



FINAL REPORT

WINROCK INTERNATIONAL
BRAZIL OFFICE

and partners

BANCO DO POVO * CENBIO * CERPCH
ECO-ENGENHO * IDEAAS * IDER
MAMIRAUÁ * RENOVE

with consulting support from
APEG

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TABLE OF CONTENTS

Executive Summary.....	4
Introduction	6
Section I – The Renewable Energy Environment in Brazil from 2003 to 2005	7
Section II. Contribution of the Energia Produtiva Program to the Development of the Renewable Energy Market and the Technologies’ Productive Uses in Brazil from 2003 to 2005.....	9
Section III – Success Stories and Lessons Learned	36
Section IV. IMPACT OF ACTIVITIES ON SO9 INDICATORS.....	55
Section V. THE ROAD AHEAD	60
Attachments	63
A. Real and personal property procedures: disposition of all acquired property and equipment	64
B. Description of contents of enclosed CD-ROMs	67
C. List of acronyms	68
D. Final Financial Report	71

Executive Summary

From October 2003 to September 2005, the Productive Energy Program (Energia Produtiva - EP) achieved important successes in promoting the utilization of renewable energy technologies in Brazil for the mitigation of global climate change, promotion of market-based mechanisms/private investment, and poverty alleviation via the application of innovative, productive, clean-energy technologies. Some activities were clearly pioneering. EP successes spanned a very wide range of activities including local NGO capacity building, policy/regulatory changes, demonstration projects, disadvantaged youth training, and innovative financing/contractual mechanisms.

Designed to be a four-year program (FY 2004 to FY 2007) Energia Produtiva faced an early closeout due to Mission's uncertainties about availability of funds for FYs 2006 and 2007. However, Winrock and partners managed to mitigate associated impacts and deliver concrete and long-lasting results that will be boosted in the years to come by the many stakeholders engaged.

Under EP, approximately 70,000 people benefited directly or indirectly from information dissemination efforts, capacity building and energy service projects. These actions targeted remote populations, native peoples, at-risk youth, staff of NGOs, public agencies and the general public. Training initiatives and information dissemination reached more than 60,000 beneficiaries, while direct interventions in income generation and improvement of quality of life reached over 8,000. An additional 20,000 people are expected to benefit from initiatives that are starting and will continue after the end of the Program.

Governed by the philosophy of market-based solutions for sustainable development, the Program's strategy focused on selected market chains with the goal of adding value to local products and services and/or reducing costs. Energia Produtiva carried out direct interventions in the Northeastern productive chains of: Organic agriculture, Hydroponics, Dried fruits, vegetables and spices, Organic cocoa, Marine algae, Apiculture, Dairy farming, Cattle farming, and Goat and sheep farming. Through these activities, 17 clean energy driers were installed, three equipment suppliers were created or strengthened, 11 PV and thermal solar energy systems for water purification and supply were delivered, 5 small-scale biodigestion systems were successfully demonstrated, and another 5 large-scale systems were installed, around 50 efficient stoves were installed, and another hundred are underway. Furthermore, students at 6 rural schools have access to digital technologies for better education and 90 disadvantaged youths have significantly increased their employability.

The program was implemented by eight highly-committed institutions that partnered to compose a team with multi-disciplinarity, wide geographical reach and complementary skills. The Consortium was composed of Eco-Engenho, IDER, CERPCH, CENBIO, IDEAAS, RENOVE, IDSM, and Banco do Povo, led by Winrock International, and had special consultancy by APEG.

The challenges faced by the Program were enormous. Attracting the interest and collaboration of the private sector to implement activities traditionally regarded as unattractive, such as delivering energy to remote communities, or providing small-scale energy solutions, and changing negative attitude towards renewable energy systems due to several flaws in past efforts were some of these obstacles that had to be overcome by the Program partners through a strong and consistent strategy. Despite these challenges, in this very short two-year period, the Program was able to achieve

USAID / Brazil Productive Energy Program

concrete and important results for the Brazilian renewable energy market. This was due in part to the fact that all the Consortium members had worked together under the Winrock-managed USAID Brazil Clean & Efficient Energy Program (BCEEP). By continuing to partner with the experienced and leading NGOs of the BCEEP team, Energia Produtiva was able to conduct a rapid start-up of activities, benefited from lessons learned from the previous program and was implemented in a very collaborative approach with shared responsibilities, through a working group structure.

As demonstrated by the numbers in the following pages, most of the original targets were surpassed. Highlights of the Program include: a) consolidation of RENOVE and increased networking among its members; b) strengthening of a number of small entrepreneurs and NGOs; c) improved technology for biodigestors, dryers, desalinators and other equipment; and d) significant funds secured for micro and small hydro power plants, several of which are now under construction in the Amazon Region.

