Proceedings of the Side Event

Biofuels Development in Drylands – Panacea or Empty Promise?

COP 8 UNCCD, Madrid 5th and 6th of September 2007

gtz CCD Project
Convention Project to
Combat Desertification

On behalf of
Federal Ministry
for Economic Cooperation
and Development

This publication contains a partial summary of presentations and remarks made by participants at two panel discussions that were held as side-event to UNCCD COP 8 in Madrid, Spain, 2007.

Its purpose is to serve as an unofficial work of reference for use by anyone interested in the subject matter.

This publication is not a formal record of proceedings, nor do the views expressed in these pages necessarily represent the policies of any of the organizations who were represented at the event or were involved in its planning and organization.

Published in December 2008 by

Deutsche Gesellschaft für
Technische Zusammenarbeit (GTZ) GmbH
Postfach 5180
65726 Eschborn/Germany
www.gtz.de

Editor:
Anselm Duchrow,
Convention Project to Combat Desertification (GTZ);
Mike Gardener, Ruth Delzeit

Responsible:
Dr Anneke Trux,
Convention Project to Combat Desertification (GTZ)

Design: Karina Waedt

Contents

Introduction

Energy from Biomass continues to be a focal point of interest worldwide. While several countries have considerably increased their production for domestic demand, the international biofuels market is clearly set to grow, too. European biofuels quotas, for example, of attaining a 5.75% biofuels share by 2010 and even a 10% share by 2020 can only be met by imports. The necessary biomass will predominantly be produced in developing countries, which places the issue at the centre of development politics.

The two key arguments put forward in the biofuels debate are their long-term contribution to securing energy supply and their beneficial role in the context of climate change thanks to reducing CO_2 emissions levels. Moreover, developing countries have high expectations with regard to boosting employment in rural areas, solving local energy and transportation problems as well as improving their trade balance.

However, and this is why the debate has become increasingly controversial, biofuels also entail undeniable risks. First of all, there is an environmental risk. Especially in fragile environments such as drylands, production itself could jeopardise the environment, for example through large-scale plantations putting pressure on water resources and biodiversity. Critics therefore prefer to refer to Agrofuels instead of Biofuels. They argue that the prefix "bio" wrongly suggests that some kind of biological production systems are at the root of these energy sources.

A further issue raised by critics is the threat of biofuels crops displacing food crops and thus contributing to hunger, also indirectly through increasing food prices. The recent price explosions of corn in Mexico are said to be partly a result of massive levels of ethanol production from corn in the USA.

Finally, concern has also been mounting over potential negative impacts on resource concentration trends in rural areas, resulting in further impoverishment of small-scale farmers and their families.

Against this background, and bearing in mind that high expectations have been raised with regard to their potential for dryland development, biofuels suggest themselves as an issue to be addressed by the United Nations Convention to Combat Desertification, UNCCD.

The two side-events of "Biofuels in Drylands – Panacea or Empty Promise" organized by GTZ, on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), on the occasion of the UNCCD 8th Conference of the Parties in Madrid in September 2008, reflected a considerable interest taken by many actors in the topic.

Two guiding questions led through the event:

How can existing investments in biofuels production in the drylands be evaluated against the main socio-economic as well as environmental criteria?

What potential role can the UNCCD actors play in improving local and global governance of biofuel development?

The side-events were attended by representatives of biofuels projects in the South, NGOs and international organizations as well as academics working in the relevant areas. Side-Event I comprised a stocktaking of developments in the biofuels field, while in Side-Event II, the emphasis was on identifying the standpoint and role of UNCCD actors. The first of the two three-hour events was arranged as a series of four presentations with subsequent discussions with the audience, while the second one was held as a panel debate, again with opportunities for the audience to comment (see Programme in Annex 1).

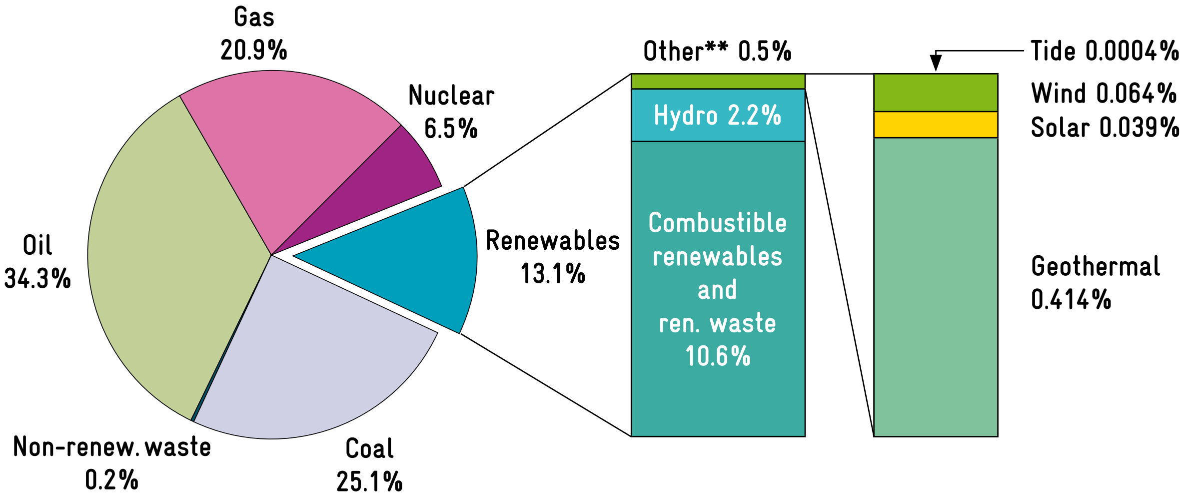
These proceedings aim to provide the reader with a documentation of the case studies and the discussions of the two side-events in Madrid. Part 1 looks at experience gathered in a selection of schemes promoting biofuel value chains in Asia, Africa and Latin America, while Part 2 provides some elements for an interdisciplinary assessment of biofuels development. Setting out from the panel debate in the second side-event, Part 3 puts the issue of biofuels development into the UNCCD context, with special emphasis on the potential role for UNCCD actors to play in the light of the UNCCD 10-Year Strategy.

The focus being on the drylands, only biofuels derived from oilseeds are dealt with here. In terms of the biofuels options, this includes the use of pure plant oils (also known as straight vegetable oils) and their processing for biodiesel, not however bio-ethanol, as this option usually relies on sugar cane or maize and therefore has little potential in the drylands. Bio-ethanol is referred to in the Box below for reasons of comparison.

Box 1 Global bioenergy production:

Biomass can be used for transportation (biofuels), for the production of power/electricity and for heat generation. It accounts for around 10 percent of the global energy mix and represents the lion's share of renewable energies (see Figure 1). It can be divided into traditional biomass, which refers to the direct (mostly inefficient) combustion of wood, charcoal, leaves, agricultural residues or animal/human, and urban waste and is still the most important form of biomass, and modern biomass energy use, which comprises the conversion of biomass energy into advanced fuels, namely liquid fuels, biogas and electricity (Karekezi et al. 2004).

Figure 1: 2004 fuel shares of world total primary energy supply*



* TPES is calculated using the IEA conventions (physical energy content methodologoy). It includes international marine bunkers and excludes electricity/heat trade. The figures include both commercial and non-commercial energy.

** Geothermal, solar, wind, tide/wave/ocean.

Totals in graph might not add up due to rounding.

Source: IEA Energy Statistics

Box 2: Biofuel production and raw materials

The production of pure plant oil and biodiesel is possible with a wide range of oil-bearing plants, including e.g. rapeseeds, palm trees, cassava, castor and Jatropha. Jatropha plants belong to the Euphobiaceae family. This genus comprises hardy succulents, shrubs and trees that have a variety of useful properties. The most well-known of them, the Barbados or Physic nut (Jatropha curcas), has a considerable potential for biofuels in drylands. In the following, it will usually be referred to simply as Jatropha.

Pure plant oil is extracted with an oil press, and with a subsequent processing step (desertification), it can be processed to biodiesel. Pure plant oil is produced decentralized, while a central biodiesel plant is needed for the production of biodiesel. Both can substitute fossil diesel. If biodiesel is used as a blend, a diesel engine requires no modifying, while if it is used pure, minor modifications of the engine or generator will be necessary. With pure plant oil, diesel engines need to be modified. Both types of fuel can be used for transportation or the production of energy. Worldwide, 95 % of biodiesel is produced in the European Union, with rapeseed as the major source of biomass.

Bioethanol is the most commonly used biofuel. Globally, 41.3 bn litres bioethanol was produced in 2004, a figure that rose to almost 46 bn litres in 2005. In the same year, the United States of America was able to overtake Brazil in bioethanol production for the first time (F.O. LICHT 2005b, p. 430). Bioethanol is gained from plants containing sugar or starch, like sugarcane, sugar-beet or maize.

The Biomass-to-Liquid technology is still in a pilot phase and economically not viable yet. By gasification of whole plants, synfuel is produced from the gasified biomass. It can be used to substitute fossil diesel.

Biogas, produced from e.g. manure, biogenous waste, and maize, can be used for the production of heat and power in block heat power plants, or if processed to natural gas quality, it can substitute natural gas for cars or by induction in the natural gas net.

Figure 2: Overview on biofuels process chain

	Biofuels based on plant oils		Bioethanol	BtL (Biomass-to-Liquid)	Biogas facilities
	Pure plant oils	Biodiesel			
Field Biomass supply	Rapeseeds Sunflowers Soy Palm Jathropa Cassava Castor-oil plant		Sugar cane Maize Corn (cereal) Sugar beet (Lignocelluloses)	Wood waste and residues Straw Energy crops	Menure Biogenous waste Maize Corn (cereal)
Biomass processing	Pure plant oil Oil press (decentralized) Press cake	Pure plant oil Oil press (centralized) Oilseed extraction meal	Cleaning, washing, milling and preparation for suspension Vinasse	Coke/Pyrolysis oil Smouldering gas Hydrogene	Fermentation to biogas Biogas facilities, farms Degistate
Biofuel production		Esterification at biodiesel plant Methanol Glycerine	Fermentation and distillation at bioethanol plant Mash	Gasification (synthesis gas) Fischer-Tropsch-Synthesis	Biogas processing to natural gas quality
Biofuel marketing	**Pure plant oil** Modification of diesel engines necessary Use in car engines or generators (electricity)	**Biodiesel** Minor modification of diesel engines necessary Blending to fossil diesel, use in car engines or use in generators (electricity)	**Bioethanol, ETBE** Pure Ethanol Cars Blending to fossil gasoline (-> Flexible-Fuel Vehicle)	**Sundiesel** Blending to fossil diesel	**Greengas** Power and heat generation Induction into gas net Substitution of natural gas in cars

By-products
Additives

Source: Modified after Breuer et al. (2008)

Jatropha Based Biofuel Development in Semi-Arid Tropics: Experience from India

The biodiesel project in India was presented by Ms. Divya Kashyap, who is a member of the GTZ Natural Resource Management (NRM) Programme in India.

Background and context of the project

In India, biofuels development aims at four main objectives: energy security, employment opportunities, greening of wastelands, and reduction of greenhouse gas emissions. Some basic facts, presented in the following, may suffice to explain the expectations attributed to biofuels in these four areas.

With respect to the energy sector, India imports 70 % of its fossil oil consumption. By 2030, this share is expected to increase to 92 % (World Energy Outlook), increasing the country's dependency on imports and exposing its economy to the volatility of world market prices for this commodity. At the same time, rural areas in India are still facing an energy deficit, given that presently only around 55 % of households are electrified, leaving over 20 million households without power (Cust et al. 2007).

However, the substitution of fossil fuels by biofuels can only make a limited contribution to satisfying rising fuel demand. GDP growth of 7 % per annum implies an increase in fuel supply of 10 % per annum. A 10% blending of biodiesel by 2030 at present yield levels requires a cultivation area of 47.5 million hectares of wastelands. In fact, only 32 million hectares of land is classified as cultivable wastelands, resulting in a maximum potential blending of 5 % under the current productivity of oil plants. This would result in limited foreign exchange savings of about US$ 2.5 billion.

More important are the expectations with regard to employment and income generation opportunities through decentralized and people-centric biofuel approaches which relate to the socio-economic problems of rural areas. It is important to recall that 75 % of India's poor are still concentrated in rural areas. While 67 % of the population are involved in agriculture, this sector contributes only 33 % of the country's GDP. Small-scale or marginal farmers with very limited resources and minimal access to state-of the-art agricultural technologies make up more than 70 % of the sector (Ministry of Environment and Forestry 2002). Poverty is accompanied by unequal access to resources. While about 84 % of rural households cultivate less than two hectares of land, the other 16 % operate almost 66 % (Turner 2004).

The contribution to productive use and even reclamation of wastelands is based on 17 % (55 million hectares) of India's total land being classified as wastelands, 32 million hectares of which is cultivable (Wasteland Atlas of India 2005). The "Report of the Committee on Development of Bio-Fuel, 2003" estimates a potential for Jatropha cultivation on wastelands of two million hectares, and a total potential on different land types of 13.4 million hectares (see Table 1).

The contribution to productive use and even reclamation of wastelands is based on 17 % (55 million hectares) of India's total land being classified as wastelands, 32 million hectares of which is cultivable (Wasteland Atlas of India 2005). The "Report of the Committee on Development of Bio-Fuel, 2003" estimates a potential for Jatropha cultivation on wastelands of two million hectares, and a total potential on different land types of 13.4 million hectares (see Table 1).

These opportunities have led the Indian government to support biofuels, and a "Committee on Development of Biofuel" was constituted in 2002. A report written by the Committee in 2003 proposed a National Mission on Biodiesel (NMB) and recommended the use of non- edible oils and the development of wastelands in order to avoid competition with food production. In the report, two non-edible oil species, Pongamia pinatta (indigenous) and Jatropha curcas were identified and a demonstration project to raise 400,000 hectares of Jatropha for the production of 0.5 tons of biodiesel was proposed. In the same year, a Public Private Partnership (PPP) Project between Germany's DEG (German Investment and Development Association) and Daimler Chrysler was set up, and initial Jatropha biofuel tests were conducted with different engines. In 2005, the Bureau of Indian Standards defined biodiesel quality standards, and a "Biodiesel Purchase policy" was implemented, offering US $ 0.63 per litre of biodiesel. In the same year a study on "Biofuels for transportation: potential & implications for sustainable agriculture and energy – India" was completed by German development cooperation. Additional efforts were made to promote biodiesel from Jatropha in 2006, when the NRM collaborated with the Indo-German Export Promotion Project (IGEP) in testing a small diesel engine to study the impact of non-edible vegetable oil on engine performance. The IGEP Foundation reinforces and promotes bilateral commercial and economic partnerships between India and Germany. It is sponsored by the Indian Government.

