# A Sustainable Environment: Our Obligation to Protect God's Gift

by

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## Are Bio-Fuels the Answer to Our Energy Problem?

Last year, the Congress approved a $14.5 billion energy bill that included a provision to increase ethanol production to 7.5 billion gallons per year by 2012. The current administration is placing considerable emphasis on both bio-fuels as a partial solution to alleviate our dependency on oil as well as converting biomass to other forms of energy. Does all this really make sense? Let's take a look.

One of the most visible forms of bio-energy is the production of ethanol from corn. In a recent Renewable Fuels Association report, it states that thirty-three new ethanol production plants are under construction and another eight are being expanded. We will have a total of 128 plants in operation within a few years. In addition to Congress having authorized several billion dollars toward this initiative, the automotive industry is in support by manufacturing engines that can burn E85, a blend of 85% ethanol and 15% gasoline. Almost all engines currently run on a 10% ethanol blend. However, this adds about $0.05 to the price of a gallon of gasoline. Certainly, E85 will be much higher.

But is this really an efficient process for producing energy? A professor at Cornell University claims that it takes 1.3 units of energy to produce one unit of energy in the form of ethanol. In other words, the process consumes 30% more energy than it produces. A scientist at Argonne National Laboratory believes that the energy input to produce ethanol is about 75% of the output. This discrepancy is probably due to the assumptions used to make the calculations. In the Cornell case, when ethanol is produced there are other by-products to which no energy utilization may not be assigned. If an assumption were made that it takes a certain amount of energy to produce the by-products, then all the energy consumed by the process would not be assigned exclusively to ethanol. In either case, we are gaining little in producing ethanol from corn. And if there weren't any subsidies, the price of the 10% blend would be much higher. But then again, gasoline is also subsidized.

Corn is not the only feedstock for the production of ethanol. In Brazil, there are large fields of sugar cane that are harvested specifically for producing ethanol and are able to accomplish it with a more efficient process than with corn. About 75% of the cars sold in Brazil this year will run on flex-fuel, meaning they can burn gasoline, ethanol or a blend of both. Their goal is to maintain the price of ethanol below 70% the cost of gasoline, unlike in the U.S. where ethanol increases the cost of fuel.

Diesel fuel, currently produced from petroleum, can also be produced from vegetable oils or animal fats. One of the largest sources of this fuel is from waste greases

generated in food production. Converting restaurant grease to bio-diesel is an excellent solution for the disposal of this waste. In addition to converting waste to energy, the other advantage of bio-diesel is that it produces less carbon emissions than fossil fuels. On the other hand, bio-diesel will start to gel when the temperature falls below 40º F., thus precluding the use of this fuel in northern U.S. winters or requiring a heating system to lower the temperature – thus consuming more energy.

You may have also seen projects where bio-diesel is produced from animal manure. Some government officials praise these projects for energy production because they benefit both nature and agriculture. Consequently, public funds are used to build the bio-diesel plants and other subsidies are used to operate them. However, manure does not contain that much energy and without the subsidies, the projects wouldn't even break even. In addition, the conversion process generates more waste than is consumed.

On the positive side, there are some interesting technologies that convert waste to energy for heating or electricity production rather than for transportation. A small company in southern Wisconsin has been collecting non-recyclable waste paper and plastic film, material that would be destined for the landfill, and converting these wastes to a solid fuel that can be used as a coal substitute. This waste paper cannot be recycled because it has been coated with wax or plastic, or may contain some other materials that cannot be tolerated by a paper recycling plant. Since paper is produced from wood pulp, the State of Wisconsin considers this feedstock as renewable energy and encourages the expansion of this technology. In fact, the major consumer of this waste-derived energy is the State of Wisconsin.

For a number of reasons, expansion of this technology has not taken off, as one would expect. The waste paper is either pre-consumer or post-consumer. The former is a clean waste with a consistent composition, while the latter may be contaminated and could cause undesirable emissions when burned. Burning this type of waste for energy is called Refuse-Derived-Fuel (RDF) and has gained a bad reputation because of the initial poorly operated waste incinerators. The technology to convert the waste to a solid fuel is very simple, but to do it efficiently requires some art and very few have developed this art. The critical factor is to find the source of waste, the processor of the waste and the solid fuel burner all in the same area because large transportation costs will make the business uneconomical.

Another more interesting technology has been developed by a California company called AgriPower. The technology consists of a transportable unit that burns agricultural waste at a very high temperature, transfers the heat to clean air, which in turn drives a turbine to produce energy. For as little as 800 pounds per hour of wood chips, the unit will produce 250-350 kilowatts of electricity. Unlike the Wisconsin technology where the waste material is shipped to a processing plant and then the solid fuel is transported to the energy plant, the AgriPower unit can be operated at the plant where the waste material is generated. The resulting power production can then be consumed by the waste generator or sold to the local utility. This technology could have applications throughout

the world, particularly in the agricultural-based developing countries where villages are void of electrical power but have enormous quantities of agricultural waste.

Producing energy from biomass may be very beneficial but we must be sure that the conversion process does not require more energy than is produced, or even if it is somewhat less. Also, the process must be economical without government subsidies. Otherwise we haven't gained much.