PACEAA

Poverty Alleviation through Cleaner Energy from Agro-industries in Africa

An Innovative Business case for Rural Electrification

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Through a combination of capacity building, training, and detailed rural energy planning, the PACEAA project, coordinated by UNEP-Risø, has laid the foundations for using the surplus energy produced by agro-industries to bring electricity access to the surrounding rural communities.

For rural residents in developing countries, access to energy can transform lives and livelihoods – it can mean education, medical services, and income generation, among other positive steps towards poverty alleviation. For this reason, electrification is an urgent need in countries where large portions of the population live in rural areas with little or no access to modern and clean energy. This is a particular challenge for most countries in sub-Saharan Africa.

Agro-industries are an important component in growing economies, and they can both benefit from, and contribute to, rural electrification. However, due to low or unreliable levels of electricity supply from the grid, agro-industries often have to resort to producing their own power. Consequently, there has been increasing interest in recent years for agro-industries to utilize local renewable energy resources, such as small hydro and agricultural waste or by-products, for generating power. Where such projects are developed, there is also an opportunity for businesses to sell excess supply to the local community. This can make good business sense by harnessing economies of scale in electricity generation, diversifying revenue streams, and contributing to local community health and development.

The three-year PACEAA programme concentrated on small hydroelectric projects in East African tea-growing regions. However the PACEAA concept can be applied to many other forms of renewable energy projects by agro-industries around the world. Many agro-industries, such as floriculture, horticulture, dairy farms, and sugar processing are investing in renewable energy projects such as biogas or biomass and waste cogeneration, often as a lower-cost and more convenient way to generate electricity than conventional grid-connected supply. While the generation methods may differ, the basic concept of PACEAA remains the same: using surplus clean energy to bring electricity to rural villages with the aim of advancing development goals and improving quality of life, while creating new business opportunities.

Workers plucking tea in Kenya

A focus on the Tea Industry

Tea production is an economic mainstay in several East African countries. Kenya alone accounts for 18% of annual world tea exports, with Malawi supplying 4%. Usually located in remote areas, where grid power is weak or limited, tea factories are often obliged to resort to costly and polluting diesel generators to assure a steady flow of electricity. Fortunately, these same areas often have excellent potential for hydroelectric energy, and tea producers are increasingly investing in small hydroelectric projects to power their production lines. With good planning, small hydro can supply clean, reliable and affordable electricity.

In conjunction with the GTIEA project (see below), the PACEAA team selected four pilot sites in Kenya, Malawi, Rwanda, and Tanzania, where there is good potential for small hydro as an energy source for tea factories. While the hydroelectric plants' primary function will be to supply electricity to tea factories, any surplus energy generated could be channelled to communities in the surrounding areas, where there is little or no energy access (see box "Bringing Power to the People"). The pilot sites are Kipchoria, in Kenya's Nandi Hills; Ruo Upstream, in the Mulanje region of Malawi; Giciye, near the Gishwati forest in Rwanda; and Suma, in the Mbeya region of Tanzania.

Laying the Foundations for Investment

With support from the European Commission's COOPENER programme, a PACEAA project team helped develop the tools, policies, and plans necessary to initiate this innovative business case for rural electrification. The project team was composed of two European partners; namely UNEP-Risø, a centre within the Risø-DTU National Laboratory for Sustainable Energy

in Denmark which provided the overall coordination, and Innovation Energie Développement (IED), an independent engineering and consulting firm which carried out most of the field work and preparation of rural electrification plans. The DTIE branch of UNEP, based in Paris France, also contributed to the project as an international partner.

Upstream, the PACEAA Project was linked to two Global Environmental Facility (GEF) projects; Greening the Tea Industry in East Africa (GTIEA - http://greeningtea.unep.org/ and Cogen for Africa (http://cogen.unep.org/). GTIEA entailed development of power generation from tea industries as mentioned above, and was managed by the East African Tea Trade Association (EATTA), based in Mombasa, Kenya. The other GEF project, Cogen for Africa, focussed development of power generation from sugar cane waste (bagasse) and other agro-industry by-products, and was managed by Energy, Environment and Development Network for Africa (AFREPREN/FWD), based in Nairobi, Kenya.