Embedded in this framework, the case study focuses on a PPP Project which was started in 2005 by GTZ with Lurgi AG and Southern Online Bio Technologies Ltd. (SBT), ICRISAT and Chemical Consortium International Ltd. (CCI).

Table 1: Estimation of lands suitable for Jatropha curcas plantation

Area in Million Hectares

Land Type	Area	Potential for Jatropha plantation
Under stocked forests	31.0	3.0
Protective hedge around agricultural fields	142.0	3.0
Agro-forestry		2.0
Fallow Lands	24.0	2.4
Land related programmes of Ministry of Rural Development		2.0
Public lands – railway tracks, roads, canals etc.		1.0
TOTAL	197.0	13.4

Source: Planning Commission (2003) Report of the Committee on Development of Bio-Fuel, Government of India Planning Commission, p. 113.

Objectives and opportunities of the project

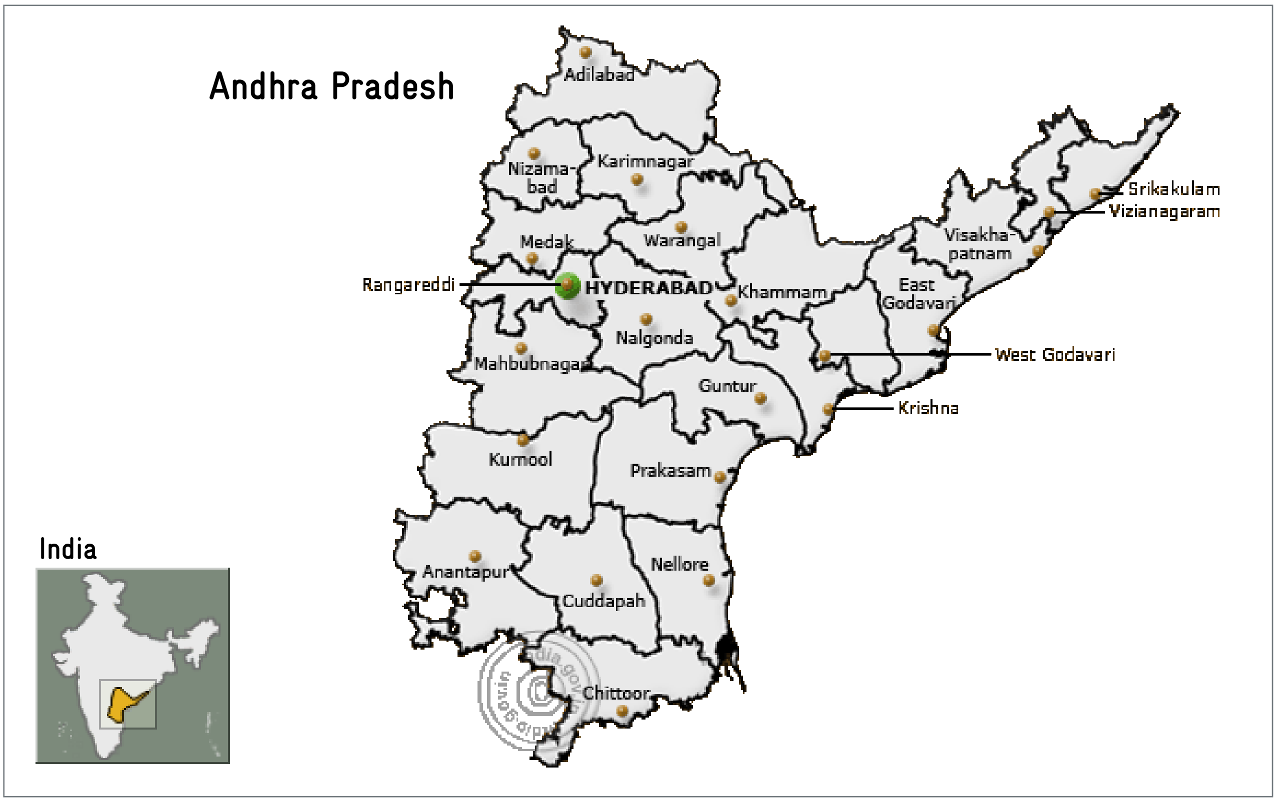
The goal of the project was to ensure that rural poor benefit from the commercial production of biodiesel by improving livelihood opportunities, and by developing sustainable production models in the biodiesel sector. It was intended to assist small farmers within 50 km of the biodiesel plant site in cultivating oilseed-bearing trees, oil extraction and marketing, through training, technology support and field demonstrations. The key goal of this project was not only to produce biodiesel but also to ensure benefits for the rural population along the value chain. Special attention was given to the most marginalized landless farmers, who were intended to benefit through specific collectors' schemes. Other objectives referred to testing new sources of tree-borne, non-edible oil-bearing seeds that can be grown on degraded lands and new methods of oil extraction. Lastly, the project intended to disseminate results to decision-makers in order to guide their policies in renewable energy and rural development.

Project setting

The project is located in the State of Andhra Pradesh in Southern India; 60 km from Hyderabad in the Nalgonda district (see Figure 3). The region has a semi-arid climate with some districts eminently suited for Jatropha plantation (Committee on Development of Biofuel, p. 121).

27.7% of the population in rural Andhra Pradesh live in poverty (Turner 2004, p. 2). Land ownership is distributed very unevenly, as illustrated in Table 2: approximately 88% of rural households own less than two hectares of land, and the remaining 12% possess 60% of the land (Turner 2004, p. 3).

Figure 3: Location of the project



Source: Survey of India, 2005, National Informatics Centre

Table 2: Rural land ownership

	Andhra Pradesh	
	Percent of households	Percent of operated area
Landless (0 – 0.002 ha)	37.5	–
Marginal (0.002 – 1 ha)	36.9	17.5
Small (1 – 2 ha)	13.3	23
Semi-medium (2 – 4 ha)	8.4	26.5
Medium (4 – 10 ha)	3.4	23.6
Large (>10 ha)	0.5	9.5

Source: Turner 2004

On behalf of the German Federal Ministry for Economic Cooperation and Development, the private public partnership framework "Supporting Farmers' Activities in the Value Chain of Biofuels" was initiated by GTZ involving Lurgi AG, Chemical Consortium International Ltd. (CCI), Southern Online Bio Technologies Ltd. (SBT) from the private sector and ICRISAT as a further public partner.

ICRISAT and GTZ are responsible for training farmers in Jatropha and Pongamia cultivation, developing and evaluating appropriate cultivation practices, and assistance in setting up nurseries. For plantation activities eight villages were selected and two cooperation models were promoted: the collector's model, involving the landless poor in collecting seeds either from forests or plantations, and the grower's model, encouraging farmers to plant Jatropha and Pongamia on their own marginal agricultural land, which is mostly fallow, or on cultivable private wastelands. Farmers are offered a guaranteed feedstock buy-back by SBT.

The feedstock buy-back guarantee is for the growers only, and the collectors are free to sell the seeds either to SBT or on the open market. Andhra Government itself offers a minimum support price for Jatropha / Pongamia seeds for which there are many buyers.

Linking biomass production with processing, GTZ and ICRISAT network the farmers, landless and oil extractors for localized value addition. German development cooperation via GTZ has provided the funds for building refineries, while Lurgi AG and CCI India have contributed the technology as well as technical and managerial training for running the plant. Based on multiple feedstocks, the plant has an annual plant capacity of 10,000 tons. The biodiesel produced is sold by the SBT to a bus company and mobile phone operators in Hyderabad.

Finally, GTZ and ICRISAT disseminate results of the pilot measure.

Progress achieved

At research level, Jatropha and Pongamia have been tested for oil content. Results show oil contents of 27.8 - 38.4% for Jatropha and 21.3 - 40.9% for Pongamia. For the creation of trials for agronomic practices, accessions with more than 30% oil content have been selected. In botanical terms, an accession is a plant or group of similar plants received from a single source at a single time. Each accession is assigned a unique accession number. In rainfed conditions, it varies from less than a ton to 1.5 tons per ha. Under irrigated conditions, with high quality inputs, it can go up to 3-5 tons per ha.

Training of farmers on cultivation practices has been carried out as well as raising of nurseries. In eight villages, plantations have been set up on private fallow lands or on salt-affected land and degraded common lands. Landless, marginal and small farmers have been given particular support, as 60% of the beneficiary farmers own less than two hectares of land. Landless and women have been encouraged to collect Pongamia seeds from reserve forests, and the buy-back guarantee has been successfully drafted. As the plantations raised by local farmers are very young, no seeds have been harvested yet. Some seeds are collected from forests, but as the quantity of seeds is very small, they are priced ranging between 0.6 US$ and 0.8 US$. These prices are not economical for the refinery, but opportunities for sale of seeds in the market are quite adequate.
The biodiesel plant has been commissioned and is already producing 20 tons of biodiesel a day. Due to the comparatively high prices of Jatropha or Pongamia seeds, the main feedstock is fish oil (see Figure 5). The fish oil SBT buys is from the local market within India. This fish oil is a by-product of the fishmeal industry, and it is non-edible.

Discussion of sustainability criteria

Socio-economic sustainability:
Given the short period of observation and as yet uncertain productivity expectations (yields vary between on-site measurements of 1.5 tons/ha and claims of 12 tons/ha under optimized conditions), farm level financial results can only be considered preliminary. Production costs are estimated to be US$ 625/ha. What can be said for areas with fertile soils and water availability is that opportunity costs are high. Alternative crops such as paddy yield US$ 250/ha/season and are thus more attractive than Jatropha at low productivity levels (see Figure 4 below). The fact that Jatropha oil seed plantations only produce after three years on average represents an additional disadvantage.

At current costs and productivity levels, farmers can only be expected to adopt Jatropha for the purpose of fencing or field demarcation. The project shows that investments in Jatropha plantations might prove more viable on waste or fallow lands (ICRISAT 2007, Chand and Pal 2003).

With increasing production, prices for oilseeds can be expected to fall from a current US$ 450/ton to somewhere near the minimum price granted by the Andhra Pradesh government of US$ 150/ton. This trend would further reduce profitability of Jatropha farmers but could be counterbalanced by productivity increases. Only time can tell which trend will have more influence on farm-level financial viability.

Figure 4: Cultivation costs for Jatropha

Cultivaton Cost: US$ 625/ha for 3 yrs			
Year	Yield (ton/ha)	Income @USD 150/ton*	Income @USD 450/ton**
3	0,5	75	225
4	0.75	112.50	337.50
5	1	150	450
6	1.5	225	675
7	1.5	225	675
8 onward	1.5	225	675

* Minimum Support Price offered by A.P. Govt.

** Prevalent price for Jatropha seeds

Based on different input prices for feedstock (fish oil and two different price levels for Jatropha seeds), internal rates of returns (IRR) of biodiesel production are shown in Figure 5. IRR is an indicator of the efficiency of an investment: if the IRR is higher than the rate of returns of an alternative investment, the quality of the investment is efficient. Net incomes prove to be negative at current seed prices of US$ 450/t. Compared to fish oil, biodiesel from oil seeds only turns viable at prices of 150 US$/t. The use of the by-products seed cake and glycerine can substantially affect financial viability. Currently, the purchase of the by-products is rather limited due to high prices on the market. Nevertheless, the situation could change in future. The seed cake is a rich source of nutrients for the soil and can be used as manure.

Figure 5: Returns from biodiesel production for different feedstocks

	Fish oil biodiesel	Jatropha based biodiesel	
			US$/tonne of biodiesel
Feedstock cost	550.00	450.00	1350.00**
Oil extraction/Transesterification cost	120.00	157.50	157.50
Total biodiesel production cost	670.00	607.50	1507.50
Net income from biodiesel (sale price US$ 800/tonne***)	130.00	192.50	-707.50
Income from seed cake (2 ton) Income from Glycerol (0,1 ton)	– 100.00	100.00 100.00	100.00 100.00
Total income	230.00	392.50	-507.50
IRR (only biodiesel)	1	16	–
IRR (biodiesel + by-products)	23	50	–

07 *Seed cost - US$ 150/tonne, **Seed cost - US$ 450/tonne ***Govt. offers US$ 625/tonne of biodiesel

It is early to thoroughly assess impacts on local development. From an employment point of view, the average estimate ranges from 75 - 80 person days per hectare to be generated. Other research and government estimates expect about 200 persons per ha.

Further, additional income can be gained from seed and by-product production. An average increase of US$ 200 per ha per annum is expected from the sale of seeds.

Besides economic benefits, the standard of living can be raised by providing local energy supply. The Pongamia tree has good firewood, and the biodiesel produced can be used for decentralized electrification (using a decentralized oil press for instance) or for substitution of fossil fuels for irrigation and mechanical power. However, these activities are not promoted within this PPP.

Economic concerns embrace over-hyped yield claims to attract farmers, or over-hyped benefits for employment generation. Moreover, the volatile market means uncertain price levels.

Environmental sustainability

Little evidence on environmental impacts can be obtained at present. However, positive effects may include an increase of green cover, resulting in protection against erosion and arrest of further land degradation. Depending on the biomass production and farming practices, recycling of nutrients might also improve soil fertility through litter fall and seed cake. Wani (2006) observed that Pongamia cake improves maize and soybean yields by 41-47%. Furthermore, Pongamia fixes nitrogen.

However, negative effects on biodiversity could also arise if Jatropha is planted on a large scale. Thus, multi-species plantations including neem (*Melia azadirachta*), Pongamia (*Pongamia pinnata*), mahuva (*Madhuca indica*), and kusum (*Schleichera triguga*) should be promoted. This would lower the risk of pest outbreaks as well. Given the current low profitability of Pongamia and Jatropha, it is unlikely that large plantations of Jatropha or Pongamia will spread.

