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Think Note

Jatropha: From global hype to local opportunity

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The global interest in biofuels does not go unnoticed. The keen interest in biofuels is mainly inspired by climate change issues, aiming to reduce CO_2 emissions, as well as by geopolitical issues, aiming to reduce nations' dependence on fossil fuels (Verrastro and Ladislaw, 2007). However, biofuels are highly controversial because their production holds significant economic (e.g., subsidies and protectionism), social (e.g., food security) and environmental risks (e.g., loss of biodiversity and water recharge, negative carbon balance) (FAO, 2008; Fargione et al., 2008; Mitchell, 2008; Searchinger et al., 2008; Stephens et al., 2001; UN-Energy, 2007). *Jatropha curcas* takes a special place in this debate, as it is claimed to produce biofuel and enhance socio-economic development while reclaiming marginal and degraded lands in (semi-)arid regions (Francis et al., 2005), without competing with food production or depleting natural carbon stocks and ecosystem services.

The global biofuel interest, materialized in directives and blending targets (e.g., European Union, 2009; India, 2003) and the hyped sustainability claim of the *Jatropha* biofuel (Fairless, 2007), is triggering large-scale investments and expansion of *Jatropha* plantations (Carels, 2009; GEXSI, 2008). With the current state of knowledge about the impacts and potentials of *Jatropha* plantations, this pathway holds risks of unsustainable practices in developing countries (Achten et al., 2007; Maes et al., in press).

We believe that the current knowledge gaps and uncertain economic perspectives, together with competition on the global biofuel market, might drive *Jatropha* investors away from marginal or degraded lands towards agricultural or lands that are valuable for biodiversity, in order to reduce financial risk. *Jatropha*, despite the fact that it is largely undomesticated, needs resources like any crop to achieve high productivity. If *Jatropha* competes for land with food crops or high carbon stocks, it would lose its acclaimed sustainability advantages. The considerable lack of insight in genetics, input responsiveness and agronomy of *Jatropha* makes yields poorly predictable (Achten et al., 2008). Additionally, monocultures are likely to face unexpected pest and disease infestations (Shanker and Dhyani, 2006). Consequently, the economic viability of this – basically wild – plant is still highly uncertain, particularly when created jobs respect sustainability standards and social costs are accounted for (Achten et al., 2007).

As an alternative, we believe the global hype could be harnessed to increase rural development by considering small-scale, community-based *Jatropha* initiatives for local use, like small *Jatropha* plantations, agroforestry systems with *Jatropha* intercropping, and agro-silvo-pastoral systems. In land-locked or very remote areas, where fuel wood is the main source of energy and where kerosene and diesel supply are erratic and very expensive, *Jatropha* offers an improvement opportunity. The oil, easily extractable with simple (Achten et al., 2008) and cheap (Messemaker, 2008) technology, is a good fuel for stoves, lamps and even large static running engines (e.g., pumps, mills, generators) (Achten et al., 2008). Communities using fossil fuels can reduce their dependency on them by substitution with *Jatropha* oil. Communities without access to fossil fuels acquire an asset for development (e.g., energy used to increase productivity).

The approach of small-scale *Jatropha* production for local oil use offers additional advantages. First, as an additional crop to the current set of farmers' activities, applicable in different cropping systems, farmers can diversify their income sources. Second, *Jatropha* produces woody by-products such as pruning waste and

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fruit hulls which are useful as combustible (Gubitz et al., 1999), which will reduce pressure on remaining forests and woodlots. Third, planted as a hedge *Jatropha* can be used as a living fence, to exclude browsing animals for ecological restoration or food crop protection because it is unpalatable to livestock (Gubitz et al., 1999; Zahawi, 2005). Fourth, *Jatropha* can also be planted in contour hedgerows to reduce soil erosion (Gubitz et al., 1999; Heller, 1996) and to improve soil quality in degraded ecosystems (Ogunwole et al., 2008). Finally, locally organized oil extraction will keep seed cake, which is useful as combustible or as a soil amendment (Gubitz et al., 1999), available for the local farmers, which is more difficult in centralized processing setups (Francis et al., 2005), often used for large-scale projects.

Besides these advantages, this approach reduces several risks related to large-scale monocultures. First, the farmer can individually limit initial investment and control his/her start-up risk. Second, the limited scale of the initiatives holds only small risk of environmental impact on biodiversity, ecosystem functions and hydrological balance. Third, a community-based approach is unlikely to drive farmers to unsustainably convert arable or natural lands to *Jatropha* at large scale.

Implementation of this model needs important extension efforts through cooperatives and local networks having good insight in local environmental, economic, cultural and social processes. Their assistance in the introduction of *Jatropha* should start with the communication of correct information on land suitability including potential yield range, risk of yield loss, management practices and possible water competition (Maes et al., 2009), as *Jatropha* will not yield well on all sites for which its suitability has been claimed (Trabucco et al., 2008). Furthermore, these extension efforts should assist in acquiring plant material at low cost and in the post-harvest processing and product use as well (e.g., multifunctional platforms, see Havet, 2003).

The most important condition for the success of such a pathway is that this small-scale model benefits the adopting farmer. Therefore, the *Jatropha* cultivation and oil pressing, delivering oil and by-products, should be less costly, in terms of resource use, be it labor, water or money, than the collection of firewood, the purchase of kerosene or other conventional fuels. Under such conditions *Jatropha* can be added to farmers' current set of activities on lands unsuitable for expansion of one of those activities or natural conservation, but suitable for *Jatropha*.

This is not a call for abandoning the large-scale *Jatropha* pathway, as beside the risks, this model hosts opportunities (e.g., significant and efficient energy production) and risk reducing possibilities (e.g., conservation set asides) as well. The authors intend to show that the global *Jatropha* hype hosts local pro-poor opportunities as well and note that initiatives are already on their way (Lengkeek, 2007; Practical Action Consulting, 2009).

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