

Laborers, Dzeve community, Bilene District, Mozambique.



agrofuels &  
corporates

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# jatropha: money doesn't grow on trees

ten reasons why jatropha is neither  
a profitable nor sustainable investment

december 2010 | issue 120



Friends of  
the Earth  
International



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## contents

# jatropha: money doesn't grow on trees

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december 2010 | issue 120

introduction	4
one jatropha is not economically viable	5
Reason 1. jatropha doesn't guarantee high returns	5
Reason 2. jatropha doesn't thrive on marginal land	6
Reason 3. jatropha needs significant amounts of water	6
Reason 4. jatropha is not pest resistant	7
Reason 5. many jatropha investment projects have failed	7
two jatropha is bad for people and the environment	9
Reason 6. jatropha competes with food production	9
Reason 7. jatropha causes displacement of local communities	10
Reason 8. jatropha plantations are not pro-poor	10
Reason 9. jatropha plantations negatively impact biodiversity	11
Reason 10. jatropha is likely to increase carbon emissions	11
three conclusions	12
footnotes	13

## introduction

### A panacea for the energy crisis, climate change and poverty? Or a dangerous false solution?

Jatropha (*latin: Jatropha curcas*), a succulent shrub or tree originally from Central America, has become naturalised in many tropical and subtropical areas, including Africa, where it is used as a hedge plant. The non-edible oil from the seeds has long been used for making candles and soap, while the remaining seed cake can be used to produce biogas or be used as fertiliser or animal feed, once detoxified. The oil can also be refined into biodiesel for use as vehicle fuel.

Jatropha has been hailed as a particularly suitable crop for biofuels because unlike many other feedstocks, it is not edible, and so does not supposedly compete with food production. Jatropha is also said to grow on marginal, dry land, contributing to its reputation as a "miracle crop". Jatropha is increasingly seen as a cash crop, grown in large-scale monocultures in the tropics and subtropics. It is widely cultivated in Asia, Latin America and Africa, with an estimated 1 million hectares (ha) of jatropha globally in 2008. Some claim there are now 5 million ha and predict there will be 13-15 million ha by 2015. In 2008, Asia accounted for around 85%, Africa for around 12% and Latin America just over 2%.<sup>1</sup>

Many investment companies promote jatropha projects, promising that jatropha is a secure investment with guaranteed high returns. British companies the Sceptre Group, Onyx World and Solutions Investment, for example, rate jatropha very highly, claiming, "Money really does grow on trees".<sup>2</sup> Some companies initially anticipated financial returns of 93% per year on jatropha,<sup>3</sup> but these figures have now been scaled down.<sup>4</sup>

Investment companies also claim jatropha is an ethical investment. Viceroy Invest's brochure claims that "jatropha grows best in soil which is unfit for food production and its farming is therefore a potential way for third world countries to grow themselves out of poverty".<sup>5</sup> Carbon Farming explains that jatropha reduces poverty in developing countries as it uses marginal land unusable for crops or cattle.<sup>6</sup> The Jatropha Investment Fund claims: "There are hundreds of thousands of hectares, uncultivated ground. This land lies mainly in areas where the population leads a completely hopeless life. You can give these people a future and an existence, now and for generations to come".<sup>7</sup>

But evidence reveals that jatropha not only has detrimental impacts on people and the environment, but that it also isn't economically viable. This report sets out 10 reasons why jatropha is neither a profitable nor a sustainable investment, focusing on evidence from Africa.



Sun Biofuels jatropha plantation, Mozambique.

© niza matxel

## one jatropha is not economically viable

### jatropha is not economically viable

The economic viability of growing jatropha as a cash crop depends to a large extent on the yield that can be obtained when it is grown in plantations. As most large scale plantations were planted relatively recently, there is a significant lack of data on yields. Some older projects do, however, appear to show that yields have often been significantly below expectations.

*“Although there have been increasing investments and policy decisions concerning the use of jatropha as an oil crop, they have been based on little evidence-based information.”* (UN Food and Agriculture Organisation FAO).<sup>8</sup>

This chapter highlights evidence that just like any other cash crop, jatropha needs fertiliser and pesticide inputs, as well as a lot of water to produce high yields. If additional costs, such as labour and further processing are taken into account, returns even from high yields are marginal at best.

