Title: Jatropha curcas: Sowing local seeds of success in Malawi. In response to Achten et al. (2010)

Article Type: Short Communication

Keywords: biofuels; livelihoods; Africa; food security; small-scale.

Abstract: Although biofuels remain contentious, Achten et al. (2010) note that small-scale, local shifts towards growing the inedible, biodiesel crop Jatropha curcas (Jatropha) may overcome some of the negative points inherent in popular biofuel-focused debates, including those surrounding food insecurity and environmental degradation. In this short communication, we assess the views expressed by Achten et al. (2010) using new case study research that identifies and analyses the impacts of both local-level community-led and larger-scale private sector Jatropha projects in Malawi. Although large-scale cultivation of Jatropha faces risks of economic loss due to knowledge gaps and unpredictable yields, our research shows that small-scale initiatives can contribute positively to rural livelihoods. Sales of seeds or production of Jatropha oil for stoves, engines, soap and paraffin can result in reduced household expenditure or increased incomes, offering a supplementary livelihood activity, or in some cases, a substitute for less attractive current activities. For these benefits to be realised and up-scaled, further institutional support in terms of knowledge and technical provision is vital, and must be communicated through well-established and locally-appropriate channels. So while the biofuel debate and hype remains global, we assert that actions should be focused at the local level. Such an approach can help to realise developmental, sustainability and climate change benefits across a range of scales.
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**Jatropha curcas: Sowing local seeds of success in Malawi**

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**Introduction:**

The global debate on biofuel cultivation continues as governmental, private sector and Non-Governmental Organisation (NGO) actors strive to address ongoing challenges relating to climate change, energy security and the depletion of fossil fuel reserves (Ravindranath et al., in press). Although biofuels remain contentious, Achten et al. (2010) note that small-scale, local shifts towards growing the inedible, biodiesel crop *Jatropha curcas* (*Jatropha*) may overcome some of the negative points inherent in popular biofuel-focused debates, including those surrounding food insecurity and environmental degradation. Currently, *Jatropha* cultivation is taking place on a range of scales, through both large-scale plantations driven by private-sector companies and local-scale community-led projects typically supported by NGOs (Openshaw, 2000).

In a recent think note published in the Journal of Arid Environments, Achten et al. (2010) evaluate the opportunities and challenges associated with *Jatropha* cultivation. They express concern that in order to reduce the financial risks of investment into large-scale *Jatropha* cultivation, investors will be likely to plant *Jatropha* on productive agricultural lands, rather than the marginal lands that *Jatropha* can allegedly reclaim (Francis et al., 2005, Fairless, 2007). Small-scale models of community-based projects for rural development purposes are therefore
identified as a priority area requiring further research to assess whether the espoused benefits of *Jatropha* production to be realised (Achten et al., 2010). For example, they consider that the use of *Jatropha* oil in stoves, lamps and generators can reduce farmers’ dependency on fossil fuels at the local level, assisting rural development. They note the potential benefits that *Jatropha* offers smallholder farmers as an additional income source and/or through conservation of other valuable ecosystem services, and/or by reducing labour demands for fuelwood collection. They further describe how *Jatropha*’s woody by-products can be used for fuelwood, seedcake for manure, and how the shrub can act as a living fence with the potential to reduce soil erosion and protect crops from grazing animals. In order for small-scale approaches to be successful and for projects to be sustainable, Achten et al. (2010) recognise the need for *Jatropha* to benefit the adopting farmer(s) and stress the importance of extension services through cooperatives and local networks.

In this short response, we assess the views expressed by Achten et al. (2010) in light of new case study research that identifies and analyses the impacts of both local-level community-led and larger-scale private sector *Jatropha* projects across Malawi.