Food security

One risk of bioenergy production relates to food security. In India, food grain requirements are likely to increase from 250 million tons (2007) to 350 million tons by 2020. However, given the low returns of Jatropha for farmers, it is unlikely that productive land will soon be reallocated for biofuel crops. The same is true for the potential usage of edible oil or food crops for biodiesel production, as India imports almost 40% of its edible vegetable oils and prices are prohibitive.

There is a danger that common property pastures can get affected by policies wherein such resources are used for raising oil plantations. However, a judicious decision to intercrop oil plantations with fodder grasses and giving landless usufruct rights on these commons could minimise such conflicts.

Another concern relates to competition for water between energy crops and food crops. This is also unlikely to occur given the fact that plantations in the project region are rainfed — a situation that could however quickly change with changing factor price ratios and therefore needs careful monitoring.

Value chain approach for Jatropha in arid and semi-arid areas – Experiences from Tanzania

The Public-Private Partnership (PPP) on sustainable production and processing of Jatropha oil in Tanzania between GTZ and Prokon-Energy Systems was presented by Arshfod N. Ngugi, Programme Officer, Promotion of Private Sector Development in Agriculture (PSDA), GTZ Kenya.

Background and context of the project

Tanzania is totally dependent on imports for its fossil oil needs, and approximately 95% of energy is consumed as woody biomass. The collection of firewood is reported to be contributing to deforestation, which is currently estimated to amount to over 91,000 hectares per year.

About 70% of the rural population are involved mostly in agricultural and livestock production activities. Agriculture is the chief sector of the Tanzanian economy, accounting for 45% of GDP and about 60% of export earnings. Therefore, the project's aim is to improve farmers' prospects on national, and in the long term, international agricultural markets, while at the same time increasing the local communities' standard of living by giving them access to modern energy.

Tanzania has a land area of 88.58 million hectares, almost 40% of which is forest resources, another 40% is agricultural land, and 20% is classified as "other land" (see Figure 6). Arable land for agricultural production has a share of 10% of the land area, of which 12% is used for permanent crops. The share of pasture in agricultural land is 70%. Only 4% of the arable land is irrigated (FAO 2004). The distribution of land cover is shown in Figure 2. In the western part of the country, forest is the dominating form of land use. The central plateau consists mainly of savannahs and grassland. Land cover in the coastal area with tropical climate in the east is cropland and pasture. Given the small share of arable land, Jatropha might be a suitable crop for sustainable energy production since it can be grown on less productive lands. For the regions Arusha and Kilimanjaro in the west and Bukoba in the North, good potentials are expected for Jatropha production, with a levels of 18,000 – 58,000 tons/year and an oil content of 33 – 66% (Worldwatch Institute 2007, p. 41).

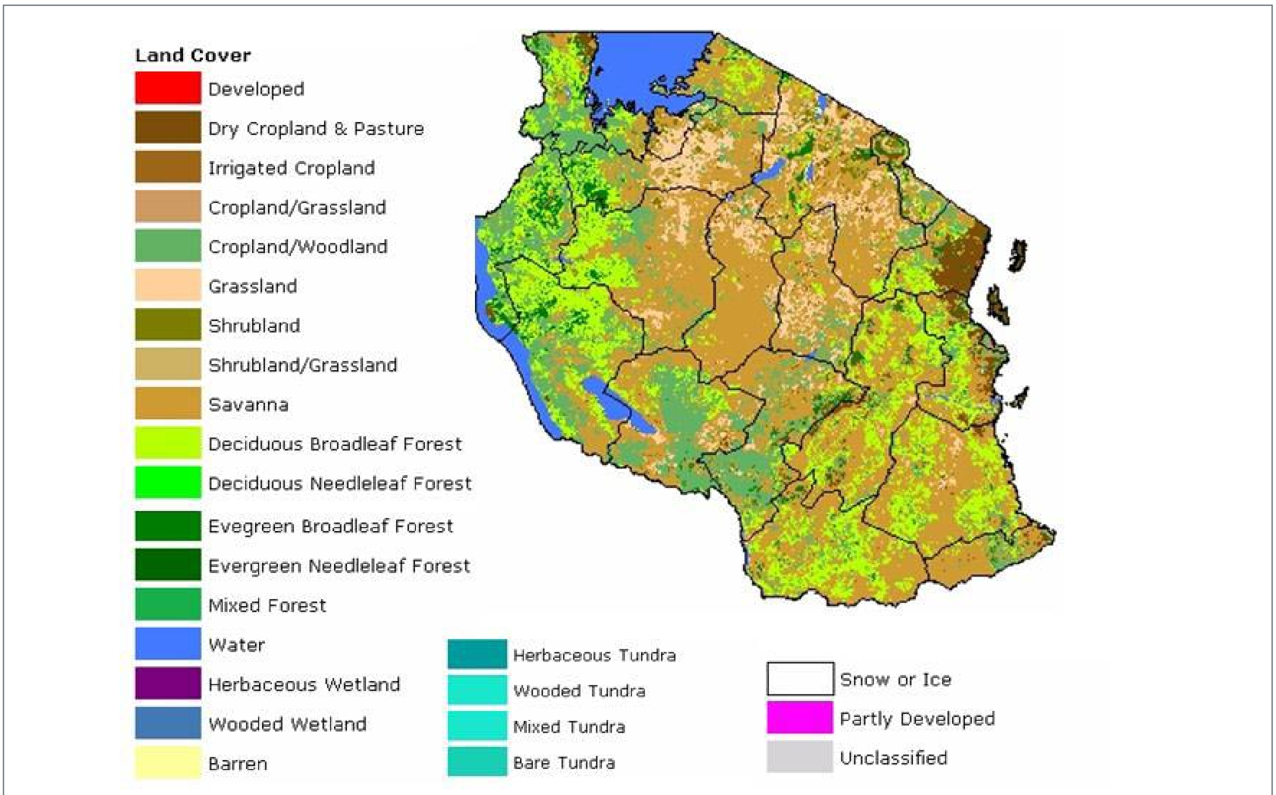
Figure 6: Land use in Tanzania in 1,000 ha

Area | Tanzania, United Rep of

commodity	year	
		2005
	Country area	94 730.00
	Land area	88 580.00
	Agricultural area	34 350.00
	Arable land	9 200.00
	Permanend crops	1 150.00
	Permanent meadows and pastures	24 000.00
	Forest area	35 257.00
	Other land	18 973.00

FAOSTAT | FAO Statistics Division 2008 | 9 January 2009

Figure 7: Land use



Source: FAO 2008, Data base: Landcover datasets from University of Maryland and the World Land Cover dataset from the USGS EROS Data Centres Global Land Characteristics Database.

Tanzania, Kenya and Uganda are seeking to establish a common market with a customs and monetary union, and considerable development potentials as a regional business location are expected. Within the scope of development cooperation, the PPP is supported by PSDA, a bilateral technical assistance programme jointly implemented by GTZ on behalf of the German Government and Kenya's Ministry of Agriculture. Prokon is a German company working in the wind energy business and, since 2001, in the biofuels sector as well. The company specializes in pure vegetable plant oil, as its production is cheaper than that of biodiesel because one processing step is avoided.

Objectives and opportunities of the project

The goals of the project are the promotion of a sustainable production of Jatropha through smallholders, the extraction of oil, which is used as fuel for diesel engines, and the processing of the by-product seed cake to meet household energy requirements. In doing so, operators are assisted along the value chain. It is assumed that the better all partners in a value chain operate, the higher the value will be that is generated at each stage of the value chain for the individual operator. Key to the Value Chain Approach of the PSDA is participatory analyses of processes and sharing of experiences to promote competitiveness and efficiency and to boost trust. Value chain development is a business-oriented approach targeting on assisting operators along the value chain (input-suppliers, farmers, traders, processors, and the final consumer) to achieve the highest value at all stages of the value chain.

The pure plant oil can be used as fuel in diesel engines and, prospectively, in engines run on pure plant oil, substituting expensive diesel oil and gas, which have to be transported over 300 km to Mpanda, where the project is located (see Figure 8).

Some concrete targets were set in the beginning of the project: by mid 2007, 25 extension officers were to be trained and an extension service system established in close cooperation with Kakute Ltd., and more than 5,000 farmers were to be trained in Jatropha planting and receive seeds and plant Jatropha. In the beginning of 2008, a local oil mill is supposed to be converted and fully operational for Jatropha oil pressing. By the end of the project (December 2008), 50,000 litres of oil is supposed to be processed.

Expected environmental benefits are reforestation of underutilized land, maintenance of soil fertility, and carbon sequestration through perennial crop production.

The project setting illustrates how these goals are to be realized. Regarding energy supply, the Jatropha oil produced can be an alternative to expensive fossil fuels for decentralized energy systems with plant oil generators and vehicles. Additionally, the by-product press cake can be used as a household energy source.

Project approach and setting

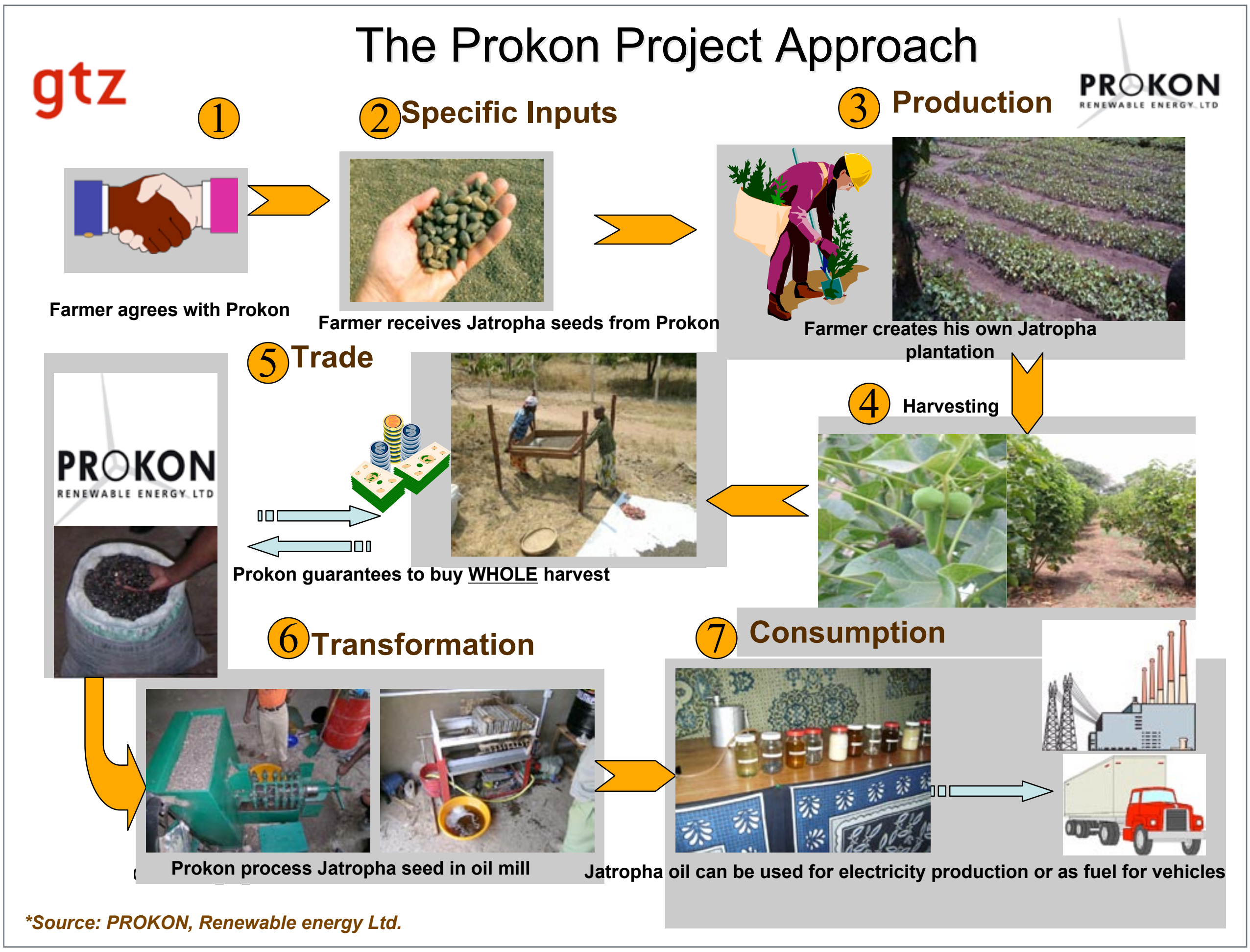
The Mpanda region, in Southwestern Tanzania, is endowed with sufficient suitable land, and as there are no local markets, farmers are looking for cash crops to secure incomes. Another advantage of the region is a connection to the railway line to Dar es Salaam, where an oil mill operates on spare capacity (GTZ 2005). The district has only 932,136 ha (19.4% of total land area) which is ideal for crop production, whereas 2,801,163 ha (58.9% of total land area) is classified as forest reserves, and 18% as game reserve (Mpanda District Council). The most dominant vegetation includes tropical and savannah wooded grasslands and thorny bushes. Jatropha could be grown as an intercrop in all arable land areas. In addition, it can also be planted in some of the drier regions to reclaim land. Therefore, area potential to be planted under Jatropha is more than 19.4% of arable land.

Figure 8: Location of the project

The project was started in September 2006.

The value chain, illustrated in Figure 9, includes input suppliers and farmers for biomass production, traders, processors and retailers up to the final consumer of bioenergy. It is aimed to attain the best value at all stages of the production chain. Furthermore, seed cake, which accrues as by-product, is intended to be processed to meet household energy requirements by using it as fuel pellets in biogas plants.

Figure 9: The PROKON project approach



Farmers were offered several incentives for the production of Jatropha: from the Tanzanian company Kakute, they received free training for technical skills on establishment and management of Jatropha, and seeds were provided free of charge. KAKUTE is a private company based in Arusha that specializes in technology dissemination and training.

