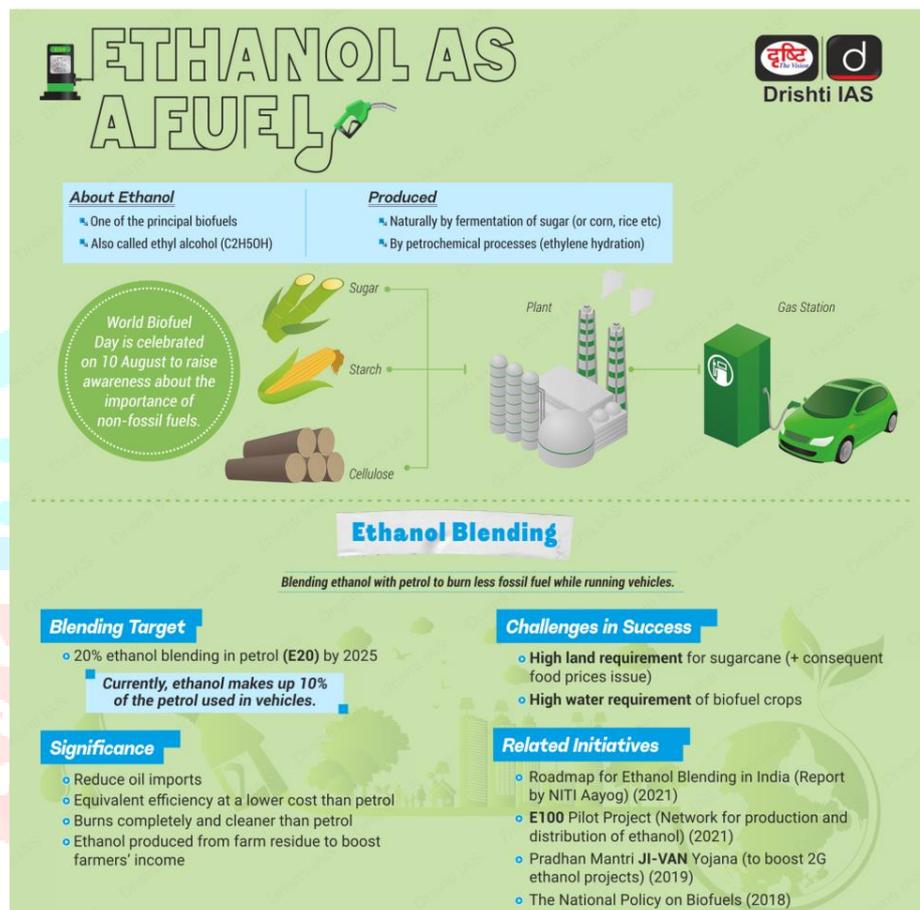
- **ETHANOL** is an organic compound which is a clear, colorless liquid that is flammable and has a typical characteristic odour. Ethanol is mainly produced from a by-product of the sugar industry, namely molasses, but other raw materials like sugarcane juice, sugar, sugar syrup, and damaged food grains can also be used.

The salient features related to Ethanol are as under :

- **Production:** Ethanol can be produced through the fermentation of sugars by yeast , similar to the process used in the production of alcoholic beverages. Ethanol can also be synthesized through chemical processes, such as hydration of ethylene.

**Uses:**

- **Beverages:** Ethanol is the type of alcohol found in alcoholic beverages. It is consumed socially in various forms, such as beer, wine, and spirits.
- **Fuel:** Ethanol is used as a biofuel and is often mixed with gasoline (petrol) to produce ethanol-blended fuels.
- **Industrial Solvent:** Ethanol is used as a solvent in the manufacturing of pharmaceuticals, perfumes, and other products because of its ability to dissolve a wide range of substances,
- **Medical and Laboratory Uses:** Ethanol can also be used as an antiseptic, disinfectant, and a preservative in medical and laboratory settings.
- **Chemical Feedstock:** Ethanol also serves as a feedstock for the production of various chemicals

