

Farmer on a farm in the Moamba district.



agrofuels

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the jatropha trap?

the realities of farming jatropha in mozambique

may 2010 | issue 118



**Friends of
the Earth
International**



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acronyms

CEPAGRI	Centro de Promoção de Agricultura (Center for Promotion of Agriculture)
DUAT	Direito de Uso e Aproveitamento de Terra (Right to Use and Develop the Land)
FAO	Food and Agriculture Organization of the United Nations
GEXSI	The Global Exchange for Social Investment
INE	Instituto Nacional de Estatística (National Statistics Institute)
MINAG	Mozambique Ministry of Agriculture
ME	Mozambique Ministry of Energy
PRAGR	Programa Nacional de Desenvolvimento Agrícola de Moçambique (National Program for Agricultural Development in Mozambique)
REDE	Rede de Organizações Para Soberania Alimentar (Network of Organizations for Food Sovereignty)

executive summary

In Mozambique, the debate on agrofuels has advanced steadily over the last five years, fueled by industry speculation and demand, grand promises, and foreign interests. Investors applied for the rights to some five million hectares in Mozambique in 2007 alone, nearly one seventh of the country's officially defined 'arable' land. The Mozambican government is rushing to create favorable conditions for investors in the industry as quickly as possible, at the expense of Mozambicans' civil rights. Mozambique's World Bank-funded process to develop a National Policy and Strategy for Biofuels, for example, deliberately excluded civil society participation, lacked transparency, and was only made available to the public after it had been completed and approved by parliament.

Because of Africa's water-scarce climate and the availability of supposedly 'marginal' land, jatropha has been prioritized as a potential agrofuel crop that could be grown on degraded land without affecting food production. Many question the claimed benefits of jatropha however, and believe that the current rush to establish jatropha production on a large scale is ill-conceived, under-studied and could contribute to unsustainable trade rather than helping to solve the problems of climate change, energy security or poverty.

This study evaluates jatropha production in Mozambique to date, and its conclusions support such concerns. In particular, interviews with and evidence from farmers and communities in different regions of the country indicate that there is a significant gap between rhetoric and reality.

myth 1: jatropha grows well on marginal land and can produce high yields on poor soils

The researchers did not find a single example of this being true in Mozambique, either in the literature or as a result of the many interviews conducted with communities, industry experts and individuals. On the contrary, almost all of the jatropha planted in Mozambique has been on arable land, with fertilizers and pesticides applied. Yet even under these conditions harvests have failed to deliver the promised growth rates and yields.



Farmer with jatropha seeds, Moamba district.

Furthermore, one of the main factors underlying Mozambique's projected potential for jatropha production is the claim that the country has extensive stretches of 'unused arable and marginal land.' Many experts believe these claims to be grossly overestimated (Econexus *et al*, 2008). In addition, around 70% of Mozambique is covered in forest and woodlands (DNTF, 2007), and most large-scale agricultural projects would be likely to replace natural vegetation to some extent. The loss of such vegetation would have significant implications for climate change, since vegetation, and especially forests, extracts carbon from the atmosphere (and is referred to as a 'carbon sink' as a result). For this reason, the production of agrofuels in Mozambique also threatens the country's ability to decrease its carbon footprint.

Using more and more land to grow jatropha could also interfere with the maintenance of key ecosystem services, disrupting processes relating to local hydrology, soil nutrients and biodiversity. Resources used to sustain people's livelihoods, such as animal protein, fruit, firewood and building materials, which are especially vital for rural communities, would also be at risk.

myth 2: jatropha does not use excessive quantities of water and only needs minimal maintenance

The researchers found that irrigation was essential for healthy growth in plants during the early development phase, even in areas where the rainfall ranged from 800mm to 1,400mm. Furthermore, in the southern region of the country, where the lower rainfall limit is around 600mm, constant irrigation was often required; and even in areas that received around 800mm of rainfall some farmers still found it useful to irrigate their crops. In one of the districts visited there were already concerns about the impacts of water loss due to the significant quantities of water being used for irrigation by the large-scale farming company operating in the area.



Sun Biofuels jatropha plantation, Mozambique.

executive summary

continued

myth 3: jatropha is resistant to pests and diseases

The study found extensive evidence of jatropha's vulnerability to disease, and problems with fungi, viruses and insect pests. In cases where plants were heavily infested, they stopped producing leaves and remained in a state of stress, which meant that farmers had to remove them. The extensive use of fertilizers and pesticides in industrial plantations did not appear to resolve such problems.

Of even greater concern is the growing body of evidence - from interviews with subsistence farmers and experts alike - that jatropha pests are spreading to surrounding food crops. More research is required to understand the full extent of this trend and its potential impacts on subsistence farmers and food sovereignty in general. But it is already clear that the current food deficit, weak support and lack of 'safety nets' that is characteristic of the subsistence farming sector in Mozambique makes even minor impacts on food production a serious concern.

myth 4: jatropha poses no risk to food security and is a development opportunity for subsistence farmers

In Mozambique, subsistence farmers are planting jatropha in place of food crops, rather than on unused land, primarily because they are unable to increase the size of the plots they can realistically manage. Given that around 87% of Mozambicans are subsistence farmers, and that they produce 75% of the food they consume, major concerns arise when one considers the plan to encourage more and more subsistence farmers to plant large amounts of jatropha. These concerns are exacerbated by the fact that these farmers have very weak links to markets and lack storage capacity, communication and information, all of which makes it very difficult for them to benefit from cash crops like jatropha.

When food and other agricultural markets crash or slump in Mozambique, the price risks are passed down to small farmers, the lowest link in the agricultural value chain. However, while subsistence farmers tend to be unaffected by food price fluctuations while they produce a high percentage of their own food, they would be considerably more impacted by changes in the price of non-food cash crops like jatropha.

In addition, Mozambique's 1997 Land Law,¹ originally intended to protect local communities, has been manipulated by the government, which has passed unconstitutional decrees weakening communities' land rights. The Land Law also identifies local community leaders as key actors, when it comes to discussions and decisions relating to communities' rights, and the prevention and resolution of conflicts at a local level. However, this aspect of the law tends to be abused by investors

and government alike, who often try to bribe community leaders in order to gain community consent without consultation (Salomão & Manuel, 2008; Noticias, 2007; also interviews with farmers). Even when community consultations do take place, they generally lack transparency and tend to be loaded with promises that are never delivered.

These abuses are facilitated by weak dissemination of information about community rights in Mozambique, including in relation to the Land Law, which is further compounded by the fact that relevant documents are rarely translated into local languages. Furthermore, when abuses are uncovered, resolution is usually very difficult, especially for communities that lack resources and information about relevant legal processes. As a result of these problems, it is highly likely that Mozambique's drive to extend jatropha production will result in large 'land grabs' of community land.

conclusions and recommendations

Friends of the Earth International (FoEI) believes that the dominant arguments used to promote jatropha - as a food security-safe biofuel crop, a source of additional farm income for rural farmers, and a potential driver of rural development - are misinformed at best and dangerous at worst.

While further independent research is still needed to provide more detail, this investigation outlines a scenario that clearly challenges the belief that jatropha is likely to provide sustainable fuel and lead to development in Mozambique. Given that the evidence emerging at the international level (FoE, 2009; Action Aid, 2010; Via Campesina, 2009) also demonstrates that jatropha production is failing to meet expected outcomes, and is in fact endangering food sovereignty and rural livelihoods, FoEI recommends that support for jatropha development in Mozambique be halted, at least until some of the major development issues surrounding subsistence farming are addressed, and rural communities obtain food sovereignty.

A similar conclusion was reached by Mozambique's civil society and subsistence farmers in 2008, resulting in the emergence of a declaration with specific recommendations including the prioritization of food production, greater support for subsistence farmers and cooperatives, protection for farmers' rights, respect for community land rights, and the promotion of food sovereignty (see Annex 1).

¹ Under the Land Law the Mozambican state owns the land, which cannot be bought or sold, but people's and communities' right to use the land is also recognized. However, the Land Law is not well implemented, and many communities do not fully understand it or the rights they have as a result. <http://www.dfid.gov.uk/Media-Room/Case-Studies/2008/Mozambique-The-best-land-law-in-Africa/>

introduction

Agrofuels are being promoted as one of the main alternatives to limited and dwindling fossil fuel reserves, and many countries, including developing countries with a high level of subsistence agriculture, are ramping up agrofuels production for export in order to meet increased global demand for transport fuels. However, this switch in land use is being put in place extremely rapidly, with insufficient attention being paid to the potential negative social and environmental impacts of extensive agrofuels production.

Industrialized countries have led the way, since they create most of the demand for liquid fuels for transport. They have mandated ambitious renewable fuel targets, although these far exceed their own agricultural capacities. Agrofuels are currently projected to provide 5.75% of Europe's transport fuel by 2010, and 10% by 2020, while the United States is aiming to consume 35 billion gallons a year. To achieve these targets, Europe would need to plant 70% of its farmland with agrofuel crops and the US would have to process its entire corn and soy harvest for fuel. This is clearly unrealistic and would disrupt these nations' food supply systems. The industrialized world is therefore looking to the global South to meet its agrofuel needs. Yet very little consideration is given to the impacts that increased agrofuel production can have in exporting countries; and the climate benefits of agrofuels remain largely unproven.

