Brief on Ethanol Fuel

Ethanol (ethyl alcohol) fuel is the same type of alcohol found in alcoholic beverages. It can be used as a fuel, mainly as a biofuel alternative to gasoline. It is an increasingly common alternative to gasoline in some parts of the world.

Ethanol can be produced from a variety of feedstocks such as sugar cane, bagasse, miscanthus, sugar beet, sorghum, grain sorghum, switchgrass, barley, hemp, kenaf, potatoes, sweet potatoes, cassava, sunflower, fruit, molasses, corn, stover, grain, wheat, straw, cotton, other biomass, as well as many types of cellulose waste and harvestings. It is produced by the fermentation of plant sugars.

Pakistan's existing production capacity of fuel grade ethanol is 2,70,000 tonnes per year while it has the potential of 4,00,000 tonnes per year.

Environmental Factors:

Ethanol is one of the best fuel to fight air pollution from vehicles. Ethanol contains 35% O_2, adding oxygen to fuel results in more complete fuel combustion thus reducing harmful exhaust gases. Ethanol also displaces use of toxic gasoline components such as Benzene, a carcinogen. Ethanol is non-toxic water soluble and is biodegradable. It serves as an oxygenate (to prevent air pollution from carbon monoxide), as an octane booster (to prevent early ignition, or 'engine knock'), and as an extender of gasoline. Compared to conventional fuels, it has the potential to produce less emissions of air pollutants and especially life cycle emissions of greenhouse gases. It is sulfur free, which leads to very low SO_2 emissions and is important for the use of emission reduction technologies. Ethanol reduces Carbon Monoxide (CO) by as much as 30% and Particulate Matter (PM) by 50%. Volatile Organic Carbon (VOC) emissions are also reduced leading to reduction in smog formation.

Using ethanol in place of gasoline helps to reduce CO_2 emission by upto 29% as compared to today's technology. Ethanol is made from renewable plant waste, , feedstock, CO_2 released during vehicled fuel combustion is recycled by plants as erosed. New technology, additional feedstock and higher blend of ethanol including E 85 all promise greater CO_2 reduction.

Backdraws:

- It has about 33% per liter lower energy density than gasoline, leading to a lower vehicle driving range.
- As an octane enhancer in gasoline, it increases the volatility when mixed in the 0-20 % range and unless offset by low volatility blending components tends to increase evaporative hydrocarbon emissions.
- It tends to increase aldehydes emissions.
- It absorbs water and may cause phase separation in gasoline mixtures if water comes into the distribution, storage or vehicle fuel system.

- Depending on the production method, high energy inputs and N_2O generation from fertilizers may more than offset this advantage.
- High agricultural inputs, including energy, can lead to higher fuel prices, as well as influencing the potential to avoid greenhouse gas generation.

Recommendations:

- As Pakistan is facing much higher levels of PM, it may go for adoption of ethanol (starting from E10) as an alternative fuel in order to reduce the emissions.
- As sugar is a water intensive crop, so water and food security may be considered while going for enhanced production of ethanol.
- Large amount of land required for crops may be considered. Production of ethanol for fuel would also be in direct competition with food production.
- In order to efficiently utilize ethanol's potential to cause low greenhouse gas emissions, production methods may be designed to minimize energy expenditure.
- Adding E 10 to gasoline does not require specially configured vehicles (Flex Fuel Vehicles). Almost all existing vehicles will tolerate these fuels without problems and with likely advantageous emission benefits.