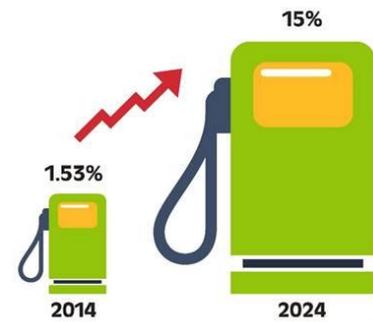


**Ethanol Blending Program (EBP) :** The EBP is an initiative by the Government of India to promote the use of ethanol, a renewable and environment-friendly fuel, in petrol. The main motives and aim of EBP are as follows :-

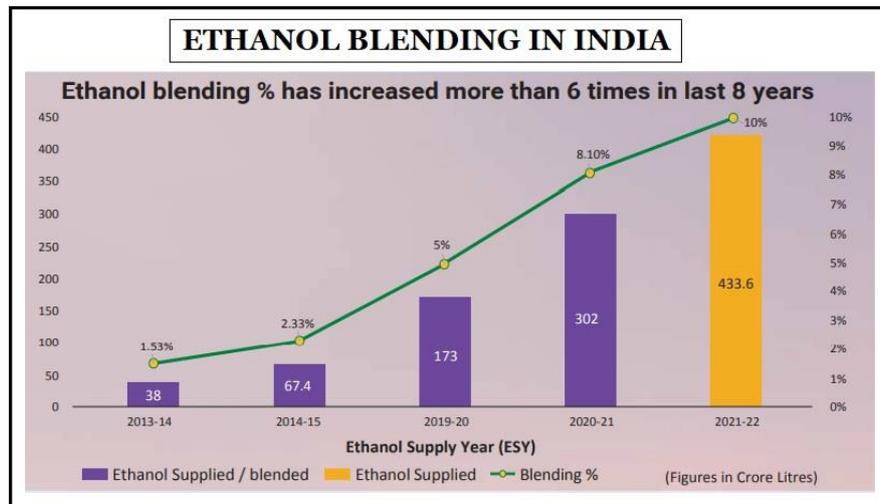
- EBP program aims to reduce the import of fuels from other countries which will save foreign exchange for country and will also increase value addition in the sugar industry.
- The target of 10% ethanol blending set in the 'Roadmap for Ethanol Blending in India 2020-25' for Ethanol Supply Year (ESY) 2021-22 has already been achieved. Public Sector Oil Marketing Companies (OMCs) have started selling E-20 (20% ethanol blended) petrol across the country.
  - ✓ Further, the National Policy On Biofuels – 2018 targets 20% blending of ethanol in petrol by ESY 2025-26.
- The Government has taken various steps to facilitate the procurement and supply of ethanol under the EBP, such as fixing remunerative prices, simplifying the procedure, waiving excise duty, and extending financial assistance.
- Due to effective Government policies, the supply of ethanol to OMCs has increased by more than 13 times in ESY 2022-23 from ESY 2013-14.
- The blending percentage has also increased from 1.53% in ESY 2013-14 to targeted 12% in ESY 2022-23.



## Surge in Ethanol Blending



Source: <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2050907>



Under the leadership of Prime Minister Shri Narendra Modi, the Government has embarked on a series of comprehensive reforms aimed at enhancing energy security, combating climate change, and boosting the rural economy. Though an indicative target of 20% ethanol blending in petrol was initially set for year 2030 under the EBP Programme, however, in the year 2020, the Cabinet Committee on Economic Affairs (CCEA) advanced this target to year 2025, reflecting the Government's commitment to accelerating ethanol usage.

The progress of India's Ethanol Blended Petrol (EBP) Programme has been noteworthy, with the ethanol production capacity more than doubling in the last four years to reach 1,623 Crore litres as of September 18, 2024. This substantial increase highlights the Government's commitment to enhancing the role of ethanol in the nation's energy landscape.

In the Ethanol Supply Year (ESY), which runs from November to October, the blending of ethanol with petrol stood at 38 Crore litres with a blending percentage of 1.53% in Ethanol Supply Year (ESY) 2013-14. Over the following years, the Government implemented various initiatives that led to remarkable growth in ethanol blending. By ESY 2020-21, the blending volume surged to 302.3 Crore litres, increasing the blending percentage to 8.17%. During this same period, petrol consumption also rose by approximately 64%. The momentum continued, with blending further increasing to over 500 Crore litres in ESY 2022-23, raising the blending percentage to 12.06%. In the current ESY 2023-24, the blending percentage surpassed 13% with approximately 545.05 Crore litres of ethanol blended as of August 31, 2024.