In order to assure a market for seeds, farmers signed 10-year contracts with Prokon. In 40 cases, credits were offered for land preparation and for demonstration plots. It was agreed that the credit would be paid back in the form of seeds. Thus, farmers produce and collect the seeds on their private land, and sell them to Prokon. The company guaranties to buy the total harvest. Prokon processes the seeds in an oil mill, and sells the produced oil and press cake for fertilizer. As projected prices for Jatropha oil are favourable compared to diesel, the oil is sold to the village to run generators. Since Mpanda is connected by rail to Dar es Salaan, Prokon plans to export some of the biodiesel in the long-run. Because the oil press is currently located in Dar es Salaam, local stakeholders aim at processing the seeds in their own local mill. The local oil press is expected to be available early in 2008.

Progress achieved

So far, a large number of farmers (16,000) have participated in the scheme. In general, the structure of farm establishments is characterized by average farm sizes of 46 acres, 13 persons and a total number of 7 crop and tree enterprises on the farms. The land used for cultivation of Jatropha shows high variation, as most plants are grown as hedges, and thus, the total production area is not fully known yet. Generally, Jatropha plantations are quite small, and intercropping is practised with maize, groundnuts, beans, cassava, mangoes and other crops. Prior to the start of the scheme, farmers in the areas have grown other cash crops such as sunflower, cotton, tobacco, and palm oil.

As there has been no harvest yet, average incomes from different crops from farms in the Mpanda area are used to point out the economic performance of Jatropha. They indicate gross margins of 35,000,000 Tanzanian Shillings (€ 1:1,300) for maize mono-crops per acre, compared to 112,857–722,500,000 Tanzanian Shillings for mixed cropping of maize, groundnuts and Jatropha, and 31,000,000 to 36,000,000 Tanzanian Shillings for Jatropha mono-crop systems. The variations are caused by assuming different establishment costs. Thus, mixed cropping is expected to result in the highest revenues per acre.

Jatropha seeds for planting cost 0.19 – 1.54 € per kg. The high prices are caused by transportation costs, as seeds were bought from Arusha in the first year. These costs were covered by Prokon, who intend to support farmers' own production of seeds in Mpanda in order to reduce the price of seeds for planting and make it competitive with other oil sources (see prices in Figure 10). It is furthermore expected that seeds for oil production can be sold for 0.32 – 0.48 € per litre, which is 0.08 – 0.12 € per kg seeds (see Figure 10). The table compares the different prices of Jatropha in different parts of Tanzania and plant oil.

Figure 10: Price information and comparison of plant oil

	€ (1:1.300 tshs)
Diesel at local station TZ/l	1.20
Kerosene/l	0.77
Oil for cooking/l	1.23 – 1.54
Cotton oil as fuel/l	0.92
Jatropha oil (Diligent)/l	1.54
Jatropha seeds for planting/kg	0.19 – 1.54
Jatropha seeds for oil production (expected)/l (8 – 12 cts/kg; 4 kg nuts/l	0.32 – 0.48
Rape seeds Germany (farm gate)/kg	0.25 – 0.30
Rape seed oil in Germany fob oil mill/kg	0.65 – 0.85

Source: Presentation of A.N. Ngugi, COP 8, Madrid 2007

According to PROKON, the seedlings have a survival rate of 70 to 80 %. An analysis of soils is being conducted to ascertain the differential performance of the plant.

In terms of supporting structures, a district facilitation team has been established. Links have been forged with Government ministries, both at national and regional level, as well as with TANESCO Electric Supply Company Limited, a Tanzanian parastatal. The government structure of the Ministry of Agriculture supports the project in extension advice and training of farmers in Jatropha cultivation. TANESCO is interested in buying the biodiesel to reduce costs of power generation in Mpanda town as the company relies on diesel supplied from Dar es Saalam.

An electricity grid already exists in the town (district headquarters). Electricity grid extension to the village does not exist but is foreseen as TANESCO have indicated that the demand is higher than what they are able to supply.

For the processing part of the project, the new oil mill is currently being set up by Prokon. Twenty-five direct jobs have been created in oil and electricity production, and 200 new jobs are expected to be added indirectly in new businesses. Activities include welding and metalworking, woodworking, tyre repair, restaurants, pharmacies, shops, hotels and rural radio.

Discussion of sustainability criteria

Socio-economic sustainability

All the steps in the chain are expected to be financially sustainable, add value, create jobs, and provide services to the population. Due to the early stage of the project and the fact that the first harvest of seeds has not been gathered yet, the following analysis is an ex-ante exercise.

As the quantity farmers deliver to the processor is fixed (due to restricted land), prices for their produced seeds are an important factor. A risk might arise for fuel production if their high expectations are not satisfied and they abandon their plantations. Then it would not be possible to operate the mill at full capacity.

A problem may arise if Jatropha yields are low due to unsuitable planting material. As seeds are granted and developed by Prokon, it is the company's duty to ensure appropriate yields. Unreliable data on production levels and volume could prove a risk. Unforeseen fluctuations in quality and volume of yields, caused by harvest failure, need to be taken into consideration when assessments for economic viability are made.

Another challenge to sustaining Jatropha production socio-economically is a rejection of Jatropha oil by local processors and consumers, e.g. continued preference to use fossil diesel for engines and cars, as its use is thought to be already accepted and more reliable. Thus, the acceptance and image of Jatropha oil needs to be supported.

Overall economic benefits are expected regarding a contribution of GDP in the agricultural sector and import substitutions for oil, as well as foreign exchange savings. Furthermore, rural livelihoods can be improved through higher incomes and employment opportunities. If Jatropha oil finds multiple use, e.g. in cottage industries or soap production, it can serve as a safety net. This is already happening in other parts of Tanzania but has not started in Mpanda. Additionally, positive effects on the development of other agricultural/horticultural value chains are expected. This has already been experienced with Jatropha, planted as an intercrop with beans. Moreover, as the planting and collection used to be a woman's duty, supporting Jatropha leads to an empowerment of women.

Risks to socio-economic sustainability may emerge if policies and regulations hamper the local use of Jatropha oil and generate disincentives for public and private investments or neglect pro-poor growth policies and strategies. In addition, high price fluctuations of fossil fuels have negative impacts on farm gate prices, but this cannot be avoided by the project.

Environmental sustainability

Regarding the environmental advantages of reforestation of underutilized land, maintenance of soil fertility and carbon sequestration through perennial crop production are expected, but to ensure a sustainable production, negative impacts need to be avoided:

An expansion of agricultural production (whether for food or energy) might endanger existing ecosystems, high value forests and biodiversity. If Jatropha is produced on degraded and idle land or land that has been used for the production of cash crops, this risk does not apply to the project.

Jatropha may become an invasive species if the expected outcome and perceptions of farmers cannot be achieved. In the case of intercropping, workforce levels for the Jatropha tree are quite high. Thus, if prices for seeds are lower than the income from other crops, the Jatropha tree might be neglected, resulting in its turning into an invasive species.
Another potential negative impact is a loss of water resource availability. There is currently no information on water use for Jatropha plantations and its effects on availability of water. Although not applied yet, if incomes rise and electricity is accessible, irrigation might be used for Jatropha or cash crops to improve yields. With an intensification of plantations, unknown pests and diseases may arise.

Food security

Growing Jatropha has not led to any competition between energy crops and food crops so far, as plantations are small and an intercropping system is used. The latter aspect results in higher yields for food crops due to improved ploughing and weeding.

Food crop yields are expected to increase, as additional cash income from Jatropha production will allow farmers to purchase farm inputs like fertilizers, improved seeds, and irrigation equipment. Another potential benefit is seen in a better market integration and new production options for the Jatropha value chain.

Mali case study: Jatropha for local energy supply & rehabilitation of degraded land

Thanks to its potential to increase living standards among the local communities by providing access to modern energy, and to raise the income of small-scale farmers, as well as to improve degraded land, the project "Garalo Bagani Yelen – a new paradigm of energy for sustainable development" is supported by the local community, the Malian government and international organizations.

This project was presented by Ousmane Ouattara, coordinator at the department of development of natural resources at MFC Nyetaa (Mali-Folkecenter).

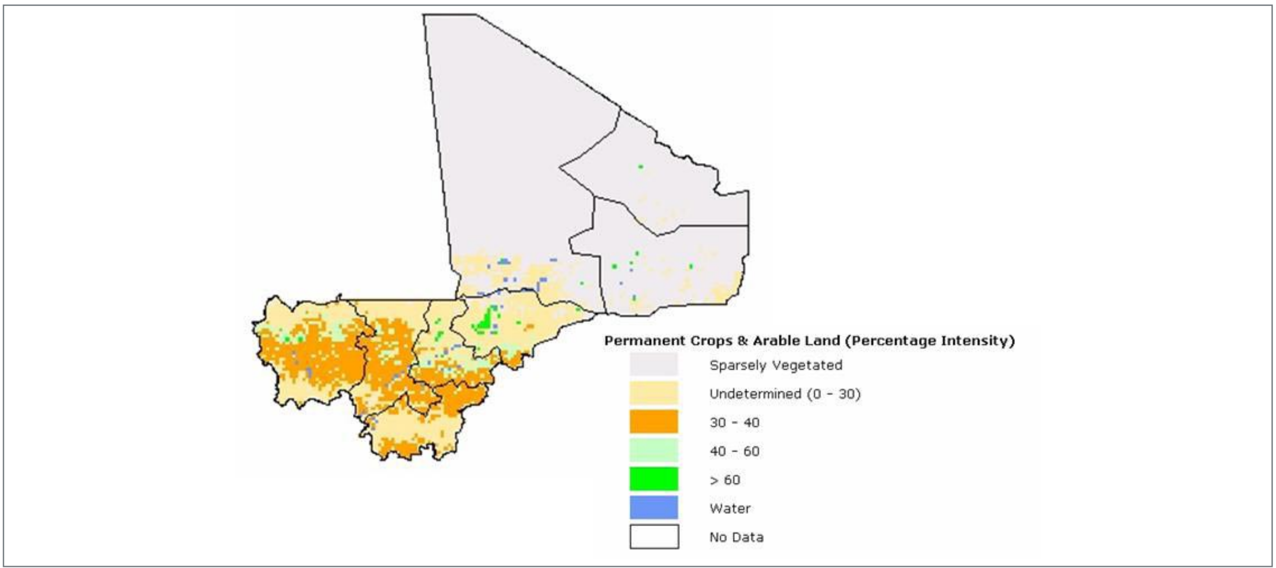
Background and context of the project

Like India, Mali seeks to diversify its energy sources, and especially as an oil importing country, it wants to reduce its exposure to the price volatility of the international oil market. Around 90 % of the population in Mali use firewood and charcoal as primary energy sources. Modern energy supply is based mainly on hydropower and on imported fossil fuels. Only 15 % of the population have access to electricity, and the 70 % of Malian s who live in rural communities share just 3 % of it (MFC Nyetaa 2006, Denfeld 2007).

Established in 1999, MFC Nyetaa is an organization associated with Denmark's Folkecenter for Renewable Energy. Its mission is to promote the sustainable management of natural resources and the use of these resources to catalyze local economic growth and sustainable development by working in partnership with rural populations and local entrepreneurs.

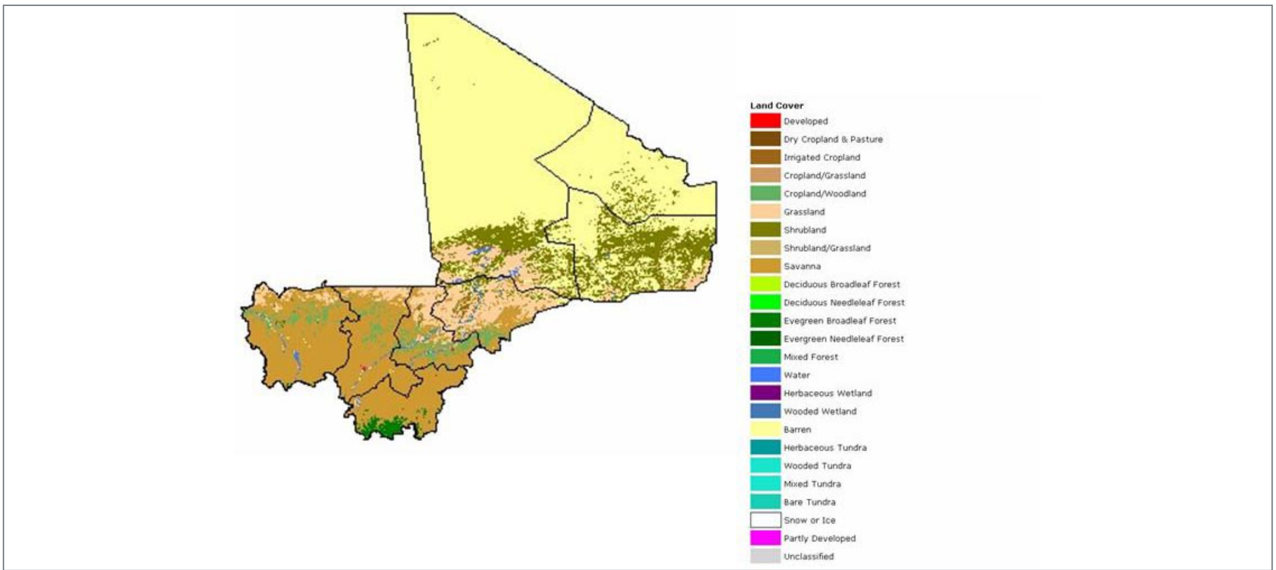
An option for providing access to modern energy and for diversification of energy sources is seen in the production of bioenergy from Jatropha. The plant needs only 500 – 600 mm annual rainfall to grow, which means that it can flourish even in Sahel and semi-desert regions (MFC Nyetaa). In Mali, arable land and water are scarce resources. The country's average annual rainfall ranges from 200 mm in the north to 1,200 mm in the south. Land cover and land use in Mali are shown in Figures 11 and 12, illustrating that only 4 % of the land is arable, 25 % is used for pasture, and 71 % is classified as "other land" including the Sahara desert in the North. Irrigation, which is crucial for local food security, takes place in 5 % of arable land, particularly in the inner Niger Delta (FAO 2004).

