

Andrew Hittenmiller, Student Participant  
Linn-Mar High School  
Marion, IA

## **Biofuels: Promises and Implications for Food Security in Developing Countries**

Black gold, Texas tea, oil products have been known by many names throughout time and have been in use for more than 5000 years. Native Americans used oil products as medicine and for waterproofing. Modern times have seen fortunes made and lost, wars fought and nations conquered, all for control of fossil fuels. As the era of cheap oil comes to an end, many countries around the world are looking for solutions to the supply and demand dilemma created by oil. They are hoping to keep their economies from slowing or even failing as the price of oil surges higher. This is not a simple goal, nor is it a national goal; this is a global problem that will take a global solution. One such solution being presented to prolong or eventually take over for oil is Biofuels. Nations as diverse in culture as Pakistan, Brazil and the United States are uniting for a world effort in growing a solution-Biofuels. Biofuels must contain over 80% renewable materials, produced from living organisms or organic waste products. They do not add carbon dioxide to the atmosphere.

To make this goal happen, there must be two key events taking place. There must be the creation of a global infrastructure that will allow crops from all over to be fermented efficiently into fuels and the cheap and plentiful amount of high yield seeds to be distributed and there must be an immediate end to subsidies and tariffs dealing with Biofuels or affecting their production.

It will be the nations that have invested in an infrastructure outside of oil that will be capable to continue to operate as a sovereign state. If not, the price of oil will most likely strangle their economy or rule their foreign policy.

This global infrastructure is needed to provide a measure of security to make sure that goods move freely and without issue. This will also prevent problems such as over production and single crop nations. This organization will be comprised of members that have agreed not to pass any law that hinders the movement or sale of Biofuels between member nations without majority rule. They will provide every member nation the unrestricted ability to sell and buy Biofuels and materials to create and produce the fuels. All nations of the world would be included in the organization until such a time that they broke one of the regulations. This nation would lose the protection that the group had provided, but would still be allowed to sell to other nations. The governing group would be able to act as a watchdog to ensure that even with the increase usage of crops for fuel, that the world food security still manages to expand and that humanity does not take a step backward in the name of industry. This will allow every nation, not just the substantial sized or the ones that can afford to subsidize their own products to truly be on an even footing with the rest of the world.

There is not an adequate amount of farmland to provide the planet with enough Biofuels to replace oil outright and to still provide enough food to feed the majority of the world's population. There is approximately 3,764,771,550 acres of farm land. ("Land Usage" & Mobolaji) If every acre produced 662 gallons of ethanol, (Stillman) there would be 2.5 trillion gallons of ethanol produced. Worldwide usage of crude oil is approximately 1 trillion gallons yearly. (Hassan 6) Almost 40% of the world's farm space would be used to make ethanol. The resulting amount of farmland left would only feed the Western Hemisphere. The only way to maintain proper balance between providing fuel and feeding the world is to initiate an oversight system to not only make sure that Biofuels are economically feasible, but to ensure that no nations are left behind in the rush to produce Biofuels. This would also help guarantee that the price of non-Biofuels crops will not increase as the result of lost farm land. Countries that already cannot produce sufficient crops to provide for themselves would not be able to remain sovereign for any length

of time if the prices of food increase more than they already have. There is a need for a unified undertaking to facilitate the production of crops all over the world without damaging the environment and to help developing nations to increase their productivity. This would be greatly aided if all bans on genetically altered foodstuff were lifted.

Pakistan consists of 197 million acres of land. Only about 21 million hectares are cultivable because the majority of the acres suffer from environmental issues such as water logging and an ever increasing issue of salt deposits caused by the back flow on the Indus River. It will cost roughly 18.2 billion euros to fix these problems and to bring the land back to some sort of agricultural state. (Eck) The main issue facing the average Pakistani farmer is the simple costs of farming. In the neighboring country of India, for comparison example, a farmer pays Rs540 while in Pakistan the same farmer would pay Rs658. (Hassan) The average Pakistani farmer has 4.7 hectares of crop land. (Dove) Wheat is the biggest crop in Pakistan, there is however a shortfall in the nations usage and production of about 2.36 million tons of wheat. This shortfall keeps prices as high as Rs 1,200 per 100 kg. These high prices have resulted in increasing the average cost of living by as much as three percent in 2006. Although Pakistani government incentives exist, the average Pakistani farmer does not qualify. Few farmers know about or how to get financing to increase or improve their crop production. This is an issue that most Indian farmers understand and have used to some extent. Educational programs in Pakistan would help to better educate farmers. The removal of government restrictions on the import of foreign farming goods would allow for farmers to produce more crops at a cheaper cost. There is a concern that because of cheap Russian wheat many farmers will need to diversify to a new crop in order to escape a stagnate market. Many could begin growing sugar beets and sell them on the open market. This diversification would add an increase in their income of €56 or 4,843.30 PKR. Farmers could then spend this on increasing their farm size, education or even luxury items to help fuel the nation's economy. The export of a sugar beet crop could result in a decreased Pakistani dependence on oil, by raising their export numbers while lowering the import figures. These exports would further fuel the economy by allowing more public work programs to be created and improve farmland and open and expand more refineries. With the right leadership and goals the poor farmers of Pakistan can become the future. Pakistan is currently the fifth largest producer of sugarcane. Twenty percent of this sugarcane is exported. Sugarcane can be less costly to turn into ethanol than corn can. The starch in corn must first be broken down into sugar before it can be fermented adding an extra step to the cost process. The byproducts of sugarcane can be burned during the processing stage providing energy for the ethanol plant. Until recently, Pakistan was the second largest exporter of sugarcane ethanol to the European Union, all despite no infrastructure for bio-fuel development. The only Pakistani government involvement in this venture has been an order for a few select refineries to blend 10 % of locally produced sugarcane ethanol with gasoline. (Habib)

