

With the Climate Crisis On, E10 Might Be India's Ethanol-Blending Sweet Spot

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- *India has to reduce fossil-fuel use and use carbon mitigation strategies asap, as the first part of the IPCC Sixth Assessment Report recommends.*
 - *The government's Roadmap for Ethanol Blending in India 2020-2025 lays out a plan to achieve a 20% ethanol blending target by 2025 using sugarcane and food grains.*
 - *The challenge in meeting the E20 target for 2025 is that extra sugarcane will need to be grown solely for ethanol production.*
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In his Independence Day address to the nation, Prime Minister Narendra Modi mentioned India spends over Rs 12 lakh crore on importing energy, and that domestic energy production will be a policy priority for the country.

Reduced fossil-fuel use and carbon mitigation strategies will also have to be prioritised immediately, as highlighted in the recently released Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC).

AR6 recommends that our mitigation strategies be risk-proof and not adversely affect the environment. One such strategy often considered in India, towards achieving energy security and carbon mitigation, is the use of biofuels. However, it should be evaluated carefully to ensure that its benefits outweigh its negative consequences.

Biofuels can be produced from designated crops grown in fields (first-generation, or 1G, biofuels) or from crop residues and wastes (second-generation, or 2G, advanced biofuels). India's 2018 National Policy on Biofuels mentions many types of biofuels, including a biodiesel blending target. However, the focus of implementation has been on blending ethanol with petrol.

Estimates suggest that ethanol blending increased to 5% in 2019 and approximately 8% in 2020–2021. Most of the supply came from sugarcane. In India, therefore, biofuels have been synonymous with 1G ethanol.

The government's Roadmap for Ethanol Blending in India 2020-2025, launched on World Environment Day (June 5), lays out a plan to achieve a 20% ethanol blending target (E20) by 2025 using sugarcane and food grains.

While 1G biofuels are rightly criticised for competing with food crops for arable land and water resources, in India, sugarcane is not primarily grown for ethanol. Only the by-products of sugar production (molasses), and sugarcane juice in years of surplus, are used to produce ethanol. Diverting the excess sugar towards ethanol production has protected farmers and sugar mills from sugar price fluctuations and could continue to be beneficial in sugar-surplus years.

The challenge in meeting the E20 target for 2025 (approximately 1,000 crore litres), however, is that extra sugarcane will need to be grown solely for ethanol production. Even worse, food grains or vegetables will have to be used. Both options are non-ideal. The former will lead to excessive withdrawal of water in already water-scarce areas, and the latter will undermine food security.

Even if only the excess or wasted food grains are used, our focus as a country should be on minimising waste through better storage facilities.

Another issue with the E20 target is vehicle technology. Existing vehicles in India are not readily compatible with E20. This defeats the notion that biofuels can be used in existing vehicles, and invalidates their often-quoted advantage over an immediate shift to electric vehicles. Manufacturing new two-wheelers and cars compatible with E20 could lead to stranded assets and carbon lock-ins, assuming these segments are expected to be electrified soon.

On the other hand, most existing vehicles in India today are materially compatible with E10 – i.e. fuel that is 90% petrol, 10% ethanol. In terms of supply, an E10 by 2025 target would demand around 550 crore litres of ethanol, which can be produced entirely from sugarcane without increasing cultivation.

One drawback is that since E10 would replace less petrol than E20, it will reduce savings on crude oil imports and carbon emissions compared to E20. However, opting for E10 could lower certain risks. For example, because of erratic monsoons and other impacts of climate change (as described in the IPCC's AR6), if we can't cultivate enough sugarcane in a particular year and all vehicles are tuned to run only on E20, we might have to resort to importing ethanol. This defeats one of the main purposes of the ethanol blending mandate: energy security.

2G ethanol is an alternative that could circumvent some issues with 1G ethanol. The main roadblock to producing 2G and advanced biofuels is the supply chain of biomass feedstock. Typically, to achieve economies of scale, technologies need to be deployed at larger scales. In India, this may not hold true because biomass residues would have to be collected from many small farms and transported to biofuel plants, which may not be efficient.

Smaller-scale plants spread out near fields or portable torrefaction units may be promising solutions as torrefied biomass can be transported more easily and

sustainably than raw biomass. Another concern is that the 2G ethanol production process has a high water footprint, shifting the burden from water-intensive cultivation (of sugarcane) to water-intensive ethanol production.

E10 hits that sweet spot – where we realise the benefits of sugarcane-based ethanol fuel-blending and avoid the unsustainability issues around water depletion, food security, existing vehicle incompatibility and dependence on 2G ethanol. In addition to restricting ethanol-blending to E10, India must also shift focus and support to biofuels that can be used in the hard-to-electrify transportation segments such as aviation and long-haul freight.

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