Nevertheless, southern governments appear eager to oblige, based on loose promises of development. Indonesia and Malaysia, for example, are aggressively expanding oil palm plantations in an attempt to supply up to 20% of the EU's biodiesel requirements. In Brazil, fuel crops already take-up an area the size of the Netherlands, Belgium, Luxembourg and Great Britain combined, mainly in order to supply local demand; but as global demand increases the Brazilian government is planning a five-fold increase in land used for sugar cane production. Brazil's goal is to replace 10% of the world's fossil fuel-derived gasoline with agrofuels by 2025 (Giménez, E.H., 2007).

In Mozambique, the debate on agrofuels has advanced steadily over the last five years, fueled by industry speculation and demand, grand promises and foreign interests. Visits from influential leaders, such as Brazilian President Luiz Inácio Lula da Silva, have further entrenched agrofuels as one of Mozambique's chosen paths to development. The government's initial plans called for small and medium-scale production carried out primarily by family (subsistence) farmers: as in the Brazilian biodiesel program, companies would then purchase feedstocks from those farmers, thereby increasing rural incomes. The central stated objective was to reduce domestic dependence on fuel imports, whilst increasing local food production (Action Aid International, 2008:17-18).

Since then, however, proposals for investment in the agrofuel sector have increased and diversified, with several multinationals from different countries showing an interest in investing in agro-industrial businesses in Mozambique, focusing primarily on sugarcane and jatropha. Agrofuel investors applied for the rights to some five million hectares in Mozambique in 2007 alone, nearly one seventh of the country's officially defined arable land. This is in addition to the 40 million-plus hectares of so-called 'marginal' land with some crop potential that the government considers potentially suitable for agrofuels production (Welz A., 2009).



MocimCarp jatropha nursery

introduction

continued

Because of Africa's water-scarce climate and the availability of supposedly 'marginal' land, jatropha has been prioritized as a potential agrofuel crop. This is based on a misconception that jatropha is well adapted for 'marginal' land, generates high yields even in poor soils, has low water requirements and is pest resistant. Even Mozambican president Armando Guebuza actively promoted jatropha during his presidential rallies in 2007, repeating the perceived benefits and advantages of cultivating the plant (República De Moçambique, 2009; Namburet S., 2006). Other promoters of jatropha, including ESV Group Plc, SGC Group, Sun Biofuels UK and Energem Resources Inc, have championed it as Africa's solution to energy independence and poverty eradication.

However, international studies and social movements have also started to voice strong concerns about the reliability of many of these claims (FoE, 2009; Africa Centre for Biosafety); and local farmers have increasingly questioned the reliability of the information being provided by industry and government, especially as news reports are beginning to cover some of the problems associated with jatropha farming.

According to the farmers' union, União Nacional de Camponeses (UNAC), peasant farmers in Mozambique have experienced difficulties planting jatropha in 'marginal' land, where it has exhibited slow growth rates, low yields and a marked susceptibility to pests. These are the same farmers who

initially believed in and relied upon the promises made about jatropha, to such an extent that they were prepared to invest their scarce resources in jatropha production. In the end many have had little or no return on those investments.

In 2008, civil society, UNAC and subsistence farmers from throughout Mozambique met to discuss their many concerns about agrofuels. They released a declaration stating that the race towards agrofuels would lead to land conflicts and the exploitation of farm labor, as well as creating an excessive dependence on chemical-based farming, with associated environmental impacts. They collectively recommended the prioritization of food production; greater support for subsistence farmers and cooperatives; respect for farmers' rights, the Land Law and land rights; and guarantees of transparency (see Annex 1). In general, it was considered that the development of agrofuels would be harmful for Mozambique's people, especially its subsistence farmers, and that the country is not ready to move towards agrofuels production – small-scale or otherwise – in the absence of food sovereignty.

The presence of large-scale agrofuel investors and the methods employed by them to access sufficient land to establish jatropha projects has also come to the fore as a problem. Major concerns include a lack of public participation in decision-making about land use, disregard for local culture and practices, false promises, corruption, land conflicts and resource grabs.



Jatropha plant eaten by pests.

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box 1: jatropha and landgrabbing: the case of procana ltd

A well-studied case that highlights these practices is that of ProCana Ltd, a 30,000 ha sugarcane project along the Limpopo river that was projected to produce 120 million liters of ethanol.²

The land chosen for the project, in the District of Chókwé, is highly fertile communal grazing land, and had already been allocated to communities. They had agreed to be relocated from their current homes within the Great Limpopo Transfrontier Park because of potential human-animal conflict, resulting in part from the reintroduction of dangerous wildlife.

When the local communities realized that they would lose their grazing land, it became apparent that conflicts could develop. In an attempt to mitigate these tensions, ProCana obtained adjacent land for grazing, but this simply exacerbated land conflicts in the area, since that land had also been allocated to another community's conservation park project.

Nevertheless, in late 2007 President Armando Guebuza cut the ribbon for the project (Ribeiro D., 2007; Welz A., 2009). It has been met with considerable opposition however. Farmers opposed the project on the basis that it could create a regional environmental disaster as a result of excessive water consumption: the plantation requires over 400 million m³ of water per year (Camona F., 2007). Such situations are not uncommon with agrofuel investments in Mozambique.

This study aims to evaluate on-the-ground experiences of jatropha production in Mozambique. Jatropha projects have been established in the southern provinces of Inhambane and Gaza, the central provinces of Sofala and Manica, and in the northern province of Nampula.

FoEI believes the current rush to develop jatropha on the scale intended is ill-conceived, under-studied and could contribute to unsustainable trade, rather than helping to solve the problems of climate change, energy security or poverty as claimed. Large-scale jatropha production is also likely to have negative impacts on food sovereignty and the ecology of the country. The more arid southern part of the country is particularly vulnerable in this respect.

It is vital that the costs and benefits of jatropha production at both the community and industrial levels are thoroughly researched to ensure good decision-making in relation to agrofuels. Yet even this is difficult, since the jatropha sector is particularly opaque. What is known is that the Mozambican government has been promoting the country as a southern african agrofuels hub, and has succeeded in attracting the interest of a wide range of investors. Some of the large jatropha companies already in Mozambique are ESV Bio Africa Lda (originating from Ukraine/UK), Energem Biofuels Limited (Canada), Enerterra (Portugal), MoçamGalp (Portugal), Sun Biofuels (UK), and AVIAM (Italy) (see Annex 2 which is mainly based on the government's own 2008 national biofuels assessment).

The links between these companies, and their connections with local companies and influential government individuals, are especially difficult to disentangle. Furthermore, even when information is obtained, it is often excessively complex, outdated or incorrect. It is thus extremely difficult to assess the different players in the jatropha industry in Mozambique.



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Jatropha curcas - Moamba District.

² The contract with ProCana Ltd was cancelled by the Mozambican government in December 2009, when it became clear that the land was not being used. <http://allafrica.com/stories/200912221060.html>. They failed to comply with contractual obligations: in two years they only used 800 hectares of land. But non-official sources have raised the possibility that a new company may continue the existing project.

one context

context

1.1 jatropha: basic facts and uses

Jatropha curcas is a tall shrub of the *Euphorbiaceae* family that reaches 2-6 meters in height. The plant has green leaves, 6-15cm long, and presents small yellow-greenish flowers. It produces oval fruits averaging 1.8cm in length and 1.2cm in width, usually containing three seeds. *Jatropha* is indigenous to Central America and the northern parts of South America and was distributed to other tropical regions by European sailors as early as the 16th century (Fact Foundation, 2006). It now grows in tropical regions throughout the world. *Jatropha* seed is high in oil content, and it is this part of the plant that is processed to produce agrofuel, specifically biodiesel. The oil is also used in domestic lamps and stoves, and the plant has medicinal uses.

Jatropha is known to be resistant to periods of stress (cold weather, drought and low sunlight). This is partly due to its ability to relocate nutrients in its stem and root system. This allows it to survive in stressed environments and has led to the assumption that it is a good crop for marginal lands.

However, survival in these conditions does not imply that it can yield high or sustainable quantities of oil under such circumstances, especially considering that its main survival mechanism under conditions of stress is to relocate its resources away from the leaves, flowers and fruits/seeds. The productivity and profitability of the plant therefore depends on the climatic conditions of the area where it is being cultivated. In order to get a good quantity of high quality seeds, *jatropha* must be grown in fertile land or with additional nutrition. It also requires high rainfall or irrigation, and effective pest control (CEPAGRI, 2008; Bashir *Jatropha*, 2009).

In Mozambique, one of the main uses of *jatropha* is as a hedge or living fence, because it is toxic and therefore not browsed by cattle. Its toxicity is due to a toxalbumin (or toxic protein) called curcin, which is present in the seeds. This irritates the gastrointestinal mucosa and is also a hemagglutinate (that is, it causes red blood cells to clump together). The main toxic manifestations are severe gastro-intestinal disturbances such as nausea, vomiting, intense abdominal pain and diarrhea.

“A total of 17 children between 5 and 9 years of age were admitted to the Mavalene General Hospital on the night of Wednesday, April 1st with symptoms of Jatropha poisoning, commonly known as “galamaluco”. The children are all residents in the Quarter 18 of the Polana Caniço “B” Area, outskirts of Maputo.”

(Notícias, 3 April 2009)

Jatropha fruit usually contains three seeds. The oil is then converted to biofuel.



Interview with Energem laborers, Dzeve community, Bilene District.