The economic viability of jatropha cultivation is also influenced by external market conditions. Moratoria or bans in producer countries can for example alter market situations significantly overnight. South Africa banned jatropha planting in 2007;<sup>9</sup> the government in Zimbabwe has banned its export,<sup>10</sup> and in Tanzania, the government has reportedly suspended approvals for new biofuel projects until clear criteria are put in place.<sup>11</sup>

Political discussions in the EU also affect the biofuels sector. The EU target of a 10% share of renewable transport fuel by 2020<sup>12</sup> has triggered a boom in biofuel production, but the target is highly controversial and may yet be revised.

#### Reason 1: jatropha doesn't guarantee high returns

The oil yields predicted by investment companies range from around two tonnes of oil per hectare (t/ha)<sup>13</sup> to around 3 - 3.5 t/ha of oil per hectare.<sup>14</sup> The Jatropha Investment Fund even promises about 6 t/ha<sup>15</sup>.

However, there is hardly any long-term data from large-scale jatropha plantations to support these claims<sup>16</sup> and estimates of potential seed yields and seed-to-oil conversion ratios vary widely.

The World Agroforestry Centre<sup>17</sup> estimates that 3 - 5.5 kg of seed are required to produce one litre of oil, while a study in Tanzania<sup>18</sup> found that on average oil extraction efficiency was 1 litre from 5 kg of seeds, but sometimes as low as 1 litre from 8 kg of seed, depending on the extraction efficiency and the varying oil content of the seeds. Even if the highest conversion ratios of 3 kg per litre of oil are assumed, seed yields of almost 9 t/ha would be

needed to achieve the 3,000 litres of oil per hectare (2.76 t/ha) promised, for example, by Experience International.<sup>19</sup> This rises to 24 t/ha of seeds if conversion ratios are low (8:1). But experts estimate that actual seed yields are much lower than this.

The World Agroforestry Centre estimates that in China, barren land yields 1.7-2.2 tonnes of seed per hectare, while on more fertile soils in high rainfall areas, up to 7.5 t/ha can be expected.<sup>20</sup> BioZio, an Indian biofuels consultancy, claims that yields will be 6.25-7.5 t/ha from the fifth year.<sup>21</sup> According to Plant Research International, under good conditions yields can vary widely between 1.5-7.8 t/ha dry seed per year.<sup>22</sup> Given that conditions are normally far less than optimal, others suggest yields as low as 0.3 t/ha or even no yield at all<sup>23</sup>.

The limited available evidence from existing projects appears to reflect this. In India, jatropha plantations yielded just 0.45 t/ha after three years under rain-fed conditions, less than a fifth of what was expected. Under irrigated conditions, absolute yields were higher (0.75 t/ha), but were only one tenth of what had been predicted.<sup>24</sup> In Maharashtra, yields stabilised after seven years at less than 1.25 t/ha. In fact by 2003, the Maharashtra plantations had been abandoned, mainly because of low seed yield, poor oil content and poor or variable oil quality.<sup>25</sup> The German Development Agency GTZ concluded that under rain-fed conditions in India, yields of less than 1 t/ha were more realistic.<sup>26</sup>

Evidence appears to show that yield is highly unpredictable and that the high expectations promoted by investment companies such as Viceroy Invest, Experience International, Aston Lloyd and others are far from realistic.

*“No one really has commercial figures for jatropha. We even went to India where jatropha apparently was big business, to get some answers. Wherever we looked, we didn't find any viable projects.”* (Francois Waal, whose employer, Namibia Agriculture and Renewables, recently backed out of a 100,000-hectare jatropha development in Namibia's Caprivi region).<sup>27</sup>

The Overseas Development Institute found that even with high yields, jatropha shows only marginal returns. They concluded that it was difficult to see how this crop could be of much benefit to the poor, although it may have a niche role, possibly serving local energy needs.<sup>28</sup>

*“It turns out jatropha is not economically viable. Even working at minimum wage, just getting the seeds of the trees is too expensive.”* (Christoff Brock, head of the Namibian Agronomic Board).<sup>29</sup>

