



NL Agency
Ministry of Foreign Affairs

Baseline study: Plantinum Madagascar, clean fuels for local use

- Summary Report

>> Focus on energy and climate change



Access to sufficient, clean energy is generally assumed to be a condition for achieving the Millennium Development Goals. In order to underpin this assumption, the impact of creating access to energy on social and economic developments should be determined. Measuring this impact starts with recording various socio-economic indicators, such as energy consumption, the amount of households and people connected to energy and amounts of jobs created. This is done during a so-called baseline-study, prior to the implementation of the project activity. Once the project has been implemented, the same indicators again are measured during an impact study. Differences between both studies are subsequently attributed to the project activity i.e. the provision of energy.

In this document you will find the summary of a baseline study, being a Master's thesis performed by a student from the University of Eindhoven. The study was executed in Madagascar at Plantinum Madagascar. The study resulted in the graduation of the student.

The following issues will successively be addressed in this summary:

- Daey Ouwens Fund;
- Energy and the MDGs;
- Plantinum Madagascar S.A.R.L. (formerly called JSL);
- Results from the baseline study;
- Background information.

Daey Ouwens Fund

The Daey Ouwens Fund aims to provide people in Least Developed Countries (LDCs) with access to energy by promoting small-scale projects in the area of renewable and job-creating forms of energy supply.

The Daey Ouwens Fund thus fits the Netherlands' wider objective of contributing towards the achievement of the United Nations' eight Millennium Development Goals (MDGs). The fund focuses particularly on the goals:

- MDG1 eradicating extreme poverty and hunger and
- MDG7 creating a sustainable environment.

The Daey Ouwens Fund is commissioned by the Netherlands Ministry of Foreign Affairs and is managed by NL Agency.

More information on the fund and the projects supported can be found at www.daeyouwensfonds.nl

Energy and the MDGs

MDG1

Energy plays an important role in achieving MDG1 (eradication of extreme poverty and hunger) as it underpins all economic activity and is a prerequisite for development. Improved access to (renewable) energy sources in least developed countries reduces time spent on firewood collection. Replacing firewood with affordable renewable energy sources allows (mainly) women and children time to engage in economic activities and employment creation, or attend school. Renewable energy also offers possibilities for improved lighting, facilitating a broader range of activities after sunset. Moreover, income spent on energy can be decreased, allowing households to spend more on other essentials. Modern energy also offers potentials for deploying machines in agricultural production processes, having positive effects on production scales and labour diversification to other economic activities.



MDG7

MDG7 (creating a sustainable environment) contains important links between renewable energy, environmental sustainability and health. In practice, high dependence on firewood negatively impacts the environment and climate. This can be reduced if firewood is substituted by renewable energy sources. Wood is not scarce but is not always used sustainably. And a rapid population growth means that demand often outstrips supply. Replacing fossil fuels with renewable sources also mitigates accompanying greenhouse gas (GHG) emissions, leading to improved climate conditions. Moreover, access to energy allows water pumps to be installed, supplying the local population with cleaner water by which health conditions are importantly improved.

Plantinum Madagascar

- the Clean Fuels for local use project

The Daey Ouwens Fund (DOF) is managed by NL agency. The fund aims to provide more people in Least Developed Countries (LDCs) with access to energy by promoting small-scale projects in the area of renewable and job-creating forms of energy supply. The DOF project 'Clean Fuels for Local Use' was set up in Madagascar by JSL Biofuels Madagascar (currently called Plantinum Madagascar) to grow jatropha. This project mainly targets the transport market for sales of pure plant oil (PPO), plans to install jatropha-suitable generators, brings cooking stoves on PPO to the market and promotes the use of the oil in lamps. Generators will be installed in schools and hospitals in the communes.

For cooking on PPO, special stoves will be sold.

JSL plantations currently employ 80 daily workers.

This is expected to be 163 in 2011 and 950 by 2015.

With continuous up-scaling to 30,000 hectares,

4.500 workers may be needed. Integrating small

farmers in the project via the outgrower scheme

also provides further income-generating

opportunities. JSL aims to integrate 750

smallholders by 2015, with 4,000 targeted in the full

scenario, increasing to 12,000 by 2020. Moreover,

plantations on marginal soils around the

d'Ankarafantsika national park serve as a firebreak

against bushfires and protect biodiversity. They also

deter loggers from entering the park illegally.

