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Jatropha: The Rise and Fall of a Biodiesel Wondercrop

The story of jatropha as a biofuel energy crop, a sustainable alternative to fossil fuels, is one of exciting innovations, eager investment, and hope for a cleaner and more sustainable future for the world's growing population. Yet it is also one of struggle, of hastily made plans, and the conflicting vision of sustainability in a profit-driven industry.

As the twenty-first century opened, the world faced big problems. The climate crisis was all over the media. In developing countries, people faced food security uncertainties and clean water was in short supply. Most of the planet, was in one way or another intricately connected in a system of globalised production, trade, and consumption that drained heavily on the planet's resources. Panic over overpopulation, the distribution of food, new worries about its quality, fear of additives, contaminants, and Genetically modified organisms (GMOs) drove speculations that the current agricultural system simply couldn't sustain the amount of people on earth in the new millennium. With the heightened concern for global warming and climate change, came criticism of the so-called Big Oil, the extractive industry companies damaging the environment, polluting the atmosphere, destroying habitats, and depleting the planet's finite reserves of oil for profit. How could this situation be resolved? What could be done to ensure the environment was preserved, and more people enjoyed a basic standard of living? In the early 2000s, the situation seemed dire.

Enter the marvelous 'wondercrop'. The great silver bullet solution. A wondercrop is an agricultural product that is new, or 'rediscovered', with bio-properties that promise to solve any number of problems. From agricultural and environmental issues, such as soil condition or air quality, to economic and social issues, such as wealth distribution or gender equality, wondercrops offer enticing hope for an easy solution to some of the world's most pressing issues.

Jatropha Curcas: Imagining the Possibilities – marginal soils, maximum returns

In the early twentieth century, petroleum-based fuels dominated technology and thereby consumption, with what seemed at the time like bountiful supply of its necessary natural resource – oil – and reasonable prices. In particular the invention and spread of the internal combustion engine drove the need for gasoline and importantly for the story of Jatropha plants, diesel fuel. Diesel became the fuel that ran heavy industry. From freight trucks, to trains, busses, and boats, diesel moved large, heavy cargoes around the world. Diesel-generated electricity became essential for many remote communities and industrial sites. Factories, hospitals, and other large building complexes, still use diesel-run generators for electricity backup. Diesel fuel became the primary power for vehicles used in construction, those in industries such as mining, and the military. Furthermore, it became essential to running farming equipment, from essential mechanized tools like tractors and harvesters, to controversial agricultural techniques like low-flying crop-dusting planes.[1] In more remote communities, agricultural processing facilities also utilized diesel. For much of the 'developing world' of the later twentieth century, affordable and reliable access to diesel fuel was key to economic growth and food security.

However, as the second half of the twentieth century transpired, increasing awareness of the diminishing supply of fossil fuels combined with fears and uncertainties surrounding oil price shocks, particularly of the 1970s, to create heightened interest in alternative sources of fuel. Attention began to turn to plant-based sources of fuel, becoming what we call today 'biofuels'. The term 'biofuel' technically means any liquid fuel derived from biological matter. Since fuel can be produced in a number of ways from any source of carbon, resources such as trees, grass, bio-waste, or crops can be a source of 'biofuel' and different biofuels can be used for various purposes. Generally, however, in our contemporary terminology, 'biofuel' refers to liquid fuel of biological origin used for transportation. Indeed, the two main types of biofuel are biodiesel and bioethanol, both used as substitutes or additives for vehicle fuel.

The figure below demonstrates some of the main ways biofuels can be produced.