1.2 agriculture and mozambique's lack of food and energy sovereignty

Most of Mozambique's rural population is dedicated to the production of food. Food production is not only a survival strategy for farmers, but also one of the few economic activities within their reach. Despite food being produced on the basis of various agro-ecological production methods by the majority of the population, the country lives with cyclical hunger and malnutrition, especially in the southern region (Garret *et al*, 1997; UNAC, 2006). An estimated 64% of Mozambique's rural population and 51% of its urban population lives below the absolute poverty line (Ministério de Plano e Finanças, 2004).

Mozambique's agricultural sector contributes 23% to the country's Gross Domestic Product (GDP) and is the primary source of livelihoods in the country. Only about 3.6 million ha of the total 36 million ha of arable land is currently used for farming. However, this figure distracts from the ecosystem services provided by the remaining arable land, which is often forested; and from the fact that a significant amount of the 3.6 million ha is shifting cultivation, and thus not static from year to year.

97% of cultivated land in Mozambique is comprised of small-scale family-based farms. In total, this sector has about three million families with an average farm size of about 1.24 ha. Farms rarely exceed 5 ha. Of these three million farming families, 87% are dependent on agriculture for their livelihoods and produce 75% of their own food requirements, with a very low percentage of households marketing their food crops. Nevertheless, small farmers also produce about 95% of the country's agricultural GDP (Coughlin P. E., 2006).

Even though the government has had a national food sovereignty strategy in place since 1998, and other policies such as PROAGRI (Mozambique's Sectoral Reform Program in Agriculture) have identified small-scale food production as vital for development and poverty eradication, the reality is far from ideal. Very little progress has been made on the well-known problems faced by small-scale rural farmers which include: no links to markets; insufficient storage and processing facilities; little or no information or knowledge of storage, processing and marketing techniques; and no access to subsidies, improved technologies or equipment (for irrigation, for example). There have certainly been some areas of improvement when one compares agricultural production immediately after the civil war in 1992 with the state of farming in the nation ten years later: Mozambique's ability to produce food to meet its own requirements jumped from 20% to about 80%. These improvements came about as a result of a combination of peace, government programs in the 1980s and early 1990s, which provided support to the small-scale rural farming sector, and an absence of severe or prolonged droughts.

However, in the last ten to fifteen years, farmers have been forgotten in the rush to implement economic readjustment programs and liberalize the domestic market, which included a shift towards large-scale industrialized farming (something regularly backed by the World Bank and International Monetary Fund (IMF)), and a subsequent failure to support rural farmers.

As a result the gains made since the end of the civil war have now stagnated and are even at risk of being undone. Rural development policies that ostensibly aim to combat poverty actually exclude the poor and lead to the implementation of programs that are against their interests. Farmers are now faced with an agenda that tends to favor the privatization of natural resources and basic services. These trends are threatening the economic and cultural survival of many rural producers. In addition to causing numerous land conflicts, they have forced domestic agricultural producers to choose between competing against subsidized imports and seeking alternative occupations in the cities.

At present there is a 567,000 ton deficit when it comes to food requirements in the southern region, and a 222,000 ton deficit in the central region. Only the northern region is showing a surplus (Ministério da Indústria e Comércio, 2004). The average energy value of available food is around 2,000 Kcal per person per day: about a quarter of children are underweight, about 40% of the population is undernourished, and the average life expectancy is only about 40 years.

Mozambique also has major energy sovereignty challenges that need to be addressed (and jatropha has been projected as one of the solutions). Mozambique imported US\$750 million of fuel in 2008, over US\$300 million more than in 2004. Petroleum products and natural gas constitutes only 8.03% of the total energy consumption in the country. The main energy source is firewood and charcoal, which accounts for 89.94%, while hydroelectricity and coal contribute only 2.03% (AfDB & OECD, 2004). However, this is not due to the country's production or projected capacity, but is a direct result of its policies and priorities.

one context

continued

For example, Mozambique's output from two gas fields in the southern Inhambane province is 120 million GigaJoules (GJ) at the moment, soon to increase to 183 GJ per annum; and other gas reserves such as Pande, Temane and Buzi are projected for exploration, and expected to result in estimated gas reserves of 700x109m³ (Ministry of Mineral Resources and Energy, 2000). It has also been estimated that hydropower potential for Mozambique could reach 14,000 MW, even though current hydropower production sits at just 2,488 MW. The 2,075 MW produced from the Cahora Bassa dam alone would be enough to meet the country's entire energy needs. Yet only about 1% of the Mozambican rural population and 14% of the total population currently has access to electricity: the bulk of both gas and hydropower produced in Mozambique is in fact exported to neighboring South Africa. In addition, even those people that can access electricity may not have the resources to pay for it. Thus the country is unable to meet its population's energy needs, even though it has the potential to do so. This is partly due to the free market approach imposed by the international financial agencies, which fund more that 50% of the government's annual budget (IMF, 2004). The local market is considered to be weak; foreign markets offer better prices.

Yet government revenues from exports are also mismanaged, with insufficient investment directed to solving the current food and energy sovereignty crises. Overall there is a lack of conception, implementation and management of public policies oriented towards the needs of the country, meaning that Mozambique enjoys neither food nor energy sovereignty. Jatropha production can be expected to follow a similar pattern: the majority of the planned production will probably be exported to feed foreign markets such as Europe.

1.3 access to land in mozambique

When first drafted in 1997, Mozambique's Land Law involved extensive consultation and resulted in a good balance between peasants' rights and private investment, to "*safeguard the diverse rights of the Mozambican people over the land and other natural resources, while promoting new investment and the sustainable and equitable use of these resources*" (SAPRN, 2010). At a local level the Land Law included the recognition of customary rights over land, rights acquired through occupation, and various inheritance systems.

The advantage to rural communities is that the Land Law does not require formal land rights entitlement or rigid processes for acquiring land rights, and communities do not pay land taxes. However, if a community wants to obtain their land rights formally they do have to follow a process known as demarcation, which requires a map to be sketched and then approved by neighboring communities. Following this, it is automatically approved and registered by the land registry, and a certificate is issued. To strengthen community rights and facilitate land management, some NGOs have focused on helping communities obtain their certificates.

However, in spite of the Land Law, the land is still owned by the State, and the Right to Use and Develop the Land (DUAT) is awarded in accordance with Mozambique's social and economic order. This 'DUAT' is valid for 50 years and can be renewed. The law defines three ways in which people can gain land use rights:

- *individuals and communities have a right to the land they have traditionally occupied*
- *Mozambicans have a right to land which they have occupied 'in good faith' for at least 10 years, and*
- *people and companies can be authorized by the government to use land.*



Local farmers and a research team member in the settlement of Zifwaa, Moamba district.

However, in spite of the Land Law, the land is still owned by the State, and the Right to Use and Develop the Land (DUAT) is awarded in accordance with Mozambique's social and economic order. This 'DUAT' is valid for 50 years and can be renewed. The law defines three ways in which people can gain land use rights:

- a community consultation has been undertaken
- the investment project has been approved
- in the case of individuals, they can prove they have resided in the Republic of Mozambique for at least five years, and
- in the case of legal entities, they can prove they are incorporated or registered in the Republic of Mozambique.

Regarding the allocation of areas, Resolution 70/2008 says that:

- applications for DUAT of areas up to 1,000 ha must be submitted to the Provincial Governors
- applications for DUAT for areas between 1,000 and 10,000 ha must be submitted to the Minister of Agriculture and Fisheries, and
- applications for DUAT that go beyond the jurisdiction of the Minister of Agriculture and Fisheries must be authorized by the Council of Ministers.

The Land Law identifies local community leaders as key actors, when it comes to discussions and decisions relating to communities' rights and the prevention and resolution of conflicts at a local level. However, this aspect tends to be abused by investors and government alike, who often aim to bribe community leaders to gain community consent without consultation. Even when community consultations do take place, they often lack transparency and tend to be loaded with promises that are never delivered.

These abuses are facilitated by weak dissemination of information about community rights, including those mandated by the Land Law, and this is compounded by the fact that documents are rarely translated into local languages. Furthermore, when abuses are uncovered, resolution is usually very difficult, especially for communities that lack resources and information about relevant legal processes.

In recent years decrees have also been issued, which shift the balance towards private investors. For example, decree no50/2007 of 16 October 2007 changed the delimitation process from an automatic approval to a government-controlled process, by imposing new procedures for the approval of land, which vary according to the size of the territory in question (for less than 1,000 ha, the decision is made at provincial level and for over 1,000 ha, at ministerial level). Part of the reason for increasing government intervention in the process is that Mozambique has no unallocated or free land: one community's land ends where the next community's land starts. This can create very large community areas, and this was creating concern within the government. Even though the Land Law recognizes customary rights over land and rights acquired through occupation, and does not require formal land title, large land grabs (especially by government individuals) were still easy because of uncertainties about precise delineations, which meant that community boundaries could be questioned. However, once land is delimited, land grabbing is far more complicated. Thus some non-governmental organizations have focused their efforts on supporting community delimitations. Nevertheless, these changes in the Land Law have generally weakened communities' ability to protect their land from a government that favors an influx of foreign investors.