For more information: www.jsl-biofuels.com.

Poverty alleviation is the main incentive for beneficiaries to participate. Local mayors stressed the project's importance for local development. It is also expected to improve agricultural knowledge. Although familiarity with jatropha and its applications is rather low among the local population, the vast majority of the local population is interested in a grid connection, driven by the expectation that such provides better lighting quality.

Approach baseline study

Data has been collected in the field via various sources, namely household surveys, interviews with key local persons and beneficiaries, professional observations and focus groups. The fieldwork yielded 473 surveys, 17 interviews and one focus group in Madagascar. The results will allow quantitative comparison of the baseline situation with the follow-up situation when the project is at a later stage, i.e. measuring the actual impact.

Measuring poverty solely as income is unreliable, therefore other indicators were also taken into account, such as food consumption. The latter directly relates to MDG1. To construct a wealth index, data were collected on ownership of durables (fridge, radio, mobile phone), housing (building materials, rooms) and access to services (sanitation, water and electricity). Other measured indicators were access to education and healthcare, gender equality and access to energy. Energy indicators have been based on use, costs, problems during use and availability.

For the baseline study three key areas were identified. The fokontany (village) of Marosakoa in the commune of Marosakoa, which borders the national Parc d'Ankarafantsika. By February 2010, 200 hectares of jatropha trees had been planted. JSL has also targeted an area of 200 ha to be planted by 2010/2011 in the commune of Ankazomborona, so the fokontany of Mahatzana was identified as a second key intervention area. The third chosen area is the fokontany of Ambatomalama in the commune of Boanamary, where JSL is in the process of setting up an outgrower's scheme. Full sampling was chosen to give a clear and detailed view of the local population. It was decided not to look for a control group outside the intervention areas. Instead, households in the sample were split into three groups: plantation workers and outgrowers, consumers, and a part of the population that is not involved in the plantation work or outgrower schemes nor being consumers of the jatropha biofuels. The latter serve as an alternate control group.

Results from the baseline study

Access to energy

Since a local grid is only available in Marosakoa, grid electricity is used by few households. Alternatives such as car batteries and generators are expensive and only affordable by wealthier households. Batteries are used by three quarters of households, but 96% are non-rechargeable and thrown away after use. The majority of respondents owns a radio, normally battery powered. Another common device is the mobile phone, even though coverage is often low, and many people have no credit as this is expensive. Households that own a TV often also had a VCD or DVD player.

The most important application of energy is for cooking. Households mainly rely on firewood (91%), followed by charcoal. In the case of firewood, a three-stone fire is normally used to prepare meals, and 98% acquires the wood for free. Collection is mainly a man's task. The majority of households experience problems with wood, mainly from smoke and odour nuisance. Availability is not a problem. Charcoal is used as a cooking fuel in 20% of households, and often in combination with firewood. Most households report few problems with charcoal, but although it is widely available, a quarter of respondents said it was too expensive. A second important application is lighting, used almost exclusively inside the home. Petrol (kerosene) is by far the most widely used fuel. Other households rely on electrical lighting, candles or batteries. The most widely reported problems with using petrol are fire hazards, availability and expense.

Socio-economic situation

Of all households 77% said their current income was insufficient to provide for basic needs. Only 3% said it was more than sufficient. In the intervention areas 94% of the respondents are occupied with agriculture. The main crops cultivated in Marosakoa and Mahatazana is rice; in Ambatomalama it is cassava and maize. Harvests are used for self-consumption and selling, and 76% of households owns livestock. Agriculture and livestock are thus very important sources of income for most households. Other sources of income are fishing, old age pensions, remittances and entrepreneurs. Few respondents have a loan or save through a financial institution. However, some save money at home, and most have a fallback option of selling crops and/or livestock.

A large portion of households in the survey indicated they do not always have enough money to buy food. On average households in Ambatomalama have enough money available for daily food needs more often than Mahatazana. Respondents were more positive about the variety of food in their diet. Only 35% were unsatisfied. Periods of hunger are common. Households in Mahatazana experience on average more severe periods of hunger than the other fokontanies. Meals in Madagascar consist mainly of rice. Vegetables are consumed considerably less, but most people eat them regularly. Meat is a luxury and is eaten less often. All three fokontanies have access to a river, and fish is eaten regularly. Only 3% never eat any fish.

