

# Why ethanol is not a suitable fuel for automobiles

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Government of India (GOI) is accelerating its program of blending ethanol with petrol. This push is coming because of two reasons; one that our [petroleum import bill is continuously increasing \(we import more than 85% of all our fuel\)](#) and the other is that we have surplus of sugar in India which has no demand in the export market.

Thus ethanol production from sugar industry is being pushed again. Besides GOI is also encouraging the use of other sources of sugar from which ethanol could be produced. One such source is sweet sorghum (SS).

Sweet sorghum is a multipurpose crop. It produces grain from its earhead for human consumption; sweet juice from its stem can either produce syrup or could be fermented to produce ethanol; and the bagasse and leaves make good fodder for animals. Thus from the same piece of land it can produce food, fuel and fodder simultaneously.

Sweet sorghum is a dry land crop and uses [40% less water than sugarcane to produce](#) sugar. Besides it is a 3-4 months crop and can be harvested two times a year.

[Nimbkar Agricultural](#) Research Institute (NARI) [introduced sweet sorghum in India](#) in early 1970s and in 1987 was the first in the world to set up a [solar-powered pilot plant](#) for distilling ethanol from sweet sorghum. In the 1990s it was also the first Institute in India to produce syrup from SS.

Ethanol development at NARI was initiated to use ethanol to replace kerosene as a cooking and lighting fuel in rural households. NARI thus developed [lanterns and stoves running on low concentration ethanol](#). However in the 1980s and 1990s there

were no takers for ethanol as automobile fuel and this also affected the spread of ethanol for cooking and lighting.

Nevertheless in hindsight we can say that the use of ethanol for running automobiles is a total waste of high quality fuel. Automobile is an extremely inefficient mobility device. [Its efficiency is mere 1-2%](#); the total amount of energy used in transporting a passenger certain distance at a certain speed divided by energy input of petrol is less than 2%. And yet we persist in using a high quality chemical like ethanol and other biomass-based fuels like biodiesel etc. for this purpose.

A much better alternative to use of biofuels for automobiles is to develop electric mobility. On energy of fuel to wheel basis, electric vehicles are 3 times more efficient than internal combustion systems. This is because of very high efficiencies of D.C. [motors \(80-90%\) as compared to 25-30% efficiencies of IC engines.](#)

Since biofuels are biomass and land-based it is instructive to compare their solar efficiency to electricity generation by PV systems. The electric vehicles running on PV electricity, in this comparison, are more than 100 times efficient than biofuels-based IC engines. This is because the average photosynthesis efficiency of crops is about 0.1% as compared to 10% solar efficiency of PV modules. These efficiencies also take into account the charging and discharging of batteries for electric vehicles. Presently in these batteries around 35% of the energy is lost during charging/discharging cycle.

With [ultra-capacitors](#) being rapidly developed and their use in place of batteries, the whole system will become even more efficient and economical. Ultra-capacitors are basically charge-storage systems and coupled with smart electronics release the charge to the electric motor like a battery does. Since no electrolytes are used in them they can go through millions of charging/discharging cycles. Batteries on the other hand fail after 5000-10,000 cycles. Also the [ultra-capacitor systems can be charged in a matter of minutes](#) while batteries take almost overnight to charge.

The world over countries are turning away from biofuels, since it competes with food production and is neither sustainable nor economical. I feel land should be used either for producing food for humans or fodder for animals. The residues and other

farm waste should be added back to the soil, either with or without composting, to improve its quality. Good land and precious water should not be wasted for producing biofuel for inefficient automobiles.

Similarly, a better usage of sweet sorghum is in the production of syrup rather than ethanol. NARI in the early 1990s pioneered in India the [production of syrup from sweet sorghum](#) and is presently the only Indian Institute which sells syrup from sweet sorghum.

[Sweet sorghum syrup is very high in antioxidants](#) and is being used by nutraceutical industries in their formulations. This fetches good price for syrup which can translate into increased remunerations for the farmers.

Whenever petroleum prices start climbing a plethora of articles appear in the Indian press regarding how ethanol from sugary biomass like sugarcane, sugar beet or sweet sorghum can be a solution to the fuel price crisis. But nobody gives a thought to the fact that for last at least 40-50 years this solution has been tried again and again all over the world without any success. Even in India many distillery units failed in their attempts at producing ethanol economically from sweet sorghum; one being Rusni distillery in Telangana and other a Tata Chemicals plant in Nanded, Maharashtra.

One of the main reasons for the failure of many distilleries in India who attempted to produce ethanol from sweet sorghum in the past was that majority of the crop was diverted to fodder purposes as generally there is a perpetual shortage of good quality fodder and the factories could not offer a competitive price to the farmers. Secondly, availability of good quality seeds is a bottleneck as none of the seed companies have entered into large scale seed production of any of the dozen or so released sweet sorghum varieties and hybrids in India.

The only success story of [ethanol use in the world is that of Brazil](#) which has been producing ethanol from sugarcane since 1970s. The ethanol produced is used in flex-fuel cars which can run on any concentration of ethanol. The program is not without hiccups. As the price of fossil fuels fluctuates the ethanol program also goes through cycles of ups and downs.

In India I feel the sugar industry can become the hub of chemical revolution. Though the consumption of sugar is reducing all over the world, both sugar and ethanol can be [excellent feedstock for chemical industry](#). Besides the bagasse can produce electricity. So [taluka-based industrial plants](#) for producing electricity and chemical feedstock from sugarcane can be a viable and sustainable enterprise in rural areas.

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