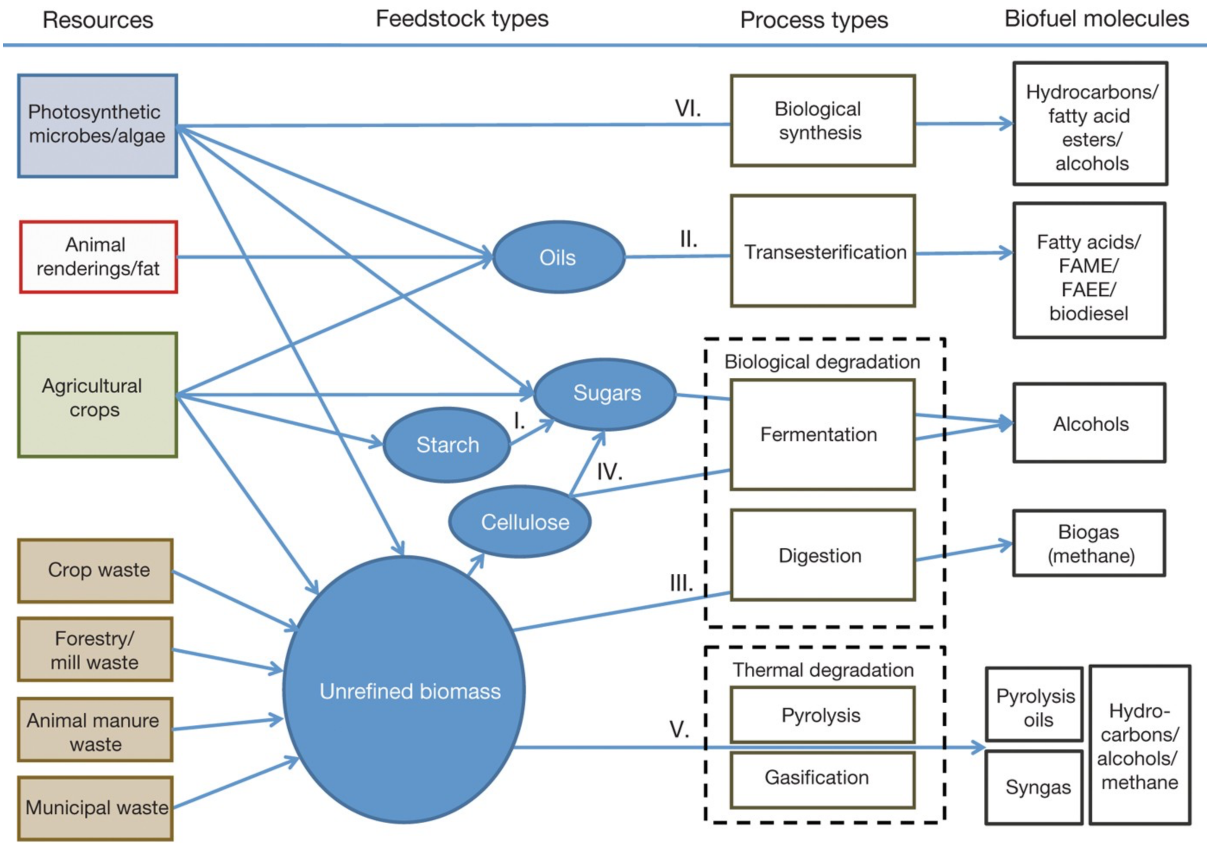

Image: Stevan C Albers, Annabelle M Berklund, and Gregory D Graff, 'The Rise and Fall of Innovation in Biofuels', *Nature Biotechnology,* vol. 34 (2016), Figure 6: 'The six main pathways of biofuel production, based on major sources of biological feedstock, conversion processes, and resulting biofuel molecules.'

Initially, using biofuels as an alternative fuel was slow to catch on. This was due to several reasons. Early initiatives at commercial-scale biofuel production were experimental, and competed with standard agricultural productivity for land usage, and were therefore not prioritized in production. One of the first countries to explore this new industry were the sugar-growing regions of Brazil. Ethanol produced from sugarcane grown on Brazilian sugar plantations was introduced to the market in the 1980s. Despite the promising outcomes of plant-ethanol production, however, biofuels produced from known or existing plantation crops, such as sugar, that already had established value and markets, struggled to gain momentum. This compounded with the relatively low prices that oil maintained through the decade, which made it difficult for alternative fuel newcomers to enter the market and gain widespread acceptance. Furthermore, when it came to developing new plant sources of diesel biofuel, there was a critical lack of agronomic research into species of oil-yielding plants that were not already cultivated in agrisystems for other commercial purposes. So, while it was possible agriculturally and scientifically to produce biofuels, they had a limited level of success in the competitive production environment.