Fig. 11: Mali: Arable Land and Permanent Crops in %



Source: FAO 2008, Data source: Derived by CGIAR from the USGS Earth Resources Observation System (EROS) Data Centre 1998

Fig.12: Mali: Land Cover



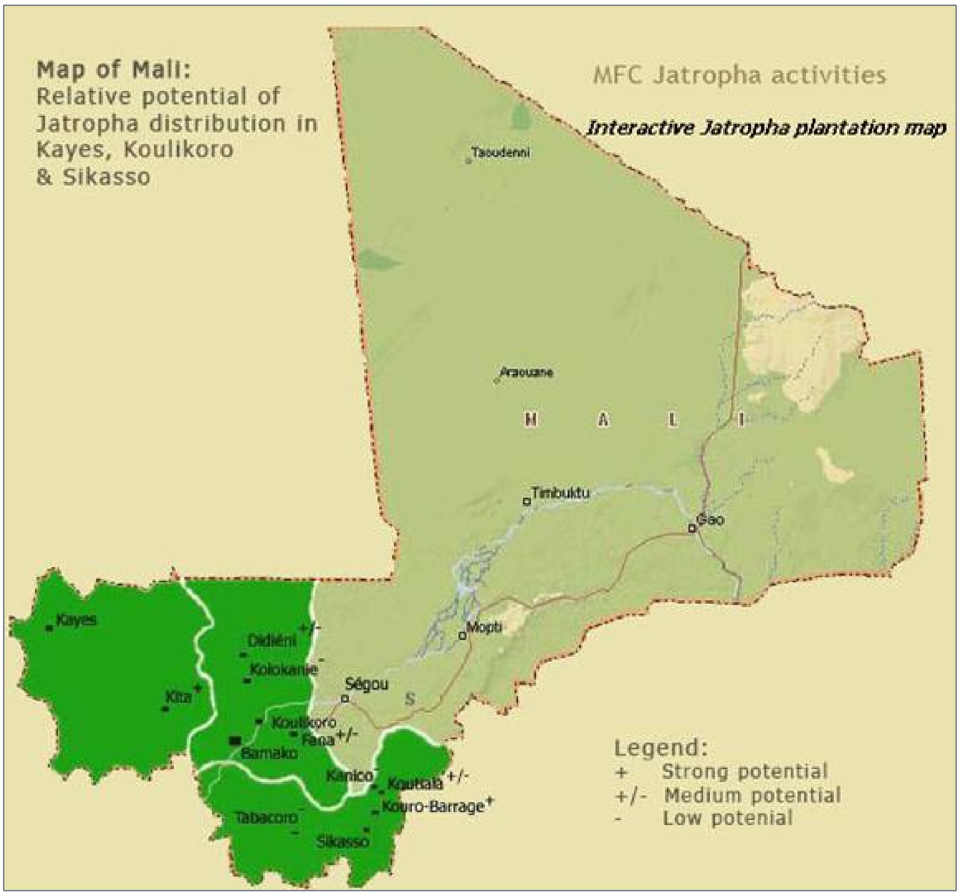
FAO 2008, Data source: Landcover datasets from University of Maryland and the World Land Cover dataset from the USGS EROS Data Centres Global Land Characteristics Database.

Due to these natural restrictions, energy production on land suitable for food crop production needs to be avoided. Jatropha is said to be a suitable crop for sustainable energy production, as it can be grown on less productive and abandoned lands with higher probabilities of droughts.

Jatropha has traditionally been used as a hedge of fields and gardens. An inventory was made to help quantify the potential of Jatropha. Decision-making tools then provided data, which was subsequently compiled to produce a map illustrating the potential of various regions. The potential of Jatropha in the different regions is illustrated in Figure 13.

The potential uses of Jatropha are manifold: as a hedge to protect fields and gardens from livestock, for medical treatments, for local soap production, and as a diesel substitute for rural electrification, transport, and for stationary engines for shaft power.

Fig. 13: Relative potential of Jatropha distribution in Kayes, Koulikoro & Sikasso



Source: MFC Nyetaa 2007

The oil's potential as a fuel source was recognized (Henning 2000) as far back as the late 1930s. The initiatives in Mali date back to the 1940s, specifically for the conversion of Jatropha. Nevertheless, these attempts have remained limited to very small-scale usage in the context of improving rural access to basic energy services (ENDA 2007).

In the framework of a renewable energy programme and on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), GTZ reinitiated Jatropha activities in Mali in 1987. The Jatropha Project "Women and Energy" started in 1993 in the region of Ouélessébougou and ended in 1997. Opportunities were seen in the utilization of renewable energy, promotion of women, poverty reduction, erosion control, and soil improvement (Henning 2000). One of the reasons for ending the project was that while it was developed as an energy project, the local community (represented by women's groups only) were much more interested in the income-generating activity of soap production that Jatropha offers, as well as in its environmental benefits, than in the energy supply aspects (MFC Nyetaa 2007).

For these reasons, when MFC started its activities in 1999, sustainable energy production was embedded in a broader approach to rural development. In October 2006, the project "Garalo Bagani Yelen – a new paradigm of energy for sustainable development" was set up.

Objectives and opportunities of the project

The rural community of Garalo (10,000 inhabitants) is located in the Sikasso region in the South of Mali (see Fig. 14), two hours south of the regional town of Bougouni.

In Garalo, the agricultural sector is the main source of income: subsistence crops and cash crops, particularly cotton, are grown and cattle are raised. The agricultural products are traded on the local market. In 1999, the local community, represented by the village of Garalo, contacted MFC to request electrification. The initial request was purely for electricity supply, and no specification was made how the electricity should be produced. Thus the local community was interested in the electricity supply and the benefits it would bring in terms of living conditions and opportunities for economic development.

MFC Nyetaa is committed to sustainable renewable energy technologies, and hence the idea of using Jatropha as a fuel source for the village was developed. Challenges arose from experiences of former projects, where socio-cultural barriers were encountered: initially (and traditionally), women were allowed to collect Jatropha seeds from planted hedges and use them for small-scale soap production. This was a useful income-generating activity, but mostly limited in magnitude, providing only modest incomes. The owners of the gardens (mainly men) were happy to allow women to use the seed. However, with the arrival of a project, the men increasingly saw that the Jatropha seed had monetary value as a product, and they wanted to have payment for the seed taken from their land. This created a conflict which caused problems with the supply of the seed.

Fig. 14: Location of Garalo

The land tenure and socio-cultural issues encountered by the GTZ project on behalf of BMZ were avoided by using a different approach, where farmers would produce the seed on their own land for their own benefit. The approach of using small individual plantations, often on abandoned land or land previously used for cotton production, would allow production of sufficient quantities of oil without these problems occurring thanks to the small-scale nature of soap production.

One of the main advantages of the project, as promoted by MFC Nyetaa, is the fact that it drives local sustainable development by dropping fossil energy dependency. This implies access to an ecologically sound modern energy supply, job creation, diversification of incomes for farmers and increasing the welfare of the rural population through decentralized revenues at each step of the process chain, as well as ecological benefits like combating soil (wind) erosion and mitigation of CO2 emissions.

Project setting

When setting up the project, the inclusion of the whole population of Garalo was taken care of. In order to overcome the lack of capital to invest in seed and machinery, the scheme is supported by a wide range of project partners that provide financial support and technical know-how. The project started with training, orientation, awareness, assessments, and technical designs of the participants.

The product chain for bioenergy comprises:

- **Production of biomass:** Biomass is produced via a small-scale out-grower approach. In small out-grower schemes, farmers organize themselves in companies, cooperatives and associations or as individuals and get involved in trading, processing and input supply. In Garalo, the farmers have created a local Jatropha cooperative. It is intended to expand the area to 1,000 hectares of Jatropha within two years. Financial support for plantation of Jatropha is provided by the SHGW Foundation, based in the Netherlands.

- **Processing of biomass:** The processing of the seeds to pure vegetable oil is accomplished with an oil press and filters. This equipment has not yet been installed in Garalo. MFC will help to set up a cooperative in the village that is responsible for purchase of Jatropha seed, the management of oil processing, and the sale of Jatropha oil to the power station. This is also financed by SHGW.

- **Bioenergy production:** This part of the project is operated by ACCESS SARL, a rural energy service company which has been granted a concession by AMADER and the Ministry of Mines, Energy and Water to produce electricity in the village. Three gensets of 100 kW (totalling 300 kW) are installed. In an initial step, they are presently being run on fossil diesel only. As the Jatropha oil becomes available, the engines are converted to run on this locally produced biofuel. Pure vegetable oil will eventually be used in the generators to produce all power. The project partners AMADER (Malian Agency for Rural Electrification & Domestic Energy) and SHGW are providing financial support and FACT Foundation from the Netherlands technical support in this section of the project.

- **Marketing and distribution of bioenergy:** The electricity produced is distributed by the project partner ACCESS SARL, in cooperation with the local electricity committee.

Progress achieved

From an institutional perspective, the project has facilitated collaboration between the village, the Malian government, financers, private companies and MFC Nyetaa. Furthermore, it has helped the community to get organized and participate in developing the project. Farmers have organized a cooperative for Jatropha production. An electricity committee has also been created to facilitate communication and relations between the population and the project.

Regarding biomass production, 433 hectares of Jatropha with 320,000 seedlings has been planted. As Jatropha plants take two years to produce, an oil press and filter have not been bought yet. Three of the specially converted 100 kWh generator sets have been installed and started operating in July 2007. However, given the lack of Jatropha oil production, they have been using fossil diesel as fuel up to now. They are currently being tested. Assuming an optimum of 8,000 operating hours, 2,400,000 kWh could be produced in one year. This would exceed the requirements of the 10,000 inhabitants of Garalo, taking the African average of per capita electricity consumption of 140 kWh as a reference (figures from 2001 in Energy Information Administration 2004). The power station has been deliberately over-dimensioned to allow for one generator as a backup and some reserve capacity to meet future increased energy needs of the population.

By July 2007, infrastructure such as grid construction was almost completed and work on a storage building and powerhouse had been started. Furthermore, an administration building has been built (FACT Foundation 2007). The grid is now complete (December 2007) and 180 domestic connections have been made. More domestic connections and three-phase light industrial connections are to be added throughout 2008.

Discussion of sustainability criteria

As the project is relatively young and the first harvest of seeds is only due in 2008, the following analysis is an ex-ante exercise and is based on the assumptions used in project planning.

Socio-economic sustainability:
While offering many advantages, both environmental and economic, Jatropha has one main drawback in that it takes 3 years before production reaches significant levels. The initial approach has been through seedling production in a nursery. The seedlings have then been provided to farmers free of charge, when they sign a production contract with the cooperative. Thus all Jatropha produced from the seedlings is to be sold to the cooperative. However, the nursery is quite an expensive means of production, and in 2008 a new approach of direct seeding and intercropping will be tried. It is hoped that this will be a more efficient and economical approach.

A national Jatropha oil market does not really exist as production is very low. Diesel fuel currently costs 525 FCFA (= 1.17 $) in Mali. It is expected that the eventual cost of Jatropha oil will be around 420 FCFA (0.93 $). Thus it will be economically competitive.

The oil content in Jatropha seeds is high and ranges from 25 to 37 percent. Seed yields are currently around 3.5 to 5 tons in Mali, corresponding to 875 to 1,850 litres / ha / year (UN Commission on Sustainable Development 2007). Improvements of genetic material and agricultural practices are estimated to raise productivity to 8.8 tons or 2,200 litres per ha in the near future. One of the processing by-products is press cake, which can be used for fertilization. 3 - 4 kg of Jatropha seeds yields 2 - 3 kg of press cake (which can also be sold and improve overall economic performance). Press-cake fertilizer is significantly richer in nitrogen and phosphates than cow dung. MFC Nyetaa is currently working on the basis of 2 tons per hectare of Jatropha (to be on the safe side). This seems a reasonable estimate based on experience in the field.

Standard cultural practices are timely weeding (4 times a year), proper fertilization, surface ploughing and pruning. Still, less time is spent on the cultivation and harvest of Jatropha than on the collection of traditional fuels (firewood).

The expected economic benefits of the project are the creation of 25 direct jobs in oil and electricity production, as well as an additional 200 jobs in new business activities through access to electricity. Also, domestic income of the rural population could be improved through the sale of seeds.

While electric power for the village community has been the prime driver of the Garalo project, mechanical power provided by small Jatropha oil-fuelled engines is becoming an equally important aspect of Jatropha development. These engines, in a concept developed in cooperation with GTZ, provide mechanical power to mills for agricultural processing, battery chargers for domestic lighting and radio / TV, alternators for village electrification and an oil press, with the oil press supplying both fuel and the raw material for soap production. These integrated schemes are known as Multifunctional Platforms (MFP) and are also promoted by UNDP via a special program.

MFC has installed 5 Multifunctional Platforms using small presses produced in Mali. The presses have a limited capacity (70 kg / hour), which is suitable for small-scale applications. In the Multifunctional Platform concept, power can be provided, for example, for welding and carpentry equipment in small industries. MFC Nyetaa's pick-up truck has also been converted to run on pure plant oil produced using such presses. The conversion process, carried out by the German firm of Elsbett GmbH, did not require a major effort. All the sub-products from Jatropha processing can be valorised, including press cake as an organic fertilizer and as animal feed. Possibilities are being explored for intercropping, which can improve yields of both food and oil-producing crops, as well.

One concern is that large-scale production might displace small farmers by big ones as these are more productive and obtain more capital. Thus, land tenure rights could be violated and people could be forced to leave their land. This is a real risk, and experience in Latin America and Asia has shown that large-scale biofuel production can create serious social and environmental problems. Thus there is a need for capacity building at all levels (from farmers to government) to address the risks, and there is also a need for legislation to promote local production and, crucially, local use of biofuel. These natural resources should be developed for local use and production of local benefits rather than to supply international markets.

Environmental sustainability

The project is well aware of the environmental concerns, but no in-depth assessment is available yet. With regard to the C02 balance, a life-cycle analysis for Jatropha production and processing would be necessary. This is, however, out of reach for a single project and would therefore need to be part of a broader research project.