Energia Produtiva's integrated approach to productive uses of renewable energy, combined with the development of demonstration projects and the successful engagement of public and private stakeholders, led to a truly successful and sustainable strategy for wide-scale replication of the demonstrated technologies. Exploring synergies with other public and private programs was one of the priorities of the Consortium. A wide range of stakeholders was mobilized to co-invest in the projects, such as: Government of Bahia (Agriculture Secretariat, EBDA and CAR), CEFET, Ministry of Mines and Energy, and the National Institute for Land Reform, INCRA, among others. While in some cases this scale-up has already begun, in others the strong interest demonstrated by stakeholders makes us believe that that a much greater legacy of Energia Produtiva will become evident in the upcoming years.

During the implementation of Energia Produtiva the partners faced innumerable obstacles, such as: time-consuming negotiation with stakeholders, delay for federal administration to start key programs and local conflicts between established leaderships in target communities, just to mention a few of the issues that ultimately were overcome through a mix of creativity, expertise and persistence by the Consortium.

Energia Produtiva's follow-on project, USAID's Renewable Energy & Development Program, maintains the core of EP's implementation team, which will scale-up most of the activities and field interventions started under Energia Produtiva. Additionally, several stakeholders, such as State and Federal Governments, local NGOs, newly-created self-help groups, foundations and other donors, have committed to promote renewable energy income-generating solutions advocated by the Program.

This report documents the work undertaken during the course of this two-year Program, and highlights Energia Produtiva's achievements in the promotion of policies favorable to renewable energies, development of renewable energy productive projects and market, and promotion of technical cooperation with U.S. institutions.

USAID / Brazil Productive Energy Program

Introduction

This report and its annexes are intended to describe and document the Brazil Productive Energy Program (Energia Produtiva) over its duration, corresponding to the period of October 2003 to September 2005. All relevant documents generated under this program are recorded in the accompanying CDROMs (please refer to annex B for a description of contents).

On September 2003, the USAID/Brazil Energy Program, through the Cooperative Agreement number 512-A-00-3-00029-00, selected the consortium led by Winrock International to carry out a comprehensive program that aimed to stimulate economic growth, reduce poverty, and address climate change effects and other adverse environmental impacts through application of cost-effective, replicable, and income-generating RE technologies, contributing to the Agency's global goal of having the threat of *Global Climate Change Mitigated through Market-Based Renewable Energy and Energy Conservation*. This program was designed to address this subject and contribute to reaching the Agency's targets for a set of intermediate results defined under USAID's Strategic Objective 9, namely:

IR 9.1 - Improved policy and regulatory framework promoting renewable energy and energy efficiency

IR 9.2 - Increased technology cooperation and transfer between U.S. and Brazilian firms to support clean and efficient energy production and use

IR 9.3 - Market development for renewable energy and energy efficiency

The consortium was composed of the following multidisciplinary and complementary institutions: Winrock, IDER, EcoEngenho, IDEEAS, CENBIO, CERPCH, Mamirauá, RENOVE and Banco do Povo – all of which had developed a successful relationship with Winrock under the BCEEP¹ Program. This team combined the range of specialized expertise and depth of experience in renewable energy technologies, income generation, finance, policy, rural development, gender and climate change necessary to successfully implement the Program's activities.

Project History. This report is complemented by a CDROM in which the reader can find a copy of every relevant document related to Energia Produtiva over its course. For a list of the files in the CD, please refer to annex B.

Acknowledgement. Winrock would like to thank USAID and its staff for funding and managing this important and complex program and thank our many partners who, together with Winrock, comprised a comprehensive and skilled network of leading NGOs and other institutions dedicated to make positive and lasting changes in Brazil's renewable energy markets. We believe the collaboration consolidated under Energia Produtiva will long outlive the program itself.

¹ Brazil Clean and Efficient Energy Program

Section I – The Renewable Energy Environment in Brazil from 2003 to 2005

For the past two years, the new Federal Government searched for solutions to implement some of the promises made during the Presidential campaign. The Government's energy and social inclusion policy was of special relevance to Energia Produtiva, specifically the Zero Hunger² and Electricity for All³ Programs. In addition, extensive restructuring of the operational model of the Brazilian energy sector was underway.

With the goal of reducing electricity tariffs, mitigating the risk of power blackouts, and increasing the access of Brazilian citizens to electricity, the Government launched in November 2003 (decree number 4.873) the Electricity for All Program, and in July 2004 (decree number 5.163) a proposal for the new Power Sector model. The latter decree created an alternative way to contract large energy blocks and marked the attempt to return to or strengthen the energy planning by the state through the creation of the EPE - Empresa de Planejamento Energético (Energy Planning Company). The former decree decreased the time to reach the energy supply targets established in ANEEL's Resolution 223/03 that regulated the universal access to energy services, according to Law 10.438. Resolution 223 set targets for utilities and determined that consumers would no longer be charged for grid connection expenses, which was the major bottleneck for universal access to electricity service. The Electricity for All Program states that by 2008, nearly 10 million new consumers will have access to electricity. To achieve this goal, power utilities will rely on several sources of subsidies. For more details, see decrees at www.mme.gov.br and resolutions at www.aneel.gov.br.

Specifically regarding renewable energy, attention was oriented towards PROINFA and the role that clean energy sources could play to help reach the scattered and very low consumption communities targeted by the universalization effort, particularly the Electricity for All Program.

