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Reducing Pollution by Increasing China's Biofuel Capacity

Throughout recorded history, China has been a constant, slowly and gradually changing empire. At times, China was the world leader in advanced technologies. During other more recent times, China was tucked away in the East, quietly toiling behind its great wall of independence, a giant neighbor the rest of the world tolerated. Now, China has emerged from a sleep mode to become the buzz of world economic, political, and environmental concerns. Developing at an unforeseen rapid pace, China is producing more goods than ever while gobbling up a lion's share of natural resources. The people of China already make up one-fifth of the world's population while continuing to grow, and the government in their charge is straining under progressive and democratic pressures from within and globally. As a result, China struggles to maintain the overall health of its society and cleanliness of its cities and countryside, despite the nation's massive area. China is currently the 2nd highest user of fossil fuels, but it will wildly surpass the world leader (U.S.) as the country continues to industrialize and develop. Amid this doom and gloom is an opportunity for China to reinvent itself. By accelerating past its history of gradual change, China could rewrite history by the inclusion of biofuels and alternative energy sources in its economy. One-fifth of the world's population is a powerful influence, and for the sake of the global society, China needs to chart its path of progress wisely and rapidly.

Introduction

Whether it is the most recent media exploitation of a Chinese made toys laced with lead, or the concerns of terrorism at the upcoming summer Olympics in Beijing, China is awash in negative press recently. There are many images that can come to mind when considering China. The average global citizen may know of their extremely large population and crowded cities, or possibly their cuisine and culture. Aside from the tags on their clothing and the occasional dish of chow mein, everyday Americans might even belittle the country they joke about "digging a hole" to. This lack of awareness must stop, and long overdue attention needs to be given to the contributions and consequences China gives to the rest of the world.

The major issue needing to be addressed is the rate at which China uses energy, and the burning fossil fuels that inevitably pollute their country. China's environment is in trouble. A recent study found that seven out of the top ten most polluted cities in the world are in China and two-thirds of China's cities are considered moderately to severely polluted. Air pollution is of chief concern, and has a wide range of negative effects, from the respiratory health of citizens to the unnatural colors of the sunset. Furthermore, recent studies suggest poor air quality may be the cause of reproductive problems in twenty to thirty percent of Chinese males. No longer can the rest of the world leave China to worry about their own air pollution problem, as greenhouse gases such as sulfur dioxide and carbon dioxide are now regular topics of political and recreational discussion. Global air patterns carry Chinese dust around the world and spectacular sunsets are created for the West Coast of the United States thanks to Chinese borne pollution.

As little as one percent of the 560 million city dwellers in China breathe air that is considered safe. Any atmospheric reading above forty micrograms of particulate matter that is greater than ten microns in diameter is considered unsafe. The United States allows fifty micrograms. The average reading level in Beijing is 141! An estimated 300,000 people die each year from breathing contaminated air. Surely, this is reason enough to limit fossil fuel borne air pollution.

Water quality is also an issue. Only half of China's population has access to clean drinking water because of the acid rain that falls on thirty percent of the country. Almost 500 million people lack access to clean, safe drinking water. Some wells need to extend more than half a mile to reach fresh water. Keep in mind that many of these wells have to be dug by hand by Chinese farmers. Last year more than a quarter of the length of China's seven main river systems was deemed unfit for any human contact. The Yangtze River is so polluted that it is on the verge of ecological death.

China's environmental degradation does not only affect present day China--in time it will affect the whole world. While American media still continues to linger around the reality of climate change, current pollution in the Beijing skyline is obvious to the traveler's naked eye. Credible scientists link greenhouse gases to global warming, but regardless of whether or not the contaminants are warming the planet, the pollution needs a cleaner. Could biofuels be the way to a clearer Beijing skyline, safe drinking water, and improved health of Chinese citizens?

Changing Chinese Agriculture

Chinese citizens are certainly taking note. Modern day China is far removed from the almighty Communist state of old. Free enterprise has staked a claim in the Chinese economy, and with it has come more of a voice for the people. Not surprisingly, some outspoken Chinese want the fossil fuel/energy/pollution complex addressed. From January to May of this year, the State Environmental Protection Administration received 1,814 petitions demanding cleaner water and air. This display was mildly impressive, but not powerful enough to sway China from fossil fuels.

