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Biofuels in India: A Matter of Diversity

Mark Twain once said, "So far as I am able to judge, nothing has been left undone, either by man or native, to make India the most extraordinary country that the sun visits on his rounds. Nothing seems to have been forgotten, nothing overlooked." This famous American writer's statement manages to perfectly describe the explosion of diversity and culture that is India. From the tropical monsoon climate in the South to the temperate climate that is the North, India is diverse in the extreme. Its terrain ranges from the sweeping upland plains of the Deccan Plateau in the South, and the flat, rolling plains located about the Ganges River, to the arid heat of the deserts of the West and the majestic and immense Himalayan Mountains and their valleys to the North. However, it is this exact diversity that presents such a difficulty to the modern day economic and environmental issue that is biofuels. The diverse climate and geography cause it to be difficult to initiate one crop as the primary biofuel crop for the entire country, just as difficult as it would be for subsistence farmers to afford to pay for the seeds necessary to grow such crops without outside financial assistance. Rather, for both the development of biofuels and improvement of food security, it is better to concentrate on tapping into a largely unused and under-appreciated resource -- the women of India. The discrimination against and under education of women in India needs to be combated by government incentives, non-governmental organizations, and programs specifically designed to educate and empower women. If this were done, women would become a valuable asset in the modern-day development of biofuels as well as improvement in food security.

In India, it is estimated that two hundred and twenty-two million people are considered rural poor. These people belong to one of two groups that make up this portion of the population, one of which is the thirty-four point seven percent of the total population of India living under one U.S. dollar a day. The other is a group of seventy nine point nine percent of the overall population that lives below two U.S. dollars per day (Rural Poverty Portal). It is these rural poor whose lives revolve around an agrarian society, with three-fifths of the overall population of India involved in the agricultural labor force of the country (CIA). These are the people who are the subsistence farmers of India.

Subsistence Farming

A typical subsistence farm in India consists of only one hectare, and the crops grown on the farm rotate depending upon which of the three main crop seasons it is currently. The seasons are the kharif, during which rice, jowar, bajra, maize, cotton, sugarcane, soybeans, and groundnuts are grown, and the rabi, when the crops grown are wheat, burley, grains, linseed, rapeseed, and mustard. The final crop season is summer, when rice, maize and ground nut are farmed. Like the number of different crops grown in India, the subsistence farming family is typically large. A single family often consists of the entire extended family living under one household, including in-laws and daughters-in-laws, as it is traditional a bride in India to live with her husband's family.

Barriers to Women in India

However, not all traditions in India are as innocuous for women as a new bride's living arrangements. Females in the Indian rural society are largely discriminated against, from hearth to workplace. For example, according to a 2001 census, the literacy rate for male subsistence farmers in India is seventy-three point four percent, compared to a forty-seven point eight percent literacy rate for females in India. This disparity in literacy is yet another reason for the difficulty women of India have obtaining jobs outside the home in order to help support their families. As of 2003, women in the Indian labor force made up merely thirty-two point six percent of the overall labor force, leaving the majority of

the work force to the males of the agrarian society. The women are thus a largely unused work force, which, if empowered by the correct governmental incentives, non-government organizations or NGO's, and programs, could prove beneficial to the development of biofuels in India.

Several NGO's and programs within India already in existence prove the potential women have in enhancing food security, as well as the overall quality of life for their families. One such organization is the Tamil Nadu Women's Development Project, sponsored by the International Fund for Agricultural Development, otherwise known as IFAD, and co-financed by the Government of India and the State Government of Tamil Nadu. Located in the state of Tamil Nadu, this program worked with women's self-help groups, counseling them on the benefits of taking small formal loans from the Indian Bank, and setting up a system for small emergency loans among its own members, for emergencies such as necessary immediate repairs on small farms and for repayment of the formal loan from the Indian Bank (IFAD). This program empowered the women who joined these self-help groups, causing them to become more economically secure and independent, and providing increased income. This increase allowed the women to do what these women had never before been able to do, such as sending their children to school (IFAD). Also, this program succeeded in gaining these women higher positions within their communities. From cases of such programs as IFAD, it is apparent that the involvement of women greatly increases food security in an agrarian society, and that the involvement of women will also increase the success rate of the developing of biofuels within the country.

Biofuels in India

Like the women of this agrarian society, the biofuels currently being promoted by the government, such as Jatropha oil, are currently being underrepresented in the crops grown by subsistence farmers (Gonsalves 22). Jatropha, if it began to be grown by subsistence farmers, would do well, as it is a tree borne oilseed that grows in dry, arid land, making it ideal for a large proportion of the land used for agrarian purposes in India. Originally developed in Central America, Jatropha has many other benefits as well that increase this source of biofuels potential exponentially. A few of these benefits are as follows: Jatropha is not browsed by animals, its' seeds are easy to collect, Jatropha grows quickly and is extremely hardy, and it can be grown in areas of low fertility soil, as well as in areas of low rainfall (Gonsalves 23). The cost is effective at forty-seven cents in U.S. dollars per liter for the manufacturing price of the biodiesel fuel. This cost is very comparable to the current price for normal fuel (Gonslaves 24). Despite these benefits, Jatropha has not yet taken off among farmers as a cash crop. Indian farmers attribute this lack of plantation to several factors, including the lack of a minimum support price as that which exists for sugarcane. Price supports help assure that farmers are protected from sharp drops in the market. Also, there is a lack of confidence in the plant from farmers due to a delay in notification, publication, and explanation of recent government biodiesel policies. Finally, no announcements are made by the government of incentives currently being offered. The current situation for Jatropha oil, though it is being promoted by the government, is as a whole too risky of a venture for subsistence farmers to take. It is for this reason that the government of India, NGO's, and programs for biofuels development should focus on what is already being grown by a large portion of the subsistence farmers in India -- sugarcane.