Capacity Building – Involvement at Local and Regional Levels

IED undertook the important task of PACEAA's development of detailed electrification plans while UNEP-Risø formulated the necessary business models. In the process of creating plans for each pilot site, IED also developed tools and methodologies that can be used to create rural electrification plans for future projects. However none of these plans would have been possible without input from the local and regional stakeholders who will potentially see the projects through to completion. Once the stakeholder's ideas were integrated into the initial project plans, they were once again contacted to verify the final plans and to familiarize potential implementers with the plans' contents. With these goals in mind, a series of training workshops and stakeholder meetings were held in 2009.

The training workshops were attended by around 100 participants, including government officials, rural electrification officers, consultants, entrepreneurs, and academics. Overall, the response to the PACEAA project was enthusiastic, and the participation rate was far higher than predicted. As Said Abdallah of UNEP-Risø pointed out, these workshops demonstrated that rural electrification is no longer the exclusive domain of government ministries: "People are generally unaware that rural electrification can be initiated by individual groups," he says, "not just governments."

A series of separate stakeholder meetings also proved to be crucial. The participation and co-ordination of a wide range of organisations – from local NGOs, government ministries and tea growing cooperatives is essential for putting PACEAA's project plans into action (see box, "Farmers' Associations – Important Players in Rural Electrification Projects). To advance this collaborative process, meetings were held in each of the four countries selected for the pilot projects. Dozens of representatives from community-based NGOs, public utilities, international energy development programmes, consulting firms, government agencies, and private businesses attended these sessions, and their input proved vital to finalizing the rural electrification plans.

For more information, contacts, and downloads of the rural electrification plans for each pilot site, and access to IED's GIS software application developed specifically for PACEAA, please visit PACEAA's website: www.paceaa.org.

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Bringing Power to the People
Using Surplus Energy for Rural Electrification

PACEAA's goal was to demonstrate that rural populations can benefit from agro-industry's investments in renewable energy using the surplus energy generated from small-hydro or biomass cogeneration units. But how does it work? A careful analysis of the given agro-industry factory and its existing energy needs and supply was conducted, taking into account seasonal variations in both supply and demand. During this process, the potential for rural electrification was assessed, by considering the projected power demand and the project's related costs.

Coming back from the battery charger, Malawi

In the Kipchoria tea factory plan in Kenya, for example, PACEAA decided to focus on public services and productive end uses rather than individual homes, as the majority of households lie outside of trading centres, and connecting them would prove too costly. In these cases other solutions like Solar Home Systems or Pico Hydro might be more economically attractive. The Kipchoria plan targets 11 schools, 3 medical dispensaries, 223 commercial activities, and 175 households living close enough to transformers to be potential customers for electrification. Interviews were held with village chiefs, and future potential energy demands were integrated into the RE plan. The electricity will be supplied via low and medium voltage line extensions from the existing internal network at the EPK tea factory.

Overall, some 8,000 people in the surrounding region will benefit directly and indirectly from the Kipchoria project. PACEAA calculated that the rural demand represents only 3% of the total power generated by the EPK tea factory's small hydro plant, illustrating the marginal impact of the rural electrification (RE) project to the overall financial viability of the small hydro project. At the same time, rural communities who would otherwise not be connected to a power supply will enjoy undisputable benefits from this renewable energy source.

Farmers' Associations
Important Players in Rural Electrification Projects

2

PACEAA's rural electrification (RE) planning involved a large number of stakeholders, including NGOs, government ministries, and entrepreneurs. But perhaps the most direct link with the people who could most benefit from the RE plans was through farmers' associations. These associations not only represent the small-scale farmers that work in agro-industries, but are also becoming important partners in RE projects, both on a financial and organizational level. In PACEAA's case, tea farmer associations were a vital component in realizing the RE projects.