However, a persistently high level of corruption is by far the main problem. In addition to preventing communities from defending the land that they live and depend upon, it creates a sense of insecurity and lack of ownership amongst the rural poor, whose sense of identity, culture and being is intricately linked to the land. This has led to individuals using land less sustainably and with less regard. In some interviews with communities³ it was not uncommon to hear phrases such as, "Why protect what others are going to steal?" or, "It's mine until the government wants it," or, "I must take what I can from my land before it's stolen by others."



3 Interviews in a Preliminary Survey of the Problems of Forests in Cabo Delgado.

one context

continued

1.4 national policy and strategy for biofuels

The National Policy and Strategy for Biofuels, approved on 24 March 2009 by the Council of Ministers, was published on 21 May 2009 in the Bulletin of the Republic. The Strategy is an instrument that specifically focuses on the promotion of ethanol (sugarcane and sweet sorghum) and biodiesel (jatropha and coconut) for the production of liquid fuels to be used mainly in transport, as well as for other energy purposes.

According to this document, biofuel development in Mozambique will be based on:

- *the production of biofuels as an essential activity for the private sector that can be developed through public-private partnerships*
- *the encouragement of international cooperation by strengthening existing links between institutions*
- *improving cooperation with development partners, taking into consideration the growing diversity between South-South and North-South links, and*
- *strengthening the implementation of the Kyoto Protocol's mechanisms and instruments to encourage the rapid development of the production and use of biofuels, in order to contribute to an effective reduction in greenhouse gas emission levels.*

The Action Plan contained within the strategy identifies actions for biofuel development in Mozambique, including:

- *increasing demand for biofuels, including by developing the country's biofuels industry, changing fuel taxation, preparing criteria for the sustainability of biofuels, and helping to establish a regional agreement between the Southern African Development Community (SADC) countries*
- *improving opportunities for biofuels development, including by establishing programs for technical cooperation between partners*
- *developing a price-fixing mechanism, including by establishing a program for the purchase of biofuels (PCB)*
- *managing social/environmental impacts and developing sustainability criteria, and*
- *creating an institutional framework, including a national biofuels commission.*

The National Policy and Strategy for Biofuels process deliberately excluded civil society, lacked transparency, and was only made public *after* completion and approval by parliament. The lack of a strong civil society perspective is one of the reasons why it fails to focus on the much needed development of the subsistence farming sector, to ensure that it both benefits and is protected from the many risks associated with agrofuels production.

The Strategy also undervalues research that illustrates the negative impacts agrofuels can have on addressing climate change: it continues to propagate the false concept that agrofuels contribute to an effective reduction of greenhouse gas emissions. In general, the Strategy was developed in accordance with the interests of the private sector, and created a foundation for fast-tracking agrofuels development in Mozambique.



A failed subsistence crop of maize mixed with Jatropha.

two case studies

context

2.1 case study areas

The study was mainly focused in the south of Mozambique, due to the drier climate and larger percentage of marginal land; it has been claimed that jatropha is well adapted to such conditions. In addition to this, the south has the largest food deficit and the most serious food sovereignty concerns. At the start of the project, the southern part of Mozambique was also thought to have a higher number of jatropha projects. The main districts identified as having jatropha plantations in the south and centre of Mozambique were the districts of Moamba, Bilene, Panda, Jangamo, and Gondola.

The research group was particularly concerned that there is a tendency in Mozambique to focus on desktop research with very weak or no on-the-ground verification with local subsistence farmers and the affected communities in and around project areas. So, in addition to investigating existing relevant research and information, the researchers gathered information from the numerous subsistence farmers associated with co-authors União Nacional de Camponeses (UNAC). They also visited the identified

plantations, two of which were managed by communities and six by agribusiness, and neighboring communities. In total 77 people were spoken to, including some company managers.

There were significant constraints though. In Mozambique civil society is not routinely provided with information, and there is an institutional resistance to responding to requests for information. The 'public' consultation about the elaboration of a national strategy on jatropha had had limited participation, and information about it was only recently made available to the public. In addition to this, databases tend to be out of date and there are few national studies on the subject. This made it difficult to even identify and select plantations to visit.

The collection of information about the communities who live next to the plantations was also more difficult because of language barriers: many community members do not speak Portuguese. They also feared being 'punished' or hurt if they were known to have cooperated with the interviewers.

box 2 data collected, districts visited

Data collected included:

- **Land Use Cultivation Factors:** *Plantation area; production model; water required for irrigation; plants per hectare; production per hectare; systems used for storage and seed processing; access to land; previous land use; land use conflicts; and proximity to protected areas and nature parks.*
- **Actors and economics:** *Main actors in the industry; subsidy or government programs; costs, benefits and profits for peasants; final destiny of product; and quantity used for urban/rural electrification.*
- **Access to information:** *Access to food; information shared with peasants; and labor rights.*

Moamba is situated in the north of Maputo province. The climate is dry, with an annual average temperature of 23°-24°C, and an annual rainfall of 580-590mm. Two community plantations were visited in this district, one in the settlement of Goane 1 and the other in the settlement of Zifuwa.

Bilene is situated in the southern part of the Gaza province. In the sub-coastal band the average annual temperature is 24°-26°C and the average annual precipitation is 800-1,000mm,

which makes the climate sub-humid. However, in the interior regions, the climate is semi-arid and the rainfall is 500-800mm. Industrial plantations belonging to Energem were visited. Researchers also interviewed the communities that previously owned the land, and communities neighboring the plantation.

Panda is in the west of the Inhambane Province and has a tropical-dry climate, which adversely affects the mainly rain-fed agricultural production. The average annual temperature varies between 18° and 35°C, and the average precipitation is 750 mm. Industrial plantations belonging to the company ESV Bio Africa, in the town of Inhamusse, were visited. Communities surrounding the plantation were also interviewed.

The coastal district Jangamo is situated in the central part of the Inhambane Province; the climate is tropical-humid and the average annual precipitation ranges between 800 and 1400 mm. Researchers visited industrial plantations belonging to CHEMC Agric in Guifugo, and local communities.

Gondola is located in the province of Manica, and has a dry sub-humid climate with average annual precipitation ranging from 850 to 1,100 mm. The district is crossed by six rivers. Industrial plantations belonging to Sun Biofuels and MoçamGalp, in the neighborhoods of Gondola Antena and Gondola Cutche respectively, were visited.

three results

results

Over 80% of the total area of cultivated land in Mozambique is used for the production of staple food crops, including maize, beans, sorghum, cassava and rice. Cash crops grown on the remaining 20% include cotton, cashew nuts, sugarcane, tobacco, tea, sisal and sesame (FAO, 2010).

Of the 3.6 million families in Mozambique, 87% are dependent on agriculture for their livelihoods, but 98% of these have no formal land titles (FAO, 2010). The small-scale production system is characterized by manual work, the use of rudimentary cultivation techniques, and dry farming systems dependent solely on rainfall. No chemicals are used.

In contrast, large-scale plantation systems are characterized by mechanization, large-scale irrigation and chemical inputs. In all the industrial projects visited, jatropha is planted on large expanses of arable land; and all make use of chemical-based fertilizers (such as NPK 12-24-12 and Urea 46) and pesticides (mainly petroleum based). Despite the use of pesticides however, pests are still regularly apparent and are a major problem, forcing some of these projects to experiment with different mixes of pesticides, stronger chemicals and other types of controls such as hormone treatments.

With regards to jatropha, until recently the trend has been to plant it as hedges or a living fence, because cattle will not eat it. However, in 2004 information about jatropha's potential use as an agrofuel started to circulate and by 2006 some communities were beginning to plant it as a cash crop (GFU and GTZ, 2004). The only government data available on jatropha is for the 2007 season. This indicated an estimated 2,030ha of jatropha had been planted and that 64 nurseries had an average 3,000 plants each, resulting in a total of over 190,000 plants (CEPAGRI, 2008). However, the government study is unreliable and is now out of date. For example, no information was included about the amount of jatropha planted by the private sector or the number of jatropha nurseries in over 80 of the 129 districts in Mozambique. The government has recently acknowledged the study's weaknesses and the need for more updated studies.

3.1 subsistence farming and jatropha

The government study calculated that 1,000ha of jatropha had been planted by subsistence farmers, with Nampula, Manica and Inhambane provinces having the highest jatropha coverage (202.5ha, 181.1ha and 140.8ha respectively) (CEPAGRI, 2008). Initial campaigns for jatropha, such as that run by the president, combined with the projected high price of roughly US\$2/kg (over US\$1.5/kg higher than other food crops like maize, beans and cassava) created an initial interest in farming jatropha. But farmers subsequently turned away from it (ESISAPO, 2006), due to difficulties experienced in growing the crop and finding markets to sell their jatropha seed. Nevertheless, whilst the number of subsistence farmers and hectares covered currently is unknown, researchers conducting interviews were able to conclude that it is possible that numbers could now have topped the figures for 2007, mainly due to new farmers experimenting with jatropha (rather than existing jatropha farmers expanding the area of land under cultivation).

3.2 lack of development limits potential benefits and threatens food sovereignty

Based on the interviews and the vast knowledge-base of the national farmers' union, UNAC, the research revealed that subsistence farmers are not planting jatropha in marginal soils, but in good arable soils, in place of food crops. Most local farmers who have experimented with jatropha planted considerably less than a fifth of their total farmer land, but this is still highly significant as it takes land away from much needed food production.

