Transition Towards Jatropha Biofuels in Tanzania?

An Analysis with Strategic Niche Management

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Summary
The global energy supply is predominantly based on fossil fuels. This causes great environmental, political and social problems. There is an urgent need to develop more sustainable sources of energy. Biofuels are one option, since they do not contribute to the greenhouse effect. The biomass which is necessary for the production of biofuels can be derived from several sources, one of which is oilproducing crops.

Currently, Eindhoven University of Technology is exploring the potential of biofuels in Tanzania, where the population is mostly rural, very poor and without access to adequate energy services. Production of biofuels in Tanzania - and many other poor tropical countries - could help to stop soil erosion, create additional income for the rural poor, and provide a source of energy both locally and internationally. Thus, production of biofuels could save, or even earn precious foreign exchange.

Current initial activities in Tanzania have been directed towards the use of *Jatropha curcas* L., an indigenous plant whose seeds can be pressed to obtain oil. The water and nutrient requirements of the plant are modest, while its oil yield is relatively high. However, so far it has remained unclear how a transition towards a Jatrophabased energy regime could be realised, and what factors would influence that process. Therefore, the main research question posed in this research is:

> *What is the status of the energy transition process towards Jatropha biofuels in Tanzania, and how can that process be improved?*

The principal tool for analysis adopted in this research is Strategic Niche Management (SNM). SNM is a recently developed approach in the field of evolutionary innovation studies. It focuses specifically on the issues involved in the introduction of sustainable new technologies, and the catalytic role these innovations can play in fostering a broad socio-technological transition towards more sustainable development. SNM adopts a multi-level perspective, consisting of 'landscape' (overarching macrosetting); 'regime' (sectoral setting); and 'niche' (the micro or project level where the innovation develops and diffuses). This perspective is used to analyse whether developments at each of those levels have a positive or negative influence on an emergent transition process.

The research is based on substantial fieldwork in Tanzania during March-June 2005. Existing literature was used as a secondary source of information.

Many applications for Jatropha were found to exist. Using the production chain concept, these were ordered into three stages: cultivation, production (pressing) and usage. At the third stage, a further subdivision was made. The oil can be used in diesel engines, but also in oil lamps, cooking stoves, and as basis for soap-making. The seedcake has several uses, mainly for biogas production and as fertiliser.

The landscape, regime and niche dynamics of all these different applications were examined. Most developments at the *landscape level* influence the transition positively. At regime level, four regimes were found to be relevant to the transition: the *agricultural* regime, the *vegetable oil* regime, the *energy* regime and the *financial* regime. Most regimes are open to new developments, and current practices are close to those needed for Jatropha. The user preferences in the energy regime might limit the possibilities of the use of Jatropha oil, but at least there is a clear recognition of current problems. All four regimes are influenced in the same way by the cultural aspect: people seem to be risk averse and reluctant to try something new. Guaranteeing a fixed sales price for seeds to farmers, for example, might overcome this problem. The analysis of the dynamics within the different *niches* showed that the processes in the first step of the production chain, cultivation, have proceeded particularly well. In the other niches, the major problems are lack of sufficient learning processes, and expectations that are still wide and diverse.

The main conclusion is that the transition toward Jatropha biofuels in Tanzania is still in a very early phase.

Recommendations are made for action at several socio-economic levels, to increase the possibility of a transition. Methodological recommendations are made as well.