



Implementing Sustainability Criteria for Biofuels and Bioliquids: a case study of Jatropha cultivation in Central and South America

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Summary

Sustainability criteria for biofuels and bioliquids are the favoured policy tool for delivering these types of products in a way that leads to greenhouse gas (GHG) emission reduction while respecting environmental and social goals. Despite the extensive debate over the nature, phrasing and interpretation of sustainability criteria, there is only limited information available about the on-the-ground knowledge of producers, their perceptions of sustainability criteria, current practices and future aspirations. There is a need to understand the current situation and the anticipated response, in particular to the legally binding requirements applicable to all biofuels and bioliquids used to meet targets under the [EU Renewable Energy Directive \(2009/28/EC\)](#).

This briefing examines where and how European energy policy could influence biofuels feedstock production decisions in Central and South America. It is concluded that: while rural development (known as outgrower) projects pursue mainly local social objectives, larger plantation projects - where yields are higher and economic objectives are more important - are more likely to take into account EU policy and requirements in future. Outgrower projects tend to focus on the delivery of local benefits and resources, while plantations are focused on producing a commodity for the national and international market place. However, by far the greatest influence, in terms of monitoring GHG emissions, is the desire to receive carbon credits from the international markets.

While sustainability criteria may help tailor the activities of plantation owners, they will have little impact on, and will not actively promote, the rural development focused outgrower projects. As a consequence if the EU is serious about delivering rural development in developing countries through the promotion of biofuels, there is an additional need to support small-scale and outgrower projects to deliver local social, economic and environmental benefits.

This analysis is based on conclusions from an extensive study conducted by IEEP into Jatropha cultivation in Central and South America¹, part of the wider [Gota Verde](#) project examining Jatropha production.

¹ IEEP (2010) EU Energy Policy and Sustainability of Biofuels: The Case of Jatropha in Central and South America, Nele Bünner

Background

The rapid development of the global biofuels market has led to concerns over the environmental, economic and social sustainability of the industry. As a consequence a number of sets of criteria for assessing the sustainability of biofuels have been developed. Within its Renewable Energy Directive (RED) – 2009/28/EC the European Union adopted the first legally binding set of sustainability criteria (although these criteria are exclusively focused on environmental protection) specifically preserving ‘valuable’ land uses (according to biodiversity value or carbon stores²) and delivering a minimum greenhouse gas saving (initially 35% rising to 50% by 2017 and 60% for new installations).

The Directive requires that biofuels or bioliquids must comply with these sustainability criteria to be eligible for financial support or to count towards the delivery of the Directive’s twin targets for 10% of EU transport fuels and 20% of EU energy needs to be sourced from renewable sources by 2020. As it is unlikely that the target will be met with biofuels sourced in the EU alone, a large share is expected to be imported from suppliers abroad, including Central and South America. The EU approach is complemented by the evolution of sustainability certification systems focused on delivering both sustainable biofuels, that is the Roundtable for Sustainable Biofuels, or sustainable commodity chains, these are the Roundtable for Sustainable Palm Oil, the Task Force Sustainable Soy, the Better Sugar Cane Initiative.

While debate surrounding the setting and implementation of standards has been extensive, there is a more limited understanding as to how these approaches will be taken up and operationalised on the ground. This is particularly the case for novel, non food crops such as *Jatropha*³ – a plant of particular interest given its perceived benefits associated with production, particularly its ability to grow on degraded land and under limited water conditions.

Understanding Jatropha Cultivation in Central and South America

In 2009 IEEP surveyed 10 projects growing *Jatropha* in Central and South America. These were either outgrower⁴ or plantation⁵ projects or adopted a mixed approach,

² Primary forests, protected areas and grasslands of high biodiversity value (both natural and non natural) must be protected. In addition production is not permitted in continuously forested areas, wetlands and peatlands should biofuels production change the status of the land.

³ A detailed summary of the properties and issues of interest associated with *Jatropha* is set out in IEEP’s briefing entitled ‘*Jatropha*: a review of this important biofuel feedstock and the sustainability?’

⁴ **Outgrower projects** are a form of contract farming with smallholder participation (FAO, 2008). Outgrower schemes include an enterprise (this can be private, public, a public-private-partnership, or part of a development project) which is the central managing entity which contracts farmers to plant *Jatropha*. With *Jatropha* as an additional crop, farmers can diversify their income sources. This is a common model applied in development projects which enables farmers to increase knowledge and productivity. It is also applied to biofuel feedstock like cassava and sugar cane.

⁵ **Plantations projects** in contrast, are managed mainly by one enterprise which operates large amounts of land and has all of the decision-making power about production and processing.

that is with both plantation and outgrower characteristics. A table summarising the characteristics of these projects is Annexed to this briefing for information.