The long-awaited PROINFA Phase I Economic Values (VE)⁴ were finally announced in 2004 along with the prioritizing criteria. With the VE defined, which allowed the bidding to be issued and Eletrobras to define the PPAs, the next step was securing financing with BNDES. And this remains the main difficulty delaying the start-up of construction of most projects. There are still some claims from investors for lighter guarantee requirements. Grid connection of wind power plant has also received a lot of attention. For Phase II and according to EPE, the likely outcome is that PROINFA will be changed and that instead of having a pre-defined share for each of the three technologies (biomass, hydro and wind), that the market determine the adequate share. There would be a single call and the winning technology is the one that offers the best price. For more details about PROINFA Phase I results please see www.eletrobras.gov.br.

² Programa Fome Zero.

³ Programa Luz Para Todos

⁴ Reference price established by Law 10.438/2002 for each renewable energy source, which would drive commercial relations between utilities and Eletrobras in the first phase of PROINFA and would indicate the share of the CDE for the second phase.

USAID / Brazil Productive Energy Program

Brazil's efforts in regards to universal access to energy services brought a concrete opportunity for solar home systems (SHS), especially after ANEEL's resolution 083/2004, which gave it a strong impulse. The resolution rules the use of SHSs by utilities and has encouraged utilities such as CEMIG and COELBA to announce their plans to use this technology for specific niches where grid extension cannot compete. COELBA alone has already bought approximately 3,000 systems in 2005 and plans to install 18,000 systems in 2006. CEMIG, meanwhile, estimates that at least 5 % of its unattended market will be served using SHSs. Feedback from field experience is indicating the need for some changes in the resolution, which is already under discussion at the Regulatory Agency.

Stimulated by the success of Japan's program, the PV industry is pushing to have a similar rooftop systems program in Brazil. With recent tariff levels, however, very high subsidies would be necessary, something that is very unlikely to happen due to strong competition by other more urgent social needs. Japan's residential tariff level is about twice Brazil's, which justifies a much earlier crossing of the competition's threshold for solar technology.

Social inclusion programs have also generated a demand for infra-structure, including power supply. Sensitive to this issue, the Ministry of Mines and Energy—stimulated by USAID/GVEP—has created an Integrated Action Initiative that aims at bringing together multi-sector stakeholders to discuss energy use and decide on priority applications. On the poverty alleviation front, the Federal Government's Zero Hunger Program stimulated the search for affordable solutions to promote income generation and food security in Brazil's poorest regions, the North and Northeast. Small farmers, rural settlements, women and other disadvantaged groups were at the center of Zero Hunger's efforts, sponsored mostly by civil society and private companies' social investments. These efforts represented opportunities for scaling-up of Energia Produtiva's "social technologies", which were continuously explored during the Program.

The Amazon region continues to deserve special attention due to its scattered market. Not accidentally, the lowest rural electrification levels are in the northern states and despite the aggressive approach and targets of Electricity for All, achieving universal access there is still a dream. The possibility of using the CCC (Conta de Consumo de Combustiveis – or Fuel Consumption Account) funds in support of cleaner energy sources in the region is facing serious difficulties due to the strong lobby of the fossil fuel-based electricity generation industry. Here, Energia Produtiva's outcomes are remarkable. One noteworthy example is the ongoing discussion about the discrimination against small hydro power plants with regards to the CCC subsidy. EP has insistently brought this issue to stakeholders' attention and proposed a new draft law at the National Congress that extends CCC benefits to SHPs under 1MW. The Program was also responsible for approval of the draft law by two Commissions at the House of Representatives. The process of approval of this law is still underway.

The general outlook for the power sector is uncertain. The private sector continues reluctant to invest and there is a real risk of blackouts in 2009 if the sector regulation is not defined soon. The recent eruption of corruption scandals in several spheres of the Government, coupled with federal investigation of power plant constructions, will likely delay this process even more.

Section II. Contribution of the Energia Produtiva Program to the Development of the Renewable Energy Market and the Technologies' Productive Uses in Brazil from 2003 to 2005

Energia Produtiva was implemented based on a market-based approach to develop chains of production, on the engagement of stakeholders, and on productive applications for renewable energy, such as drying, water delivery and consumption, and the use of biofuels. These program components are summarized here, as well as the results achieved by the Consortium in terms of development of the renewable energy market over the last two years.

Productive Chains

Governed by the philosophy of market-based solutions for sustainable development, the Program's strategy focused on interventions in selected market chains with the goal of adding value to local products and services and/or reducing costs, thus generating increased income for the beneficiaries, especially members of poor, rural communities. Energia Produtiva analyzed and carried out direct interventions in the following productive chains in the Northeast:

- Organic agriculture
- Hydroponics
- Dried fruits, vegetables and spices
- Organic cocoa
- Marine algae
- Apiculture
- Dairy farming
- Cattle farming
- Goat and sheep farming

In many cases, such interventions were guided by the development of market studies, business plans and feasibility studies, which indicated the opportunities and paths for energy, technology, human capital or credit improvement. Several equipment manufacturers and service providers were created or strengthened to supply the new market demand stimulated by the Program. The results of these complex interventions are summarized in the next sections.

