

Are alcohol fuels suitable for rural households?

[Anil K. Rajvanshi](#)
[Nimbkar Agricultural Research Institute](#)
Phaltan-415523, Maharashtra
anilrajvanshi@gmail.com

Last week an [International meet - Clean Cooking Forum was held in New Delhi](#). This forum funded by International organizations like UN, World Bank, USAID among others, attracted 600 delegates from 50 countries. Participants discussed various aspects of providing clean cooking fuel for rural households to mitigate indoor air pollution. One of the panels in the forum discussed the use of alcohol for cooking. Use of alcohol for cooking is gaining traction in African and Latin American countries since it can provide clean burning so that household pollution is drastically reduced.

Use of alcohol fuel for rural households was pioneered in India by a rural NGO [Nimbkar Agricultural Research Institute](#) (NARI) in late 1980s. In 1985 on their campus in Phaltan, Maharashtra they set up the [world's first solar pilot plant to produce ethanol from sweet sorghum](#) and used it in specially [designed lanterns for lighting and stoves for cooking](#). Their pioneering efforts were recognized in this panel.

Presentations made in this panel showed that [large scale efforts are underway all round the world on the use of ethanol for cooking](#). There are estimates (though the numbers are very suspect) that China has close to 4 million ethanol stoves and Madagascar is shooting for 100,000 ethanol stoves/year in the coming decade. Similarly other countries like Kenya, Nigeria, Ethiopia, Ghana, Haiti, etc. are embarking on a major program of using alcohol as a cooking fuel for rural households.

But are alcohol fuels safe and available cheaply? This article will examine these issues.

In quite a number of these national programs the fuel used is a mixture of ethanol and methanol. Ethanol is produced from plant-based materials like sugarcane, sweet sorghum, corn or any other starch or sugar-producing plants, while methanol can be produced from natural gas, coal or via biomass gasification. Since India has a good supply of natural gas, Niti Aayog is pushing for national program of methanol as a substitute for diesel or gasoline for transportation purposes. There is no program presently for its use as cooking fuel in rural households.

Also in all these programs the alcohol concentration used in stoves is between 90-95% (on volume basis). Alcohol at such concentrations is very inflammable and has high chances of creating kitchen accidents. Its flash point (the lower the flash point the more dangerous a fuel is for kitchen use) is $\sim 17^{\circ}\text{C}$ whereas for diesel and kerosene it is more than 50°C . This was the reason why NARI's pioneering work in 1980s was based on the [use of 50% concentration alcohol/water mixture in the stoves](#). This mixture with higher flash point resulted in a safe fuel for cooking.

Also ethanol is a very high quality fuel derived from land-based plant material. This puts a pressure on land. In food vs. fuel debate it is imperative to look at [multipurpose crops like sweet sorghum](#) which provide food, fuel and fodder from the same piece of land. In any national program on ethanol every country will have to make a decision on how much land is to be allotted for fuel production. In extreme cases where very little land will be available for producing food what is the point of growing fuel for cooking!

Ethanol is an excellent material for chemical feedstock and is used in pharmaceutical, perfumery and other chemical industries. Burning it either in cookstoves or automobiles is a waste of precious, high quality chemical. Besides there are issues of drinking it. Large number of deaths in villages in India takes place every year from drinking illicitly distilled alcohol.

For cooking needs of rural poor the cost of ethanol becomes very important. Since it is produced from plant based material, farmers should get adequate remuneration from growing it. Most of the alcohol produced in India is from molasses which is a byproduct of sugar industry. That is the reason why alcohol prices are low. Today the

Government of India purchases alcohol from local distilleries at Rs. 40/liter. If it is produced directly from sugar based plant material the alcohol price will double or treble. With calorific value of high concentration alcohol around 60% that of LPG, kerosene or diesel the net alcohol cost becomes Rs. 83/kg. This is costlier than diesel and kerosene.

In U.S. the alcohol is produced from corn and the corn farmers are heavily subsidized by U.S. government. [They are provided close to \\$ 6 billion/year in subsidies](#), which comes to 60% of total cost of alcohol produced. That is why farmers can afford to produce alcohol. Any country in the world will produce alcohol with such heavy subsidies.

Besides putting a heavy burden on finances of a country, the subsidies also put pressures on land since it has to be diverted from food production. For countries like U.S. and those in Latin America where land is plentiful this strategy might work. However for countries like China, India and those in Africa the use of precious agricultural land for producing alcohol is not feasible.

There are better fuels than alcohol for rural household cooking. Biogas after cleaning it and compressing it is equivalent to compressed natural gas (CNG). All over the world CNG is used as a cooking and home heating gas. It is safe and can easily be transported by pipelines to large distances. In India with the present laws of saving cows, the cattle sheds which are being put up by various state governments to house them can become biogas producers with cleaning and compressing facility so that the biogas could be converted to CNG. Such plants all over the country can provide a good amount of cooking fuel for rural households. This will be an excellent renewable fuel.

Another technology for [producing renewable liquid fuels from biomass is pyrolysis](#). Pyrolysis oil is a medium calorific value (CV) fuel with CV of 17 MJ/kg and can be produced from any biomass and agricultural residues via fast pyrolysis route (hence the name pyrolysis oil). Major work in this area is being done in the US and Europe where it is being used for power generation. R&D is therefore needed to produce it economically and efficiently in India and in developing suitable cookstoves to run on

it. It is equivalent to No. 6 oil and has good flowability, thereby making it an ideal fuel for cooking. Again a small unit producing 1000-5000 kg/day pyrolysis oil will help the rural areas in generation of wealth. [With 400 to 600 million tons/year of agricultural residue production in the country, which is mostly burnt in the fields,](#) pyrolysis oil can be an extremely attractive alternate to petroleum products for household fuel.

Government of India (GOI) is [pushing very aggressively for liquid petroleum gas \(LPG\) as a rural household fuel.](#) With 90% of it being imported, local renewable sources outlined in this article will be a better choice. Not only will it save foreign exchange, but will provide large scale employment in rural areas.

[HOME](#)

©NARI. November 2017

Syndicated by IANS and published in various newspapers and newlines like [Economic Times](#), [Business Standard](#), [Statesman](#), etc. 16 November 2017.