# one jatropha is not economically viable

continued

**TABLE 1** COMPARING OIL YIELDS PROMISED BY INVESTMENT COMPANIES AND REALISTICALLY ACHIEVABLE YIELDS

	EMERALD KNIGHT INVESTMENT	VICEROY INVEST & ONYX WORLD	EXPERIENCE INTERNATIONAL	ASTON LLOYD	CARBON FARMING	JATROPHA INVESTMENT FUND
Promised oil yield in t/ha (& litres/ha)	2 t/ha (2174 l/ha) <sup>30</sup>	Approx. 2.27 t/ha (2467 l/ha) <sup>31</sup>	Approx. 2.76 t/ha (3000 l/ha) <sup>32</sup>	3 t/ha (3260 l/ha) <sup>33</sup>	Approx. 3.41 t/ha (3706 l/ha) <sup>34</sup>	Approx. 6 t/ha (6522 l/ha) <sup>35</sup>
Seed yield needed at high seed-to-oil conversion ratio (3 kg of seed for 1 litre of oil)	6.5 t/ha	7.4 t/ha	9 t/ha	9.8 t/ha	11.1 t/ha	19.6 t/ha
Seed yield needed at medium conversion ratio (5.5:1)	12 t/ha	13.6 t/ha	16.5 t/ha	17.9 t/ha	20.4 t/ha	35.9 t/ha
Seed yield needed at low conversion ratio (8:1)	17.4 t/ha	19.7 t/ha	24 t/ha	26.1 t/ha	29.7 t/ha	52.2 t/ha
Estimates of seed yields realistically achievable on marginal land <sup>36</sup>						<b>0 - 2.2 t/ha</b>
Estimates of seed yields realistically achievable in good conditions <sup>37</sup>						<b>1.5 - 7.8 t/ha</b>

## Reason 2: jatropha doesn't thrive on marginal land

The high yield expectations cited by investment companies are largely based on exaggerated claims about jatropha being a drought-resistant 'wonder crop' thriving on marginal soils. But jatropha does not yield well on all soils. While jatropha can survive on land with minimal water and poor nutrition, evidence shows that it does not *thrive*. To produce a good yield it needs water, nutrition and other inputs.

*"if you plant trees in a marginal area, and all they do is just not die, it doesn't mean you're going to get a lot of oil from them."* (Rob Bailis, lead researcher of jatropha life-cycle assessment at Yale School of Forestry and Environmental Studies).<sup>38</sup>

*"If you grow jatropha in marginal conditions, you can expect marginal yields."* (D1 Oils).<sup>39</sup>

Studies on marginal land plantations in India showed that applying fertiliser increased seed and oil yield by more than 70%.<sup>40</sup> Another study found that limited nutrient availability led to a decrease in the number of fruits and seeds that eventually develop.<sup>41</sup> In dry regions with only one wet season per year, there is one annual harvest, compared with up to three if the crop is irrigated and fertilised.<sup>42</sup>

In its report on the potential of jatropha for smallholders, the UN Food and Agriculture Organisation (FAO) doubts whether profitable yields can be achieved with minimal expenditure on

fertilisers, irrigation and pesticides. Without these inputs, jatropha farming is a risky enterprise, it concludes.<sup>43</sup>

*"The level of economic returns that would attract and retain investment by the private sector may not be attainable on degraded lands."* (FAO).<sup>44</sup>

This has been well understood by many developers – who have established their plantations on fertile lands (see Chapter 6).

## Reason 3: jatropha needs significant amounts of water

One of the reasons why jatropha does not grow well on marginal lands is that, like other cash crops, it needs significant amounts of water to grow well. Jatropha has been lauded as a miracle crop that grows on arid soils without irrigation, but evidence suggests this is not the case.

Researchers from the University of Twente in the Netherlands<sup>45</sup> found that on average, jatropha needed more water than any other bioenergy crop to produce the same amount of oil, requiring up to 20,000 litres of water per litre of fuel produced. This was five times as much per unit of energy as sugarcane and corn, and nearly ten times as much as sugar beet. Later studies also found that jatropha needs more water than previously thought, especially in the first few years of cultivation.

