ETHANOL BLENDING: ENVIRONMENT

India has successfully advanced its E20 ethanol blending program to reduce oil imports and support farmers, but this policy creates significant environmental stress from water-intensive crops, faces consumer opposition over vehicle mileage, and conflicts with the long-term push for electric vehicles.

Ethanol Blending

It is the process of mixing ethanol (ethyl alcohol, C_2H_5OH) with petrol. In India, ethanol is primarily produced from agricultural feedstocks like sugarcane, rice, and maize. E20 Fuel is a blend of petrol containing 20% ethanol.

Policy Goal and Achievement

The National Policy on Biofuels (2018) initially set a target to achieve 20% ethanol blending nationwide by the year 2030. This target was successfully achieved in 2025, five years ahead of the original schedule.

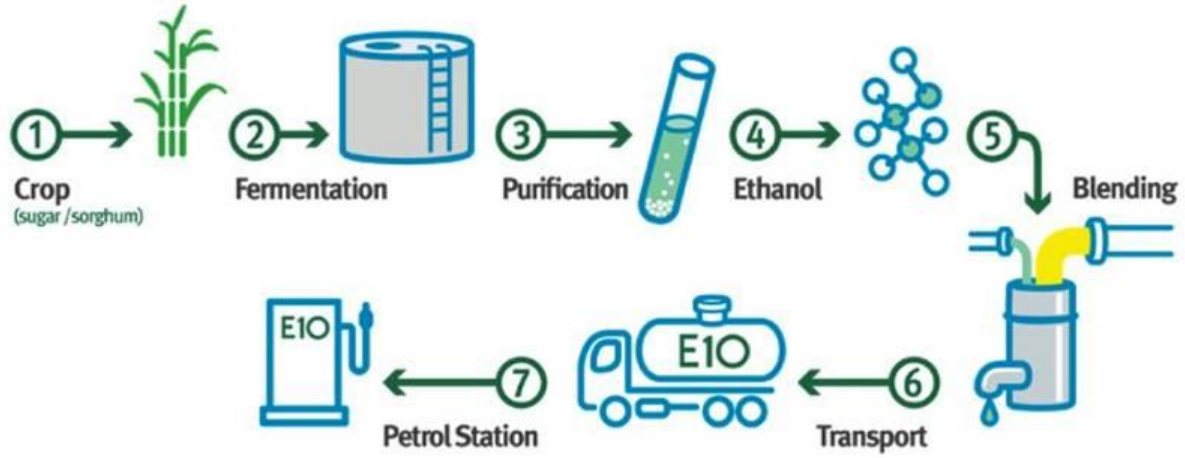
Global Context

Global Leaders

Brazil and the United States are the world leaders in ethanol blending, with some blends containing over 50% ethanol.

India's Rationale

India's push is driven by its high dependency on crude oil imports and its commitments to climate change mitigation.



Economic Impact

Foreign Exchange Savings

The government claims that since the 2014–15 fiscal year, India has saved approximately ₹1.4 lakh crore in foreign exchange by substituting petrol with domestically produced ethanol.

Benefits to Public Sector and Consumers

Dividends for Public Sector Undertakings (PSUs) like IOC, BPCL, and ONGC have surged by 255% since 2022–23. However, despite a ~65% fall in global crude oil prices, the retail price of petrol for consumers has only decreased by ~2%. This suggests that the financial benefits have been absorbed as state revenues rather than being passed on to the public.

Impact on Farmer Income

Since FY15, around ₹1.20 lakh crore has been disbursed to farmers through the procurement of ethanol. The supply of ethanol from sugarcane has grown exponentially, from 40 crore litres in FY14 to 670 crore litres in FY24.

Agricultural Shifts and Trade-offs

An OECD-FAO report projects that by 2034, 22% of India's sugarcane production will be diverted to ethanol. This creates a heavy dependence on water-intensive sugarcane. Diversification to other crops like rice and maize is leading to a food-versus-fuel conflict. For instance, India had to import 9.7 lakh tonnes of corn in 2024–25 to meet its needs.