The risk to biodiversity is considered low as plantations are promoted on degraded lands. Given the fact that Jatropha provides a vegetation cover to erosion-prone soils and press cake is used as organic fertilizer, plantations as such are seen as a contribution to soil fertility and improved natural resource management. With growing demand and higher profitability of Jatropha, this picture could change quickly, in which case production could potentially spread into biodiverse areas and increase pressure on water resources.

Food security

As long as Jatropha production is limited to land that would otherwise remain idle, no negative impact on food security is to be expected. Furthermore, small farmers in the project area have relatively diversified farming systems in order to reduce vulnerability to droughts and other natural risks. It is not likely that these families will give up their food security strategy and specialize on a single energy crop. Cotton has been Mali's main cash crop in the past. It was also produced using the out-grower principle, which is not widely considered as having put food security at risk. Now cotton production is on the decline (for various reasons), and Jatropha can fill the gap. An approach focusing on large production schemes and huge monocultures would be a different matter.

In summary, under the given framework conditions and the project's approach, the socio-economic as well as environmental impacts are expected to be positive.

PART I

Case studies

Structural public policies and new ways of value adding in family farming Experiences from Brazil

Arnoldo de Campos of Brazil's Ministry of Agrarian Development described his country's approach in fostering family farming and introducing biodiesel production. Brazil has a wide range of structural public policies in place to support family farming. Production support and protection is facilitated by measures in areas ranging from credit and insurance to the promotion of equality. Land reform has been a big issue in Brazil over the last few decades. More recent measures include the setting up of rural cadastre systems and land credit. Land regularization is in progress, as is the settlement of new families. Territorial development comprises investment and infrastructure measures, capacity building and mobilization, and steps to support unions and cooperatives and commercial activities.

Family farming

There are around 4.1 million family farming establishments in Brazil, employing 14 million workers – that is 77% of the overall rural labour force. In all, 800,000 families have settled. A total of 160 million hectares is under the management of family producers and settled people, producing 65% of the food consumed in the internal market. The criteria for being considered a family farmer comprise the workforce, property dimensions and income.

In 2004, family farming and family animal husbandry accounted for 20% and 12% respectively of agricultural produce in the Gross Domestic Product, with the share of agribusiness and agribusiness animal husbandry at a respective 50% and 18%. Overall agricultural produce was at 29.9% of GDP, with family farming making up 9.6% of that share and agribusiness 20.3%. In 1995/96, area distribution of agriculture comprised 30.5% of family farming and 67.9% of agribusiness, while public properties accounted for 1.6% (see Figure 15).

The Biodiesel Programme

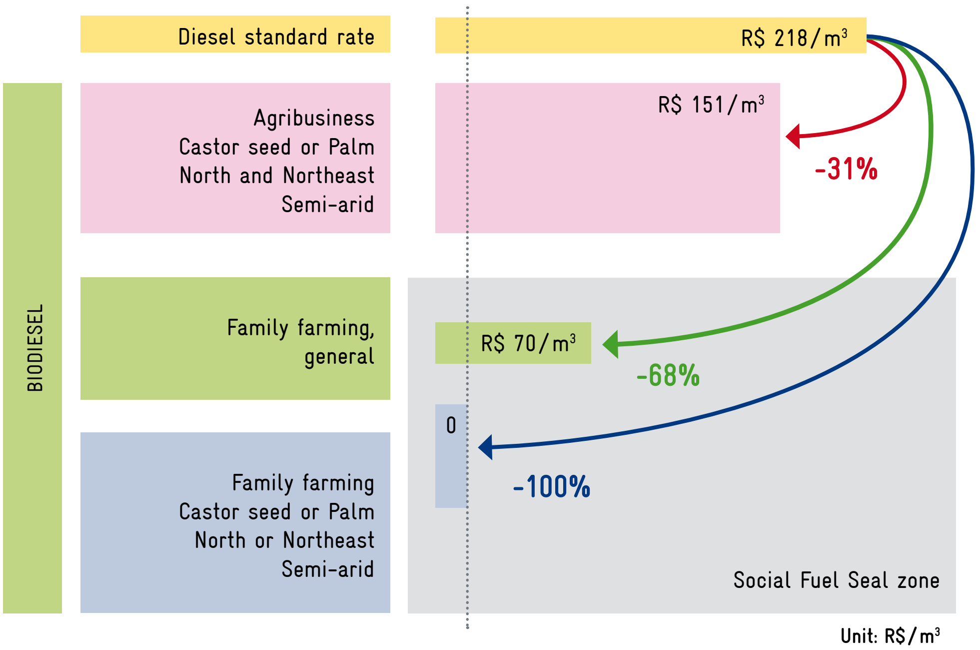
In 2005, Brazil launched its biodiesel programme. The aim was to implement a self-sustained programme taking into account price, quality and guarantee of delivery. The programme was intended to generate jobs and income while maintaining environmental sustainability. Plants and distributors are obliged to apply for trade permission. Direct sale to end-consumers and gas stations is forbidden. A large set of legislative regulations have been introduced to accompany the biodiesel programme.

The Biodiesel Act establishes a minimum percentage of biodiesel in diesel fuel and the monitoring of the new fuel's insertion in the market. For 2005 to 2007, a minimum of 2% was authorized, with a potential market of 840 million litres a year. The 2% will be mandatory from 2008 to 2010, guaranteeing a market of a billion litres a year. As of 2010, there will be a mandatory 5% of biodiesel, guaranteeing a market of 2.4 billion litres a year.

Figure 15: Family farming - basic figures

Gross Domestic Product (2004)	Family farming	20 %	100 %
	Family animal husbandry	12 %	
	Agribusiness	50 %	
	Agribusiness animal husbandry	18 %	
Participation in Brazil's GDP (2004)	Family farming	9.6 %	29,9 %
	Agribusiness	20.3 %	
Distribution of rural establishments (1995/96)	Family farming	4,139,369 (85 %)	4,852,589 (99.7 %)
	Agribusiness	554,501 (11.4 %)	
	Public properties	158,719 (3.3 %)	
Distribution of area (1995/96)	Family farming	107,768,450 (30.5 %)	353,340,146 100 %
	Agribusiness	240,042,122 (67.9 %)	
	Public properties	5,529,574 (1.6 %)	

Figure 16: Federal taxation and social fuel seal



The Social Inclusion Programme

Of equal importance is the Social Inclusion Programme, a measure aimed at involving family agriculture and settled people within the diesel supply chain. Its principles comprise a regional focus, income complementation, security in the productive arrangement, the participation of family agriculture organizations and environmental sustainability. The Social Inclusion Programme relies on a range of instruments. A tax policy has been devised to enable a total or partial withdrawal of taxation according to the type of producer, region, and crop variety. An acquisition policy incorporates biddings guaranteeing the participation of family agriculture. Various organizations provide credit. A special policy has been designed to foster the organization of family production via capacity building, cooperativism, research and other measures. The Social Fuel Seal defines rules for family agriculture's participation. Minimum percentages have been set for raw material acquisition from family agriculture: 50 % from the Northeast and the semi-arid areas, 30 % from the Southeast and South, and 10 % from the North and Centre-West.

The standard rate of taxation on diesel is R$ 218 a cubic metre. Agribusiness producing castor-seed or palm oil in the semi-arid North and Northeast is entitled to a 31-percent reduction. Family farming in general enjoys a 68-percent reduction, while family farming engaging in castor-seed or palm-oil production in the North and Northeast is fully exempted from taxation (see Figure 16).

The role of the Social Fuel Seal

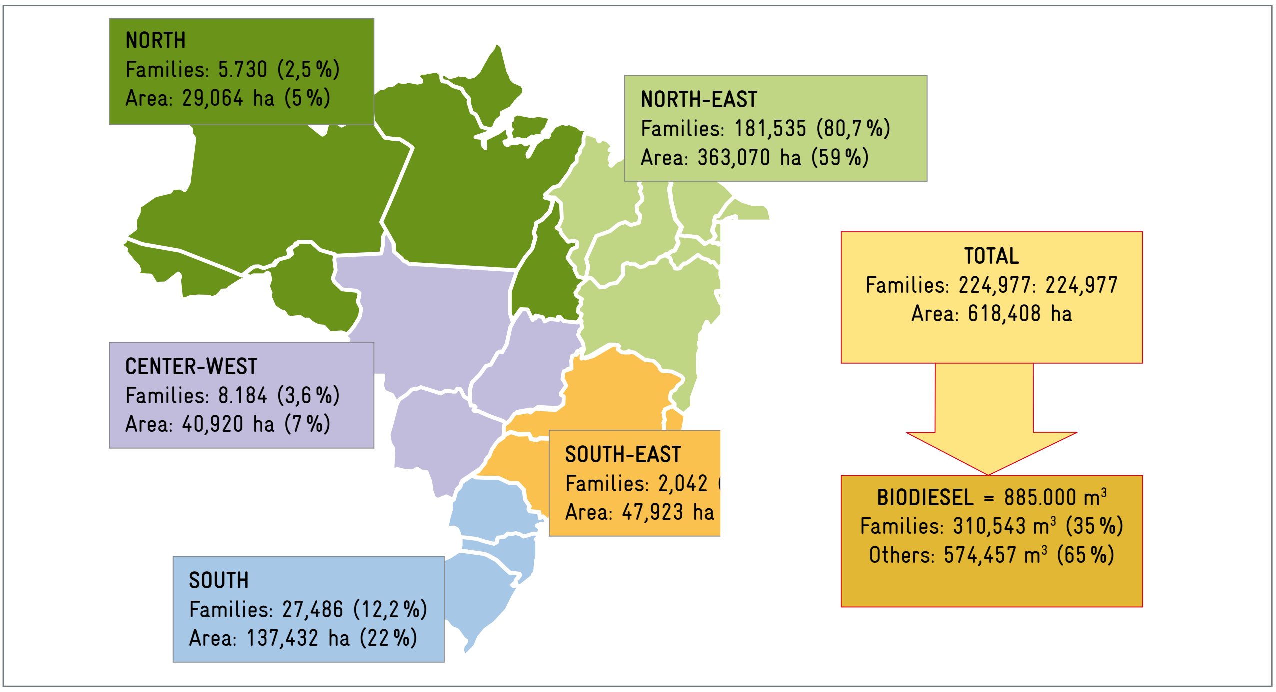
The Social Fuel Seal forms a core element of the new policies. Negotiated contracts are established with family producers which identify the association representing them that participated in the deal with the buyers. The Social Fuel Seal is required for accessing tax benefits and for taking part in biddings in sales to the biodiesel plants. Tax benefits are proportional to the raw material effectively purchased and actually used in the production of biodiesel. The Social Fuel Seal does not apply to raw material purchased from family farming but processed and sold as oil.

Success scored and outlook

Improvements brought about by the Social Fuel Seal include a defined legal structure giving priority to family farming and the conduction of public sales. Companies are affiliated to the Social Fuel Seal, and civil society organizations interact with the overall process. So far, a total of 80,000 contracts have been signed with families, covering an area of 300,000 hectares (see Figure 17).

By 2010, with 350,000 families participating, Brazil will be one of the world's largest biodiesel producers. A total of 1.5 million hectares is being cultivated for biodiesel in Brazil - compared to the 7 million hectares for sugar and the overall 25 million for soy.

Figure 17: Estimate of families based on 5 biddings from November 2005 to February 2007



Elements for an analytical framework

Interdisciplinary assessment of biofuels development

Dr. Raymond Jongschaap of Plant Research International at Wageningen University and Research Centre, the Netherlands, reported on an evaluation programme being carried out at the centre to minimize risks involved in the introduction of Jatropha curcas as an oil-producing crop in developing countries.

Dr. Jongschaap sees a need for careful assessments of Jatropha curcas. Well-founded proof or reliable sources of information about the plant's success as an oil-producing crop are lacking. As yet, Jatropha is an uncultivated wild species, so that environmental and genetic information on oilseed production still needs to be explored. Knowledge about what line of Jatropha curcas to cultivate under what environmental conditions is critical to increasing the prospects of development programmes. All plants need water, nutrients, CO_2 and land to grow, with low inputs resulting in low yields, and high inputs in high yields. The huge numbers of competing claims on natural resources for Jatropha curcas have to be tested.

The Jatropha curcas evaluation, breeding and propagation programme (JEP)

The JEP (www.jatropha.wur.nl) has been designed to investigate claims about Jatropha curcas, collect and characterize its genetic resources and passport data (such as information on productivity, oil contents, growth conditions, agronomic practices, propagation methods and sensitivity to pests and diseases), examine genotype x environment interaction and identify and map traits from future breeding programmes. Its first phase covers the period from 2006 to 2010. The JEP is embedded in a larger framework of stakeholders dealing with all aspects of renewable energy (www.fact-fuels.org). A possible key method to survey the impact of introducing Jatropha curcas will be explained in the following.