Many farmers explained that subsistence farming in Mozambique is very labor intensive, making time a severe limiting factor when it comes to determining the maximum area that a farmer and their family can manage. It also became clear that the term 'time' was strongly correlated with lack of capacity (in terms of infrastructure, education, technology, etc), which increases the time it takes for various tasks to be completed. For example, when irrigation is required, it is done by hand, and even with a relatively close water source, can still take up a large part of the available day. From this perspective then, it is not so much time that is the limiting factor but lack of infrastructure. But the farmers themselves focused on time. From their perspective they already had a full day's work. One farmer laughingly said he did not have "26-hour days." Farmers simply don't have the resources or capacity to cope with extra fields of jatropha: instead they have to choose between the different crops, making each crop a direct competitor.

Basic tasks such as spending time finding water and firewood also use valuable time that could be used for increasing the manageable farming area of a family unit. Other issues linked to rural farming capacity that need to be taken into consideration include health, size of family units and community structure (eg whether time can be saved through shared parenting). Overall, subsistence farmers in Mozambique are struggling to achieve food sovereignty because their ability to farm is constrained by a lack of attention to basic human needs including health, water, sanitation, energy and education.

Even when rural communities achieve food sovereignty and food surpluses are possible, there are numerous obstacles in the way of farmers aiming to maximize the benefits of these good years and develop a safety net against future bad years. The lack of infrastructure – which includes roads and communication systems – makes it complicated to get surplus production to local markets or even communicate with intermediate buyers to coordinate possible links with smaller sub-markets (ROSA, 2005).

At both the local level and the national level there are also serious problems with storage capacity; and at the local level there is also a lack of information about suitable methods and forms of storage. This is particularly relevant to jatropha. The plant's value as a biofuel lies in its capacity to produce seeds with a high oil content, but the quality and quantity of oil extracted depends on numerous factors. Two of the most important of these are the method of storage and the time taken to extract the oil. In the case of rural communities where there is no capacity to extract the oil, the suggested procedure is to dry the seeds in the sun for a week and then store them in nylon bags. However, this method reduces the quantity of oil extracted. More seriously, it also reduces the quality of the oils, which become more and more acidic as time passes. The maximum period that the seeds can be stored before the level of acidity is too high is around three months (Bashir Jatropha, 2009). Buyers are well aware of these limitations, but most communities are not, nor have they even been trained to store the seed in this way.

There is also a lack of information about replanting. Jatropha seeds intended for replanting have to be dried in the shade before storage, and the probability of germination also decreases with time. It is therefore very important to replant as soon possible, using a lot of water during the early phase of development. But this additional care was not mentioned during jatropha promotions, and rural farmers, who were expecting an easy, low-maintenance crop, ended up using valuable time just to keep their investments alive. Major risks are imposed on rural farmers both by the storage requirements and the lack of efficient links to markets, which slows down the flow of goods from producer to buyer.

3.3 jatropha and pests

Another problem that materialized was an unexpected level of infestation by pests. Information from various individuals (UNAC and JA field staff, specialists such as Gagnaux, and journalists who have visited or interviewed local communities), and from all the communities visited during this study, revealed that the jatropha plants were infested with pests, especially in the southern region. The highest occurrence of pest infestation was during the rainy season, which normally coincides with the fruit-cropping season. In cases where plants were heavily infested, they stopped producing leaves and remained in a state of stress, leaving the farmers with no choice but to remove them. Interviews also revealed that local government in Mozambique is unable to assist farmers with pest treatment technologies.

Particularly worrying is the fact that interviews with subsistence farmers in the Moamba District regularly gave rise to accounts of jatropha pests spreading to other food crops such as sorghum, maize, and peanuts. Although the majority of the pests associated with jatropha should be host-specific and not attack other food crops, there is increasing evidence suggesting that this may not actually be the case. In interviews with Gagnaux, who wrote her undergraduate thesis on insect pests related to jatropha in Mozambique, she noted that if jatropha is cultivated in combination with food crops, or close to them, there is a risk of jatropha pests contaminating those other crops (interviews with Eng. Pomme Gagnaux).

Additionally, and of particular relevance to Mozambique, the Jatropha Handbook (2006) also states "*that [Jatropha] could possibly contain viruses harmful to cashew nut trees, which occur in large quantities all over the country*" (Fact Foundation, 2006).

Of the forty pests covered in the Gagnaux study, eight had never been seen before in Mozambique. Furthermore, the jatropha plants from which the insects were collected were in their vegetative or flowering phase, so it is possible that even more pest species could have been found during fruit development and maturation. In addition, Gagnaux raised the possibility of jatropha behaving as a plant parasite by consuming the nutrients of other plants in the area - making jatropha potentially risky for small-scale farmers dependent on nearby food crop plots (interviews with Eng. Pomme Gagnaux).

three results

continued

3.4 cash crops and markets

The subsistence farmers visited didn't have much information about jatropha: they knew that the plant produces oil to make biodiesel, that they could sell it, and that its seeds must not be eaten because they are toxic. The fact that they knew little more than this made them especially vulnerable to the extensive marketing campaign associated with jatropha, and subsistence farmers became interested in the idea of growing it as a cash crop. In general, the leaning to grow cash crops is more dominant in the central and northern region of the country where rainfall is higher and high value cash crops such as tobacco, sugar cane and cotton can be cultivated. However, even in these regions weak links to markets limit community investments in high value cash crops. Other types of cash crops have previously been chosen primarily because of ease of storage, as this allows communities to wait until prices are good and/or wait for transient sales opportunities (such as sales to trucks that pass through communities to collect various products at irregular intervals). The fact that jatropha has been marketed both as a high value cash crop and one that stores well is thus problematic. The other concern is that the false information about jatropha's ease of storage will attract subsistence farmers who are not physically close to markets, which could cause them to waste large amounts of time and precious resources.

In cases where communities are close to industrial buyers, another concern is that the pattern of jatropha production will follow a path similar to that of crops such as sugarcane, where subsistence farmers have moved into production to supply neighboring plantations. The farmer obtains seeds and chemicals on loan and this is usually deducted from the price when the harvest is sold. But lack of experience with these new crops combined with climatic risks that occur regularly lead to lower yields than expected, and the subsistence farmer typically falls into a growing cycle of debt (JA & UNAC, 2008).

Mozambique is considered to have huge potential for large-scale industrial farming, and has attracted strong interest from agrofuel investors. This is because of its favorable natural climatic conditions, the fact that around 90% of its potential arable land is currently free of any form of agricultural activity, the pace at which regional markets for liquid fuels are expanding, and the positive investment climate created by government-backed incentives and guarantees. It has been estimated that by the end of 2007 agrofuel investors had applied for rights to as much as 5 million hectares of arable land; there are also unverified reports that the government received over 3,000 agrofuel-related proposals during 2007. Based on the current data there are presently 438,326ha of arable land allocated to jatropha production (see Annex 2). 26% of this (116,000ha) is from the four projects analyzed during this study (run by Energem Biofuels Limited, ESV Bio Africa, Sun Biofuels and MoçamGalp). These are collectively responsible for planting 9,907ha of jatropha so far. (In addition to this, the project by Bashir Jaropha was also visited, but their partnership with Enerterra had ended and the project was no longer functional.)

However, it has to be remembered that this is also just the beginning. The government is strongly committed to the success of the agrofuels program and projections for biodiesel production by 2025 vary between 106,265 tons (the worst case scenario) and 273,811 tons (the government's optimal projection) (CEPAGRI, 2008).

3.6 petromoc

Mozambique's national petroleum company, Petromoc Lda, is one of the larger investors, with proposals to invest in both ethanol and biodiesel production units, one in the central region of the country and one in the southern region. The estimated investment is projected to cost over US\$58 million: US\$28 million for the ethanol processing plant, with a production capacity of 27,000 tons of raw material per year producing 33,000 m³ of ethanol; and US\$38.2 million for the biodiesel processing plant, with a production capacity of 35,000 tons of raw material per year resulting in 40,000 m³ of diesel. The total operational costs have been put as low as US\$0.33/liter of ethanol and US\$0.41/liter of biodiesel (Namburet S., 2006).



Interview with Energem laborers, Dzeve community, Bilene District.

four companies growing jatropha

companies growing jatropha

As well as investigating specific projects, the study also considered the nature and activities of each of the companies responsible for the industrial-scale projects included in this research.

4.1 energem biofuels limited

Energem Biofuels Limited is the alternative energy division of the Canadian company Energem Resources, Inc. It is currently established in two African countries, with one project each in Kenya and Mozambique. In Mozambique, the company has been allocated 60,000ha in Gaza province that was previously used for community farming and grazing land. This project uses seeds from Malawi, but is considering experimenting with seeds from other regions due to slow growth rates, pest problems and lower than expected yields from their current crops.

At present each hectare is planted up with 1,716 plants, and is irrigated with groundwater from boreholes. During the development phase of the plants they use 7,500 liters per ha per day resulting in a need for 108,525,500 liters per day for the total 1,447ha currently under cultivation. Most communities do not depend directly on groundwater in anyway significant way, and this was therefore not considered to have an immediate short-term impact on water supplies. But the town of Bilene and some rural farmers do depend on groundwater. Groundwater levels also influence the hydrology of the area. There are also concerns about salt water intrusion into groundwater and fresh water bodies due to the area's proximity to the ocean.