However, as the twenty-first century opened, the fuel-source pattern of 'panic-and-innovate' was to continue. This time, however, there was another important factor. If earlier forays into biofuel production had been driven by the need to find *alternatives* to petroleum-based fuel to counter perceived instabilities in the oil market, the twenty-first century brought the need to find *sustainable* sources of fuel. In the 2000s, the world faced intensified concerns about the growing environmental crisis. Climate change and human-generated global warming took centre stage in research, debate, and media. As everyday use of the internet became widespread, issues such as overpopulation, the clean water crisis, endangered species and habitat destruction, and the toll of human consumption on the Earth's resources became common knowledge. One of the most contested debates, however, was over sources of energy.

The so-called 'decade of climate change' of the 2000s, saw a fervor of interest amongst the public, politicians, and investors in biofuels. Energy, and 'clean energy' alternatives to fossil fuel had become one of the central debates amongst policymakers and consumers. Biofuels offered powerful substitutes for fossil-fuels in the mission to reduce carbon emissions and environmental destruction associated with oil extraction. Unlike traditional fossil-fuels, biofuels contain no polluting sulfur, and dramatically less carbon monoxide and other toxic emissions. In the swelling tide of 'thinking green', the idea of growing sources of fuel agriculturally appeared far less environmentally damaging than extractive industries. Biofuel sources also could be regenerated relatively quickly, much more so than the extremely long natural process of crude fossil oil formation. This appealed to the vision of sustainable resource management that was shared by consumers eager to make ethical purchasing decisions, and governments concerned for heavy reliance on finite reservoirs of fossil fuels. In the world of media and policy, 'Energy Security' became a buzzword for leaders and governments as they sought to plan ahead for the decline of fossil fuel resources.

It was the production of diesel fuel from plants that was to spark major interest. Diesel was, of course, the fuel of global transportation and machinery that built, farmed, and processed most of the world's products. Incentives and agreements to reduce carbon emissions made the larger-scale production of biodiesel desirable, as well as to invest in future-focused ways to continue doing business without crucial dependency on conventional diesel. Fuel dependency and the need for energy security, 'the uninterrupted availability of energy sources at affordable prices', presented particular problems in developing countries. How could an emerging economy grow if there were chronic shortages of fuel to power its industrialisation strategies? How could people living on the land in the developing world possibly produce enough to be competitive when the price of diesel to operate equipment was too expensive? It was clear, that for a sustainable future, a new source of diesel was needed.

In the mid-2000s, a seemingly miracle solution appeared: Jatropha Curcas. Native to Mexico and Central America, jatropha trees offered a carbon-neutral way to produce oil. Their seeds contained a non-edible oil that through the transesterification process could yield biodiesel. Known historically for its medicinal properties, the reason jatropha trees were introduced to Europe by explorers and traders returning from the Americas, these obscure small trees proved to be quite remarkable.

Being essentially a desert plant, Jatropha can survive in arid and semi-arid conditions. Furthermore, it could grow on what is known as 'marginal soil', that is, low-grade land or poor-nutrient soil otherwise not useful for agriculture or pasture. It therefore in theory didn't compete with food agriculture. For regions of the world that had a lot of marginal soil, jatropha could make profitable use of land that otherwise provided no financial benefit. Jatropha cultivation held promises based on claims that it was ideal for small farmers in poor regions, as a source of revenue and of biodiesel fuel, because of its ability to grow in marginal soil, and even improve the topsoil quality, making the land more arable and reducing fuel dependency. One Jatropha plant, it was claimed, could provide a litre of biodiesel fuel per year, for forty years.[2] Furthermore, it was perceived to be a strategically strong option for rural development in Africa and Asia because most of the labour associated with Jatropha cultivation could be done by women, thereby creating a revenue source and financial independence for women in poor areas of Africa and Asia.[3] As a crop that could grow in otherwise unused land and provide biodiesel, could jatropha be a remedy for the persistent problems of rural poverty in the developing world *and* climate change?