It was found that the different ownership structures, outgrower versus plantation, have a significant influence on production decisions. Whereas the pure outgrower's primary interest is the pursuit of local rural development objectives (diversifying farm incomes or offering local fuel supplies for farmers and their communities), pure plantations focus more on economic returns.

The survey found that none of the study participants currently exports to the EU nor were strategic decisions at present driven by the EU policy targets increasing demand for biofuels. Rather, projects were driven by local and regional development needs. Many of the countries in question are net importers of transport fuel. Therefore, there are potential market opportunities available domestically. Plantation owners are potentially interested in accessing the international markets, but this is dependent on the market price for their product.

While delivering environmental benefits was not specified as the primary objective of the projects, this was often considered at a secondary level. All projects noted some form of environmental aim including reduction of GHG emissions, improving soil quality by restoring and reclaiming land, and preventing further soil erosion.

▪ *Awareness of Developing Sustainability Criteria*

Sustainability criteria have been extensively discussed by NGOs, biofuel practitioners, policy makers and in the media. It is often perceived that biofuel producers in developing countries want to export to other markets, e.g. the EU, and that such projects will therefore be affected by EU policy decisions and also by stronger sustainability criteria.

Among those surveyed, while there was an awareness of sustainability criteria as a concept and a desire to deliver *Jatropha* feedstocks in a 'sustainable way', some were not familiar with the standards set by the EU or those being developed by the Roundtable for Sustainable Biofuels (RSB)⁶. Overall, more plantations were aware of the EU's targets, EU criteria and the RSB's approach, than outgrowers. This is likely to be a consequence of the intent of plantations to export their products.

▪ *GHG Emissions and Carbon Credits*

Delivering GHG emission reduction is central to fulfilling any biofuel sustainability standards or criteria, hence securing access to the EU market. Most of the plantations and combined plantation-outgrower projects highlighted that they either will be, or already have, already commenced (as of 2009) calculating GHG emissions. The main driver for this activity, however, is not compliance with sustainability requirements but to obtain carbon credits. In addition to their production of

⁶ There is currently no scheme operational that looks specifically at the sustainability of *Jatropha*, therefore, the main route for certification would be under the RSB once it becomes fully operational.

feedstock, carbon credits can provide a potentially important income source for plantations in particular.

An analysis was conducted looking at the different strategies developers can employ in order to receive carbon credits. It emerged that receiving carbon credits for Jatropha projects is possible based on four different strategies. These are described in detail in the table below.

The best strategy to obtain carbon credits depends on the stage of development of the Jatropha project. In an early stage the strategy would focus on an afforestation or reforestation (A/R) project activity, monetarized in the Voluntary Market. At a later stage renewable energy project activities can accompany this.

Table 1 - Strategies for receiving carbon credits for Jatropha plantations

Project Type	Origin of Carbon Credits	CDM methodology	Standard	Volume of credits	Value per credit	Demand and buyers
Reforestation – judged against a baseline of degraded or extensively managed land – variable requirements for reforestation may apply across counties	Carbon accumulated in Jatropha trees	AR-AM0001	VER* with CCBS add-on recommended	High	Variable 0.5-3 Euro	<ul style="list-style-type: none"> • No demand in compliance market • Higher demand in voluntary market**
Biofuel – produces biodiesel and reduces emissions compared to consumption of fossil fuels	LCA comparison between biofuels and fossil fuels	AMS III.T ACM0017	CDM (possibly GS CDM)	High	High 5-7 Euro	<ul style="list-style-type: none"> • Moderate in compliance market • No demand in voluntary market
Biomass – supplies biomass to power plants, thus reducing emissions from burning of fossil fuels	Electricity production (possibly methane avoidance)	AMS I.D AMS I.C AMS III.E	Depends on project, CDM and VER possible	Medium-high	High 5-7 Euro	High demand in all standards
Biogas – supplies inputs (residues or seedcake) to gas-based power plants instead of fossil inputs	Low carbon electricity and/or heat production (possibly methane avoidance)	AMS I.D AMS I.C AMS III.F	Depends on project, CDM and VER possible	Medium-high	High 5-7 Euro	High demand in all standards

Source: Horka, 2009.

*VER: Verified Emission Reductions (GHG emission reductions not certified under the Flexible Mechanisms of the Kyoto Protocol (i.e. CDM and JI), but in a voluntary certification process for the voluntary market.

**Voluntary market: The voluntary market consists of carbon credit buyers that have voluntarily committed to compensate for their GHG emissions by purchasing emission reduction certificates from GHG reduction projects.