Brazil initiated an ethanol program in the 1970s and is now reaping the benefits. Leaders financed a billion dollar sugarcane ethanol business and now a third of the fuel used in cars in Brazil comes from ethanol production. Ethanol produced using sugarcane however requires a large work force to harvest the crop, this severely limits the number of small farm owners that can grow and still profit off. Many of these small farms have been bought out or simply out produced by corporate farms. All gasoline sold in Brazil must be at least 26 percent ethanol and some motorist with "flex cars" can fill up on 100% pure ethanol. Brazil exports ethanol to Sweden and Japan, which with this new source have been able to drastically drop their oil imports. Brazil has had an increasing problem of finding an international market for their ethanol outside Sweden and Japan. This has happened as a result of other countries passing tariffs to keep cheap ethanol from flooding their market and undercutting the local countries ethanol producers. This is not an isolated incident. Many countries have passed tariffs or have limited the amount of ethanol that can be imported. This is especially true with sugarcane based ethanol, which is far more efficient to make and grow than any other ethanol crop. This has allowed those countries with the right climate and precipitation patterns to grow sugarcane, and dominate the ethanol market.

The United States may have trouble duplicating the success that Brazil has had with ethanol. Using sugarcane ethanol, Brazil produces as much ethanol as the United States does using their corn based technology. The demand however is 90 % higher in the United States. Brazil consumes only 10 billion gallons of gasoline a year compared to the 170 billion consumed by the United States per year. (Yacobucci, Brent & Schnepf) Brazil is also the leading producer of sugarcane, so they have lots of leftover surplus sugarcane byproducts to put into the ethanol process. If the United States were to switch to sugarcane based ethanol, the costs would double due to market prices. Only about twenty percent of the corn raised in the United States goes into ethanol production. As oil prices increase the demand for ethanol as an alternative fuel have also increased causing a sharp rise in corn prices. While at first glance this seems good for the farmer, consideration of their rising production costs, animal feed and lost export opportunities have to be taken into consideration. The soil fertility could be depleted. There is also a humanitarian factor to consider. Should the United States be growing more crops for fuel when there are so many hungry people in the world?

Currently the majority of the infrastructure in the United States used to move oil cannot be used with ethanol. Ethanol blended gasoline tends to separate while in the pipeline and is corrosive and could harm the pipes. The ethanol must be moved from rural areas to the refineries in more populated areas, which are opposite of existing pipelines. The majority of the infrastructure would at the very least need to be retooled. The costs would be very prohibitive and would take many more millions to create a new system. This cost is far beyond even the largest farm owners and it is unlikely that major oil companies would pay for the cost of this system, let alone have their current system be taken off line in order to be retooled. The current delivery system for ethanol consists of railroad cars, barges and tanker trucks. These limited options lead to much higher delivery costs than a pipeline would. It will need to be the costs of the international community, to ensure that farmers make a decent profit off of their products. There are many highly industrialized bodies that see it as a waste of money to invest in Biofuels if an infrastructure needs to be created. They believe that a hydrogen based system would not stretch the food supply and isn't still reliant on oil as ethanol and other Biofuels are. Existing vehicles can run on blended Biofuels without modification. Hydrogen based fuel cells require a completely new vehicle at an extremely high start up cost. This process would only be capable by very highly industrialized nations and would not benefit the average farmer; it would in fact put a high drain on them. Fuel cells themselves are still quite expensive due to the platinum and other expensive material required for their construction. As with ethanol, an infrastructure must be created for hydrogen fuel cells that would include re-fuelling stations that would take costs into the trillions. Fuel cell batteries also have a limited efficiency and storage capacity.