BioZio, a biofuel consulting and research company, claims that a minimum of 600 mm/year of rainfall is needed to produce fruits.<sup>46</sup> Other researchers and practitioners have calculated that for optimal growth, jatropha needs 1,000 mm/ha to 1,500 mm/ha<sup>47</sup> – far more than is available in many arid areas where jatropha has been proposed. A study of existing jatropha plants found that the natural habitat is typically wetter than many of the areas where jatropha is now proposed.<sup>48</sup>

*“The results demonstrate that Jatropha is not common in regions with arid and semi-arid climates and does not naturally occur in regions with [average annual precipitation] of less than 944 mm year.”<sup>49</sup>*

In Mozambique, experience shows that irrigation appears to be required during the early development phase, even in areas with higher rainfall. In the drier, southern region of the country, constant irrigation was often needed. Such demands can compete with family water use, forcing woman and children to make extra trips for water. Where jatropha was not watered, especially in the early phases of development, the germination rate was low and plants were more prone to disease, stress and shock.<sup>50</sup>

#### Reason 4: jatropha is not pest resistant

Jatropha plantations also need pesticides. The claim that jatropha is highly resistant to pests and diseases appears to be based on observations of single trees. Grown as a monoculture, jatropha has been found to be vulnerable to the common pests and diseases found in many food crops.<sup>51</sup>

Farmers in Swaziland reported problems with pests when they started to grow jatropha as a crop, but because the crop was new, the government had no expertise on how best to eradicate the pests.<sup>52</sup> In Tanzania, researchers found crop damage due to pests on all field visits to small-scale farms.<sup>53</sup>

In Mozambique, many industrial projects rely on petroleum-based pesticides. Despite this, pests are still common, forcing some projects to experiment with different mixes of pesticides, stronger chemicals and other controls. Jatropha pests were found to be spreading to nearby food crops.<sup>54</sup>

In Nicaragua, where plantation experiments were carried out in the 1990s, yields slowly decreased after the fifth year due to increasing levels of pests and disease.<sup>55</sup>

The extensive use of pesticides not only affects biodiversity and water supplies, it also increases costs and affects economic viability. In Nicaragua, costs per year for pest/disease treatment were found to be up to 80 USD/ha per year.<sup>56</sup> In Swaziland, some farmers lost whole fields of jatropha because they couldn't afford pesticides.<sup>57</sup> On large-scale farms in Tanzania, pests and fungi were a deciding factor in determining economic feasibility.<sup>58</sup>



© Nilza Matavel

Jatropha with pests.

## one jatropha is not economically viable

continued

### Reason 5: many jatropha investment projects have failed

The fact that many jatropha projects have not been successful indicates that jatropha is not the miracle crop it is claimed to be.

UK biofuel company **D1 Oils** incorporated in 2004<sup>59</sup> as an alternative energy crop company focusing on jatropha. Its main planting activity is currently in India. In Africa, D1 Oils has regional development centres for its plant science programme in Cape Verde and Zambia, and planting interests in Malawi and Zambia.<sup>60</sup>

But D1 Oils has scaled back its planting interests in Africa. D1 Oils Africa Ltd initially planned in 2005 to develop 50,000 hectares of jatropha and biodiesel refineries in Swaziland, with more than 100,000 jobs promised.<sup>61</sup> In June 2009 D1 Oils declared that, "Jatropha planting in Swaziland has delivered disappointing results and our Jatropha planting joint venture with BP, D1-BP Fuel Crops Limited, took the decision to withdraw from Swaziland as part of the reorganisation of the business that is currently underway".<sup>62</sup> D1 Oils also abandoned large-scale investment plans for Tanzania.<sup>63</sup>

In June 2009, BP pulled out of its 50/50 jatropha joint venture with D1 Oils, saying:

*"we looked again at whether jatropha was going to be the best biofuel source that could be scaled up. There were problems with it. We have decided to look elsewhere."*<sup>64</sup>

In December 2008, activist investor Brian Myerson became chair of the D1 Oils board, announcing that, "*Jatropha is a very promising new energy crop*".<sup>65</sup> A year later, after substantial losses, Myerson's fund Principle Energy Ltd (PEL) proposed to cease all jatropha investment and refused to support plans to raise further equity capital unless the company stopped "fruitless spending".<sup>66</sup> Myerson was voted off the board and D1 Oils share price fell to below 6pence (November 2010), from peaks of over 500pence in early 2005.<sup>67</sup>

The Swedish private company **BioMassive AB** signed a controversial 66-year lease agreement in Tanzania in September 2007 for 55,000 hectares of land to cultivate jatropha.<sup>68</sup> BioMassive envisaged the production of over 100,000 tonnes of biofuels per year and employment for over 4,000 people.<sup>69</sup> CEO Louis Strydom published a biodiesel entrepreneur's checklist for potential jatropha investors in 2006,<sup>70</sup> listing a range of requirements essential for success such as good soil, fertiliser application and irrigation. He claimed that his company complied with these requirements,<sup>71</sup> but even so BioMassive reported a loss up to 2009 and has not been heard of since.<sup>72</sup>