Energem plants seed directly, as well as transplanting seedlings grown in nurseries; but the general trend in industrial jatropha farming in Mozambique is towards seedlings (Energem's success rate for seed germination is well below 10%, for example). This allows the farmer to meet the higher water and nutrient requirements that the seedlings have much more easily, and thus to cope better with the plants' sensitivity during the early growth phase. More recently the industry has been looking into using cuttings (pieces cut from a parent plant) to decrease the time and cost of growing healthy seedlings.

Once a jatropha plant has reached a pre-determined size, usually after its first flowering, it is pruned to increase the number of branches. There is a strong correlation between the number of branches and the amount of fruit, as fruit grows mainly on the ends of the branches. At Energem, this pruning is planned to take place during the first 4 to 5 years of plant growth, after which each plant should have close to 100 branches and be able to produce around 1kg of seeds per plant per harvest, which is considered a good economically sustainable yield. However, growth has been much slower than predicted and after 2 to 3 years of growth most plants have only 18 to 30 branches and are producing well below the required amount of seed. At this rate the plants are still 3 to 5 years away from producing the amounts of seed predicted. Further delays have been caused by major pest attacks that have caused plants to become stressed, lose all their leaves and stop flowering, forcing Energem to replant entire fields and start the process all over again.

Another issue is that of Energem's relationship with the local communities. The land was acquired through DUAT (the Right to Use and Develop the Land policy) based on community consultations conducted mainly between the community Regulo⁴ and Energem. In the process, Energem made numerous promises to develop the area in exchange for the land, but after two years of inaction, the communities are becoming restless about the delays in delivering on these promises.

"When the company arrived here, they promised to build schools, hospitals, make water holes, help widow women and abandoned children and provide scholarships for young men, but it has been two years and almost nothing was done. The one thing done was water holes but they did not install water pumps...how is it going to be possible to get the water from the hole? When we complain they say that by the end of this year the hospital will be ready, but until now we haven't seen any movements to build anything. The record of the public consultation is in the hands of the company and with the local authorities"

(Interview in Bilene District with Community of Chilengue, 9 April 2009).

⁴ A Regulo is a community leader who represents the maximum authority at a community level, and is considered by the population as the most knowledgeable person, capable of resolving the community's interests.

four companies growing jatropha

continued



One of the weaknesses inherent in the community consultations and negotiations, which was raised by the individuals interviewed, was the role of the local Regulo, who is believed to be corrupt. The research team did notice a well-above-average standard of living when compared to all other Regulos interviewed in this study. Numerous stories were told of the Regulo being involved in the transfer of community land to more than one private investor at a time, which has resulted in investors losing their investments. One such conflict exists with a small subsection of Energem's land, and another independent conflict is believed to be in court (this information came from an interview with a tourist operator in Bilene). However, the Regulo is an important district member of the governing party Frelimo and is feared by the local communities. Many community individuals also mentioned that they were under pressure to hand over their land.

Independent of the level of corruption of the Regulo, it is clear the local communities are not receiving any major assistance with development from Energem, be it in the form of schools, hospitals or water and sanitation. The main benefit seems to have been increased employment. Interviews with local communities and company workers indicate that an estimated 500 jobs (permanent and seasonal) have been created in the area by Energem, and this is expected to increase as the area planted with jatropha expands. The average worker receives about US\$60 per month and has a working day that starts early and ends early, leaving some daylight hours to attend to personal fields. However, the salaries, despite meeting the minimum wage, are too low to allow workers to improve their standard of living.

"The Regulo of the Chilengue Location put pressure on the population to sell their land to the Energem Company, declaring that the company, besides giving money to buy that piece of land, would grab up another area for the people to farm."

(Interview in Bilene District with Community of Chiixo, 9 April 2009)

Jatropha with pests on Energem Plantation, Chilengue community.

4.2 esv bio africa

ESV Group is based in London and was established as a logistics and trading company, but has repositioned itself with a strong focus on agrofuel farming to supply feedstock to the European biofuel industry. Its main operations are based in the Ukraine, including the management of the Black Sea grain terminal, and it has only one project in Africa, run by its subsidiary company, ESV Bio Africa. This is based in Mozambique.

The ESV Bio Africa project is located in Inhambane province and covers an area of 31,000ha, of which 7,400ha has already been planted. ESV also uses seeds from Malawi, and plants an average of 1,250 plants per hectare. They do not plant the seeds directly, but use nurseries and then transplant the seedlings. Plants are irrigated manually in nurseries during the early phase of development. The water is sourced from the Inhassane river, and the nursery consumes 10,000 liters per day. Once the seedlings have been transferred to the field they are not irrigated and depend solely on natural rainfall.

ESV acquired the land in the same way as Energem (DUAT through negotiation with the Regulo), but the communities were content with the role of their Regulo in the negotiations, and were more involved than in the Energem case. The main issues raised were around the extent to which ESV delivered on its promises. For example, the company started the process of improving the existing school and hospital, but stopped due to the financial crisis. In addition, the community benefited from new water supply points and from minor social support such as for occasional funeral costs. The company originally employed around 1,350 workers and paid permanent workers US\$72 per month, and seasonal workers US\$46 per month. However, many workers left when salaries went unpaid for nine months. Others remained at the request of the provincial government.

Originally, the local farmers saw the job opportunities as a form of secure and constant income that would compensate for some of the risks associated with farming. For example, 20 of the country's districts are highly prone to drought; 30 to flooding; and another seven to both. Overall 48.2% of the

population is prone to one or both of these risks (FAO, 2010b). The income from the wages was lower than the income from farming in an average to good farming year, but higher than farming income in a bad farming year. Furthermore, farming revenue is seasonal, creating financial problems at certain times of year. By combining farming and wages, the family unit could theoretically benefit from farming's seasonal peaks and the constant predictability of a job.

The reality is rather different however. Both here and in other areas visited, the communities found that they had overestimated the area of farmland that they could manage whilst also working: farming areas used by family units decreased from more than 1ha to about 0.5ha. This, combined with a nine-month hiatus when wages were not paid, created a great deal of suffering for many families.

ESV Bio Africa is currently in financial crisis due to the longer than expected time it has taken to create mature, stable and productive plantations, the higher-than-expected cost of doing so, the fact that outputs were lower than predicted, and market fluctuations. This has left the company in need of further investment and they are even considering selling their Mozambique operations.

Other companies have also been seriously affected, and two that we visited, CHEMC agri and Bashir Jatropha, were completely paralyzed. All companies visited and experts interviewed mentioned the risks involved in investing in jatropha, because it is a new crop and there is relatively little information about its large-scale farming applications. This is further complicated by jatropha's varied dynamics in different areas. Considerable funding needs to be invested in research before economically sustainable large-scale industrial farming can be successfully established in the different regions of Mozambique.

In general, because markets for agrofuels are still young, and because petroleum prices have crashed and the global recession is worsening, agrofuel investors are facing a particularly volatile and therefore risky situation.

"The workers have no salary for nine months, and as a consequence they organized a manifestation. To calm down the tense sufferers, the Permanent Provincial Secretary of the Ministry of Labour travelled to the locality and explained that it was a question of financial crisis that would soon be resolved as the owner was already looking for partnerships to resolve the problems, and appealed that the workers did not abandon their work places."

(Interview in Panda District with Community of Inhassane, 19 May 2009)

"...the Group announced that it is currently awaiting a formal offer for the sale of our Mozambique operations, but at the same time it is also considering off-take arrangements for the supply of Jatropha oil, commencing with this year's crop, with interested parties in the European biofuel industry, based on the strategy to expand and manage operations."

(ESV Group, 2009)

four companies growing jatropha

continued

4.3 sun biofuels and moçamgalp

Sun Biofuels Ltd is a UK-based company focused on jatropha farming in Africa. Currently it has a 5,000ha jatropha project in Ethiopia, a 15,000ha project in Mozambique, and an 8,000ha project in Tanzania.

MoçamGalp is a joint venture between two Portuguese companies, Visabeira and Galp Energia. Visabeira is a Portugal-based international conglomerate with projects in countries such as Angola, the United Arab Emirates, and Mozambique, and diverse interests including telecommunication, construction and tourism. The Galp Energia Group consists of more than 100 companies engaged in a range of activities including natural gas supply, and petroleum exploration, production and refining. One of MoçamGalp's priority areas is agrofuel production and it has projected a possible expansion of up to 60,000ha in Mozambique. Both companies are based in the Manica province and acquired land by purchasing the infrastructure of old companies that were producing cotton and tobacco respectively. This could have made local land conflicts more complicated, but none were immediately apparent. However, the study did not have the time to investigate this aspect in more detail.

Both companies pay the minimum wage - the equivalent of about US\$50 per month at the time of the interviews. MoçamGalp was still in the early phase of operations: it only had 34 workers and had planted just 60 of the planned 15,000ha. Sun Biofuels, on the other hand, had 430 works and had already planted 1,000ha of the 6,000ha originally allocated. In the case of Sun Biofuels, employees worked 45-hour weeks, averaging nine hours per day, one hour more than is legally allowed.

In the Sun Biofuels Project, the seeds come from Tanzania and each hectare is planted with 1,667 plants; in the MoçamGalp project the seeds come from Brazil and each hectare is planted with 1,250 plants. Only the nursery phase of development is irrigated and, once planted in the field, crops are completely dependent on rainfall. Although these projects experienced problems that were similar to those in other areas, such as pests, and low growth rates and yields, the general health of the jatropha plants was marginally better. This supports the general perception that the agro-climatic conditions of the central region of the country are more conducive to jatropha production than the arid south. However, this relative success can be attributed to other factors involved as well, including more effective pest monitoring, the extent and combination of fertilizers applied, and even the strain of seed used.