'Get rich, save the planet': from small farmer to international agribusiness

As awareness of jatropha and its oil-yielding seeds spread amongst the agricultural and environmental community, claims for its potential as a silver bullet crop for small-scale farmers in disadvantaged regions of Africa and Asia intensified. The greatest appeal of jatropha as a commercial crop lay in its ability to produce biodiesel. The argument that biofuels could be the solution to climate and environmental issues arising from the world's excessive usage of diesel-based industries held a lot of weight in favour of exploring this 'green alternative' to fossil fuels in the 2000s. Companies eager to reduce their carbon footprint and remarket themselves as environmentally aware to a new wave of eco-conscious consumers began to change their thinking about fuels. Fear surrounding access to and supply of oil during the tumultuous geopolitics of the U.S. war in Iraq invigorated interest in biodiesel as an energy-security issue for one of the world's most needed fuels. Jatropha, and its oil-bearing seeds, emerged as one of the strongest candidates for an alternative source of diesel. Diesel was, however, primarily the fuel of industry, produced and consumed at an industrial scale. This presented a conflict of interest with jatropha's initial appeal as a resource for small-scale farmers in developing economies. To substitute diesel on the industrial scale, production of biodiesel crops needed plantation-scale cultivation.

Excitement surrounding the potential – and potential profits – of this 'green fuel solution' sparked intensive interest amongst wealthy enterprising investors in Europe. Marketed to European/wealthy investors as a 'wallet-swelling, planet-saving financial bonanza'[4], jatropha was highly susceptible to becoming a cash crop. This played straight into the hands of existing global inequalities, which contradicted the 'development' role many had hoped jatropha to fill. Indeed, jatropha did become a significant cash crop. Big business was more than willing to invest in the potential of this plant to produce biodiesel. Far from 'a revenue and fuel source for small farmers', by 2008 it was estimated that 721,000 hectares (ha) worldwide had been given to jatropha plantations, with an annual investment of upwards of 1 billion USD, and over 130 companies in the race.[5] With such eager international interest, the map of Jatropha investment, cultivation and its biodiesel refining process globalized rapidly. Rather than 'small scale' African and Asian farmers with a handful of jatropha bushes on their farms, large scale companies such as British Petroleum (BP) had designs on 100,000 ha plantations in Indonesia to feed its 350,000 tonne-per-year (tpy) biodiesel refinery there. Hardly 'providing income for small farmers', revenues from jatropha-sourced biodiesel concentrated into the hands of corporations located far from where the trees were grown. In Singapore, for example, the American corporation Van der Horst built a 200,000 tpy biodiesel plant that was planned to be supplied with jatropha from plantations operated by the corporation in Cambodia and China, with designs on further plantations in India, Laos, and Burma.[6] The model of internationalized jatropha industries became the norm, given the scale of investment now required for a viable venture. Other companies followed suit, such as Mission Biofuels, an international cooperative for renewable energy, contracted Indian company Agro Diesel to manage 100,000 ha plantations and negotiate with contract farming networks to supply its jatropha refineries in collaborating regions of Malaysia and China.[7]

The jatropha biofuel race was dominated by D1 Oils of London, whose global jatropha operations were forecast to overtake its existing soy-biofuel focus during the peak of jatropha-frenzy in 2007. D1 not only owned and operated its own plantations across the world, but also engaged in contracting with local oil companies to maximise profits and geographical reach, such as its joint venture in the Philippines with the Philippine National Oil Company to operate a 1-million-hectare mega-nursery for jatropha.[8] The Philippine National Oil Company had further lucrative joint ventures with UK company NRG Chemical Engineering, to the amount of 1.3 billion US dollars, to construct a biodiesel refinery, two ethanol distilleries, and a over half a billion USD in over a million hectares of jatropha plantations on the Philippine islands of Palawan and Mindanao.[9]

In 2007, in the peak of jatropha-fever, D1 struck a 160million dollar joint venture with oil giant BP, known as D1-BP Fuel Crops Ltd. In this venture, D1 Oils would bring to the table their existing jatropha plantations, 172,000 hectares in India, South East Asia, and Southern Africa, and as a major global biofuels company, D1 offered to the deal exclusive access to its scientifically developed jatropha seedlings, and plant science division. The plan was to plant a million hectares of jatropha trees across Southeast Asia, Southern Africa, and Central and South America in the first four years, expanding by 300,000 hectares annually, making D1-BP Fuel Crops the world's largest and most influential biodiesel producer.