The households were assigned to five poverty levels based on their scores on the wealth index. In total 82% of households are assigned to the first (highest) poverty level.

Environment

Few households in the sample have access to toilet facilities. Just 2% have access to a public latrine, and 1% uses a pit latrine or flush toilet. Public latrines are usually found near school buildings or the mayor's office. Diarrhoea is a common disease among villagers. The main source of water is the river. Wells are used to a lesser extent. Many households bathe, do the laundry and wash their zebu in the river. Crocodiles live in the river in Marosakoa making these activities very dangerous.

Conclusion and recommendations

It was sometimes rather difficult to get a good view of the expectations of beneficiaries, even though they were very positive. Local knowledge about jatropha is still low; this could be due to the early stage of the projects. Pilot schemes are needed to improve general knowledge about jatropha. Then expectations can be adjusted and uncertainty reduced. Learning processes are ongoing. As this was a baseline study, no conclusions can be drawn regarding impact. Instead, the study reveals the current situation in terms of energy, poverty and environmental sustainability. Poverty levels are high and many households have low variety in their diet and endure annual periods of hunger lasting months. This indicates that basic needs are not being met.

In this baseline study the focus was on expectations among beneficiaries in the intervention areas. However, the use of the term 'expectations' yielded some astonished looks in remote Areas. Re-phrasing the questions as foreseen 'advantages' and 'disadvantages' made the concept more comprehensible. People in low-income countries often live by the day and are less occupied by the future. As one interviewee emphasized: "We spend a lot of time finding water and food, first we have these problems to solve and then we can be concerned about development."

There are opportunities for a transition towards jatropha in Madagascar, but there are also barriers to overcome. Fuel costs, local practices and current technologies all play a role in the adoption of biofuels. Least resistance is expected for fuel substitution for lighting and for electricity generation. For lighting, conventional lamps can be used, no additional investment has to be made, and households can directly benefit from cost savings if the price of jatropha is lower than fossil fuels. As power generation by means of jatropha oil does not influence the end product, electricity, end users will not experience differences. In developing successful biofuels to replace fossil fuels, oil prices are a main influencing factor.

The project can contribute to poverty reduction as they create employment on the plantations; another possibility for local people is to participate in the out grower scheme where jatropha is planted on parts of their own land. A large portion of the local population in the intervention areas lives in extreme poverty, with subsistence agriculture their main source of income.

Jatropha technology and opportunities

The JSL project in this study involves biofuel based on *Jatropha Curcas L.*, a drought-resistant tree that produces oil-bearing seeds. Originally from the Americas it is now abundant in most tropical and sub-tropical regions. An inedible crop, it was used as a hedge to protect houses, land and livestock. Plant elements were used to produce soap and medicines. In this project the seed oil is used for the production of Pure Plant Oil (PPO) or biodiesel.

The majority of people in Madagascar live in rural areas and depend on traditional biomass for energy, with wood and charcoal being the most important sources, used mainly for cooking. Cutting wood leads to deforestation and soil erosion. Smoke from firewood also has health implications. *Jatropha* PPO and biogas from seedcake can replace wood and charcoal as a cooking fuel, and also provide employment, but this requires modified cooking stoves. Thus poverty can be a barrier to large-scale use as investment is needed. Another obstacle is local habits.

Jatropha PPO can also be used as a fuel for lighting in standard kerosene lamps. There is no need for additional investment, thus switching to *jatropha* has great potential. With regard to vehicles and generators, switching to PPO requires modification to the engine or the PPO, involving additional investments by either the supplier or the buyer. In the case of PPO modified for mixing with conventional diesel/petrol, resistance is expected to be low. Consumers do not have to make modifications themselves, nor do they have to invest, but they still profit from cost savings. When engines need to be adapted, resistance is expected to be higher as consumers need to invest. *Jatropha* oil and biogas can be used for electricity generation, and can replace conventional oil.

Besides energy, several other regimes are relevant to *jatropha*. In agriculture, a low level of education among farmers means many use traditional practices that hamper yield increases. Farmers can increase income by cultivating *jatropha* as an additional crop. This can in turn increase general knowledge about crop cultivation. The financial regime can also play a role, especially in Tanzania where many people have access to micro-credit, enabling them to buy seeds. There are barriers however. Poverty makes the price of biofuel important. If biofuels cannot compete with fossil fuels, consumers will not switch. Applications for lighting seem most feasible as no additional investment is needed. In transport, price-wise biofuels are a good alternative to diesel or petrol, but infrastructure and technology can be a barrier.