Encouraged with this development, the Government Of India has set an ambitious target of achieving 20% blending by the year 2025. Over the past decade or so, this initiative has delivered significant benefits which are not only noteworthy but has added tremendous value to the country. The facts are as under :-

- ❖ Savings of ₹1,06,072 Crore in foreign exchange
- ❖ Reduction of CO<sub>2</sub> emissions by 544 lakh metric tons
- ❖ Substitution of 181 lakh metric tons of crude oil.
- ❖ Further more, the program has had a considerable economic impact, with OMCs disbursing ₹1,45,930 Crore to distillers and ₹87,558 Crore to farmers.

### Significance of Ethanol Blending in Fuels :

- ❖ **Reducing Fossil Fuel Dependence:** India imports most of its oil requirement which makes it vulnerable to fluctuations in global markets and geopolitical risks. Recent turbulences in the globe caused by Russia Ukraine war and conflicts in South East Asean nations countries are some of the developments which has adversely affected oil imports. By using ethanol, India **can reduce its oil imports and increase its energy self-reliance.**
- ❖ **Protecting the Environment:** Ethanol is a clean fuel as compared to gasoline, which implies that it produces less harmful emissions that cause air pollution and climate change. By using ethanol, India can improve its air quality and meet its climate goals.
  - ❖ According to a study by the Indian Institute of Science, Bangalore, blending **ethanol with petrol can reduce the carbon monoxide emissions by 30-50%** and hydrocarbon emissions by 20%.
- ❖ **Supporting Farmers:** Ethanol production requires agricultural inputs, such as sugarcane or corn. By using ethanol, India can create a **new demand for these crops** , which will boost the income and support the livelihood of farmers and rural communities.
- ❖ **Enhancing Energy Security:** Ethanol is a domestic and diverse source of energy, which can reduce India's dependence on a single and foreign source of energy. By using ethanol, India can increase its energy security and resilience.
- ❖ **Generating Economic Benefits:** Ethanol blending can stimulate the growth of the ethanol industry, which can create new jobs, investments, and innovations. It can also help India develop a more sustainable and modern energy system.
  - ❖ Ethanol blending can **save the country USD 4 billion per annum**, i.e., Rs. 30,000 cr.



Source: <https://x.com/PetroleumMin/status/1846195338715320506>

- ❖ **Enhanced Vehicular Performance:** Ethanol has a higher octane reading than gasoline, which means that it can improve the engine performance and reduce the knocking tendency.

### Limitations of Ethanol Blending :

- **Feedstock Availability and Cost :** Ethanol production requires a large amount of biomass, such as sugarcane, corn, or lingo cellulosic materials, which may compete with food, feed, or other uses. The cost and availability of these feedstocks may vary depending on the season, weather, market, & policy conditions.
- **Conflict with Food Security:** The use of corn for ethanol production come directly in conflict with food security.
  - In the case of sugarcane, ethanol is produced by processing the molasses (C-heavy/B-heavy) and constitutes minimal trade-off with the sugar output.
  - The B-heavy molasses path produces less sugar as compared to the C-heavy molasses one, but both produces sugar and ethanol simultaneously from sugarcane.
  - But using corn for producing ethanol directly reduces its use as food or livestock feed. It not only diverts grain to fuel use, but also links food prices directly with crude oil prices through the demand side.
- **Conversion Efficiency and Yield:** Ethanol production involves several steps, such as pretreatment, hydrolysis, fermentation, and distillation, which have different efficiencies and yields

depending on the type and quality of the feedstock, the process technology adopted and the operating conditions.