Advertisement for D1 Oils jatropha projects, Maputo.



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five limitations and markets

limitations and markets

The interviews conducted and literature studied demonstrate that jatropha is not the ‘miracle crop’ described in jatropha marketing campaigns: it actually has very specific requirements and limitations. Local experts have already realized this, and mention that in order to produce good yields jatropha actually requires soils with good nutrients, an acidity greater than pH5, and good levels of nitrogen, potassium and calcium. A lot of care is also needed during the first 18 months of growth, when the plants require large amounts of water (at least five to seven liters per day). This is a crucial phase for the plant’s survival. During this development phase the plant will produce its first fruits, although it only reaches peak production in four to five years (after which it can remain productive for up to 40 years) (Bashir Jatropha, 2009).

Recommended rainfall levels are between 600 and 1,300mm, but only areas with rainfall levels above 800mm showed any signs of sustained growth.

Overall, however, the truth is that there is still not enough information, and even industrial farmers are having major problems due to a lack of understanding of the agroecology and economics of jatropha. This situation is made even more difficult by false marketing of the crop.

“Planting Jatropha requires a lot of investment, from the training of staff through to control of pests. I have been in various industrial Jatropha projects and sincerely, not one of them seemed sustainable because there wasn’t adequate training. I have offered my services to develop the capacity, but they (the projects) reject it and think it’s just one more expense.”

(Director of Bashir Jatropha)

The various setbacks, which have prevented the effective establishment of jatropha at an industrial level, have also delayed the formation of a local market for the seeds, thus preventing the subsistence farmers who responded to the jatropha promotion campaigns from selling the seeds they have produced.

In addition, the main market is for export and is served primarily by the large producers. It is also vulnerable to fluctuations in international prices for seed, biodiesel, and competing fuels (including the incredible price volatility of petroleum). Thus small-scale producers are attempting to operate in a highly unpredictable market; and one that does not even serve Mozambique’s domestic needs.

TABLE 1

MAIN FINDINGS OF THIS FIELD STUDY, ILLUSTRATING DIFFERENCES BETWEEN SMALL FARMERS’ PLANTATIONS AND INDUSTRIAL PLANTATIONS

	SMALL FARMERS’ PLANTATIONS	INDUSTRIAL PLANTATIONS
land use cultivation factors	<ul style="list-style-type: none"> • small plots • fertile land • grown in combination with food products • few plants • no irrigation • regular problems with pests • land ownership based on DUAT 	<ul style="list-style-type: none"> • large plantations (those visited varied from 60 to 7,400ha) • fertile land • using chemical-based fertilizers and pesticides • 1,250-1,716 plant/ha plant density in the South • 1,250-1,667 plants/ha plant density in the North • manual and mechanized irrigation in the South • manual irrigation in early stages, in the Center • regular problems with pests • ability to purchase appropriate infrastructures • land ownership based on DUAT
markets	<ul style="list-style-type: none"> • lack of market 	<ul style="list-style-type: none"> • selling to international market
access to information and conditions of work	<ul style="list-style-type: none"> • no access to information about the negative impacts of jatropha 	<ul style="list-style-type: none"> • promises to build schools and hospitals, and make water holes do not come true (Bilene) • labor hours are not respected (Gondola) • delayed salaries (Panda) • minimal wages (Gondola)

six conclusions

conclusions

Jatropha has been the subject of much hope and speculation in terms of both rural development objectives and alternative energy interests in Africa (Horak, 2010). However the evidence emerging in Mozambique contradicts the bulk of the claims made by jatropha's promoters.

myth 1: jatropha grows well on marginal land and can produce high yields on poor soils

Africa has large areas of 'marginal' land, and the claim that jatropha can grow in marginal lands and still produce good yields has been a major driving force behind its choice as one of the main crops for Mozambique's agrofuel strategy. Unfortunately, no cases from the literature or from any of the communities, industry experts or individuals interviewed mentioned a single example of this being true in Mozambique. On the contrary, nearly all jatropha plantations in Mozambique have been established on arable land, and even then they have fallen short of the claimed growth rates and yields.

Mozambican experts such as Dr Bashir (Director of Bashir Jatropha) admit that jatropha needs specific conditions and care to produce good yields, including soils with good nutrient levels, a soil ph of more than 5, and good amounts of nitrogen, potassium and calcium. Other studies have also shown that jatropha is unlikely to produce a high yield on marginal lands or soils with low nutrients (FOE, 2009).

In general it is very hard to predict what yields are likely in different areas, and case-specific studies will be important in determining jatropha's viability in any specific geographical area. Both government and industry are aware of the few diverse studies that do exist, but still choose to make claims about jatropha without researching the local reality.

Of even more concern is the fact that there are cases of large-scale industrial jatropha plantations failing to follow all the recommended methods, including in relation to levels of use of fertilizers and pesticides, and irrigation. Even these large plantations are failing to achieve expected growth rates and sustainable yields. If anything, current research and studies in Mozambique show that promises of high jatropha yields in poor soils is a myth. At the very least it is clear that more independent research is required.

Additionally, around 70% of Mozambique is covered in forest and woodlands (DNTF, 2007) and most large-scale agriculture projects are likely to replace natural vegetation to some extent. Furthermore, the measure of 'available' land does not take into consideration the nature of subsistence farming in Mozambique, which is based on shifting cultivation. This means that if forested lands surrounding current agricultural areas are used for jatropha, farmers would cut even more forest land when shifting plots.

The claim that there are large areas of 'unused' arable land also ignores the existence of ecosystem services (including sustaining local hydrology, replenishment/maintenance of soil nutrients, and maintaining biodiversity) and the fact that these lands still provide resources for livelihoods, including animal protein, fruit, firewood and building materials. These ecosystem services need to be maintained. In the current climate change crisis, the loss of major carbon sinks like forests also has to be taken seriously. Growing agrofuels in Mozambique is a threat to its efforts to decrease the country's carbon footprint.

myth 2: jatropha requires low water use and minimal maintenance

It is often claimed that jatropha can grow in arid areas, but in Mozambique it was found that irrigation was required during the early development phase, even in areas where the rainfall ranged between 800mm and 1,400mm. Furthermore, in the southern region of the country where the lower range is around 600mm, constant irrigation was often required; and even some areas that received around 800mm of rain still found it useful to irrigate their crops. In one of the districts visited there were already concerns about the impacts of water loss due to the large amounts of irrigation water being used by the large-scale farming company operating in the area.

Communities that experimented with jatropha had to provide five to seven liters of water per day per plant. In some areas these water requirements competed with family water use, forcing women and children to make extra trips for water. In cases where jatropha was not watered, especially in the early phases of development, the germination rate was extremely low and plants were more prone to disease, stress and shock.

myth 3: jatropha is resistant to disease and pests

There is increasing evidence of jatropha's vulnerability to diseases (such as leaf spot, collar rot and root rot) and problems with fungi, viruses, and insect pests. In Mozambique, interviews confirmed this lack of resistance to disease and pests. Plants in areas of low rainfall or subject to environmental stresses such as poor soil quality and low nutrient levels were more vulnerable. The highest occurrence of pest infestation was found during the rainy season, which normally coincides with fruit cropping. In cases where plants were heavily infested, they stopped producing leaves and remained in a state of stress, which left the farmers with no choice but to remove them.

In Mozambique, a further problem with jatropha pests and diseases is their ability to spread to other crops, which is of great concern. One report showed a jatropha-based disease spreading to cashew nuts; and communities consistently recounted cases of jatropha pests spreading to other food crops such as sorghum, maize and peanuts. An increasing number of experts are raising similar concerns. The impact on food sovereignty due to crop losses from pests and diseases is severe, especially since almost all subsistence farming is without chemical support, making this sector particularly vulnerable to new pests and diseases.

However, experiences in the industrial jatropha plantations show that even with pesticides it is difficult to control the numerous infestations that jatropha is prone to. At present, government and industry have no solution to these problems. Internationally the problem seems to have been serious enough for Bayer CropScience, in partnership with Daimler, to reportedly be investing in developing herbicides, insecticides and fungicides specifically for jatropha (Cleantech 2008). Yet if jatropha does turn out to require substantial levels of fossil-fuel based chemical pesticides and fertilizers, it may take more energy to produce it than can be extracted from its seeds.

myth 4: jatropha poses no risk to food security, and is a development opportunity for subsistence farmers

Jatropha is being planted in place of food crops by subsistence farmers. Given that around 87% of Mozambicans are subsistence farmers and produce 75% of what they consume, major concerns arise when one considers the plan to encourage subsistence farmers to plant large amounts of jatropha. This concern is further exacerbated when one looks into the weak links subsistence farmers have to local and national markets. In Mozambique, when agricultural markets crash or slump, the

price risks are passed down to small farmers. Subsistence farmers tend to be unaffected by food price fluctuations while they produce a high percentage of their own food, but they would be considerably more impacted by changes in the price of non-food cash crops like jatropha.

