MICRO-CAP REVIEW

Jatropha's Place in the Biofuels Race

Jatropha, a biofuel feedstock, could change the way the world thinks about energy. Pitted against the most viable alternative energy sources on the planet, Jatropha has the potential to compete in one of today's fastest growing industries.

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With government mandates to reduce the global carbon footprint, the biofuels industry has been sent into a frenzy. Alternative fuels are in high demand and the race is on to find the alternative fuel of choice.

Jatropha curcas, also known as the "diesel plant," is an oil-bearing, sub-tropical, drought-resistant shrub capable of growing in challenging environments. When grown in the right climate, Jatropha produces nonedible nuts high in oil. Crude Jatropha oil (CJO) can be used to run diesel engines and has been tested successfully for use in aviation.

Jatropha, however, has yet to become a household name. Despite the myriad of articles and news programs about Jatropha and the heavy-hitting brands attached to it, the biofuel feedstock has a lot of competition in the world of alternative energy. Jatropha's greatest attributes are its non-food crop status and its ability to serve as a drop-in, cleaner burning replacement for traditional diesel fuel.

Jatropha has made headlines because of its association with organizations, such as Toyota, Nestle, Kia, Bayer, General Motors, NASA, and Boeing. Some are exploring the use of Jatropha as a replacement for traditional fuel; some are growing Jatropha to counter their own carbon footprint.

Originating in Central America, the plant was largely considered a weed before the discovery of the plant's potential as a biofuel resource, and was sometimes used as a hedge to divide fields. The oil from its nuts was occasionally used to fuel lamps. Jatropha begins to flower within six to eight months of planting, matures within three to four years, and continues to produce fruit for up to 50 years. When pressed, oil is extracted for biofuel and a pulp residue or seedcake is left behind, which can be made into either fertilizer or animal feed. Needless to say, Jatropha is no longer considered a weed.

Jatropha made its biggest debut in 2008 and 2009 when technological developments made it possible to refine CJO to be used as a dropin fuel in existing engines. News sources, such as New York Times, Newsweek, and Forbes, began to feature articles about the plant. In 2007, the Wall Street Journal published an article entitled, "Jatropha Plant Gains Steam in Global Race for

Biofuels." In 2008, the Economist kept the Jatropha buzz going with an article entitled, "Kept aloft by plants and algae." In 2009, Time magazine questioned, "Jatropha: the Next Big Biofuel?" In February 2010, Reuters published, "Jatropha Shines as Non-Food Oil for Biodiesel."

Crops like corn and soybean once dominated the world of biofuels until scientists, environmentalists, and human rights advocates took issue with the effects of food versus fuel. Prices of these crops were driven up because of the demands of the oil industry. Those crops became cost prohibitive to some populations. Jatropha is inedible, which excludes it from the food versus fuel criticism. Beyond its non-food status, the use of crude Jatropha oil does not require engine modification, an attribute that makes its use environmentally friendly and cost-effective.

Will Thurmond, president of Emerging Markets Online, predicted the necessity for biofuels to act as drop-in fuel in his 2009 article "Drop in Fuels: the Next Generation" published in Biofuels International. According to Thurmond, "from 2009 to 2020, the industry will see increasing investment into the production of 'drop-in' fuel technologies and refinery processes to meet rising demands for the integration of biomass and petroleum systems, and to support national biodiesel mandates and targets for biofuels production."

Thurmond listed Jatropha as one of the feedstocks that can be refined to produce a drop-in fuel "that require[s] no changes to distribution, storage or engines for planes." He used the United States as an example of a country that has spent more than $7 billion on its existing petroleum refining, storage, pipeline, and distribution structure, not to mention the hundreds of millions of dollars spent on research and development to produce a new airline jet engine. In order to be viable, biofuels have to act as a drop-in replacement.

On December 30, 2008 in Auckland, New Zealand in a joint initiative between Air New Zealand, Boeing, Rolls Royce, and Honeywell's UOP, Jatropha diesel was tested in the world's first commercial aviation test flight powered by Jatropha diesel specially blended for aviation applications.

Last year, *MIT's Technology Review* published research findings by Alok Adholeya, director of (TERI) Biotechnology and Management of Bioresources. "Jatropha is a one-stage conversion [to biodiesel]," Adholeya says, explaining that converting the plant oil to an oil that can be burned as fuel requires only one stage of heating and mixing with methanol. The resulting fuel, he says, "is a very good quality diesel that can be used in any transport vehicle."

With so much public evidence of Jatropha's potential, some biofuel companies are relying on public participation to get Jatropha plantations up and running. Bedford Biofuels, headquartered in Calgary, Alberta, Canada is educating investors about the potential of Jatropha to attract small and large investments. The company will plant 100,000 hectares (or 247,000 acres) of Jatropha in the Tana Delta District of Kenya.

David McClure, the president and CEO of Bedford, said most of the CJO produced will be consumed domestically but once quantities allow, the oil can be shipped to other parts of Africa, Europe, and beyond.

In March 2010, NASA announced the addition of a Jatropha experiment to the International Space Station to test the effects of microgravity on Jatropha cells with the intent to accelerate the cultivation of the plant for commercial use.

An article on NASA's official Web site quoted Wagner Vendrame, the principal investigator for the experiment at the University of Florida. "As the search for alternate energy sources has become a top priority, the results from this study could add value for commercialization of a new product," said Vendrame. "Our goal is to verify if microgravity will induce any significant changes in the cells that could affect plant growth and development back on Earth."

The sky appears to be the limit for Jatropha. Once considered a weed, the plant has the potential to leave a green footprint in history. ■

About Bedford Biofuels

Bedford Biofuels is a biofuel company headquartered in Calgary, Alberta that syndicates private investment offerings in Canada to facilitate its Jatropha operations in Kenya.

The company seeks to fund large-scale operations, thereby allowing it to create commercial quantities of biofuel. Bedford has achieved stable production costs by securing long-term land leases and exclusive supply agreements, and by choosing geographical areas with available labor, pre-existing infrastructure, facilities, utilities, and government support.

Bedford's humanitarian division EMPOWER (Every Member Prospers on World Energy Resources) was formed to bring healthcare, education, and clean water to the people in the areas in which Bedford operates. EMPOWER will teach farmers to grow their own Jatropha crop to sell it to Bedford for income. Through intercropping and the transfer of farming skills to local farmers and landowners, EMPOWER will contribute to long-term food and financial security. All of Bedford's Jatropha operations will incorporate sustainable use of natural resources, farming practices, and production.

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