The Dutch company **BioShape** acquired a 50-year lease for 81,000 ha of richly bio-diverse land in the Tanzanian Kilwa district to cultivate jatropha. Huge tracts of land have been cleared, threatening biodiversity and water sources.<sup>73</sup>



An unkept and unhealthy plantation in Sunderkhera village, Chhattisgarh, India.



But one of the main investors in BioShape, Eneco Energie BV, pulled out in early 2009. Their director, Ton Meijer is reported to have said of jatropha that: *"It is an interesting plant, but I don't see how it could be feasible as a business case. You can't eat principles."*<sup>74</sup> In November 2009, the company ceased operations in Tanzania.<sup>75</sup>

BioShape was officially declared bankrupt in June 2010.<sup>76</sup> Tanzanian staff claim not to have been paid for months. Foreign staff had left the country.<sup>77</sup>

In Ethiopia, German company **Flora EcoPower** (later re-named Acasis AG) holds a 50-year lease for 56,000 ha of land and concessions for a further 200,000 ha.<sup>78</sup> Their original stated aim was to become one of the market leaders in the production of jatropha and castor bean oil,<sup>79</sup> predicting oil yields of 3,000 litres/ha from marginal, dry lands.<sup>80</sup>

In 2009, Flora EcoPower was reported to be the second least successful company on the Frankfurt stock market, with the share price falling from €18.40 in January 2009 to €1 at the end of the year. Almost no oil was harvested in 2009, even though Flora Eco-Power predicted a harvest of 11,000 litres.<sup>81</sup> A new business model, announced in March 2010, didn't mention jatropha.<sup>82</sup> Ethiopian media report staff had not been paid for five months, and the management had disappeared.<sup>83</sup> The share price has now (November 2010) fallen below €0.25.<sup>84</sup>



Advertisement for D1 Oils jatropha projects, Maputo, Mozambique.

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## two jatropha is bad for people and the environment

### jatropha is bad for people and the environment

Economic considerations are not the only argument against investing in jatropha. Investors who take their commitment to ethical values and corporate social responsibility must seriously consider the human and environmental implications of their investments.

There have been some positive reports of small-scale jatropha projects, involving local smallholders, which do not displace food crops, and which ensure that profits stay within the region. But large-scale industrial projects aimed at making a profit from biofuels, have far more damaging impacts.

#### Reason 6: jatropha competes with food production

Because jatropha is an inedible crop said to grow on marginal, unused land, it is often claimed that it does not compete with food production. But as jatropha does not do well on marginal lands, many companies have established jatropha plantations on fertile, arable lands, placing jatropha in direct competition with food production.

In Mozambique, UK company Energem Biofuels has been allocated the rights to 60,000 ha of what was previously community farming and grazing land to grow jatropha.<sup>85</sup> Many subsistence farmers in Mozambique were also found to have planted jatropha in good fertile soil,<sup>86</sup> even though Mozambique is one of the world's poorest countries with a third of households facing hunger.<sup>87</sup>

ActionAid found that land being targeted for jatropha in Tanzania was not in the semi-arid parts of the country, but in areas with adequate and reliable rainfall, fertile soils, and relatively well developed infrastructure such as roads, railways and port facilities, making it easier to export the harvest. This is land that could be used to grow food.<sup>88</sup>

*“How will jatropha benefit Tanzania? Well exactly. We have no answers. We want food first, not jatropha.”* (Dr Felician Kilahama, head of Tanzanian Beekeeping and Forestry, and part of the task force overseeing jatropha cultivation in Tanzania).<sup>89</sup>

In densely populated Southern Ethiopia, UK company Sun Biofuels took 3,000 hectares of communal pastureland for a jatropha plantation in an area in which around 39% of the population still depend on either emergency food assistance or the Food for Work programme.<sup>90</sup> A further 80,000 ha allocated to Sun Biofuels consisted mostly of forest, woodland and grazing land, used by local communities for farming and grazing and as a source of firewood and food. The project was stopped after the first 60 ha of land had been cleared because the company found the land to be too rocky and poorly drained to grow jatropha profitably.<sup>91</sup>