**Jatropha in Malawi: discrepancies in yield?**

Several organisations, employing different approaches, are actively involved in *Jatropha* cultivation, operating at different scales. These include private-sector enterprises such as Bio-Energy Resources Ltd. (BERL), aiming for large-scale biofuel production through contract farming with smallholder and commercial farmers, Fuel Crops Demeter, engaging in intensive large-scale *Jatropha* farming on a commercial plantation farm, and Toleza Agricultural Enterprises, establishing small-scale contract farming schemes and cultivating *Jatropha* as boundary fences. NGOs such as Environment Africa and Janeemo¹ are also promoting small-scale adoption of *Jatropha* cultivation. Yields produced from different schemes vary greatly depending on the scale of adoption and are often confounding growers faced with managing a still largely wild crop (Gressel, 2008). Janeemo, for example, have reported excellent yields in southern Malawi from a village located on a flood plain, despite previous research suggesting *Jatropha* is sensitive to waterlogging (Achten et al., 2007, Kumar and Sharma, 2008) and Fuel Crops Demeter have experienced considerable attacks on their crop by termites and *Zonocerus elegans* (elegant grasshoppers) with subsequent growth reduction, despite claims that *Jatropha* is ‘pest-resistant’ (Francis et al., 2005, Openshaw, 2000). These findings support Achten et al.’s (2010) observation, as well as findings by Shanker and Dyani (2006), that suggest *Jatropha* yields are difficult to predict and monocultures may be subject to pests and diseases.

Considering these practical discrepancies, it is indeed pertinent to proceed only cautiously with large-scale *Jatropha* cultivation to reduce the risks of economic loss. For example, Fuel Crops Demeter have delayed the introduction of a contract farming scheme until the future of *Jatropha* as a biodiesel is more certain, leading to local concerns that social and economic benefits of the crop are not yet being realised. Furthermore, unsuccessful attempts by smallholder farmers to cultivate the crop in surrounding rural communities, without the necessary institutional support, will impact on willingness to adopt *Jatropha* in the future.

**Jatropha: Displacing agriculture and food crops?**

Many organisations, such as NGOs, Department of Forestry and Toleza Agricultural Enterprises, are continuing to promote *Jatropha* as a boundary crop around homesteads and *mundas* (areas of crop production) for smallholder farmers rather than choosing to plant on land which could be, or has been, used for agricultural production. Our preliminary analyses from across 3 schemes show that when cultivated as live fences, *Jatropha* can be tended as part of the usual farming routine with minimal additional effort, and that the fence protects the food crops from wind and grazing animals.

Results from studies involving household interviews across 6 villages also indicate that *Jatropha* will not be grown in place of food crops by smallholder farmers. This is due largely to the cultural importance of maize production (Heisey and Smale, 1995). When respondents were asked to rank the importance of household income generating activities, all placed maize cultivation as number 1 (n=25). When asked if *Jatropha* was likely to be grown in place of maize in their household, one interviewee replied: *'Maize? That's life! You have to have nsima'*

2. Of the 13.6 million population of Malawi, approximately 90 % rely on rainfed agriculture and farm smallholdings of 0.2 – 3 ha (Ellis et al., 2003). Maize is the principal crop, predominantly cultivated for subsistence use, along with, for example, pigeon peas, sorghum, groundnuts and cowpeas (Orr et al., 2009). In this context, it is critical that *Jatropha* does not replace maize or other food crops and indications are that cultural practices ensure that this will not happen.

**Small-scale *Jatropha* initiatives; rural development opportunities?**

Evidence also supports claims by Achten et al. (2010) that *Jatropha* has the potential to promote development at the household and village level in a variety of ways. While Achten et al. (2010) propose utilising the oil as an alternative to fossil fuels in stoves and generators, NGOs in Malawi are promoting soap and paraffin production, and private-sector enterprises are establishing outgrower schemes. As an alternative fuel in stoves, the use of *Jatropha* oil may lead to a reduction in respiratory diseases, such as tuberculosis, which are linked to cooking with solid fuel (Akunne et al., 2006). As an alternative to diesel and for soap and paraffin making, *Jatropha* oil can also reduce capital expenditure and/or provide an income source through sale of the oil or the subsequent products.

