CHAPTER 3

OVERVIEW OF CASES

The following vignettes provide outlines of the 15 cases and are numbered and renamed for quick and consistent reference by a three word title containing the country, form of Bioenergy and use/relevance. For the full titles of the initiatives please refer to the full case studies which are provided in full in Annex 1.

Case 1 - Mali Jatropha Electrification

The Garalo Project in Garalo commune, Mali, was established to provide the local community with access to electricity produced from Jatropha oil. Small-scale farmers are at the heart of the business model supplying Jatropha oil to a hybrid power plant. Electricity is then sold by the private power company ACCESS to residential and business consumers. Out of a forecast of 10 000 ha of Jatropha, 600 ha, involving 326 rural families, are already under cultivation on land previously allocated to cotton - a product which has significantly dropped in market value over recent years. The project provides a stable income to farmers as well as access to modern energy services for the community, both having stimulated the local economy. Furthermore, producer and consumer rights have been promoted through the establishment of co-operatives and associations.

One of three 100 kW dutch generators at Garalo able to run on Jatropha oil, diesel or a blend (Photo: Smail Khennas)

Case 2 - Senegal Chardust Briquettes

In Senegal, access to cooking fuel is a growing issue. This is because the reduction of quotas for biomass energy production and the reduction of forest areas devoted to it, along with the high cost of transport, high LPG prices and shortages, have coincided with reduced purchasing power of low income people due to rising inflation. In the city of Saint-Louis in North Senegal (population 160 000), access to charcoal is constrained by cost and scarcity as the city is hundreds of kilometres away from where people are permitted to make it. This initiative's approach to the problem is

Briquetting residues using the rotor press (Photo: PERACOD)

manufacturing charbriquettes from recycled low-value charcoal dust, which is locally available. With a favourable political climate, the programme is being driven, as a Public Private Partnership (PPP) by PERACOD (Promotion of Rural Electrification and Sustainable Supply of Domestic Fuels), a partnership between the Ministry of Energy and GTZ, and BRADES (Bureau de Recherche Action pour le Développement Solidaire), a private company. Although still at the pilot stage, sales of charbriquettes are growing rapidly, (e.g. less than 500 kg in November 2007, and approximately 2 000 kg in June 2008). With local authority support, employment is being generated, the briquettes are well-liked, polluting chardust is being cleared and used. Risks include an increase in the cost of raw materials, and the continued need for marketing.

Case 3 - Senegal Typha Charcoal

Typha Australis is an invasive species that is found throughout the delta region of the Senegal River. Estimates suggest that there is the potential of 519 000 tonnes of dry biomass from Typha in the delta area. There are two main actors directly involved in the market chain; the company of four people who harvest, dry and process the Typha into briquettes, and a women's group which markets and sells the final product. The harvesting process is very demanding and as such investigation is ongoing into the options for mechanisation of collection of the Typha. Senegal benefits from a positive enabling environment with respect to renewable energies including Bioenergy and as such local authorities have welcomed the development of this project.

Harvesting Typha in a drainage canal (Photo: PERACOD)

Case 4 - Tanzania Sisal Biogas

Tanga region in Tanzania depends on sisal as its most important cash crop. Using current production methods, only 4% of the actual plant is recovered as fibre, the residue either burnt, producing carbon dioxide, or rotted naturally, producing methane. At Katani Ltd, a sisal growing and processing company, this residue is now converted to biogas, and thence to electricity, used to power the factory and excess power can be used by those living on company premises. Further plans include doubling the power output from 150 kW to 300 kW, and developing biogas for vehicles and piping fuel to households. Katani Ltd. has strong social interests and has transferred land to local farmers on which they grow sisal which they buy. The increased income has enabled them to build better houses, buy bicycles, mobile phones and better clothes, along with access to electricity and cleaner drinking water. Electricity is used to provide light for

Sisal processing machinery (Photo: Katani)

work in non-daylight hours, and to run small-scale industries, which can subsequently increase incomes. Katani provides energy services to the local schools and hospital. It is difficult to assess the full impact of the Cleaner Integral Utilisation of Sisal Waste for Biogas and Biofertiliser as only phase one has been completed. However, higher standards of living, alongside increased levels of employment have already decreased rates of migration from rural to urban areas.