The sugar industry in India is the support of this agrarian society, forming the largest agro-industry in the nation, as well as being the source of livelihood for 45 million farmers and their dependants. Another half a million people work as laborers, or "coolies," in the cultivation of sugarcane as well as the harvesting of it (Gonsalves 12). It is upon this industry that the government of India's hopes currently rests. The government has initiated several programs specifically designed to assist farmers in planting and cultivating of sugarcane, such as the National Biodiesel Mission Demonstration project, as well as implementing a minimum statutory price to protect the poor rural farmers from extreme fluctuations in the market. The Indian government has also attempted to promote alternative crops such as sweet sorghum that can be used in place of sugarcane in biofuels. This plant is perfectly suited for India's dry vast ranges, and can also be cultivated twice a year, compared to sugar cane, which can only be

cultivated once per year, due to a four month long growth and cultivation cycle (Gonsalves 18). However, these methods have not been adequate for either India's rural poor or their biofuel dilemma. More is needed if the biofuel dilemma in India has any hope of being resolved.

It is women who the country of India must now look to in the biofuels crises. Indian women living the life of subsistence farmers are largely housewives, which when combined with their deficiency in literacy, makes it extremely difficult for these women to hold positions outside their homes. However, if the government of India, along with certain NGO's, such as the U.S. Agency for International Development (USAID) developed programs specifically designed to educate and empower the women of this agrarian civilization, the development of biofuels with in India, along with the nation's food security, would greatly benefit. For instance, the U.S. Agency for International Development or USAID recently developed a program incorporating women and low-cost drip-irrigation systems. This program trained women to install and maintain these irrigation systems that were specifically designed for the dry arid regions of the poor rural state of Maharashtra (USAID). The irrigation system increased crop productivity, and, when combined with the supplementary income received by the women for their services in installing the irrigation systems, allowed Maharashtra's small farmers as a majority to make the switch between subsistence farming to cash-crop farming. This resulted in a two hundred to four hundred U.S. dollar increase in the subsistence farmers' incomes. This program could be expanded by the Indian government with ease to include a larger region of India, as well as adapted to better encourage the farmers involved in such a program to make the switch to growing sugarcane as a cash crop. If done, this program would improve countless Indian rural poor families' quality of life.

If the government of India and specific NGO's within the country would alter their programs so that these programs encouraged the involvement of women in the work force, as well as the education of women, this alone would cause an increase in the food security of subsistence farmers in India. However, if these programs at the same time encouraged and financially supported these poor rural farmers' endeavor to transfer from subsistence farming to cash crop farming such plants as sugarcane, the increase in both food security and the development of biofuels would spike. The government, however, to encourage such attempts must make the market safer for small subsistence farmers by setting a minimum statutory price for such plants as *Jatropha*, as well as undertaking several other endeavors such as the increase of microloans to these farmers and increase the education and position of women in the agrarian society. In order to further educate and empower the women of India, both the government of the nation and NGO's within the country must offer grants and scholarships to families that allow the higher education of their female children beyond primary school. These scholarships should focus mainly on agricultural education of women, making them literate and able to function in a modern day agricultural market with knowledge of farming practices other than the archaic agricultural practices used currently by Indian subsistence farmers. In addition, the government, along with NGO's, must make subsistence farmers today more confident in biofuels by increasing the public awareness of government incentives and policies for crops that can be used in the development of biofuels, as well as educate the small subsistence farmers on how growing such a crop would assist them in becoming more financially secure. This can be done by creating small self-help groups that could be lead by a trained leader appointed by either the government or an NGO that would help educate the rural poor on such matters. If the government, the NGO's, and programs of this country could accomplish these things, the empowerment and education of women would increase the food security of India, as well as improve the development of biofuels by encouraging small subsistence farmers to undertake the growing of biofuel crops.

In conclusion, the country of India is extremely diversified. Its terrain ranges from high mountain peaks to low dry deserts, and this diversity in the landscape makes it difficult to rely on one crop specifically as the primary biofuel crop for India. The government and NGO's within India must instead focus upon attempting to educate and empower women in the agrarian society that is modern day India. Women in India have thus far been strongly discriminated against, as demonstrated by the deficiency in

the workforce. In addition, the literacy rate for females in India is extremely low. If the women of India, however, were educated further and empowered through government incentives, food security and biofuel development would improve. This has been shown through several organizations such as the Tamil Nadu Women's Development Project and the U.S. Agency for International Development, which demonstrated the worth of including women in the work force, with emphasis on their education. In addition to these measures, the government must focus on emphasizing sugarcane as the primary biofuel crop, rather than the Jatropha the government has been focusing its efforts on. Sugarcane, as it is already being grown by a major portion of subsistence farmers and because it is already a major portion of the agro-industry is a far less risk for subsistence farmers to undertake when compared to the risk that would have to be undertaken by subsistence farmers in order to attempt to grow Jatropha. In the past few decades, India has already made great strides in their economy and food security. Unfortunately, it has not been enough. More must be done in this country to ensure food security for subsistence farmers. If the government and NGO's would concentrate on the education and empowerment of women within the country, as well as the infiltration of biofuel crops into the produce grown by subsistence farmers, both food security and biofuel advancements would greatly increase. Mark Twain was right, in that India is an extraordinary country filled with culture and diversity. However, this extraordinariness is tainted by the lack of food sustainability and the oppression of the women in India. India is and will always be a fantastic country in regards to nature, but this country could become far more extraordinary merely by allowing their women the freedom to participate in the national work force. In the end, India must fight to free their women from the oppression they endure, in order to allow these women to become a part in the solution for food sustainability and biofuel advancement.

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