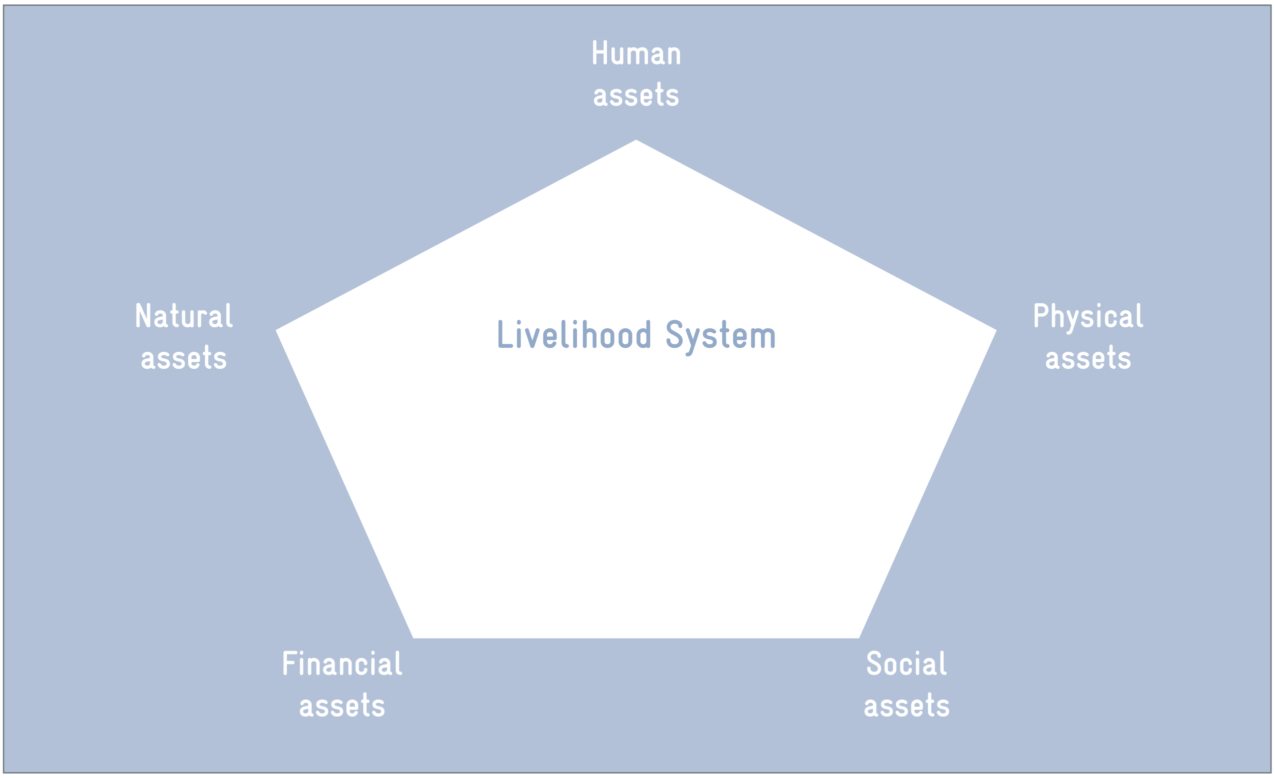
The Sustainable Livelihoods Approach (SLA)

The SLA combines conceptual insights based on research conducted in rural and urban locations since the late 1980s. It centres on a set of capabilities, assets and activities required for a means of living. SLA identifies priorities and feasibility for action by examining the assets base of different individuals, households and communities, with livelihood strategies depending on natural, human, physical, financial and social assets. The livelihood system should enable actors to cope with and recover from stresses and shocks. They should be able to maintain or enhance their capabilities and assets both now and in the future, and on a sustainable basis. The system should not undermine the natural resource base. The main role for policy is to raise the asset status of poor individuals and households and strengthen their own inventive solutions rather than substitute for, block or undermine them.

SLA can be applied to two approaches in the biofuel context: creating a bottom-up impulse and providing top-down support. In the first approach, biofuel acts as a catalyst for other developments, while it is applied in a rural development framework, catering for local markets and uses. Examples here are Nepal, where the oil-bearing Pongamia tree is grown, and Uganda, where Jatropha curcas and sunflower have been cultivated. Jatropha is also grown in Brazil, alongside castor, for oil production. The biodiesel obtained from it is used regionally or even nationally. Here, biofuel assumes the role of merchandise in the economy. It is given top-down support by central government.

To assess the sustainable livelihoods effects of the two approaches, the assets they contribute are now examined. The bottom-up impulse created in the Nepalese and Ugandan cases increases skills and education, and raises awareness. Another asset is that people gain more responsibility of their own. Physical assets include power

Figure 18: The Sustainable Livelihood System



to drive oil presses and pumps and fuel for transportation. Among the social assets are an exchange of knowledge and more independence. Financially, there is local value addition through processing, and locals gain increased income, some of which they can reinvest. The Nepalese and Ugandan programmes also increase resource efficiency and enhance sustainable production. A further natural asset is that they should be CO_2-neutral, which is easier to obtain in small-scale farming with low-inputs than more large-scale projects with high inputs.

Depending on location, former land-use and the use of mineral fertilizers, Brazil's programmes may also be CO_2-neutral and promote certified production methods. In Brazil, tax exemptions are offered for social (small-scale) farming in designated parts of the country, and may in the future include environmental sustainable production methods. Financially, the program offers tax reliefs and creates investment opportunities. Thanks to favourable market prices, farms are not required to group. Physically, the program contributes to the processing industry, infrastructure and transportation. In terms of human assets, it increases education on new sustainable cropping systems and technical skills to maintain them, including bargaining skills for the realization of a new commodity crop and the production of vegetable oil.

Table 3: Sustainable livelihood effects

Example	Human	Physical	Social	Financial	Natural
1. Bottom up impulse Jatropha / Sunflower - Uganda Pongamina - Nepal	• Increased skills and education • Raised awareness • Own responsibility • Increased work circumstances	• Electricity / Power • Oil presses • Pumps • Shops • Transportation	• Community farming • Knowledge exchange • Idependency	• Local value addition (processing) • Increased income (to be invested?)	• Increased resource efficiency • Sustainable production • CO_2 neutral
2. Top down support Jatropha / Castor - Brazil	• Increased skills and education • Bargaining skills	• Processing industry • Infrastructure • Transportation	• Grouping not required (market prices dominate situation)	• Tax relief • Investment opportunities • Cash flow • Market entrance	• Certified production methods • CO_2 neutral

Conclusions to be drawn from these cases are that:

- Development strategies depend on local conditions, opportunities and the market setting;
- Combining bottom-up impulses with external policy support could create promising development opportunities; and
- Effects can be quantified using the 5 pillars of the Sustainable Livelihoods Approach.

PART III
Panel

Panel on Standpoint and Role of UNCCD Actors

The meeting was concluded with a Panel Debate on the Standpoint and Role of UNCCD Actors. The Panel was chaired by Dr. Christoph Kohlmeyer, Head of the Division "Rural Development, Global Food Security" at the German Federal Ministry for Economic Cooperation and Development (BMZ). The four members of the Panel were:

Dr. Uwe Fritsche – Physicist and Coordinator, Energy and Climate Division, Institute for Applied Ecology (Öko-Institut) in Darmstadt, Germany. The Öko-Institut is an independent research and consultancy body that aims to make sustainable development a local, national and global reality. Areas it addresses include sustainable production and consumption, safety and health as well as a variety of environmental issues.

Marc Paquin – co-founder and executive director of the Unisféra International Centre, a non-profit organization dedicated to the advancement of sustainable development. Unisféra's main areas of expertise comprise sustainable development policy, law and management, climate change and adaptation, sustainable land management, desertification, trade & environment, and water policy. It cooperates with the private sector and governmental and intergovernmental organizations, including the World Bank, UNDP, UNEP, UNCCD, OECD, CIDA and others.

Dr. Flavio Schieck-Valente – General Secretary of FIAN International, the FoodFirst Information and Action Network. FIAN is a non-profit organization advocating for the realization of the right to food. It has consultative status to the United Nations and analyses, documents and exposes violations of people's right to food.

Grégoire de Kalbermatten – has been with the UN Convention to Combat Desertification Secretariat since 1993 and served the negotiation, design and implementation of the UNCCD. He is the UNCCD's Deputy Executive Secretary and Principal Coordinator.

The two keynote addresses to introduce the topics of the debate were given by Dr. Uwe Fritsche, who focused particularly on the development of standards in biofuels development, and Marc Paquin, who took up the issue of advocacy, referring especially to the UNCCD's Ten-Year Strategic Plan and its implications for UNCCD actors. The debate among the Panel members was concluded with comments and questions from the audience.

Keynote 1:

Sustainable Biomass from Drylands: Governance Challenges at National and International Level and Progress in Standard Development

– Dr. Uwe Fritsche

Sustainability risks of biofuels arise especially from displacement effects. These may occur across borders. No individual project, certificate or label can avoid land-use shifts from biofuels. Indirect land-use changes may, in turn, offset greenhouse gas benefits of biofuels. Moreover, there could be severe impacts on biodiversity. As there is no way to avoid such risks, national, EU and global standards are required to hedge them. This approach is part of the German proposal for international standards on biofuels.

In 2006, the Öko-Institut conducted a study on sustainability standards in the context of biofuels and the developing countries for the World Wildlife Fund. The core issues that standards ought to address according to its recommendation are:

- Priority land use: biocrops should be grown primarily on "unused" land, residues and non-food crop areas in developing countries.
- Maximum standards should be set for GHG emissions from cropping and biofuel conversion, including CO_2 from direct land use change and a CO_2 risk ladder for the displacement potential (with 0 for unused land and residues/wastes).
- No additional negative impacts should arise for biodiversity (protection area exclusion via satellite and GIS).
- No additional erosion or impacts should affect surface water or groundwater.

Out of the existing bio-related standards that the study refers to, only two – land use and greenhouse gas reduction – have global scope:

Summary of standards

Standard	Scope	Regional Adjustment	Time Horizon
Clarification of land ownership	regional/local	no	short to medium- term
Avoiding negative impacts from bio-energy-driven changes in land use	global	no	short-term
Priority for food supply and food security	regional/local	yes	medium-to-long term
No additional negative biodiversity impacts	regional/local	yes	medium-to-long- term
Minimization of greenhouse gas emissions	global	no	short-term
Minimization of soil erosion and degradation	regional/local	yes	short to medium- term
Minimization of water use and avoidance of water contamination	regional/local	yes	short to medium- term
Improvement of labour conditions and workers' rights	regional/local	no	short-term
Ensuring a share of proceeds	regional/local	no	short-term
Avoiding human health impacts	regional/local	no	medium to long-term

****

A number of other activities are in progress that could contribute to a regime of standards. For example, the FAO Bioenergy and Food Security project is working on mainstreaming food security concerns into assessments of bioenergy potential. The project, launched in 2007 and continuing up to 2009, is being funded by the German Government. Elements being developed that relate to standards are:

- Country selection criteria based on country typology, food security context, biomass potential and farming systems, agro-ecological zones

- Longer-term technical guidance, particularly in terms of land and resource modelling, and inputs on commodity markets and trade from FAO experts to assist countries in assessing their comparative advantage in the field of bioenergy

- A study of bioenergy legislation to clarify differences between policy and legal frameworks in a number of countries.

The Global Environment Facility (GEF) is developing standards to evaluate projects in the transport sector and other areas where biofuels are used. Such standards include aspects such as land use efficiency and competition for water use. Monitoring, certification and verification schemes are being tested in GEF-financed pilot projects. The European Environment Agency (EEA) advocates an approach to crops for biofuels that distinguishes between different environmental zones. The environmental impact of energy crops should then be determined on this basis. In order to maintain crop and landscape diversity, a mix of bioenergy crops should be introduced. A wide range of input from experts is required to ascertain the sustainability of crops for each environmental zone. GMO crops are not assumed in the EEA analysis. They are judged to be unsustainable. More generally, global biodiversity mapping is increasingly being regarded as important for excluding high value/high risk areas. UNEP/GEF have planned a study on sustainable biofuels for 2007-2009. Finally, voluntary codes of conduct have been introduced for palm oil and for soy.

The case studies of the first side-event have clearly pointed out the need for further research regarding the net-savings of greenhouse-gas emissions, a contribution to erosion control and sustainable land management as well as an assessment of economic viability. Still, it has to be kept in mind that a certification scheme is no proper instrument in the case of lacking governance or criminal activities or for solving conflicts on land-use. In addition, effects at the macro-level, such as food security concerns or indirect land-use changes, cannot be addressed by a certification scheme.

A further problem consists in the fact that attributing a mandatory status to social aspects of such standards would lead them to clash with international trade, and especially the World Trade Organization (WTO). They could only be of a recommendatory nature. However, a lot could be achieved through monitoring, also by the UNCCD.

Keynote 2:

Advocacy for Sustainable Biofuels: Roles and Functions for UNCCD Actors in the light of the Ten-Year Strategic Plan

– Marc Paquin, UNISFERA

Paquin points to two key factors that can impact land degradation in rural drylands as trade in biofuels accelerates. While the intensification of trade-oriented agricultural production may lead to practices that are not consistent with sustainable land management, such as increased mechanization, irrigation and the use of agrochemicals, the expansion of lands used for crops may affect fragile or marginal lands, causing further degradation. The second key driver relates to large farms seeking to capture economies of scale to enhance their competitiveness on global markets. This can deprive small farmers of the most productive land, pushing them back to marginal lands and possibly also forcing them into unsustainable livelihoods that overexploit resources, again resulting in further degradation.

Paquin maintains that such trends require national and international flanking measures, focusing in particular on sustainable land management and favouring a proactive approach. Therefore, UNCCD actors ought to define a common biofuels strategy for the 2008-2018 period. While the UNCCD's Ten-Year Strategic Plan does not directly refer to biofuels, it indirectly implies a role for the Convention, so that the UNCCD should develop a corresponding biofuels strategy including the elements referred to in the Box below with the Strategic Plan's objectives:

Connections between biofuels and elements of the UNCCD 2008-2018 Strategic Plan

Strategic objective 1: To improve the living conditions of affected populations

Expected impact 1.1. People living in areas affected by desertification, land degradation and drought are to have an improved and more diversified livelihood base and to benefit from income generated from sustainable land management.

- The growth of dryland-based biofuels could contribute to the diversification of livelihoods and provide new sources of income based on Sustainable Livelihoods Management (SLM).

Strategic objective 2: To improve the condition of affected ecosystems

Expected impact 2.1. Land productivity and other ecosystem goods and services in affected areas are enhanced in a sustainable manner contributing to improved livelihoods.

- Export-oriented biofuels production could attract investment to raise land productivity through intensification of farming or through farming techniques, thereby leading to higher yields. However, such increases in land productivity should be consistent with SLM and not occur at the expense of land quality.

Strategic objective 4: To mobilize resources to support implementation of the Convention through building effective partnerships between national and international actors.

Indicator S-8: Increase in the level and diversity of available funding for combating desertification and land degradation and mitigating the effects of drought.

- Foreign revenues generated by biofuels exports could contribute to the diversification of sources of funding to combat land degradation in affected areas, provided that they translate into investment in the field.

Connections between biofuels and elements of the UNCCD 2008-2018 Strategic Plan (cont.)

Operational objective 1: Advocacy, awareness-raising and education

To actively influence relevant international, national and local processes and actors in adequately addressing desertification, land degradation and drought-related issues.