Market and feasibility studies and communications pieces are available for download at the Publications section of Energia Produtiva's website <http://www.winrock.org.br/energiaprodutiva>.

Solar Drying Solutions to Increase the Value of Family Farm Production

In Brazil, 40% of agricultural products harvested rot due to inadequate preservation.⁵ Energia Produtiva applied dehydration processes as an alternative to increase the shelf-life and ease of transportation of such products, in addition to increasing product value. As detailed in Table 1, the Program implemented seventeen solar, biomass or solar/gas hybrid drying projects in rural communities, including a small agro-industrial facility, stimulated equipment supply by creating a new manufacturing enterprise, and is providing capacity building and commercialization support for market penetration of dried products.

Table 1 – Drying Systems Installed

Purpose/application	Beneficiary	Municipality	Manufacturer / Installer
Drying of Spice (2 driers)	Community of Baixas	São José da Tapera (AL)	Solar Móveis / Eco-Engenho
Drying of Fruits	Cooperative COPEAGRO	Maragogi (AL)	Solar Móveis / Eco-Engenho
Drying of Fruits	Community of Pedrão	Olho D'água das Flores (AL)	Solar Móveis / Eco-Engenho
Drying of Fruits	Community of Barro Vermelho	Arapiraca (AL)	Solar Móveis / Eco-Engenho
Drying of Fruits	Individual	Lauro de Freitas (BA)	Solar Móveis / Eco-Engenho / Winrock
Drying of Bananas (3 driers)	Community of Ilha do Ferro	Pão de Açúcar (AL)	Solar Móveis / Eco-Engenho
Drying of Fruits	Community of Ilha do Ferro	Pão de Açúcar (AL)	Meloni / Eco-Engenho
Dried banana factory	Nova Esperança Association	Wenceslau Guimarães (BA)	Meloni / Winrock
Drying of cocoa	Cascata Settlement	Aurelino Leal (BA)	Winrock
Drying of marine algae	APAFG Association – Flexeiras and Guajirú	Trairi (CE)	IDER
Drying of fruit, vegetable and spice	Community of Bom Jesus	Itapipoca (CE)	IDER
Drying of fruit, vegetable and spice	Community of Barra do Córrego	Itapipoca (CE)	IDER
Drying of fruit, vegetable and spice	Community of Prainha Canto Verde	Viçosa (CE)	IDER
Drying of fruit, vegetable and spice	Community of Bebedouro	Viçosa (CE)	IDER

⁵ For more information please refer to the market and feasibility study available on the Program's website.

USAID / Brazil Productive Energy Program

New manufacturers and products

During the last two years, Energia Produtiva worked with two companies, Solar Móveis and Meloni Consultoria, to promote the local manufacture of solar driers, a gap that needed to be addressed for development of this potentially large market.

With *Solar Móveis*, Energia Produtiva supported the manufacturing of a low-cost, indirect, through-pass, solar thermal drier prototype based on a design by the Appalachian State University. Eco-Engenho selected this design as the best option for small producers, in terms of both cost and ease-of-use. The equipment was tested and approved for drying bananas in the community of Ilha do Ferro, in Alagoas. Eco-Engenho developed the business plan for the new enterprise, *Solar Móveis*, which obtained financing from E&Co to manufacture ten units and deliver in comodato⁶ in the local market. The drier was also adapted to allow for the use of a back-up heating source.



Solar driers manufactured by Solar Móveis
Specifications: Appalachian model,
manufactured in wood.
Load: 5 kg of raw fruit

Sponsored by the Program, another food drier manufacturer and consultancy firm, *Meloni Consultoria*, created new renewable energy equipment. The company previously manufactured LPG-only driers. Now it also manufactures a hybrid solar/biogas equipment. The new drier was tested at the community of Ilha do

Ferro, in Alagoas, where it is being used to add value to the crop production. A biodigester of animal manure supplies the equipment with biogas.

A folder from Solar Móveis is available for download at the Publications section of Energia Produtiva's website. See <http://www.winrock.org.br/energiaprodutiva>.



New hybrid solar/biogas food drier
developed by Meloni Consultoria

Adding value to traditional crops

With the goal of increasing the producer's family income by up to 142%⁵, the Program tested and disseminated the solar drying of fruits in eight northeastern communities in Alagoas, Ceará and Bahia. Some of the results of the introduction of solar driers in these poor communities are described in the next paragraphs.

According to a market study sponsored by Energia Produtiva, the process of drying could help increase Brazil's fruit exports. For example, banana is one of Brazil's most traditional crops, and the country is the third largest producer of bananas worldwide (in addition to other fruits). However, only 1% of national fruit production is exported. One of the major barriers for exporting Brazilian bananas has been inadequate post-harvest management, which can result in damaged bananas, decreasing quality and price. The drying process can mitigate this problem by minimizing raw produce handling through rapid post-harvest processing.