In India jatropha is also often planted on land suitable for food production. One study found that less than one in five farmers in Tamil Nadu planted it on barren land or in place of non-food commercial crops. The rest planted it in place of food crops, often groundnut, which is used to produce valuable edible oil. India already faces a shortage of edible oils and one in two farmers reported a shortage of cattle feed directly caused by the shift to jatropha.<sup>92</sup>

In Ghana, communities were reportedly persuaded to grow jatropha on 200,000 ha of fertile land that had been previously earmarked for rice production. The government has said it considers the whole country suitable for jatropha production except regions with relatively dense forest.<sup>93</sup>

The World Agroforestry Centre points out that the even where jatropha is intercropped with food crops on arable land, scarcity of arable land for smallholder households is likely to lead to unwanted competition with food crops when the jatropha trees mature and occupy more land.<sup>94</sup>



Jatropha pod.



Jatropha planted on community grazing land, Medha village, India.

## two jatropha is bad for people and the environment

### Reason 7: jatropha causes displacement of local communities

Even if companies only used marginal lands to grow jatropha, most land labelled as 'marginal' is in reality already being used by small-scale farmers, herders, hunters or foragers, often without official land titles. Such land provides vital functions for communities, and the loss of such land damages their food security and livelihoods.<sup>95</sup> The International Land Coalition (ILC) calls the assumption that abundant 'unused' land is available a "myth" often perpetuated by host governments trying to attract investors.<sup>96</sup> Evidence suggests that there is very little genuinely 'marginal' land and that many communities have been displaced and their livelihoods destroyed to make way for jatropha.

The Indian state of Chhattisgarh has embraced jatropha with plans for one million hectares state-wide by 2012. Social leaders and peoples' groups have warned that as a result some of the poorest people in Chhattisgarh – the tribal adivasis and the lower caste dalits – will be forced from the lands which they have farmed and relied on under common property rights. Reportedly, some 355 families have already been displaced in just two of the state's 16 districts because of the forcible planting of jatropha.<sup>97</sup>

*"More than seventeen hundred acres of land cultivated by the tribals for generations, have been taken away from them for planting jatropha."* (Ratneshwar Nath in Chhattisgarh, India).<sup>98</sup>

In Tanzania's Kisarawe district, villagers claim that they have been cheated of 8,000 ha of their land to make way for a Sun Biofuels jatropha plantation.<sup>99</sup> In Mozambique, farmers say their land was taken without compensation.<sup>100</sup>

*"They took the land when it was already tilled...they haven't paid us anything. We are dying of hunger and there is nothing that we have that is actually our own."* (Matilde Ngoene, a farmer in Mozambique).<sup>101</sup>

In Ghana, Norwegian company Scanfuel reportedly took communal land as well as land owned by individuals, including from farmers who refused to give up their land.<sup>102</sup> In Zambia, more than 3,000 people were reportedly displaced in a remote area of a rich farming district to make way for jatropha.<sup>103</sup>

Whether jatropha is grown on so-called marginal land or on fertile arable land, there is a high risk that any large-scale investment will affect food security. Olivier de Schutter, the UN's special rapporteur on the right to food, points out that depriving local populations access to productive resources without offering appropriate alternatives violates their human right to food.<sup>104</sup>

*"Virtually no large-scale land allocations can take place without displacing or affecting local populations."* International Land Coalition).<sup>105</sup>

### Reason 8: jatropha plantations are not pro-poor

The majority of the world's poor live in rural areas, where they practice subsistence farming. When they are displaced by a new development, it is often justified by the claim that this brings much-needed investment and creates employment for the poor.

But the loss of land can only partly be compensated by the creation of jobs. Loss of land is permanent, but most of the employment opportunities created are temporary, low-paid farm jobs.<sup>106</sup> Often, these jobs don't enable workers to sustain their families. For example, in Mozambique, Energem Biofuels employs 250-500 people (permanent and seasonal) who are paid about US\$ 60 per month – the salary meets the legal minimum wage,<sup>107</sup> but the minimum wage is not enough to lift families above the poverty line.<sup>108</sup> For the average Mozambique family of five, US\$ 60 falls well below the World Bank's international standard of extreme poverty of US\$ 1.25 per person per day.