China is currently the second largest consumer of petroleum in the world. Coal is the country's main energy source. Almost seventy percent of their energy needs come from coal. Unfortunately, coal supply is falling short of the demand. China's booming industrial economy cannot function without the coal produced energy. Coupled with the threat of increasing pollution, this was enough to cause the Chinese government to jump into action. Now, the powerful government is rewarding environmental friendly corporations with incentives, while businesses that fail to adopt pollution prevention technologies and techniques will be heavily fined. Officials from the State Environmental Protection Administration also say that flagrant polluters will be denied bank loans.

Enter biofuels to Chinese policy. Another of these new laws states that biofuels are to meet at least ten percent of the energy the country consumes each year by 2010, and fifteen percent by 2020. This is ambitious and admirable, but there are currently only two official biodiesel plants to supply energy for the massive country. One of these produces forty thousand tons of biodiesel each year, while the other produces only about ten thousand tons per year. There are also four official ethanol plants with three more under construction and hundreds of smaller factories that produce ethanol. The combined production of the four working plants produces one million tons of ethanol per year. It should reach around four million tons of ethanol by the year 2010 and the amount of ethanol produced throughout the country should reach twelve million tons by 2020. Unfortunately, projections of China's energy needs surpass the biofuel goals.

Efforts have been started to improve the biofuel industry in China. The country is exploring biodiesel and ethanol production to help meet the increased demand for energy. The ethanol processing capacity has increased from 580,000 tons in 2002 to 7.1 million tons in 2007. This is an annual growth of eighty-seven percent. A number of companies have also begun investing in biodiesel plants. The production of biodiesel has risen from none in 2002 to 2.9 million tons in 2007. Private investors are motivated by potential profits in biofuels. They are disregarding the government in the areas of production and marketing. Because of this, it is not known how many biodiesel plants are actually located in the country. Not to mention, standards and regulations are questionable in the biofuel industry.

With the potential explosion of biofuel production, the emphasis passes from industry to the farmers. Can China's farmers produce enough crop to manufacture biofuels as well as maintain the country's food supply?

The average Chinese farm is only one to three acres. Only thirteen percent of China's land mass is in production, which is approximately 120 million hectares of land. Most crops are grown in the east where there are vast plains, deltas, and rolling hills. In the west there are steep mountains, high plateaus, and deserts, making it difficult to farm. Consequently, the amount of land that is suitable to be farmed is a problem. Two solutions to this problem can increase the biofuel crop production for China. First of all, a thorough examination of available land using modern investigation and excavation equipment may turn up more arable acres. Secondly, the use of agricultural land must be more efficient. One to three acre farms with limited equipment and fertilizer may not be advantageous to the burgeoning biofuel economy. Modern agricultural practices are constantly improving. Biotech crops and improved land management will increase crop production in China if resources are available to supply, educate, and motivate the farm economy, which is far from modern.

Farmers make up almost half of the population, and are in the lowest economic class. They sometimes make as little as four hundred fifty dollars per year, and modern equipment is limited in many areas. Research and development is occurring in the Chinese agricultural sector, but there is a gap between the labs and the farms. Other modernizing countries such as Brazil and India have greatly improved crop yields by adopting and teaching research proven methods to rural farmers.

China offers a wide range in climate, from almost tropical in the south to sub-arctic in the north, and farmers able to grow a wide variety of crops. The country's farmers grow many crops including rice, wheat, soybeans, corn, sugar, potatoes, corn, peanuts, tea, millet, barley cotton, apples, and oilseeds. Some farmers also raise fish and pork. Although they can grow a wide variety of crops, there are still wide ranging problems of malnutrition. Using crops to produce fuel rather food is a concern in the Chinese public and the food industry. Jin Jiaman, the executive director of the Global Environmental Institute asks "Is it justifiable to replace the feeding of people with the feeding of the economy?"

Out of China's arable land, an estimated one-tenth is highly polluted, creating grains contaminated with heavy metals. Those acres produce a minimum of 120 million tons of grain that should be used in the biofuel industry, not the food supply. This should be organized and accomplished by government officials. Also of major concern is the loss of agricultural land in China. The growing population means that cities must expand to fill the needs of its inhabitants. As a result, land that would be used for farming is being converted into housing. Meanwhile, the impressive Chinese manufacturing and ever-growing industrial base is also taking agricultural land out of production.