⁶ Through the *comodato* mechanisms, Solar Móveis provides the equipment to communities or entrepreneurs for a free "test drive" during a six-month period, after which the user must either acquire or return the product.

USAID / Brazil Productive Energy Program



Where: Alagoas and Bahia
Technology: solar drying of fruits
Impacts: Income increase for 242 people
Equipment: Solar food dryer
Supplier: Solar Móveis, AL

Locally manufactured solar driers delivered to small farmers in Alagoas

Solar Móveis manufactured the first 10 drier units, which were either sold or delivered to small farmers in the *comodato* mechanism. The following communities received the driers in Alagoas: Baixas, in São José da Tapera (2 driers), Copeagro Cooperative, in Maragogi, Pedrão, in Olho D'água das Flores, Barro Vermelho, in Arapiraca, and Ilha do Ferro, in Pão de Açúcar (3 driers). Another Solar Móveis drier was delivered to an entrepreneur in Bahia.

At these sites, the equipment was used to dry fruits, mostly bananas, and, in some cases, tomatoes, increasing the family income of 242 people. At three of the communities, micro-credit self-help groups were established to help farmers acquire the equipment after the trial period.



Where: Nova Esperança, Wenceslau Guimarães, BA
Technology: Solar-biomass drying of bananas
Impacts: Income increase for 83 families
Equipment: PD-150 LPG driers and solar driers
Supplier: Meloni Consultoria
Specifications: gas consumption of 0.75 kg/h
Load: 120 kg of banana

Ecologic dried banana factory

In Bahia, Winrock is finishing construction of a dried banana factory, which incorporates “green building” techniques, in collaboration with its State Government partner, CAR and with complementary support from COELBA/Light for All Program. The Municipality of Wenceslau Guimarães, where the factory was installed, is the State’s major banana producer.

The project is installed close to the Nova Esperança Reserve. The goal was to promote sustainable livelihoods for the small farmers that neighbor the reserve, and generate income by adding value to the banana production. Winrock provided technical and managerial assistance and capacity building to the community association, which is responsible for running the facility. The community actively participated in the planning and construction process. The factory will be inaugurated in November 2005 and will generate seven job positions in the short term, and an additional five in the medium term.

USAID / Brazil Productive Energy Program



Where: Itapipoca and Viçosa, CE
Technology: solar drying of fruits and spices
Impacts: Income increase for 40 families
Equipment: Tunnel model (University of Hohenheim), locally constructed
Specifications: 2.20 x 1.6 meters

Drying of fruit, vegetables and spices

In Ceará, IDER installed tunnel-model solar driers of fruits and organic spices at the communities of Bom Jesus, Barra do Córrego Bebedouro and Prainha do Canto Verde, in the Municipalities of Itapipoca and Viçosa. IDER was able to reduce the cost of the equipment by using local materials. In Itapipoca, the equipment was initially used for drying marine algae (see below).

In total, 40 families are participating in these pilot initiatives, aimed at generating tangible benefits in increased income.

Sustainable Drying of Cocoa beans

Brazil is home to one of the most biodiverse and threatened ecosystems: the Atlantic Coastal Forest, an internationally-recognized *hotspot* of environmental importance. As a result of human activity, only 7% of this forest is left, and despite Brazilian legislation prohibiting it, the deforestation continues. Cocoa farming, which is one of the region’s main economic activities, is one of the culprits, as wood from the native forest is used in drying the beans.

From 2003 to 2005, Winrock International tested a sustainable energy alternative for the problem of having to use wood from the native Atlantic Forest to dry the cocoa beans after harvest in a settlement community that engages in Organic agriculture. Winrock identified the potential for developing a biodigestion project using animal manure, and went on to design and implant the system and train the community in installation, operation and maintenance. The project was successful in substituting wood for biogas in the cocoa bean drier. The president of the Land Reform Institute (INCRA) participated in the inauguration of the biogas-fired drier, and is inclined to provide support for future scale-up. This project is highly replicable for cocoa drying farms in the region (numbering approximately 28,000, of which over 80% are small-scale), including both community-run operations and privately owned farms.



Where: P.A. Cascata, Aurelino Leal, BA
Technology: biogas for wood substitution
Impacts: Reduced pressure on the rainforest
Equipment: Community biodigestion system
Supplier: Sansuy S.A.
Specifications: 8x5x1.8m. 1mm Flexible PCV cover
Load: 45 m³

USAID / Brazil Productive Energy Program



Where: Operárias do Mel, Canavieiras-AL
Technology: solar drying of pollen
Impacts: Cost reduction, income increase
Equipment: Solar drier
Supplier: Eco-Engenho
Specifications: Design from the U.S. company Aguasol
Load: 10kg of pollen

Improving the apiculture productive chain

Eco-Engenho's studies indicated that, within the estimated US\$ 360 million apiculture non-traditional product market, the production of pollen had promising prospects in the natural food and medicinal markets. Since drying was a key component of pollen processing, Energia Produtiva supported the application of solar technologies at Operárias do Mel, in Alagoas, an enterprise that acquires raw material from 15 small-scale producers. A company in São Paulo was identified which manufactured renewable energy equipment that reduces production costs by 50% when compared to conventional electric drying equipment. The engagement of local government and institutions such as SEBRAE can have a significant role in replicating this solution elsewhere in the state.