- For example, lignocellulosic biomass, which is more abundant and diverse than sugarcane or corn, requires more intensive and complex pretreatment and hydrolysis to break down the cellulose and hemicellulose into fermentable sugars.
- The conversion efficiency and yield of ethanol also affect the economic viability and environmental impact of the production process.
- **Infrastructure and Distribution:** Ethanol production requires adequate infrastructure and distribution systems to transport, store, and deliver the feedstock and the fuel to the end-users. This may require high capital and operating costs, as well as logistical and regulatory challenges.
  - For example, ethanol is corrosive and hygroscopic, which means that it can damage or contaminate the existing pipelines, tanks, and pumps that are designed for gasoline or diesel.
- **Vehicle Compatibility and Performance:** Ethanol production requires compatible and efficient vehicles that can run on ethanol-blended fuels or pure ethanol. This may require modifications or adaptations in the engine, fuel supply system, and emission control devices of the vehicles. This will also necessitate changes in the driving behavior of drivers and will also require new maintenance practices.
  - Ethanol has a lower energy density than gasoline, which means that more volume of ethanol is needed to provide the same amount of energy, resulting in higher transportation and storage costs.

**Steps taken by the Government to Boost Ethanol Blending**; The Government is a pilot mode and mission to reap the benefits of Ethanol blending programme which is evident from the various measures taken on a policy mode. Several of the salient initiatives are as follows:-

- **Differential Ethanol Pricing:** The Government has fixed different prices for ethanol derived from C heavy molasses, B heavy molasses, sugarcane juice / sugar / sugar syrup, and damaged food grains or rice.
  - ✓ The prices are revised annually by the Cabinet Committee On Economic Affairs (CCEA) based on various factors such as cost of production, availability, and demand.
  - ✓ The differential pricing policy has resulted in increased supply of ethanol for the Ethanol Blended Petrol (EBP) programme and helped achieve 20% ethanol blending in petrol by year 2025.
- **Interest Subvention Scheme:** With a view to enhance the ethanol production capacity in the country to achieve the blending targets set under EBP Programme, the Government has notified various ethanol interest subvention schemes from July 2018 to April 2022.
  - ✓ Under these ethanol interest subvention schemes, Government is facilitating entrepreneurs to set up new distilleries (molasses based, grain-based and dual-feed based) or expansion of existing distilleries (molasses based, grain-based and dual-feed based) throughout the country.
  - ✓ Interest subvention @ 6% per annum or 50% of rate of interest charged by banks/financial institutions, whichever is lower, on the loans to be extended by banks/financial institutions is being borne by the Central Government for five years including one-year moratorium.
- **Tax relief:** Lower taxes are levied on E10 and E20 blends compared to unblended petrol, making them more cost-competitive for consumers.
  - ✓ Lower excise duty and GST rates for ethanol compared to petrol.
- **Incentives for E20-compatible vehicles:** Tax benefits and other incentives are being considered for manufacturers and buyers of vehicles compatible with higher ethanol blends.



Union Petroleum Minister Shri H.S. Puri highlights India's Bioenergy Progress at India Bio-Energy & Tech Expo (IBETE) 2024. Ethanol Blending % age Surges from 1.53% in 2014 to 15% in 2024. It was informed that E100 Fuel Launched at Over 400 Retail Outlets Nationwide. Further Shri Puri urged Union Transport and Highways Minister Shri Nitin Gadkari to promote production of E100-Compatible Vehicles. One of the standout achievements discussed by Shri Puri was the success of India's ethanol blending program. Since its inception, the ethanol blending percentage has surged from 1.53% in 2014 to 15% in 2024. Encouraged by this progress, the government has set an ambitious target of reaching 20% blending by 2025 and is confidently progressing towards this goal. Over the past decade, this initiative has delivered significant benefits, including saving Rs. 99,014 crore in foreign exchange, reducing CO2 emissions by 519 lakh metric tons, and substituting 173 lakh metric tons of crude oil. Furthermore, the program has had a considerable economic impact, with Oil Marketing Companies disbursing Rs. 1,45,930 crore to distillers and Rs. 87,558 crore to farmers.

Minister Shri Hardeep Singh Puri also highlighted the widespread availability of E20 fuel, which is now offered at over 15,600 retail outlets across India. He commended the Pradhan Mantri JI-VAN Yojana for its essential role in providing financial support to advanced biofuel projects, which is crucial for developing a sustainable ethanol production ecosystem.