When sustainability ideals collide: 'Green Solution' versus Development

High entry stakes made jatropha cultivation and the production of biodiesel from it difficult for 'small scale' initiatives to enter the market, and to compete with the financial, logistic, and technological advantages of multinational corporations. The global terrain of the industry became heavily influenced by where corporations sought to invest, and where their networks of production were located. This advantaged certain regions' prospects for successful jatropha plantations, and disadvantaged others that presented more challenges to international investment.

These enormous and internationally integrated jatropha plantations became increasingly not planted on 'marginal soil' either. Given the profit potential of agricultural plantations, otherwise good farmland was given over to jatropha plantations, often muscled away from the 'small farmers' it was initially meant to assist, with integrated irrigation systems implemented to maximize the plants' production. Prioritising higher yield and therefore profit over protecting existing quality farmland for food effectively eliminated one of jatropha's greatest miracle-plant properties – its ability to grow in arid, marginal soil. Through encroaching onto land that could be used for farming food, the expanding jatropha agrisystem began to threaten the food security of the very places it was heralded to assist.

One of the issues became defining 'wasteland'. In theory, the 'wasteland' or marginal soil of a given region or country was reasonably clearly defined, as land that was of such a poor quality as to be unfit for agriculture or pasture. The productivity of these spaces could be therefore increased by giving it over to jatropha cultivation. In countries such as India, strategic plans for fuel independence and meeting the skyrocketing demand for diesel transportation fuels in a rapidly expanding population placed biofuel production strategies at the centre of government priorities. In 2008, as jatropha interest gained more momentum, the Indian government announced its 'National Biofuel Policy' that outlined the target of meeting 20 % of the country's diesel demand from biofuel. Meeting this target necessitated a massive increase in the land area required to produce enough fuel-yielding plants. In the early 2000s, when some 'promising results' had emerged regarding jatropha in India, only 5,000 square kilometres were under fuel-yielding plant cultivation, mainly on smaller regional farms. To meet the 20 % demand, more than 140,000 square kilometres of productive cultivation were needed.[10] As the desire to increase yields and implement biofuel strategies swelled alongside investment interest in jatropha, the definition of 'wasteland' or 'marginal soil' became more malleable.[11] It became the prerogative of those in power to designate what any given area was classified as, and susceptible to agendas that favoured economic outcomes over developmental plans or social welfare. In order to reduce the considerable start-up obstacles for jatropha plantations, contract-based corporate plantations had governments in emerging economies commandeering land ostensibly designated as 'wasteland', therefore suitable for jatropha cultivation, which were in reality highly important common lands, forests, or shrublands upon which local farmers, pastoralists, and Indigenous peoples depended for food and fuel in their communities.[12] Often with little political leverage or resources to take on big agribusiness or governmental agents, people in regions such as Balangir, Orissa, India, could be essentially tricked and bullied out of over 138 ha of land essential to their survival and livelihoods, but barely a scratch on the surface of the national land need, by companies such as

Taj Gas Limited, with a powerful government contract to pursue jatropha plantations in the area, in the name of national fuel independence.[13]

Even with environmentally conscious ambitions, jatropha grown in plantation systems, became incompatible with the ideals of rural development. This meant that within a biofuel agrisystem based on large plantations to supply industrial quantities of biodiesel, the two noble ideals promised by jatropha of 'a green solution to fossil fuels' and 'assisting rural small farmers to earn revenue' struggled to coexist.

Reality Check – Money doesn't grow on trees

When it came to the perceived benefits of Jatropha as an energy crop, investment fever ran ahead of plant science.[14] Set against the requirements of the globalised jatropha biodiesel industry, this proved to be a serious impediment to the 'small farmers' for whom jatropha cultivation was meant to be beneficial. Earlier 'promising results' from jatropha farms were largely drawn from regions such as India, prior to large-scale plantations and actively seeking fuel-dependency solutions, that had been consequently targeted for higher levels of foreign multinational investment with government cooperation and incentives. India's jatropha, therefore, had higher likelihood of profitability during the 'jatropha-mania' of the 2000s. As we have seen, this caused a certain set of socio-cultural issues, such as the misuse of power to appropriate land. In the wake of enticing results for investors into this region, however, an important oversight was made amongst enthusiastic visions of rural development in Sub-Saharan Africa (SSA): understanding of the plant's agronomic suitability for SSA where it was proclaimed to be a miracle solution for rural development and fuel dependency, was nearly nonexistent. The agronomics of jatropha in SSA were largely explored in real-time, as the crop's cultivation was underway in the 2000s, at the expense of the said 'small scale farmers' who were in theory the beneficiaries of this wondercrop. What transpired was an underwhelming realization that the commercial production of jatropha as an energy crop needed not just the plant's *minimum* survival requirements, of which it was indeed capable, but *ideal* growing conditions were needed to make it economically viable.