Sustainable drying and processing of marine algae

Through IDER and the Terramar Institute, the Program provided support to 22 families of APAFG, an association of algae producers on the coast of Ceará, by teaching techniques of sustainable cultivation and processing of marine algae. During the Program, IDER installed an improved solar drier of algae, building on past experience with another drier installed previously at the association's headquarters. The role of women was crucial in this project as they are in charge of the algae processing and drying activities.

IDER also improved the management and commercial skills of the association members, who kept seeking for other options to continue adding value to the product, such as installing an algae-processing unit (AGA⁷ production facility). Although the processing unit did not turn out feasible with the current production amounts, the association started to commercialize dried algae for making jelly. The product is being sold at local markets.



Where: Guajirú and Flecheiras, Trairi, CE
Technology: solar drying of algae
Impacts: Improvement in algae quality and sales price increase of 500%.
Equipment: Solar drier
Supplier: IDER (local construction)
Specifications: Tunnel model

Water Supply and Use in the Semi-Arid

From 2003 to 2005, the Program promoted the application of PV and solar thermal energy systems for water purification and distribution in the semi-arid regions of the Northeast. Water is being used for domestic applications as well as income-generating activities, since a reliable supply of good-quality water is critical not only for human and animal life, but also for the development of agricultural chains of production. Via several demonstration projects, new technologies and commercialization models were successfully introduced in the States of Alagoas and Ceará. The success of these interventions is clear from their positive outcomes and from the increasing number of collaborators that have joined this alliance against poverty and hunger in Brazil's rural northeast.

⁷ Substance (jell) derived from algae, mainly the *gracilaria* species.

USAID / Brazil Productive Energy Program

Below is a summary of the water supply systems (through solar micro-irrigation or desalinization) installed with support of the Program:

Table 2 – Water Supply/Use Systems

Purpose/application	Community	Municipality	Manufacturer / Installer
Water desalinization for school supply	Várzea do Marinho	Ouro Branco (AL)	Eco-Engenho
Small-scale water desalinization prototype for demonstration	Eco-Engenho's headquarters	Maceió (AL)	Eco-Engenho
Water desalinization and PV micro-irrigation for hydroponics garden	Baixas	São José da Tapera (AL)	Eco-Engenho
Water desalinization	Cachoeira Velha	Canapi (AL)	Eco-Engenho
Water desalinization	Boa Vista	Traipu (AL)	Eco-Engenho
Organic agriculture	Bebedouro	Viçosa do Ceará (CE)	IDER
Organic agriculture	Prainha do Canto Verde	Beberibe (CE)	IDER
Organic agriculture	Bom Jesus	Itapipoca (CE)	IDER
Organic agriculture	Barra do Córrego	Itapipoca (CE)	IDER
PV Micro-irrigation	Traíras	Pão de Açúcar (AL)	Eco-Engenho
Effective use of water surplus /organic agriculture /biodigestion (project starting)	Barra Bonita Farm	Juazeiro (BA)	Winrock, UNEB and EBDA

USAID / Brazil Productive Energy Program



Where: Viçosa and Itapipoca, CE
Technology: PV water pumping, organic agriculture
Impacts: Income and food security increase for 26 families

Alliance for a better world

IDER, with the support of the local NGO, NEPA, developed a socially-responsible marketing framework for organic family farming products in Ceará. Called *Aliança Social*, this true alliance between the countryside and the city engaged urban citizens in the purchase of products from agrarian-reform communities. Produce buyers became “members,” paying a monthly amount of US\$ 40.00 up-front for the following month’s organic produce supply. These prepayments financed small farmers’ organic production. The settlement’s organic vegetable garden has a solar-PV-powered micro-irrigation system. With support from Energia Produtiva, IDER provided the growers with technical assistance and training in organic cultivation, planning, management and marketing. The

Institute also assisted the association in obtaining credit for consolidating the marketing and distribution side of the business and by expanding the network, now with 45 active members of the 150 contacted.

Due to the high demand, additional *Aliança Social* vegetable gardens were started at the communities of Bebedouro, in Viçosa do Ceará, and Prainha do Canto Verde, in Beberibe. Organic cultivation is underway.

H₂Sol - Água do Sol

With co-sponsors Fiorello La Guardia Foundation and the local utility CEAL, Eco-Engenho installed two PV-powered agriculture projects in the communities of Traíras and Baixas, in the State of Alagoas.

The first project, in Traíras, was comprised of a watermelon garden, while the second garden, in Baixas, was a hydroponics tomato and pepper project. In the first harvest at Traíras, a total of 15 tons of watermelon were produced and commercialized in the local market.

The community of Baixas, where the hydroponics garden was installed, has one of the lowest HDI⁸ in Brazil. Besides the PV system to power the water pump, a solar distillation system was also installed to supply water for the productive process. The first harvest will take place in late 2005.