Case 5 - Tanzania Palm Oil

Palm oil processing (Photo: Thomas Molony)

Based in Kigoma town, Western Tanzania, FELISA is a Limited Company cultivating 4 358 hectares of palm trees and processing fresh fruit bunches for crude palm oil. Oil may be processed into biodiesel and expected to be sold in the domestic transportation market. Given the high market value of crude palm oil however, FELISA is considering supplying the edible oil and cosmetics /pharmaceuticals markets. FELISA are distributing high oil yield seedlings to 29 farmers' groups (comprising about 990 farmers) and to date they have given around 10 000 seedlings for free. The company has developed an outgrower scheme through which small-scale farmers in regional villages will be contracted to supply additional fresh fruit bunches to help meet demand once FELISA's own plantations bear fruit. Furthermore, the outgrower scheme will provide extension services to improve production techniques and assist with the establishment of small-scale processors.

Case 6 - Kenya Charcoal Afforestation

Kenya's forest resources cover only around 6% of the country's 58.2 million hectares and are estimated to be decreasing by 2% annually. Firewood is mainly a rural fuel with over 90% of Kenya's rural population dependent on it. Charcoal made from wood, on the other hand, is produced by rural people as a source of income. Charcoal is mainly an urban fuel, with 82% of the urban population using it. In 2002, the Youth to Youth Action Group, with financial support from Thuiya Enterprises Ltd., initiated the community-driven commercial afforestation project, using two types of Acacia tree to make charcoal, in order to enhance the livelihoods of the local communities. Charcoal has previously been thought of as only semi-legal, so those involved in this initiative have to overcome social barriers to manufacture it. There is a high level of collaboration between several groups of actors, with legal contracts ensuring that each party gets paid for their efforts. The project has already increased forest cover significantly, and training in farming skills has enabled the farmers to earn short-term income through fast-growing crops and honey

Masanga Women's Group Acacia Tree Nursery in Madiany Division

production. Farmers can sell wood directly, but need permits for charcoal production. On the negative side, most men sign the contracts with their sons, rather than with their wives, and levels of corruption are still a cause for concern. The project looks positive, but a critical mass is needed before sustainability can be assured.

Case 7 - Ethiopia Ethanol Stoves

Ethiopia is one of the poorest countries in the world and the most widely used fuel for cooking in the capital, Addis Ababa, is kerosene (42.2%) followed by fuelwood (29.4%). Charcoal, LPG, electricity and residues are used by a much smaller section of city households. Recently, the number of people cooking on kerosene dropped dramatically, exacerbated by the government taking away the subsidy. Ethiopia established an ethanol manufacturing plant at the Finchaa sugar factory in 1999. Seeking potential markets for the ethanol, Project Gaia was invited to do pilot studies in Addis Ababa households in 2004. Since then, Gaia has been working to promote ethanol as a household energy fuel in both the city and in neighbouring refugee camps, where it is partnered by UNHCR which buys the ethanol stoves. Results of a pilot study have showed that the project households readily accept the new cooking technology (a stove called the 'CleanCook'), and ethanol fuel, and that ethanol could effectively substitute for kerosene, for charcoal and for fuel wood use, where the cooking task could be completed with the ethanol stove. Gaia has been working with Makobu Enterprises PLC to produce CleanCook stoves in Ethiopia for around five years. The two partners have a bilateral agreement that has helped them to work on establishing a local stove manufacturing plant. Benefits include reduced fuelwood use, with consequent reduced risks for those gathering fuel, reduced indoor air pollution, time and money savings for those using the stove, locally-available fuel saving imported kerosene, and employment in manufacture and distribution of stoves and ethanol.