In the last decade, dozens of tea farmer associations were founded in East Africa. Declining tea prices on the world market in the late 1990s and early 2000s sharply impacted farmers incomes, inspiring them to form collectives to better negotiate prices and conditions. These groups became important players in the African tea market– some have consolidated their funds and bought shares in the tea factories that they supply, becoming producers in their own right. The associations have not only reaped economic benefits, but they have also helped improve the social welfare through development projects funded with the additional income and Fairtrade premiums, often in association with NGOs and government agencies. Schools, medical dispensaries, farming equipment, and water tanks have been financed in this way, and now attention is being directed towards energy projects.

With support from PACEAA, these farmer organizations can now invest their funds in energy access for their members and their villages, where electricity usually is very limited or non-existent. PACEAA's RE plans call for using the surplus energy created by the tea factories' small hydro projects to supply electricity to village centres, dispensaries, schools, and other facilities. This relatively small amount of electricity could make an enormous difference in rural residents' lives, creating possibilities for education, improved medical services, and income generation. Farmers benefit from both sides of the equation: from a business standpoint in their relationship with the tea factories, and from a social standpoint in the improvement of quality of life in their communities.

Rwanda - Nyabihu tea factory

Currently the main player in the tea industry in Kenya is a cooperative run system called Kenya Tea Development Agency (KTDA). About 62% of the total crop in the country is produced by the smallholder growers (430,000 growers) who process and market their crop through more than 60 tea factories under their own management agency, KTDA Ltd., which is the largest single producer of tea in the world.

Fairtrade and the Power of Premiums

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Fairtrade premiums are proving to be an important source of funding for RE projects, such as those supported by PACEAA. Designed to create opportunities for producers and workers who have been economically disadvantaged or marginalized by the conventional trading system, Fairtrade's labelling system is bearing financial fruit for farmer's cooperatives who wish to improve the quality of their member's and their communities' lives. Consumer products bearing the Fairtrade label meet the standards laid down by the Fairtrade Labelling Organizations International (FLO), which include minimum prices that cover the cost of sustainable production, stable trade relations, and decent working conditions for hired labour. Issues such as workers' health and safety standards, democratic organizational structures (for smallholders), and advance credit for producers are also covered by the FLO standards.

A typical lighting appliance, Malawi (paraffin wick lamp).

One of the organization's most important contributions to social and economic development is the Fairtrade Premium. Not only does Fairtrade set a minimum sustainable price for the producer's output—something that is not guaranteed under conventional trade practices—it also sets up a premium that the producer can use for investment in social, environmental or economic development projects, such as schools, or farm machinery, or energy access projects.

While the sustainable prices set up by the FLO are helpful in terms of improving the daily lives of small-scale producers, it is the premiums that make the difference in terms of social welfare projects that can transform their communities. In the case of the East African tea farmers' associated with PACEAA, Fairtrade premiums have been used to build dispensaries, classrooms, water tanks, and purchase fertilizers, and even buy substantial shares in the tea factories they supply. Now tea farmer associations like EPK-OEP in Kenya, RSTGA in Tanzania, and Sukambizi in Malawi are ready to invest part of their Fairtrade premiums in PACEAA's rural electrification projects.

"Our association with Fairtrade has opened up for us opportunities that a few years ago were a pipe dream," says Victor Biwott, Manager of EPK-OEP. "We will be able to train the directors and staff in all management aspects using the premium funds. We will also use part of the premium funds to finance the project."

PACEAA Partners

UNEP Risoe Centre
www.uneprisoe.org

East African Tea Trade Association (EATTA)
www.eatta.com

Innovation Energie Développement (IED)
www.ied-sa.fr

AFREPREN/FWD
www.afrepren.org

United Nations Environment Programme (UNEP)
www.unep.org

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