Where: Traíras, Pão de Açúcar (AL)
Technology: PV water pumping, organic agriculture
Impacts: Income and food security increase for 6 families



Where: Baixas (AL)
Technology: Hydroponics, PV, solar disinfection
Impacts: Income and food security increase for 36 families

⁸ Human Development Index

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Government will disseminate technologies to small farmers

As a result of Energia Produtiva’s efforts, the Brazilian Ministry of Science and Technology is funding a project to begin in October at the *Barra Bonita Farm*, in Juazeiro, Bahia, developed by Winrock and its partners UNEB - Bahia State University - and EBDA – Empresa Baiana de Desenvolvimento Agrícola. The project will carry out several integrated sustainable activities with the objective of improving the livelihoods of goat and sheep farmers. These interventions will include the effective use of water surplus from existing wells, adoption of biodigestors, and organic and ecologically-sound farming practices. The *Barra Bonita Farm* will serve as an information dissemination/ capacity building focal point for the Bahia State’s *Cabra Forte* program.



Barra Bonita Farm, BA



Where: Várzea do Marinho, Ouro Branco, AL

Technology: solar desalination

Impacts: Daily clean water supply of 360 liters

Clean water for schools and rural communities

With support of the Program, Eco-Engenho installed a water desalination facility at the community school of Várzea do Marinho, in Alagoas, benefiting 70 rural families. The project received resources from USAID/Energia Produtiva’s Small Grants Award Program and support from the U.S. Department of State. To promote the equipment dissemination, Eco-Engenho released a brochure on solar desalination to facilitate the independent replication of this project (available at www.winrock.org.br/energiaprodutiva). The brochure was supplied to other communities in Alagoas. Besides the Várzea do Marinho school, three other communities, in the Municipalities of São José

da Tapera, Traipu and Canapi, in Alagoas, received medium-sized water desalination systems through the Program, as a result of the efforts of Eco-Engenho. The water provided by the systems is being used for human consumption and productive uses.

Biofuels in Livestock Farming

The Program undertook several initiatives in the productive application of biodigestion, the anaerobic breakdown of organic matter generating gas that can be used to meet energy needs. Certain key stakeholders embraced this activity, giving it excellent prospects for replication of demonstration projects installed, via private and public investors. Below is a summary of small-scale demonstration biodigestion systems installed with support of the Program:

Table 3 – Small Scale Biodigestion Systems Update

Purpose/application	Community	Municipality	Manufacturer / Installer
Biogas production	Pedraõ	Olho D’ água das Flores (AL)	Eco-Engenho
Biogas for cocoa drying and biofertilizer for organic produce	Cascata Settlement	Aurelino Leal (BA)	Sansuy / Winrock, Usisoldas

USAID / Brazil Productive Energy Program

Purpose/application	Community	Municipality	Manufacturer / Installer
Improvement of goat and sheep productive chain	EBDA's Experimental Unit	Jaguarari (BA)	Sansuy / Winrock, Usisoldas
Dissemination of biodigestion technology	ESAGRI school	Irecê (BA)	Sansuy / Winrock, Usisoldas
Biogas for community bakery and biofertilizer for organic produce	Ilha do Ferro	Pão de Açúcar (AL)	Eco-Engenho



Where: EBDA's Caraiba Experimental Unit, Jaguarari, BA
Technology: biodigestion of goat and sheep waste
Specifications: volume 7m³
Load: 150 goats and sheep

Cabra Forte Program adopted biodigestion technology

In 2004, Winrock and USAID signed a cooperative agreement with the Bahia State Government under which the Cabra Forte and Energia Produtiva Programs joined forces to disseminate biodigestion technology for animal waste as a means of improving the productivity of goat farming. With government funding and support, Winrock then installed a demonstration project at EBDA's Experimental Unit in the Municipality of Jaguarari. Sansuy, Latin America's leading company in the manufacture of flexible PVC film, donated the biodigester cover and liner. The success of this project led the EBDA and the Agriculture Secretary to invite Winrock to disseminate the project to thousands of small farmers via Cabra Forte's capacity building events and also by promoting farmer visits to demonstration projects.



Where: P.A. Cascata, Aurelino Leal, BA
Technology: biodigestion of bovine waste
Impacts: 35,000 liters of biofertilizer produced, cost reduction for 40 families

Biogas demonstration project in rural settlement is a model for the National Agrarian Reform Institute (INCRA)

A demonstration animal waste biodigestion project, which the Program installed at the Cascata settlement, enjoyed active collaboration of stakeholders such as the local municipal government, the agrarian reform movement JUPARÁ, and Sansuy. The president of the National Agrarian Reform Institute, INCRA, and representatives of Banco do Nordeste visited the *Cascata* Settlement to inaugurate an important phase of the project: the use of biogas in organic cocoa drying, substituting wood from the rainforest, as mentioned earlier. This visit represented an important step towards the replication of this project, since 70% of cocoa production is located in settlements installed by the Agency, and,

according to the president of INCRA, "for this reason, a new model of organic agriculture, increasing value, income and wealth in the rural areas, is so important." Extensive media coverage was provided for the visit. Winrock's local partner, JUPARÁ, secured additional funds from INCRA for capacity building in biodigester design, installation and management in another five settlements in the *Baixo Sul* region of Bahia, to benefit 220 farming families. The hands-on training, originally set for 2005, was delayed and is expected to take place in 2006, disseminating the benefits of decreased tropical rainforest deforestation among agrarian reform communities.