NGOs, such as Janeemo, offer technical support by providing hand presses which allow villagers to expel oil and produce their own paraffin and soap. Consensus among focus group participants suggested that this can result in a significant reduction in expenditure of up to MWK 1000 (approximately $7) per month enabling household funds to be used to purchase maize, thus increasing food security. Markets are being sought where this soap and paraffin can be sold to provide a regular income and benefit more people. In addition, leftover seedcake, with a nitrogen content similar to chicken manure, can be used as an organic fertiliser on agricultural land (van Eijck and Romijn, 2008). Janeemo also specifically target villages for their projects where *Jatropha* is already used as traditional fencing material or where soap-making, using other oils, is already taking place. This approach reduces start-up risks and safeguards initial investments. Toleza Agricultural Enterprises are embarking on a similar project, encouraging villages around the farm to grow *Jatropha* by employing local innovators to train farmers in planting techniques, as well as in soap and paraffin making. Toleza are purchasing the locally-produced seeds to achieve fuel self-sufficiency across the farm, and offer the option for farmers

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2. *Nsima* – staple food of Malawi made from ground maize flour and water
to press their seeds to make soap and paraffin. This negates the need for farmers to invest in technology such as seed presses and in the case of Toleza, reduces diesel emissions at a local scale.

Households that cultivate cotton as a cash crop see Jatropha as offering a potential additional or substitute income source that can reduce the impacts of market fluctuations, such as those that were evident in the 2009/2010 cotton harvests. One interviewee said: ‘when [cotton] flops you don’t have a fall back and it’s not stable in terms of price due to market forces. When the markets are flooded then farmers suffer and this is worse recently, especially last year (2009).’ If Jatropha is used within the household for soap and paraffin, there is a greater independence from market forces and farmers can sell the seeds and products when the prices are high, rather than being forced to sell crops on an already flooded market at low prices.

Formal and informal employment are also widely practiced livelihood activities, with the majority of farmers engaging in ganyu labour at some point during the year, most notably to undertake weeding and land preparation activities on others’ land before the harvest, at a time when food is in short supply (Bryceson and Fonseca, 2006). The availability of ganyu coincides, necessarily, with the need for smallholder farmers to spend time on their own fields. Perhaps most significant therefore, is the potential that Jatropha can offer in terms of providing a regular income, allowing households to accrue savings, which would permit farmers to devote less time to ganyu labour and enable them to spend more time tending their own crops. This benefit came across strongly in focus group discussions: ‘If we could sell lots of [Jatropha], we could stop doing piecework... we still hate having to work really hard on someone else’s garden and then be too tired to work on our own.’

**Small-scale Jatropha cultivation: what role for extension networks?**

In contrast to the findings of Ariza-Montobbio and Lele (2010) in Tamil Nadu, development benefits from Jatropha projects in Malawi appear not to be exclusive to farmers with larger landholdings or resource endowments, but rather to those who have access to information on crop cultivation practices and seed processing. This supports assertions by Achten et al. (2010) that extension networks are key to the success of Jatropha initiatives and that institutional support plays a vital role in achieving positive project outcomes. This is well demonstrated in the case of Janeemo, who are working closely with extension officers from the Department of Forestry, as well as traditional authorities, in promoting knowledge exchange and best practices. Consequently, the core messages on the cultivation and management of Jatropha underpinned by the local development and empowerment goals of the organisation have been reinforced by government extension workers. Traditional authorities have also helped the process of communication since they have considerable influence at the local level as opinion leaders in the adoption of new technologies and practices (Rogers, 1995). In villages where the Chief was unconvinced by the benefits of Jatropha, adoption was notably less widespread than in villages where the Chief was an advocate of the crop. Toleza has yet to utilise the Traditional Authority networks and as such has seen far lower uptake of Jatropha than Janeemo has experienced in their target villages.

**Conclusion**

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3 *Ganyu* is casual labour arrangements between households for cash or other payment e.g. maize
In presenting initial case study data from Malawi, the sentiments expressed by Achten et al. (2010) have been further supplemented and endorsed. We argue that this level of local case study research shows that small-scale initiatives do have the potential to contribute positively to rural livelihoods. Sales of seeds or production of *Jatropha* oil for stoves, engines, soap and paraffin result in reduced household expenditure or increased incomes, offering a supplementary livelihood activity, or in some cases, a substitute for less attractive current activities. For these benefits to be realised and up-scaled, further institutional support in terms of knowledge and technical provision is vital, and must be communicated through well-established and locally-appropriate channels. So while the biofuel debate and hype remains global, we assert that actions should be focused at the local level. Such an approach can help to realise developmental, sustainability and climate change benefits across a range of scales.

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**References**


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