Environmental Impact

Positive Claims

The government states that ethanol blending has led to a reduction of 700 lakh tonnes of CO_2 emissions. Ethanol has a lower carbon intensity compared to unblended petrol.

Environmental Concerns

High Water Footprint. Sugarcane is a water-guzzling crop, requiring 60–70 tonnes of water to produce just one tonne of sugarcane.

Land Degradation

In key states like Maharashtra and Uttar Pradesh, excessive groundwater extraction for sugarcane farming is contributing to desertification. Currently, 30% of India's land is considered degraded.

Climate Stress

Increasing instances of heatwaves and droughts worsen the sustainability concerns of promoting water-intensive crops for fuel.

Consumer Impact and Vehicle Compatibility

Vehicle Compatibility

All new vehicles sold in India since 2023 are E20-compatible. Older vehicles require material changes to their fuel systems (rubber, elastomers) to prevent corrosion and damage from the higher ethanol blend.

Mileage and Maintenance Concerns

A survey by Local Circles found that 2 out of 3 vehicle owners oppose E20 fuel, with only 12% supporting it. The main concerns are reduced mileage (as ethanol has a lower energy density than petrol) and the potential for higher maintenance costs.

Government's Response and Recommendations

The government acknowledges a "marginal drop" in fuel efficiency of about 6-8% but claims it can be managed with engine tuning. The think tank NITI Aayog has recommended providing tax incentives to vehicle owners to offset the financial losses from lower mileage.

Geopolitical and Trade Dimensions

Pressure from the United States

U.S. trade reports, starting from the Trump era, have consistently labeled India's restrictions on ethanol imports as significant "trade barriers."

India's Stance

The domestic industry, represented by bodies like the Indian Sugar Mills Association (ISMA), strongly opposes relaxing import rules. They fear it would undermine the large-scale investments made in building domestic ethanol production capacity.

Global Market Dynamics

Opening up to imports could lower ethanol prices but would negatively impact the financial stability of Indian sugar mills and sugarcane farmers who rely on the program.

Role in India's Broader Energy Transition

Short-Term Role of Ethanol

E20 is seen as a beneficial short-term strategy to cut oil imports, boost farmer income, and make modest progress on emission reductions.

Long-Term Conflict with Electric Vehicle (EV) Push

The government's long-term vision is a transition to EVs, with a target of 30% of all vehicle sales being electric by 2030. This requires an annual growth of over 22% from the current 7.6% EV adoption rate (2024). EVs offer a far greater potential for decarbonization than ethanol-blended fuels.

Challenges Facing the EV Sector

Rare Earth Dependency

The EV industry depends heavily on rare earth elements (REEs) for batteries and motors. India imports most of its REEs, primarily from China.

Supply Chain Shocks

Recent export curbs by China on materials like germanium have highlighted India's vulnerability, forcing some automakers (e.g., Maruti Suzuki) to cut their EV production targets.

Summary and Unresolved Questions

Key Positive Impacts

Reduced crude oil import bill. Higher and more stable incomes for farmers. Moderate reduction in CO_2 emissions.

Key Negative Impacts and Concerns

1. Severe water stress and land degradation.
2. The "food vs. fuel" dilemma.
3. Consumer resistance due to lower mileage.
4. Financial benefits not being passed on to the public.
5. Risk of delaying the more impactful transition to EVs.

The Big Question- Beyond E20

While the Petroleum Ministry has floated the idea of moving to higher blends like E30, the government confirmed in March 2025 that no decision has been made. The central debate remains: Should India invest further in higher ethanol blends, or should it focus its resources and policy efforts on accelerating the EV transition?

Source: https://www.thehindu.com/business/Economy/what-has-been-the-impact-of-ethanol-blending/article69943693.ece