In contrast to the plantation-based and mixed projects, outgrowers did not have strong ambitions to calculate GHG emissions. Those few that were considering doing this were driven by the desire to understand the project's carbon footprint, not with accessing carbon credits or compliance with sustainability criteria set externally. One underlying reason for the lack of enthusiasm of smaller projects is the perception that it is difficult to obtain carbon credits for smaller projects or for dispersed farmers. It is also difficult to define small, dispersed areas of Jatropha trees as forest,

hence they would not be compliant with reforestation requirements. It is, therefore, anticipated by the projects that the economic rewards would not be high.

▪ *Jatropha, Soil Conditions and Degraded Land*

All outgrower and combined outgrower-plantation projects have planted *Jatropha* on marginal soil to some extent. The share of degraded land within these projects varies from 10% to 100%. Plantation projects also use degraded land but there are some that believe *Jatropha* should be grown only on arable land; its cultivation is their core business with yield and profit higher when grown on high quality land. Due to this belief on the part of some plantation project managers there are projects working on 100% arable land and others that cultivate *Jatropha* on 100% degraded land.

It must be noted that when *Jatropha* is cultivated on degraded soil additional nutrients might be necessary to achieve an economically viable production level. Most projects undertake periodic soil examinations/analysis in order to determine the soil quality and what additional nutrients are needed.

▪ *Jatropha – Delivering fuel oil and more*

Most projects surveyed stated that they make use of all parts of the harvested *Jatropha* plant. In addition to the production of oils, residues are also then used to produce solid fuels and products that can be used as fertilisers.

- *Other fuel sources* – one project developer reported that following pressing for oils the left over material can be used to produce organic briquettes – a 3kg briquette has the calorific power of 1 kg of fossil oil. In addition seed cake or press cake (the by-product *Jatropha* oil extraction from the oil-containing seeds) can be used in biogas production.
- *Fertilisers* – All projects surveyed used *Jatropha* as a means to deliver improved soil quality, many projects leave primary material, leaf fall and cuttings, in-situ to transfer micro-nutrients back to the soil. The left over material from oil pressing can also be ground down and composted anaerobically to provide a fertiliser. Moreover, seed cake is rich in nitrogen and can be used as a fertilizer. One project developer reported that chemical fertilizers are so expensive that it is almost impossible for small scale farmers to afford them. Furthermore, in remote markets fertilizers are not even available. For them *Jatropha* provides low price biological fertilizer locally and is not only used for the production of *Jatropha*, but also to enhance the growth of other plants.⁷
- *Animal feed* – Detoxified seed cake (the *Jatropha* seeds contain a toxin, hence the reason *Jatropha* is not used as a food crop) can be used for animal feed with 56% protein.

▪ *Social and economic development*

⁷ The seed cake can also play an important economic role for *Jatropha* production, and can be regarded as a product on its own, especially in regions where other fertilizers are not readily available.

The economic and social risks are quite different between the various ownership structures. Small-scale farmers are generally closely involved in decision making and, therefore, training and economic benefits are more likely to remain in the community. From an economic perspective, outgrower schemes require investment of input material and training, but little investment in land as the cultivation is undertaken on the outgrower's land. In addition, risk is reduced as it is shared among the outgrower farmers. Outgrower projects surveyed were established to aid the local community by diversifying farmer income, offering a mechanism for utilizing degraded land and offering shade in the form of fences for other crops. As such they are likely to have a little impact (and potentially a positive impact if well managed) with respect to pressures for land, water and food security.

Plantations, on the other hand, require significant investments in land, labour and inputs, but do not have to spend money on training farmers or managing a wide network of small plots of *Jatropha* crop. In addition, plantations have more flexibility to take strategic decisions for the profit of the company, which may reduce transaction costs and increase economic efficiency. Plantations do, however, have to bear all the risk alone, with the shareholders. While bringing income into a region, plantations are therefore not pursuing the wider range of rural development objectives adopted by outgrowers.

Annex

Description of projects participating in survey*

Location	Type of project	Amount of <i>Jatropha</i> planted in June 2009 (in ha)
Central America	Outgrower	> 200 < 300
Central America	Outgrower	> 10 < 50
South America	Outgrower	> 500 < 1000
Central America	Outgrower	> 200 < 300
Central America	Plantation and Outgrower	> 50 < 100
South America	Plantation and Outgrower	> 50 < 100
South America	Plantation and Outgrower	> 1000 < 1500
South America	Pure plantation	> 1000 < 1500
Central America	Pure plantation	> 1000 < 1500
Central America	Pure plantation	< 10

*In order to present the data in an anonymised form, the amount of area planted with *Jatropha* is only presented in intervals and the location is not indicated per country but per region.