The Sustainability of Jatropha: Producing Profitable Crude Oil While Leaving a Soft Imprint on the Earth

Industries and governments have set aggressive targets for the increased use of renewable fuels, resulting in high demand for feedstock. However, the reality has emerged that some biofuels can compete with food production, harm the environment, exacerbate climate change and consume more energy than they produce.

Increased use of edible feedstocks including corn, soybean and palm oils has resulted in higher food prices and concerns regarding the long-term ability to feed growing populations. Direct and indirect land use change and the impacts of biofuels cultivation on surrounding ecosystems have also come under scrutiny. A 2009 environmental study by the United Nations cited clear-cutting of vital rain forests and the impact of petroleum-based fertilizers as two harmful bi-products of biofuels production – impacts with the potential to offset much desired reductions in carbon emissions.

As a result, more research and investment is going toward crops that can be converted to energy without competing with food or causing significant disruptions to local ecosystems.

Within this environment, non-edible Jatropha is recognized as one of the best crops for producing plant oil for diesel, jet fuel and specialty chemical feedstock replacement. Jatropha can profitably produce large volumes of high quality crude oil today. And, when Jatropha is grown in regions of the world to which it is well adapted, and when the full life cycle and attributes of the crop are taken into consideration, it is the most sustainable and profitable feedstock available. Not only is Jatropha itself not edible, it grows on marginalized land considered undesirable for food crops, preventing food price increases due to competition for land.

SG Biofuels is taking a leadership role in the sustainable production of Jatropha through its landmark partnership with the Roundtable on Sustainable Biofuels (RSB). SG Biofuels and the RSB are working collaboratively to test, evaluate and strengthen international standards for the sustainable production of Jatropha by applying current RSB standards against a community-farming model established by SG Biofuels.

Roundtable on Sustainable Biofuels

Land Use

Because Jatropha is non-edible and grows on marginalized land that is not considered desirable for food production, Jatropha avoids the direct and indirect land use issues associated with other biofuels feedstocks such as corn or palm. Jatropha is a resilient plant that can adapt to different ecological conditions. But not all marginal land in its geographic band is ideal for cultivation. Jatropha tolerates a variety of soil types, but is sensitive to waterlogging. For this reason, it may not grow well in heavy clay soils, and will not thrive naturally in acidic or alkaline soils. However, as evidenced by research at SG Biofuels' GRC, the crop can grow well in as little as 12 to 18 inches of well-drained topsoil.

Self-Fertilization

An additional advantage of Jatropha is its ability to self-fertilize utilizing its own seedcake. Top yields for Jatropha require NPK fertilizer inputs. Jatropha seedcake (the residue after the oil is extracted from the seeds) is a rich organic fertilizer source that can be applied as fertilizer. This significantly reduces the need for chemical inputs, helping to lower the carbon footprint for growers, reducing impacts on surrounding ecosystems and insulating growers from volatile petrochemical markets.

Carbon Emissions

Jatropha crude oil has been tested and verified to be a high quality, clean burning source of biodiesel and jet fuel. Independent life-cycle analysis by Ecofys shows Jatropha-based biodiesel provides a nearly 70 percent reduction in greenhouse gas emissions over petroleum-based diesel. Scientific findings released by Air New Zealand following a test flight utilizing a 48 percent blend of Jatropha oil and traditional jet fuel showed a 60 to 65 percent reduction in greenhouse gas emissions from the Jatropha-jet fuel blend compared to traditional jet fuel flights. By comparison, the European Union's Renewable Energy Directive recently awarded soy biodiesel a default carbon savings value of just 31 percent, below the EU's required 35 percent reduction.

Water Consumption

As with any crop, top yields for Jatropha require an adequate amount of water – an amount that can be realized through rainfall when planted in proper growing conditions. Jatropha requires between 1,000mm to 1,800mm of rain per year, but not less than 800mm without additional irrigation. Jatropha is drought resistant, but yields will be lower with insufficient rainfall. SG Biofuels is initially focused on the development of Jatropha in Latin America due to the availability of large amounts of land suitable for Jatropha production that receive sufficient amounts of annual rainfall.

Unlike other crops that have been domesticated for generations, water consumption characteristics for Jatropha will continue to improve with breeding and genetic improvements. Current efforts to breed and further enhance the yield of Jatropha, as well as enhanced agronomic practices and a greater understanding of the characteristics of the crop over an extended period of time, will continue to decrease Jatropha's water footprint at a rate far exceeding the improvements possible with crops that have already undergone long periods of commercialization.

A Commitment to Sustainability: Partnership with the Roundtable on Sustainable Biofuels

SG Biofuels is committed to socially and environmentally responsible cultivation of Jatropha. In March 2010, the company announced a landmark partnership with the Roundtable on Sustainable Biofuels to evaluate the practicality and usability of RSB sustainability standards applied against the company's 1,500 acre (600 hectare) Jatropha community-farming model in Guatemala. The project, the largest Jatropha community farming effort in Central America, was established by SG Biofuels in partnership with Technoserve, an international Non Governmental Organization (NGO), utilizing funding from USAID.

> "We thank SG Biofuels for their leadership in furthering the development of sustainability standards for the biofuels industry, specifically for Jatropha."
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> - **Matthew Rudolf**, *Regional Manager for the Americas, Roundtable on Sustainable Biofuels.*

Plantations were started in 2009 with initial harvests expected by summer 2010. The project includes more than 380 farmers in 25 distinct communities. Plantations were established without displacing food crops and on land that was considered marginalized and unsuitable for food crops.

Through its community-farming initiative and pilot with the RSB, SG Biofuels is working to establish a model system for the sustainable production of Jatropha that provides economic value to farmers and communities while also hedging out the harvest risk. Such a model will bring opportunities to communities where we create thousands of jobs for local workers and, more importantly, create thousands of local "owners." And, the sustainability insights gained through the pilot will be critical as the company deploys large-scale community-farming and plantation projects around the world.

Through the sustainable production of plant oil from Jatropha, SG Biofuels is contributing to the reduction of carbon emissions, preserving ecosystems and leaving a positive impact on local communities. And, through the creation of the world's largest Jatropha Genetic Resource Center and the JMax Jatropha Optimization Platform, SG Biofuels is pioneering advancements that will continue to enhance Jatropha's long-term sustainability, yield and viability.