Outcome 1.1: Desertification, land degradation and drought issues and the synergies with climate change adaptation and mitigation and biodiversity conservation are effectively communicated among key constituencies at the international, national and local levels.

Outcome 1.2: Desertification, land degradation and drought issues are addressed in relevant international forums, including those pertaining to agricultural trade, climate change adaptation, biodiversity conservation and sustainable use, rural development, sustainable development and poverty reduction.

- Advocating for a dryland/SLM-based biofuels standard and ecolabel – and more generally for a larger share of the world biofuels market originating from drylands – would fall directly in line with these objectives and outcomes.

Operational objective 2: Policy framework

To support the creation of enabling environments for promoting solutions to combat desertification and land degradation and mitigate the effects of drought.

Outcome 2.1: Policy, institutional, financial and socio-economic drivers of desertification and land degradation and barriers to sustainable land management are assessed, and appropriate measures to remove these barriers are recommended.

- Assessing the impediments to – and the impacts of – biofuels production to recommend appropriate policy interventions would fall under this objective.

Operational objective 3: Science, technology and knowledge

To become a global authority on scientific and technical knowledge pertaining to desertification and land degradation and mitigation of the effects of drought.

Outcome 3.3: Knowledge on biophysical and socio-economic factors and on their interactions in affected areas is improved to enable better decision-making.

- Assessing the interconnections between biofuels production, land degradation and socio-economic trends in affected areas would be in line with this outcome.

Outcome 3.5: Effective knowledge-sharing systems, including traditional knowledge, are in place at the global, subregional and national levels to support policy-makers and end-users, including through the identification and sharing of best practices and success stories.

- The identification and sharing of biofuels best practices and success stories would fall in line with this outcome.

Operational objective 5: Financing and technology transfer

To mobilize and improve the targeting and coordination of national, bilateral and multilateral financial and technological resources in order to increase their impact and effectiveness.

Outcome 5.3: Parties increase their efforts to mobilize financial resources from international financial institutions, facilities and funds, including the GEF, by promoting the UNCCD Sustainable Land Management (SLM) agenda within the governing bodies of these institutions.

- The GEF, the World Bank and others are already involved in the development of biofuels worldwide. These organizations could align their interventions in affected areas within the UNCCD-led standard and strategy.

Connections between biofuels and elements of the UNCCD 2008-2018 Strategic Plan (cont.)

Outcome 5.4: Innovative sources of finance and financing mechanisms are identified to combat desertification and land degradation and mitigate the effects of drought, including from the private sector, market-based mechanisms, trade, foundations and civil society organizations, and other financing mechanisms for climate change adaptation and mitigation, biodiversity conservation and sustainable use and for hunger and poverty reduction.

- Biofuels can become an important source of innovative financing in affected areas where they have most potential. They can be a vehicle to attract financing from the private sector, trade, foundations and market-based mechanisms.

Outcome 5.5: Access to technology by affected country parties is facilitated through adequate financing, effective economic and policy incentives and technical support, notably within the framework of South-South and North-North cooperation.

- Technology transfer could occur through the development of biofuels production in affected areas through involvement of the private sector. Local biofuels production could also provide economic incentives to transfer processing technologies.

Paquin concludes that, assuming a growing biofuels market, the key decision for the UNCCD is whether it assumes a proactive role or prefers to adopt a more reactive approach referring biofuels outside the scope of the Convention. The potential for the development of a drylands niche market for biofuels, he stresses, is there. But given that many questions remain unanswered regarding biofuels development, that, for example, there is no life-cycle analysis for Jatropha, and that a full range of standards yet need to be compiled, it is vital for an international organization like the UNCCD to take the lead.

Discussion

Panel members Grégoire de Kalbermatten and Dr. Flavio Schieck-Valente commented on the two Keynote Addresses. The floor was then given to the audience to comment and ask questions.

Grégoire de Kalbermatten agreed with Marc Paquin on the UNCCD's potential role in the biofuels context. He also stressed the need to speed up responses. "Documents are all good and well, but how many people really read them?" he queried, and added that he was "uncomfortable with the liturgic worship of documents". De Kalbermatten is wary of too much optimism in technological developments and deeply sceptical of the market sorting things out to the good of people living in the drylands. "The market forces are not philanthropic," he told the Panel. "It is all a matter of small farmers versus the people with the big bucks ideas". Also, he stressed the urgency of making decisions for measures to be taken in the event of crises relating to large-scale plantations, e.g. salizanation.

De Kalbermatten suggested exploring the potential for the UNCCD to feed the topic of biofuels into the Conference on Sustainable Development (CSD) as well as addressing its normative dimension, sustainability being at the very core of drylands and biofuels issues. "The key aspect is relevance for real people – those living in the drylands," de Kalbermatten emphasised. A global policy advocacy programme would have to agree on benchmarks and consider a common interest for food and water while bearing the scarcity of fuel in mind.

Dr. Flavio Schieck-Valente maintained that there had been no progress since the member states of the United Nations Food and Agriculture Organisation (FAO) pledged to halve the number of countries with absolute poverty by 2015, and he claimed that "80 % of people living in absolute poverty are in rural areas, largely on marginalized land and without sufficient opportunities to access food. 70 % of them are women. According to FIAN, in most cases, the root cause of this is a lack of access to land".

FIAN is working out 'voluntary guidelines' with UN agencies that could act as a basis for discussions with governments. It has drawn up a long list of regulations that could be imposed at international level. "But only the WTO has sanctions and teeth that can bite, so that mandatory norms to protect the locals and the environment can't work," Schieck-Valente cautioned. He suggested partnerships between the UNCCD and NGOs as a key contribution to attaining sustainable livelihoods in dryland areas. Such partnerships could strengthen people's capacity to gain control of their resources and defend themselves.

Referring to the bioethanol programme in his home country of Brazil, Dr. Flavio Schieck-Valente claims that the savannah in the country's North has already been largely destroyed by soy and sugar cane cultivation. He says that in one of the districts in the region, soy bean cultivation has resulted in thousands of people being displaced in one district, while just across the river, an agrodiesel project is in progress to protect the lives of around a hundred people.

Schieck-Valente explains that food shortages have usually been caused by megaprojects, frequently by the extension of agriculture activities or by dam construction, involving large-scale displacement of people living in such areas who were not seen as entitled to land (especially among the traditional population) and land ownership "given" to private corporations, encouraged especially by corruption. Civil society in Brazil has criticized that too much investment in wrong areas to combat poverty is itself leading to poverty.

Research on food issues is largely done under private auspices, Schieck-Valente maintains, and he queries how much of biofuels research will be under such auspices. Research activities here are led by market interests instead of things being discussed in context. Issues such as fuel neutralization or more economical use of fuel take second position, as do debates on the transportation system as a whole, while the real question ought to be whether Northern transportation modes can be taken across the world. Schieck-Valente reckons that if we were to use agrofuels only to motorize the global population, the area required would be four times the size of the planet. Rather than setting out from biofuels and then looking at what is good for them, the starting point should be the locals and their needs.

In the lively discussion following the panel debate, the audience raised a number of issues, ranging from the credibility of biofuels programmes to the displacement of locals through large-scale plantation schemes. They are summarized in the following.

Food versus fuel?

First and foremost, perhaps, concern about food crops being replaced with biofuels production was expressed. Participants claimed that "feeding cars in the North appears to be more important than feeding people in the South", and a recent television car ad showing a dog contesting the "car as a man's best friend" was cited as aptly summing up prevalent attitudes.

Credibility of programmes
The food-versus-fuel aspect also spurred doubts about the credibility of major biofuels programmes: Why were developed countries introducing a new technology in the South without a strong assessment? Why wasn't the emphasis more on other renewables, such as solar or wind? Or was the exercise merely aimed at the South helping the North to have more cars? Above all, if biofuels plantations weren't harmful, why not move the plantations to the North and let people in the South grow food?

Rural Development
It was emphasised that in addition to the impact on food prices of biofuels crops, their role as a potential source of income – or at least additional income – for farmers depended on a number of prerequisites. Farmers must be included in the value chain, rather than solely serving as suppliers. Otherwise, they might be exposed to strongly fluctuating prices for the produced crops. In the case of Jatropha, hype about 'wondercrops' had lured many a farmer into what had turned out to be a very uncertain future. Any further large-scale cultivation of this plant for fuel purposes would require more knowledge and more experience. For example, there was uncertainty regarding its potential to develop as an invasive species. Participants pointed to the worrying aspect of poor people being lured by the prospects of growing crops for the biofuels market and trying out methods without sufficient know-how, investment, etc. They called for state measures to regulate such activities and protect the rights of the locals.

Unsustainable practices
Examples were given of biofuels feedstocks being planted on vast areas of land at the expense of virgin forest that was slashed and burnt. Depending on the cultivation methods then applied, erosion and desertification were being accelerated. Creating new land for massive monoculture production in this manner represented an immense threat to biodiversity, devastating fragile ecosystems and also having severe social impacts. Such practices were totally unsustainable and invalidated any potential advantages that biofuels might have. Participants stressed that threats evolving from them applied especially to dryland areas.

Water problems
Water salinization through plantation irrigation was referred to as a creeping problem that could cause considerable damage within five to twenty years. Also, and especially in times of increased drought and lack of rain due to climate change, large underground water resources could be over-exploited by large-scale plantations, putting ecosystems in jeopardy.

Reducing greenhouse gas emissions
Recent studies were indicating that biofuels do not have positive climate-balances per se. Live-cycle assessments of biofuels comparing them to fossil energy are one way of assessing the climate-balance (and other environmental impacts). It was pointed out during the discussion that such assessments had to be applied to the region at hand, as well as to the type of biofuel based on different crops, and that they were not yet available for Jatropha.

Land for grabs?
An estimated two billion hectares of marginal land could have a potential for biofuels crops. Participants maintained that biodiversity levels had hardly been recorded in many of these areas. Exposing them all too rashly to biofuels programmes could do irreversible harm to many an ecosystem. Drylands and even deserts represented ecosystems in their own right, it was stressed. Furthermore, participants emphasised that land in marginal areas did have its local owners. Contrary to the widespread misconception in the North about "plenty of land in the South", this land was not per se for grabs.

Closing Remarks

The two side-events opened a wide array of controversial aspects regarding biofuels development and highlighted governance challenges in this sector. What they also clearly showed, however, is that there are no straightforward answers to many of the questions raised in the biofuels debate.

The projects presented in the case studies left no doubt that there is a high level of awareness in initiatives in the context of development cooperation about the risks that biofuels production entails. These projects are specially designed to address the challenges of small farmers participating in value-chain approaches, taking into consideration environmentally sound production methods, gender equity and environmentally sound production methods and avoiding competition with food crops. However, given the short lifetime of the projects and the level of experience gained so far, some key questions as yet remain unanswered.

Under what conditions can such approaches be economically viable? While the Indian case scenario provided the soundest economic assessment, it was not very encouraging in this respect. Current trends in food and biomass could change the scenario there. How would local experience demonstrated in the case studies be impacted by a massive expansion of the biofuels market, e.g. through political or other strong incentives? Are sufficient safeguards in place to avoid the negative effect that other cash crop booms have had, such as the displacement of farmers or the degradation of natural resources in drylands? What are the real environmental benefits, including the lifetime greenhouse gas balance of the different production and energetic strategies? Not even the pilot projects were able to give evidence on the resource use efficiency of the respective oilseeds.

Another aspect that clearly needs closer assessment, given experience in the pilot projects, is the roles of biodiesel and pure plant oil. Whereas biodiesel clearly requires a greater technical effort, it offers better prospects for export. Pure plant oil, on the other hand, can cater for local demand in a wide range of areas while enabling the use of existing plant and facilities in several cases. Also, fewer processing steps are involved. Here too, more insights are needed.

The Sustainable Livelihood Approach is a promising tool to assess the socio-economic and bio-physical implication of biofuel developments under different approaches. However, given the rapid pace of current trends, will there be time to thoroughly apply such a methodology? And even if enough resources for such comprehensive research can be mobilized, will policy-makers be able to adequately translate it into policies? What additional governance instruments will be necessary?

Progress of meta-certification and global dialogue on standards is promising (cf. developments in standards presented in the Panel Debate as well as developments in the FAO, etc.). Beyond certification, some initiatives are underway to regulate the expansion of biofuel plantations through national zoning and landuse planning excercises. Here experiences from forestry based on the identification of areas with high conservation value (HCV) due to their ecological roles and contributions to local peoples' livelihoods could be adapted.

The global community appears to be aware of the dangers. So far, however, this has not translated into safeguards being put in place for such far-reaching policies such as the EU biofuels quota.

All this suggests that Multilateral Environmental Agreements such as the UNCCD are the instrument of choice. However, some might say that the vital touchstone of success – national implementation of agreements and commitments – has proven largely elusive so far. High expectations have been placed on the Convention's 10-Year Strategy and its capacity to make policy advocacy more efficient. Nevertheless, adapting the UNCCD's existing structures and mechanisms to this strategy is an enormous challenge in itself. For example, the National Action Programs, the Convention's main tools to translate internationally agreed goals into measures at national level, are still fairly inefficient. In this situation, is it realistic to expect UNCCD actors to take up what is currently one of the most controversial international development challenges?

All the pressing questions related to biofuels development will have to be carefully monitored, particularly by those who create direct incentives such as the EU through its biofuel quotas. As to the UNCCD, the dialogue will urgently need to be established within the appropriate fora. This side event has certainly not given answers, but the organizers hope to have contributed to initiating the debate within the convention.

Published in December 2008 by
Deutsche Gesellschaft für
Technische Zusammenarbeit (GTZ) GmbH

Federal Ministry for Economic
Cooperation and Development (BMZ)
Contact: Dr Christoph Kohlmeyer
Referat 314
Dahlmannstraße 4
53113 Bonn / Germany
T +49 (0)228 99535-0
F +49 (0)228 99535-3980

Convention Project to Combat Desertification, GTZ
Contact: Dr Anneke Trux
Dahlmannstraße 4
53113 Bonn / Germany
T +49 (0)228 24934-264
F +49 (0)228 24934-256
E ccd-projekt@gtz.de
I www.gtz.de/desert

One World
German Development Policy