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Executing a baseline study in Madagascar:

“How much wood do you use, mum?”

Sanne Heijnen, performed the Baseline study in Madagascar in 3 different villages. “I really enjoyed doing research in Madagascar” told Sanne. “The research team consisted of 3 locals and 3 students from the local University. This combination was an excellent set up as the local people knew exactly where and to whom to go and the students were experienced in conducting a survey. The interviewed people were very cooperative and helpful. We often started a survey with one member of the family and ended with the whole family around the table: the man answering questions related to the agricultural land and the women answering the questions related to cooking. Mum: how much wood do you use for cooking per day?”



Background information

About 1.6 billion people in developing countries have little access to modern energy sources. Most rural areas are not connected to the national grid, and other energy sources are often expensive. As a result, biomass such as wood and dung is often used. However, these traditional fuels have serious implications on the environment and health. Adequate energy supplies can also improve basic services such as healthcare, education and communication, and promote economic development.

Madagascar

Madagascar is among the poorest nations on Earth. It is ranked 146th out of 177 countries on the UN Human Development Index, with an average family size of 5.4, life expectancy of 55.5 years, and a per capita income of US\$309 in 2005. More than 70% of the population lives below the poverty line, and of its 15 million citizens, more than 10.5 million survive on \$2 or less per day. Primary school enrolment rates are above 90% (although only 57% of children complete primary school, and only 7% complete secondary school). Literacy was 63% in 2005, above the Sub-Saharan African average of 61%. Child mortality rates declined from 159 deaths per 1,000 live births in 1997, to 94 in 2004; and the maternal mortality ratio of 469 deaths per 100,000 live births is far better than the Sub-Saharan African average of 830. Despite this, there are major regional inequalities. Access to safe drinking water is low.

Energy in Madagascar

The provision of energy throughout Madagascar is at a very low level, and the country has made little progress in developing infrastructure such as electricity and water supply in rural areas. The country has no oil or gas resources and is entirely dependent on imports. The main energy sources used are wood and kerosene. Wood, either used directly or as charcoal for cooking and kerosene for lamps is most common, and in many places the only options, but they cause problems including deforestation, air pollution from fumes, and



vulnerability to the rising costs of kerosene. At present only 2% of rural areas (where 70% of the population lives) are electrified. Of those that are, mechanical problems cause regular power cuts.

Madagascar and the MDGs

Madagascar still has far to go on the 8 Millennium Development Goals. At current rates of progress they will not be met by 2015. Per capita GDP growth is inadequate, and the high population growth rate of 2.7% a year makes it difficult to provide basic services, and for poor households to escape poverty. MDG 1 deals with the eradication of poverty and comprises three targets. The first of these is halving the proportion of people whose income is less than one dollar a day by 2015. According to a 2005 survey, 68.7% of the population fell into this category, and the 34% target is unlikely to be met, as the economy would have to grow at over 8% a year. The second target, full and productive employment for all, also seems unrealistic as poverty rates differ widely by region. The third target, halving the proportion of people suffering from hunger, is difficult in a country with areas of 80% poverty, and where famine is an annual problem.

MDG 7, to integrate sustainable development into national policy and reverse the loss of environmental resources and biodiversity, is particularly relevant to Madagascar given its unique ecosystem. Rapid population growth puts pressure on the fragile environment, which can only support limited numbers of people, especially with current farming practices, which revolve around slash and burn cultivation. To contribute to MDG 7, the government has committed to triple the size of protected areas to 10% of total land area. But this also creates a need for alternative income generating activities for the local population. Another challenge will be dealing with the high incidence of illegal extraction of forest products.

Baseline studies & impact assessments

NL Agency wants to learn more about the impact of small-scale sustainable energy projects on social and economic development and the contribution of access to energy to achieving the MDGs.

The baseline studies aimed to provide a picture of the socio-economic situation and energy consumption in the target areas. The studies and subsequent follow-up research will focus on the extent to which the project contributes to achieving the MDGs.

If you like to receive the full reports, please send an email to daeyouwensfonds@agentschapnl.nl

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NL Agency
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T +31 (0)88 602 9200
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www.agentschapnl.nl

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Original Author: M.Sc. S. Heijnen
Summary report: Tim Skelton

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