Stove user talking about the CleanCook stove (Photo: GAIA Association)

Case 8 - India Jatropha Electrification

The Ranidehra rural village electrification initiative of Winrock International India (WII) is to electrify a remote tribal village through the use of biofuel in the state of Chhattisgarh. The objective of this initiative is to demonstrate the technical and financial viability of running diesel generation sets using vegetable oil as fuel in place of conventional diesel to provide electricity. The initiative aims to design and implement a replicable model of remote

Woman collecting Jatropha seeds (Photo: Winrock International India)

village electrification via use of Jatropha as feedstock. The experiments undertaken in WII proved the use of Jatropha oil in conventional diesel engines as fuel instead of converting into Biodiesel. In the predominantly tribal village 110 households are accessing 3 hours of domestic and 3.5 hours of street lighting per night using 1 tonne of Jatropha seed per month. The project continues to evolve over time with weaker elements being addressed and improvements made. The initiative establishes the idea of rural electrification through active community participation. The promotion of small scale village energy generation helps to boost the village economy by providing alternative livelihood opportunities.

Case 9 - India Biodiesel Waterpumping

Orissa occupies around 5% of the total geographical area of India. It occupies an important place in the country having a high concentration of Scheduled Tribe (ST) and Scheduled Caste (SC) populations. The biodiesel-based water pumping project is being implemented in the remote and tribal belts of two neighbouring Ganjam and Gajapati districts in Eastern Orissa. This initiative led by CTxGreEn, a Canadian not-for-profit organisation, and Gram Vikas one of the largest NGOs in the state of Orissa, India, involves biodiesel-based water pumping primarily for sanitation in 4 villages. This was later extended into critical irrigation of crops through a bioenergy system that eventually led to regeneration of land resources and improved livelihood opportunities. A biodiesel production unit uses the local underutilised seeds of *Pongamia pinñata, Madhuca indiaca* from Forest *and Guizotia abyssinica* (Niger) as feedstock. Biodiesel is produced using a pedal powered reactor for grinding oil seeds, pressing oil from seeds and getting biodiesel from the oil. The biodiesel can be used in the regular pump-sets and generator sets. The press is hand operated while the grinder and biodiesel reactors are pedal operated. The local community uses the by-products, such as pressed oil cake and glycerine, as natural fertilizers and cattle/poultry feed. Although this project is successful on a small scale, and has established the technical feasibility, there is concern that fragile village level institutions, vested political interest, and the absence of strong local level governance could prove to be challenging on a larger scale, particularly as the technology lends itself to enabling social change.

Pedal-driven biodiesel reactor (Photo: CTxGreEn)

Case 10 - Sri Lanka Biomass Spice-Drying

The introduction of 19 wood-fired dryers by Alliance for Appropriate Technology Exchange (AfATE) to village level operators in Kandy District has diversified income streams and increased revenue to a range of local actors operating within the spice production market chain. As well as selling by-product fuel wood from pepper plants to the dryers, small scale growers are now also able to sell mature spices which can be

dried and preserved. These are sold by the driers to the European and Western export markets where they fetch premium prices. In addition, the installation of biomass driers has stimulated a local fuel wood supply chain including one commercial seller and numerous home growers.

Spice drying racks (Photo: Practical Action)

Case 11 - Brazil Ethanol Micro-Distilleries

This initiative has two components: the testing of ethanol cook stoves in households and the development of Micro Distilleries of Ethanol (MDE). The testing of the 'CleanCook' ethanol stoves in households has taken place in three areas of the Minas Gerais state of Brazil. Stove users have reported benefits ranging from a reduction in smoke and safety improvements, to time and cost savings. The ethanol was originally given to households at no cost, and the price was progressively increased up to market prices. The second component of the project involved the development of the micro distilleries and had two aims: to make ethanol available at a reasonable price in local communities, and to strengthen livelihoods of the producers. The legislative framework plays an important role, and has the potential to enable or frustrate the workings of the MDE market.