A fuel alternative that could be compatible with current infrastructure would be biodiesel. Biodiesel is made from agricultural products such as vegetable oils, animal fats and recycled cooking grease. Often it is blended with diesel fuel. Most current diesel engines can run on low percentage blends. This fuel while not tested is probably more compatible with current pipelines. Production of biodiesel is significantly lower than that of ethanol in the United States. The use of fats and oils for biodiesel production means the farmer can export his corn crop to feed the world, while feeding his own livestock at a cheaper price. While biodiesel is sustainable, non-toxic and 100% renewable, there are some drawbacks to this fuel. Biodiesel is not yet readily available. One hundred percent biodiesel gets slushy at less than 32 degrees Fahrenheit; this like regular diesel can be helped with additives like kerosene blended in. Emissions while almost carbon neutral with biodiesel, show an increase of NOx. NOx is a gas that contributes to smog. ("Biodiesel Now")

The idea of using Biofuels will only become more plausible as the cost of oil increases. Farmers and the governments must work together to help create and move this product to the consumers. This will only work if the market is open enough to allow trade regardless of products costs and of who created them. If this does not happen then no matter how good the product may be, it will never be able to

succeed. As the interest in Biofuels increase they will become cheaper, easier to make, easier to transport and more efficient. An idea that was put into action in Brazil over thirty years ago has traveled to Pakistan and onward to the United States. Biofuels may not ever be able to permanently replace oil outright, but they will be able to help us stretch the dwindling world oil supplies hopefully until a better, more permanent solution can be found. Issues such as tariffs, subsidies and human nature will all have an effect on Biofuels in the global market. However in local markets, farmers and the consumers will be helped out by use of Biofuels whether it is through ethanol in corn or sugarcane production, or biodiesel with animal fats and soybean oils. Biofuels crops have to be grown. Crops for food for the world have to be grown. Only a cooperative venture between governments, farmers and consumers will provide a sustainable environment for an oil alternative future.

## Works Cited

- Hassan, Bilal, "Wheat yield and food security in Pakistan" Desertification. 5<sup>th</sup> July, 2007. World Press. 19 Sept, 2007 <<http://desertification.wordpress.com/2007/07/05/wheat-yield-and-food-security-in-pakistan-dgalert-dawn/>>.
- Eck, Holmerik, "A River Diverted, the Sea Rushes In" NY Times. 22<sup>nd</sup> Apr, 2003. Mindfull.org. 20 Sept, 2007 <<http://www.mindfully.org/Water/2003/Sea-Rushes-In22apr03.htm>>.
- Dove, R. Micheal, "The Existential Status of the Pakistani Farmer" Studying Official Constructions of Social Reality. Fall of 1994. The University of Pittsburgh. 24 Sept, 2007 <<http://links.jstor.org/sici?sici=00141828%28199423%2933%3A4%3C331%3ATESOTP%3E2.0.CO%3B2-Y&size=LARGE&origin=JSTOR-enlargePage>>.
- Land Usage, "Types of Land > Farmland" Land Usage © 2007 Encyclopedia Britannica. Encyclopedia Britannica, Inc. 24 Sept, 2007 <<http://www.britannica.com/oscar/article-203588>>.
- Stillman, Charles, "a greener alternative" Cellulosic Ethanol: June 2006. TC Concepts. 21 Sept, 2007 <<http://www.cleanhouston.org/energy/features/ethanol2.htm>>.
- Mobolaji, Aluko, "what barrel of crude oil makes" 19 Sept, 2007. NigerianMuse. 19 Sept, 2007 <[http://www.nigerianmuse.com/important\\_documents/?u=what\\_barrel\\_of\\_crude\\_oil\\_makes.htm](http://www.nigerianmuse.com/important_documents/?u=what_barrel_of_crude_oil_makes.htm)>.
- Habib, Bilal, "Adding fuel to fire" 24 Nov, 2006. Daily Times/Leading News Source of Pakistan. 27 Sept, 2007 <[http://www.dailytimes.com.pk/default.asp?page=2006%5C11%5C24%5Cstory\\_24-11-2006\\_pg3\\_4](http://www.dailytimes.com.pk/default.asp?page=2006%5C11%5C24%5Cstory_24-11-2006_pg3_4)>.
- Yacobucci, Brent & Schnepf, Randy "Ethanol and Biofuels-Agriculture, Infrastructure, and Market Constraints Related to Expanded Production" 16 Mar, 2007. Congressional Research Service. 27 Sep, 2007 <<http://collinpeterston.house.gov/PDF/ethanol.pdf>>.
- Biodiesel Now "biodiesel is NOx" © 2007 Biodiesel. 24 Sept, 2007 <<http://biodieselnow.com>>.