He addressed common misconceptions about ethanol blending, clarifying that blending ethanol with petrol not only improves engine performance by increasing the octane number but also enhances engine efficiency. Contrary to some concerns, ethanol's presence in fuel helps prevent pre-ignition knock and improves overall engine operation.

Drawing from global practices, Shri Puri cited Brazil's successful use of high ethanol blends—up to 60-70% in vehicles—demonstrating the viability of high ethanol content. He reassured that India is committed to scaling up E20 production and supporting the transition with measures to facilitate the use of transition fuels in older vehicles.

Minister Shri Hardeep Singh Puri also commended the automobile industry for its proactive approach, noting that manufacturers are not only producing new E20-compliant vehicles but are also developing retrofit kits for older models. These kits, which can be installed during regular servicing, represent a significant advancement in accommodating older vehicles and promoting biofuel adoption.

**Road Map and Way Forward To Boost Ethanol Program** : Although through focused policies and dedicated efforts, the Ethanol Blending is progressing in a satisfactory way but considering the potential and benefits on a broader canvas, there can be several ways to strengthen it. Some of the suggestive steps are as follows :-

- **Production Boost:** Production can be enhanced in following ways :
  - ✓ **Diversifying Feedstock:** Encourage production from non-food sources like cellulosic biomass, waste paper, and agricultural residues. This reduces competition with food security and utilizes waste.
  - ✓ **Support 2G and 3G Biofuels:** Invest in research and development for second and third-generation ethanol production technologies, which use non-edible resources.
  - ✓ **Expand Production Capacity:** Incentivize setting up new ethanol distilleries and modernize existing ones through financial assistance and streamlined bureaucratic processes.
  - ✓ **Promote Regional Production:** Focus on establishing distilleries closer to fuel depots to minimize transportation costs and optimize logistics.
- **Policy and Market Mechanisms:**
  - ✓ **Raise Blending Mandate:** Gradually increase the mandatory ethanol blending percentage beyond the current target of 20% set for the year 2025. This creates a guaranteed market for ethanol producers.
  - ✓ **Long-term Contracts:** Offer fixed-price contracts with oil marketing companies to encourage stable investment in ethanol production.
  - ✓ **Support Research and Development:** Invest in research on optimizing blending ratios, addressing engine compatibility issues, and developing efficient conversion technologies.

- **Technological Advancement :**
  - ✓ **Upgrade Infrastructure:** Invest in storage and transportation infrastructure for ethanol to ensure efficient supply chain management.
  - ✓ **Vehicle Compatibility:** Work with automobile manufacturers to develop engines and vehicles compatible with higher ethanol blends.
  - ✓ **Quality Control:** Implement stringent quality standards for ethanol production and blending to ensure fuel performance and vehicle safety.
- **Public Awareness and Education:**
  - ✓ **Create Awareness Campaigns:** Educate consumers about the benefits of ethanol blending, dispel myths about its impact on vehicles, and encourage its adoption.
  - ✓ **Transparency and Labeling:** Ensure clear labeling of ethanol blended fuels at petrol stations to inform consumers about their choice.

**CONCLUSION :** India has made significant progress in its Ethanol Blending Program. This achievement in the course of the past 8-10 years has not only augmented India's energy security but also translated into a Forex impact of over Rs.41,500 Crores , reduced Green House Gas (GHG) emissions of 27 lakh Metric Tonne (MT) and also led to the expeditious payment of over Rs.40,600 Crores to farmers.

India's commitment to ethanol blending represents a transformative approach to energy security, environmental sustainability, and economic development. With a significant increase in ethanol production capacity and blending percentages, the government is making substantial strides towards its ambitious target of 20% blending by 2025. The strategic measures implemented, such as the modified Pradhan Mantri JI-VAN Yojana and a detailed roadmap for ethanol blending, are pivotal in overcoming past challenges and unlocking the full potential of this initiative. As India continues to advance in this domain, the dual benefits of reducing reliance on imported fossil fuels and revitalizing rural economies will not only contribute to a cleaner energy future but also foster economic resilience. The ongoing efforts underscore a proactive approach to sustainable energy solutions, positioning India as a leader in biofuel adoption and setting a precedent for others to follow.

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