Despite its lauded ability to grow in arid and semi-arid conditions, like most plants jatropha inevitably benefitted from more water. By 2007, as jatropha plantations swelled in number and size, it was becoming clear that profitable yields required irrigation.[15] The average yield leading to 2007 after 5 years was 1.1-2.75 tonnes per hectare in natural rainfall conditions, which contrasted sharply against a yield of 5.25-12.5 tonnes per hectare with irrigation.[16] The problem of supplying expensive and water-demanding irrigation systems to jatropha crops became particularly acute in Sub-Saharan Africa, particularly Tanzania, Kenya, and Mozambique, where its ability to be grown in a low range of annual precipitation of 200 mm was one of the primary drawcards for the crop, to avoid a scarce-water burden on communities and not exacerbate existing resource conflicts. Consequently, farmers in SSA had ventured into jatropha cultivation with the expectation that it would have a low water requirement. Which it did, at its lowest capability, but ideally its higher yield range – necessary for competitive production – required annual precipitation of more like 900-1500 mm, which in SSA meant the need for irrigation. Farmers in Mozambique had to supplement 5-7 litres of water *per day per plant* just to meet basic profitable yields, and around 40 % of those in Kenya utilized expensive irrigation systems that dented the region's jatropha profitability, and increased inequality within the country's agricultural population.[17] Indeed, the GEXSI report of 2008 showed that 49 per cent of jatropha plantations around the world were under irrigation, concentrated on high-foreign investment plantations, with SSA lagging behind in developing these systems. This indicated that jatropha plantations in the SSA region were underproductive for the global market, lacked infrastructural investment compared to jatropha ventures in other parts, and that this created a conflict of water resource access and usage.

Similarly, Jatropha's ability to be grown in marginal soils also fell victim to the situation that while it *could* grow in low-fertility soil, it fared much better for commercial yield purposes with the use of fertilisers, or from being grown on better-quality land. This presented an immediate challenge to the notions of jatropha's ability to assist with rural development, when principles of maximizing profitability of the crop contradicted the reasons for initiating its cultivation. The basic outcomes, however, were clear. Marginal soils untreated with fertilisers didn't produce the seed yield needed for SSA jatropha to be competitive. Consequently, to save investments and promote higher yield, jatropha plantations began moving away from the initial 'marginal soil' areas of development design to encroach on good farmland, which intensified the already acute problem of food security in these places. This echoed the food, environmental, and cultural security problems arising in other regions, such as South-East Asia and India, in which the definition of 'marginal land' became increasingly at the service of those in positions of power who wanted to invest in jatropha, rather than the actual quality and existing usage of the land itself.

While there were some problems emerging across different jatropha growing regions, there also became apparent some discrepancies between them. In SSA, where Jatropha was most heralded as the wondercrop for small farmers, the emerging reality of Jatropha's 'possible' versus 'ideal' growing conditions and the level of agricultural infrastructure and support it needed compounded with poor agronomic management of jatropha productivity to make jatropha success challenging. Outside of the exclusive plant science division of D1-BP Fuel Crops, agronomic data such as exactly how many seeds each tree yielded on what kind of plant spacing plan, how the crop established from either nurseries or direct seedings, their seed size and oil quality in different scenarios, the effects of different seasonal pruning practices, and especially a proper register of strains and propagation, were all sparsely and inconsistently monitored. There was very little or no accessible certified planting material for Jatropha in SSA, a critical missing aspect for quality and known properties of the plant and its development. In other regions, such as South-East Asia, where Jatropha was being heavily invested in as a mega-scale energy crop with powerful corporate and governmental backing, agronomic understanding of the plant increased rapidly, the information often being kept within companies. Even in India, where jatropha was most likely to gain acceptance as a diesel substitute, the lack of feedstock and seed diversity openly available frustrated the growth of the industry and government plans for biodiesel production. In the absence of well-organised and well-funded openly available agronomic practices in SSA, this led to a lack of regionally specific ongoing research, improvement, and development of Jatropha as a commercial energy crop. When faced with the increased costs of growing jatropha productively, even D1-BP got cold feet about further investment in SSA in favour of its projects in other regions. This dwindled the already limited availability of seed and knowledge in the area. Without more detailed understanding of how Jatropha responded to the particular conditions of SSA, and education for farmers on how best to cultivate it, it was unlikely that Southern African Jatropha could compete on the global scale, or even fulfil its imagined destiny of supplying a small farmer with enough fuel for their own farms.