Community-owned micro distillery of ethanol (Photo: GAIA Association)

Case 12 - Guatemala Jatropha Biodiesel

The Ministry of Agriculture of Guatemala has identified 600 000 ha of land across the country that is considered suitable for the growing of Jatropha. This project was established early in 2008 and is situated in Cuyotenago in Guatemala covering 170 ha of land, which is owned by a total of 150 families, and is projected to produce 361 000 litres of Jatropha oil per year. The farmers will be organised into clusters by a co-operative, the first cluster has already been set up. For this first cluster the processing equipment to transform the oil into usable fuel is owned and operated by an industrial partner, but in future it may be owned by the co-operative. The processing of the oil also produces products that can be used variously for cosmetics, and fertiliser. The project receives technical, organisational and business development support from TechnoServe, a global organisation whose aim is to support small entrepreneurial development.

Jatropha plantation (Photo: Technoserve)

Case 13 - Peru Veg-Oil Recycling

This case covered two individual entrepreneurs who have set up in the business of producing biodiesel from used vegetable oil in Lima in Peru. The main way of accessing the oil is through restaurants and supermarkets. The business is run on an informal basis as the formalisation process appears to be too complex and expensive for small producers to manage. Once the biodiesel has been produced by these small enterprises, it is sold (again on an informal basis) to end users, with the end user sometimes being the same establishment that the used oil originally came from. Training has been provided by Practical Action to ensure the quality control of the end product and thus improve the confidence of the customers. With the situation as it stands, biodiesel production is not a very profitable activity in Peru but initiatives have been able to continue over 10 years, still in the hope that their contribution to resource efficiency and fossil fuel substitution will be recognised in regulation or financing systems.

Mr A Jacobo with the current biodiesel reactor (Photo: Practical Action)

Case 14 - Thailand Jatropha Co-operative

In 2006, the University of Kasetsart and the Viengsa Agricultural Co-operative initiated a zero-waste Jatropha development project in Viengsa District, Northern Thailand. The University and the Co-operative have played a key role, not only in establishing and supporting market actors but also in facilitating the sale of products at highly competitive prices (lower than on the open market) to consumers within the Co-operative. The University is running a Jatropha School to train Co-operative members in Jatropha production, processing and marketing. For its part, the Co-operative has formalised agreements between members to guarantee and fix prices of raw materials and Jatropha products. To date, the project has not only provided an income to 1 000 farmers but has also established local access to an affordable and renewable source of energy to help the community reduce the costs of production and thereby increase energy and food security.

Seedling preparation (Photo: Univ. of Kasetsart)

Case 15 - Vietnam Biogas Farm

Vietnam has one of the fastest growing economies in the world. Following land rights being given to individual farmers, the country embarked on an integrated land management scheme, supported by the Vietnamese Gardener's Association (VACVINA), which works at all levels, and has national responsibility to promote this concept – called

the VAC integrated system. It involves gardening, fish rearing and animal husbandry to make optimal use of the land. Traditional fuels such as wood and coal for cooking, are becoming increasingly scarce and expensive, and can contribute to deforestation. Increasing livestock production in rural communities with high population density leads to health and environmental issues from the quantity of animal dung being produced. Biogas digesters are part of the solution offered by this initiative, using the wastes to generate energy, and the resultant slurry as a fertilizer to improve soil quality. A market-based approach has been adopted to disseminate the plants. The service provided to those buying the digester is comprehensive. The customer must have at least 4-6 pigs or 2-3 cattle that provide all the inputs (animal dung). Households use the biogas as fuel and slurry as fertilizer. They pay the total installation cost for the digesters to local service providers, and operate the biodigester using instructions provided by local service providers. A biodigester produces enough daily fuel for cooking and lighting. It improves the surrounding environment, whilst livestock produce meat, milk and fish products for local consumption and subsistence farming. Vegetable production is enhanced through use of biogas slurry. Latrines can be added to the system to enable human waste to be used for energy.

Cooking on biogas (Photo: CCRD)