There are also indications that companies are not creating as many jobs as expected. The World Bank suggests that 420 jobs are created per 1,000 ha,<sup>109</sup> while the Overseas Development Institute calculates that about 200 jobs per 1,000 ha are created once a plantation is mature.<sup>110</sup> But in reality Biofuels Africa, for example, says that in Ghana it created one permanent job per 8 ha (125 workers per 1,000 ha), plus three seasonal harvest jobs in the initial phase. However, after harvest mechanisation, demand for workers is expected to fall to just one worker for every 15 ha (67 workers per 1,000 ha).<sup>111</sup>

The argument that jatropha creates employment is obsolete in cases where workers are not paid. In Mozambique, many workers at UK-based ESV Group plantations reportedly left after their salaries were not paid for over nine months.<sup>112</sup> In Tanzania BioShape left the country having not paid wages for many months,<sup>113</sup> as did Flora EcoPower in Ethiopia.<sup>114</sup>

There is also evidence that employment is not created for people locally, but that labour is often brought in from outside the community. For example, in Ghana many of the companies involved in producing biofuels import labour from outside the local area.

According to the UN Food and Agriculture Organisation (FAO), jatropha grown on plantations can contribute to pro-poor development for farm workers – but neither plantations nor outgrower schemes do much to improve household or regional food security. By contrast, smallholder production and especially jatropha grown in community plantations on wasteland areas and as livestock hedges can improve food security both at a household and at a regional level, while also contributing to the sustainability of smallholder farmers.<sup>115</sup>

Grown on a small scale, jatropha has the potential to generate extra income for the poor. On a large scale, jatropha displaces jobs that guaranteed livelihoods, such as subsistence farming, grazing and herding, rather than bringing new opportunities.

## two jatropha is bad for people and the environment

continued

### Reason 9: jatropha plantations negatively impact biodiversity

Where jatropha plantations are not on arable land, there is a high risk that plantations will be established in valuable natural ecosystems.

In Tanzania, the NGO WWF found that the Sun Biofuels and BioShape concessions infringe the evergreen Namatimbile coastal forest, recognised as the most important part of a distinct eco-region and a globally important conservation priority.<sup>116</sup> Large areas of this have already been cleared, threatening native plant and animal species. The land requested by BioShape also includes valuable wetlands and the biodiverse Miombo woodland.<sup>117</sup> Both concessions are likely to be home to endangered species, such as bushbabies, elephants, hunting dogs, lions, endangered birds and a number of rare trees and other highly threatened plant species.<sup>118</sup> Land that is labelled barren, or idle, has reportedly been rejected by the companies.<sup>119</sup>

Natural forests have also reportedly been destroyed in Ethiopia to make way for Sun Biofuels' jatropha plantations<sup>120</sup> and in Ghana to make way for Norwegian company Biofuels Africa.<sup>121</sup>

Even so-called 'marginal' land can be vital for the preservation of biodiversity and may be home to endangered species.<sup>122</sup> Pastoral drylands, often considered as unproductive 'wastelands', provide livelihoods for pastoralists but are also increasingly recognised as biodiversity-rich areas that sequester carbon, support wildlife conservation and prevent desertification.<sup>123</sup>

Large-scale monoculture plantations, including jatropha, have a damaging impact on biodiversity in their own right, both because of the lack of plant variety and also because of the use of fertilisers and pesticides. Jatropha is officially considered as an "invasive species" in some parts of the world, including the United States, South Africa, Australia and Puerto Rico.<sup>124</sup>

Environmental Impact Assessments (EIAs) are designed to prevent the destruction of valuable natural ecosystems. However, the reality is that they are often not carried out correctly or even not at all. In Ethiopia, none of the biofuel companies operating there is believed to have carried out an EIA, despite it being required by federal law.<sup>125</sup> Elsewhere there have been allegations of fraud.<sup>126</sup>



© Umanzi Mberero  
ESV Bio-Africa Nursery, Panda District, Mozambique.