A pattern began to emerge, that while jatropha could produce an environmentally preferable substitute for fossil fuels, it created other sustainability issues where it was produced. Within a broader definition of 'sustainable' energy, its high water and land area requirements for commercial viability along with socially unsustainable factors like prohibitive refining procedures and meant that jatropha biodiesel was proving to fall short of an overall 'green solution'.

By the end of the decade, investments in jatropha had a bleak outlook. Most of the Indian plantations were considered largely failures, as maintenance costs and seed shortages ran the enterprises into the ground. The flash-in-the-pan investments in Southeast Asia began to sour, and companies just collapsed into oblivion, such as the fraudulent Sustainable AgroEnergy company in Cambodia, which led to lawsuits and eventually, its chairman sentenced to prison.[18] Similarly in SSA, private companies investing in jatropha, particularly in Tanzania, made the wider world even more wary of biodiesel ventures. A Dutch company that acquired land in Tanzania for jatropha, BioShape, went bankrupt in 2010 after laying down considerable investment, and just the year before, BioMassive, a Swedish private company in Tanzanian jatropha biofuels reported losses and then simply…disappeared. What had initially looked like 'a planet-saving, wallet-swelling bonanza' now looked like shady dealings and rickety scams. Ultimately, in 2009, D1-BP Fuel Crops was over, BP pulling out of the 160 million dollar joint venture for 860,000 dollars.

Conclusion: Sustainability versus Profitability in Jatropha Biofuel Production

By the end of the 2000s, excitement for jatropha biodiesel had, for the time being, run its course. What had started as a search for sustainable alternatives to fossil fuels and a vision for rural development, had turned into a quick-fire profit grab that undermined the very reasons jatropha had been appealing in the first place. With its ability to be grown in dry, marginal soils and bear oil-yielding seeds, jatropha had promised revenue and greater fuel independence for small-scale farmers in developing countries. In the climate of heightened concern for environmental impact and conservation, jatropha had appealed to companies and investors keen to secure an energy-positive future. Jatropha's main product, biodiesel, was however mainly desirable in large quantities, to supplement industrial use, which necessitated large-scale cultivation, placing jatropha production beyond the capabilities of many small farmers.

Ultimately, the cash-crop venture had been unsuccessful, too. Most companies that had invested in it saw little return, due to poor understandings of how the plant actually grows in different conditions, and what science had been done had become monopolised by dominant companies. The high ideals of creating sustainable fuel alternatives and assisting with fuel independence and revenue for developing regions was not enough to persist in an unprofitable industry. Ventures began to crumble, and the unstable foundations of many jatropha enterprises began to show. The jatropha wondercrop had failed to deliver what its proponents had envisioned. Had dreams of a miracle solution to the world's energy problems outweighed research and planning?

The case of jatropha-based biofuels shows what happens when investment excitement, coupled with the desire for social change and hope for green solutions proceed before practical planning, thorough policy design, and sound, accessible agronomy. As the decade closed, the world remained reliant upon fossil fuels, and marginal lands remained under-utilised. Change, however, occurs in waves, and the possibilities for sustainable biofuels did make some advances during the jatropha-frenzy. The plant itself didn't change. It was still a source of biodiesel; it could still provide a farmer with some fuel from their own farm. Following the experiences of the 2000s, more became known about this curious oil-seed tree. With global demand for fuel still straining the planet's resources, and food security, fuel dependency, and global inequality still persistent issues, the reasons behind jatropha-fever remain. What will be the next wondercrop?

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