Despite an economy that seems more capitalistic everyday, the Chinese government still influences all decisions regarding land usage, and owns and controls all of the country's land, including all of the land that can be cultivated and farmed. Traditionally, farmers were told by the government what to grow on their portion of land, until recently when a large number of farmers came together in protest for better pay and treatment. In order to end the protest, the government consented to give them more choice and control of their few acres. Still, farmers cannot buy or sell any land. Giving farmers total freedom to choose crops may not be the best idea, especially if the farmers are not supported with the latest in farm technology and trends. For example, farmers could be persuaded to grow corn instead of Chinese pistachios because of a popular corn market, but other crops may be better for the production of biodiesel, more profitable, and in the best case scenario, more environmentally friendly. For this reason, China needs to continue and expand all research and development into biofuel crops capable of growing in the country. If successful, China has the opportunity to become a leader in biofuel production.

Already, the Academy of Agriculture Sciences has developed a new type of hybrid rapeseed to try to help meet the demand for renewable energy resources. These seeds have an oil content of 54.7 percent. This is an excellent idea because the world's largest producer of rapeseed is the Yangtze River Valley. *Jatropha curcus* trees can also be used for successful biodiesel production, and they can be grown extensively on China's hilly terrain with the correct farming techniques. The United Nations Development Program and China's Ministry of Sciences and Technology are financing a project in south eastern China to try to grow more of these trees. By encouraging farmers to grow *Jatropha curcus* trees on their land, poverty could be reduced. Woody plants are another important source in biodiesel. A recent study has identified 1,553 species that can be tapped for their oil. 154 of these species have an oil content above forty percent, and thirty percent of these trees and shrubs can be used conveniently as raw materials. One more choice for large scale biofuel production is the Chinese pistachio. It has an oil content of over forty percent and it grows locally in eleven of the country's provinces.

While there are positive crops to begin growing, other crops are falling under consideration. Sugar is said to be unlikely biofuel crop in China because of environmental concerns and inefficient production technology. Wheat is not likely either because of its high demand to be used as food, and its low efficiency production rate, along with other government policies. The same holds true for corn, the American standby for ethanol production. Yang Jian, the director of the development planning department of the Agriculture Ministry states "We have a principal with biofuel: it should neither impact nor should it compete with grain crops for cultivated land." This is a difficult task to accomplish in a country with such a large population to feed.

Cassava roots and molasses can also be grown in China and used to make auto fuels. Despite the setbacks and inefficiency, it has recently been announced that China will try to start to produce ethanol from sweet sorghum and mandioca instead of grains. China will also begin to use genetically modified seeds to develop their crops. In 1999 the Chinese Academy of Sciences invested nine percent of their total budget to advances in biotechnology. It is developments like these that the Chinese government needs to accelerate and complete in order to expedite the changeover to biodiesel production for farmers and manufacturers.

Conclusion

Environmental damage is already costing ten percent of China's gross domestic product, or an estimated two hundred billion dollars each year. Her cities seem to be heavily wrapped in a gray toxic haze. This year, in an effort to beautify Laoshou Mountain, which is being used as a quarry, officials in the Yunnan Province in Southern China sprayed green paint over a large area covering many acres of rock. The little farmland China has is under-producing and limited by pollution and desertification.

China's growing population is currently at an estimated number of 1,321,851,888, and is expected to reach 1.6 billion soon. The population is so large that last year, there were eighty-nine thousand fatal automobile accidents in the crowded cities. Those accidents are caused by some of the 1000 new cars added to Chinese streets every day. That increase in cars, along with the valuable Chinese industrial complex, is contributing to unforeseen pollution levels.

China is doing well economically. The country no longer accepts any aid from the International Monetary Fund (IMF). It is time for China to invest in cleaning its country and become a leader in biofuels. The growing country has the opportunity to bypass the growing pains of a rapidly growing society in an industrial era by adopting the wide use of biofuels.

To do so, it will require an unprecedented cooperation of research and development into agricultural technology, government support, and education of farmers and citizens.

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