In addition, Mozambique's 1997 Land Law, which was intended to protect local communities, has been manipulated by the government, which has passed unconstitutional decrees weakening communities' land rights. The Land Law also identifies local community leaders as key actors when it comes to discussions and decisions relating to communities' rights and the prevention and resolution of conflicts at a local level. However, this aspect tends to be abused by investors and government alike, who often aim to bribe community leaders in order to gain community consent without consultation. Even when community consultations do take place, they often lack transparency and tend to be loaded with promises that are never delivered. These abuses are facilitated by weak dissemination of information about community rights, and a failure to translate documents into local languages. When abuses are uncovered, resolution is usually very difficult, especially for communities that lack resources and information relating to legal processes. These problems mean that large 'land grabs' of community land may be a key feature of Mozambique's drive for jatropha production.

Jatropha will have detrimental impacts on livelihoods in Mozambique if the development and infrastructural limitations of the country are not considered. Subsistence farmers require increased access to basic services (including water, electricity and education) before they can increase their farming capacity. Without these services they are unable to free up enough time to add acreage to their current farms. These limitations thus force subsistence farmers to replace one crop with another, meaning that growing jatropha generates competition between a cash crop and much needed food crops.

In addition to basic development, more support has to go directly to the small-scale farming sector in Mozambique, if the high risks of jatropha are to be mitigated (including the provision of microcredit, support and training for farming cooperatives, training in farming methods, and improvements in market links and information, storage capacity and knowledge).

Under current circumstances, jatropha does not present a development opportunity. On the contrary, substantial development is needed in the subsistence farming sector before jatropha production can succeed.

seven recommendations

recommendations

This report concludes that jatropha production in Mozambique has not met any of the expectations created. Worse, it finds that it is actually likely to worsen livelihoods and food sovereignty in rural areas in the country.

The dominant arguments used to promote jatropha – that it is a food security-safe biofuel crop, a source of additional farm income for rural farmers, and a potential driver of rural development – are misinformed at best and dangerous at worst.

The government is not adequately prepared to deal with the likely consequences of jatropha development; and the national biofuel strategy does not include a strategic environmental assessment of the impacts of jatropha. The marketing campaign pushing jatropha expansion is obscuring the reality of the situation. The general public needs to be much better informed about the reality of engaging in jatropha production. While more independent research is certainly needed, this report provides evidence that jatropha may not be the hoped-for silver bullet for energy security and development in Mozambique.

A similar conclusion was reached by Mozambique's civil society and subsistence farmers in 2008, resulting in the emergence of a declaration with specific recommendations that need to be respected. Europe and the United States should develop their own internal solutions to their energy supply problems, including through demand-side management and increases in automotive and industrial energy efficiency. Only then should research be conducted into the potential contribution that various agrofuels could make to the global sustainable 'energy balance'. Critically, these studies must, first and foremost, ensure that food sovereignty is not sacrificed.

Cleared forest and kiln for the production of charcoal.



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Jatropha with pests, Moamba district .



Chemica Agric Jatropha project.

annex 1: declaration of civil society



DECLARATION

Justiça Ambiental (JA!) , União Nacional de Camponeses (UNAC), Kulima, some farmers from the Massingir district and Zambézia province, some members of international organizations such as the African Centre for Biosafety (ACB), Trust for Community Outreach and Education (TCOE) and the Center for Food Safety (CFS) and some NGOs' whose signatures on this declaration are still to be confirmed have met on the 13th and 14th October for a reflection and experience exchange regarding agrofuels, biofuels and the green revolution in Mozambique.

On this meeting, it was clear that what is intended to be a mass production in Mozambique are agrofuels and not biofuels, according to the concept of each one of these terms, defined in Bonn – Germany in May 2008 at the World Biodiversity Conference, where agrofuels is the monoculture plantation for the large scale industrial production of fuel, while the term biofuels is referred to the fuel production from organic material (not in large scale).

Still on this conference, the following aspects were identified as the main causes for the unrestrained race for the agrofuels in Mozambique:

1. The beginning of a domination and control of the world process by the multinationals searching for more financial and economic power.
2. Concentration of both the most valuable natural resources and the decision-making power on the hands of a small elite of the Mozambican society.
3. Facility in land expropriation.
4. Exploitation of farmers' labor.
5. Facility in obtaining big financing.
6. Multinationals' control on the production of seeds, fertilizers, pesticides and genetically modified organisms.
7. Corruption.

We are not in support of the form of implementation of the green revolution in Mozambique. We believe an integrated work at a national level is necessary in order to find alternatives for Africa regarding the green revolution; alternatives that must be substantiated in local ecosystems and in the fight for food sovereignty.

More communication between farmers, learning and researching.

Non Governmental Organizations promoting campaigns to support agricultural biodiversity policies and the rights of all small farmers, the pillar of our society.

Considering the mentioned above, this group would like the Government to take the following actions regarding the agrofuel production and the green revolution in Mozambique:

1. Present a participative program, with its policies and its position around agrofuel production and the green revolution in Mozambique.
2. This program should be of public knowledge. Its elaboration process shall include the civil society's participation, with greater emphasis on the farmers.
3. The program shall always grant the land concessions in the terms of the ruling law related to land use in the country.
4. The government shall prioritize the food production instead of the agrofuel production.
5. Support small scale agriculture, organic agriculture, avoiding pesticides, fertilizers and genetically modified seeds.
6. Stimulate the creation of small cooperatives in order for the farmers to become self-sufficient.
7. Create mechanisms for the use, respect and fulfillment of the legal instruments that will allow the farmers to defend themselves in case of land conflict.
8. Assure the farmers' rights of having a healthy agriculture according to the local habits and customs.
9. Guarantee a better transparency in the whole process, involving the farmers on the decision making, informing the farmers about the impacts and benefits, respecting and protecting the farmers and not the multinationals and the foreign investment.

Justiça Ambiental (JA!), the União Nacional de Camponeses (UNAC) and Kulima are Mozambican organizations that believe and fight for:

1. The respect and fulfillment of the Mozambican laws, as well as assure the well-being and the peoples' right of access to basic alimentation, drinking water, health and education and a healthy environment.
2. Communal education, to guarantee the communities are prepared to resist the invasion of big multinational enterprises.
3. A bigger involvement from the civil society on the policies and on the national legislation.
4. The protection of the land right, the right of the community to fight against the agrofuel production through the valorization of the land, defending that the land is an acquired right and not something negotiable, with the vision of the world we want to live in and pass for our children and the generations to come.
5. Energy alternatives that are really ecologic and sustainable like the solar, the wind, the use of biodigester and green plantations.
6. The development of our country and the eradication of poverty will only be reached if the government sets the people as its priority, and not the mega investments that bring no benefit for the Mozambican people.

annex 2

TABLE 2

JATROPHA CULTIVATION IN MOZAMBIQUE

NAME OF PROJECT	SOURCE	COMPANY	PROVINCE	HA	HA (2009)	OBSERVATION
Moçambique Inhluvuka*	1	D1 Oils	Maputo	10,348		Joint venture between South African, Demetrius Pappadopoulos, who is the CEO of D1 Oils Africa together with the Swaziland citizen originally from Mauritius, Gaetan Ng Chiu Hing Ning, who is DI Oils's head in Swaziland.
AGROFER*	1	AGROFER	Gaza	138		
Energem Jatropha	2	Energem Resources Inc	Gaza	60,000	1,447	Energem Resources Inc is a Canadian company.
ESV Bio- Africa	2	ESV Bio - Africa	Inhambane	31,000	7,400	ESV Bio-Africa is an affiliate of ESV Group plc in Mozambique. ESV Group plc is a Ukrainian company.
Enerterra	3	SGC Energia	Sofala and Nampula	20,000		SGC Energia is a Portuguese company.
Elaion África	4	Elaion África LDA	Sofala	1,000		Elaion África LDA is a partnership between Elaion Ag and a Markus Speiser. Elaion Ag is a German company.
GalpBuzi	5		Sofala	25,000		GalpBuzi in a joint venture between a National company of Buzi and Galp Energia. Galp Energia is a Portuguese company.
MoçamGalp	2		Manica	10,000	60	Joint venture between Visabeira and Galp Energia. Visabeira and Galp Energia are Portuguese companies.
Sun Biofuels	2	Sun Biofuels Mozambique	Manica	15,000	1,000	Sun Biofuels Mozambique is an affiliation to Sun Biofuels in Mozambique. Sun Biofuels is a UK company
BIODIESEL MANICA	1		Manica	15,000		
Aviam*	6		Nampula	15,050		Aviam is an Italian Company
Eagle Farm	7	Viridesco Ltd	Niassa	10,000		Viridesco Ltd is a UK company
VEGETAL OIL	1			71,618		
ODEVEZA	1			18,622		
NIQUEL*	1			100,000		
BIOENERGIA	1			6,950		
QUIFEL-LIOMA	1			22600		
PRIO AGRICULTURA-BUZI*	1			6,000		
			TOTAL	438,326	9,907	

* Projects approved.

1 Ministry of Energy data.

2 Interview done during the study.

3 CEPAGRI data (CEPAGRI is the Centro de Promoção Agrícola, and is part of the Ministry of Agriculture).

4 Elaion webpage (www.elaion-ag.de).

5 http://www.abae.pt/programa/EE/escola_energia/2009/docs/biofuel_2geracao_abae.pdf.6 Public Source – Jornal Notícias (<http://www.jornalnoticias.co.mz/pls/notim22/getxml/pt/contentx/725250>).

7 Viridesco webpage (www.viridesco.com).

ESV Bio Africa Nursery, Panda District.



www.foei.org



Friends of the Earth International

