Why ethanol blending might not work for India

The country might be able to save foreign exchange by using ethanol as fuel, but this could strain its water resources and affect food availability

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India should increase the use of biofuels to reduce dependence on imported oil, Prime Minister Narendra Modi and road transport and highways minister Nitin Gadkari have suggested on separate occasions (*bit.ly/2OoBhTO*). However, increasing the production of biofuels can strain India's water resources and affect food availability.

Among biofuels, ethanol appears to be the most viable alternative, and the government intends to raise ethanol blending in petrol to 20% by 2030 from the current 2-3%.

Other biofuels, such as jatropha, have often proven to be commercially unviable (*bit.ly/2NdU9Y*). While India has become one of the top producers of ethanol in recent years, it lags top producers, the US and Brazil, by a huge margin and remains inefficient in terms of water usage (bit.ly/2cXdETw) (*charts 1 and 2*).

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Water footprint, that is water required to produce a litre of ethanol, includes rainwater at the root zone used by ethanol-producing plants such as sugarcane, and surface, ground water, and fresh water required to wash away pollutants. Estimates of water footprints are available from the Water Footprint Network (*bit.ly/2QO3YIO*).

India's water footprint is not only high in overall terms, but India also uses more surface and ground water than the US and Brazil. Most of our daily uses of water come from this source. India has the least internal surface and ground water compared with both countries.

While the US and Brazil have 2,818 billion cubic metres (BCM) and 5,661 BCM/year of water respectively, India has only 1,446 BCM per year, according to the Aquastat water statistics of the FAO (Food and Agriculture Organization of the United Nations) for 2013-17.

While India's internal surface and ground water availability is just one-fourth of Brazil's, its usage of such water for ethanol fuel production is slowly catching up with that of Brazil -- and even exceeded Brazil in 2016—despite there being a huge gap in the 'blend rates'.

In India, the blend rate—the amount of ethanol mixed with petrol—is only 2-3%.

For Brazil, which uses both an ethanol-petrol blend and just ethanol as fuel, the overall blend rate is 45-50%. India's surface and ground water requirement will hugely exceed that of Brazil if India were to achieve its targeted 20% blend rate (*charts 3 and 4*). In other words, while Brazil used 0.025% of its internal surface and ground water for ethanol production to achieve a 45% overall blend rate in 2017, India would use 0.701% even for 20%.

Water is not the only limited resource we have. Sugarcane currently accounts for around 3% of India's net sown area (*bit.ly/2PoQR2R*). A simple calculation of extra area required for the 2010 to 2017 period shows that to raise the ethanol blend rate to even 10%, India will have to devote another 4% of its net sown area to sugarcane.

In order to achieve 20% blend rate, almost one-tenth of the existing net sown area will have to be diverted for sugarcane production. Any such land requirement is likely to put a stress on other crops and has the potential to increase food prices (*chart 5*).

India's biofuel policy stipulates that fuel requirements must not compete with food requirements and that only surplus food crops should be used for fuel production, if at all. Producing ethanol from crop residue will then be a good alternative, except that the annual capacity of required bio-refineries is stipulated to be 300-400 million litres, which is still not enough to meet the 5% blending requirement (*bit.ly/2CoAhxV*).

"If that technology picks up, it will be a game-changer, but with just 1G (first generation biofuels, such as sugarcane-based ethanol), I don't see how we can meet our demands," said Ramya Natarajan, senior research engineer, Centre for Study of Science, Technology and Policy.

Increasing fuel ethanol blending, therefore, does not seem viable in the current scenario, unless concerted efforts are made to either increase sugarcane yield and decrease water usage through better irrigation practices, or increase the ethanol production capacity of bio-refineries. Trying to increase blending without these efforts can encroach upon land and water available for food production.

Abhishek Jha is a recipient of the Mint-Hindustan Times-HowIndiaLives Data Journalism Fellowship 2018.