### Reason 10: jatropha is likely to increase carbon emissions

Many investors claim that biofuels will reduce carbon emissions and help save the climate. For example, D1 Oils claims that jatropha can lead to greenhouse gas (GHG) savings of up to 66%.<sup>127</sup> Emerald Knight Consultants and Aston Lloyd claim jatropha results in savings of 68% compared to emissions from traditional diesel.<sup>128</sup> This is similar to biofuels from sunflower oil (65%) and palm oil (68%) and slightly lower than emissions from sugar cane according to the typical values listed in the EU's Renewable Energy Directive.<sup>129</sup>

But these values do not take into account carbon emissions from land use change.<sup>130</sup> When natural forest cover is turned over to biofuel production, far more carbon emissions are released than can be saved by growing fossil fuel alternatives.<sup>131</sup>

The conversion of so-called marginal lands can also release large amounts of carbon. Pastoral drylands, which cover more than a quarter of the Earth's surface, provide a natural store for greenhouse gases, second only to tropical rainforests.<sup>132</sup>

Converting rainforests, peatlands, savannas, and grasslands to produce food crop-based biofuels creates a "biofuel carbon debt" releasing 17 to 420 times more CO<sub>2</sub> than the annual greenhouse gas (GHG) reductions that these biofuels would save by displacing fossil fuels.<sup>133</sup> The time needed to repay the potential "carbon debt" of jatropha has not been calculated, but a jatropha life-cycle assessment commissioned by Daimler Chrysler found that if jatropha plantations replaced shrubland, the carbon savings compared to fossil fuels could be negative.<sup>134</sup>

A complete life-cycle assessment should also take into account carbon emissions from indirect land use change (land use change induced by biofuels when pre-existing agricultural production is displaced and moves into new areas). A study on the impacts of the EU's Renewable Fuel Directive estimated that the increase in biofuel use and the consequent change in land use will release between 44 and 73 million tonnes of CO<sub>2</sub> equivalent per year. This means that switching to biofuels can result in more greenhouse gas emissions, not less.<sup>135</sup>

Not only does jatropha fail to guarantee a reduction in carbon emissions, it is also unlikely to reduce global fossil fuel use significantly. It has been calculated that the global potential for growing jatropha on so-called 'bare areas' and areas with sparse plant cover will only provide enough fuel to lead to an extremely small reduction in global fossil fuel use (potential jatropha production in these areas could contribute 0.21% per cent of global oil consumption by 2015).<sup>136</sup>



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Jatropha Curcas.

## three conclusions

### conclusions

Jatropha is still being touted as a wonder crop. But there is evidence that jatropha does not deliver on its promises. It does not deliver satisfactory yields on marginal lands. Grown on an industrial scale, jatropha needs inputs such as fertilisers, pesticides and water, but even then the yields are often less than expected. The costs of the inputs combined with low yields almost invariably result in negative returns from jatropha plantations.

The unpredictability of jatropha yields is further exasperated by the unpredictability of market conditions, which have the potential to dramatically affect economic viability. Moratoria on jatropha growing in producer countries and political discussions in the EU to change the target for the use of renewable fuels in transport add to the uncertainty, making jatropha an extremely insecure investment. The examples of companies who have invested unsuccessfully in the 'wonder crop' jatropha show that it is not an advisable investment.

*"Jatropha the plant did not fail, jatropha the business model failed."*  
(Kirk Haney, President and Chief Executive Officer of SG Biofuels).<sup>137</sup>

Jatropha also has been shown to have a track record of damaging impacts on the livelihoods of poor communities in producer countries and on the environment. Jatropha plantations often compete with food production, either because they are put on fertile arable lands or because they are put on so-called marginal lands, which are essential to the livelihoods of subsistence farmers, pastoralists, herders, hunters and gatherers. The destruction of these livelihoods is permanent, but jatropha does not create enough well-paid jobs to sustain thousands of displaced people.

Valuable natural ecosystems are being destroyed to make way for jatropha, damaging biodiversity and rendering claims about reduced carbon emissions obsolete as the emissions resulting from the land-use change of forests and pastoral drylands are far larger than the potential savings from jatropha.

*"Things would be going great if they weren't going so badly."*  
(Biofuels Digest special report on jatropha).<sup>138</sup>

Developed on a small scale, inter-cropped with food production or used as hedges around fields, jatropha may play a role in pro-poor development. But on a large scale, jatropha is neither economically viable nor environmentally and socially sustainable. Responsible investors are well-advised to stay away from jatropha.



Bittal Tarak, villager, Sunderhera, Raipur district, India.

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*Jatropha planted on a bank, barely surviving, Medha village, India.*

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