USAID / Brazil Productive Energy Program



Biodigester at Ilha do Ferro, in Alagoas

Small Biodigester Demonstration Projects

Besides the biodigestors at *Cascata* Settlement and EBDA’s Experimental Unit, the Program installed three other demonstration small-scale biodigestion systems: one at the ESAGRI vocational school in Irecê, Bahia, for capacity building of rural youth; one at *Ilha do Ferro*, in Alagoas, for increased productivity of organic crops and fueling of a community bakery, and one at *Pedraão*, in Alagoas, selected and carried out in collaboration with *Movimento Minha Terra*, a local NGO active in agro-ecologic production in the State of Alagoas.

Development bank will finance biodigestors

As a result of Winrock’s market development effort and partnership with the manufacturer Sansuy, Brazil’s Northeast Development Bank, BNDES, approved the addition of biodigestors to its product portfolio of items eligible for financing via BNDES’ “Card” mechanism, permitting Sansuy to supply the equipment online. The Card offers pre-approved credit and attractive interest rates for micro, small and medium enterprises, provided that equipment is pre-approved and registered with the BNDES program.

Equipment: VINIBIODIGESTOR
Supplier: Sansuy Plásticos S.A.
Specifications: Cover: Flexible PVC film. Color: black.
Interest rate: 1.44% per month
Maximum loan term: 24 months
Credit limit: R\$ 50,000

Where: Bahia

Technology: biodigestion of swine waste

Impacts: More environmentally-sound industrial-scale swine operations

Load: Average biodigester capacity is 900m³

Finance: All systems are being financed by AgCert through the Clean Development Mechanism.

Agro-industries and medium farmers benefit from technical assistance

In Bahia, Winrock pursued the development of agro-industrial biodigestors in partnership with Sansuy and the Canadian company AgCert. In Alagoas, through a partnership with industry stakeholders, SEBRAE and SENAI, Eco-Engenho also undertook feasibility studies for the installation of large-scale

agro-industrial biodigestors. Although many of the entrepreneurs showed reluctance to adopt these systems, the technical assistance provided was an important step in raising awareness of the benefits of biodigestion among this community. As a result of Winrock’s efforts in cooperation with Sansuy and Agcert, five agro-industrial biodigestors were identified in the state of Bahia, and have been installed or are under construction:

Table 4 – Agro-industrial biodigestors

Farm/Company	Municipality	Status
Janna	Feira de Santana (BA)	Installed
JB	Ipirá (BA)	Installed
Alecrim	Feira de Santana (BA)	Installed
Bons Amigos	Mata de São João (BA)	Underway
Courotex	Candeias (BA)	Underway

Capacity building - Sponsored by Energia Produtiva, Eco-Engenho performed three workshops focused on biodigestion and targeting farmers and entrepreneurs. In addition to the Program’s efforts, Winrock secured additional funding from the USAID global IRES project to implement a biodigester capacity building initiative in 2005, which involves the installation of biodigestors at two separate training facilities in semi-arid, northern Bahia, where 100 students and technicians

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from the EBDA rural extension service are learning how to build and successfully manage these systems to achieve the most value. “Replicators” are being trained to bring this clean energy technology to 600 farmers in the region.

More efficient and healthier indoor cooking

According to a 2002 report by WHO, indoor air pollution (smoke) exposure kills 1.6 million people each year worldwide. A life is lost every 20 seconds to illnesses related to indoor air pollution exposure, which affects predominantly women and children under 5. *More children die annually from smoke-related illnesses than Malaria or HIV/AIDS*. Despite these appalling numbers, 2.4 billion people⁹ in the world use biomass fuels (wood, crop residue, charcoal, dung etc.) for cooking and heating, and this number is growing steadily. The vast majority lives in rural, urban and peri-urban areas of developing countries and earns less than a dollar a day.

The situation is not different in Brazil, where household stoves are a common destiny of the native wood. *Energia Produtiva* realized that, in the Atlantic Coastal Forest and the *Caatinga* biomes, two of the top conservation biomes in Brazil, implementing solutions that reduce the use of native wood is a fundamental step in guaranteeing a better future for these threatened ecosystems. The consumption of wood for cooking purposes could be reduced to half if more efficient, *ecologic* stoves were introduced in substitution of the existing ones. This enhanced stove model could also significantly reduce indoor pollution that severely damages the health of women and children. With the current stoves, smoke particulate levels can reach 100 times USEPA recommended levels.

In order to pursue this goal, Winrock and IDER promoted the use of efficient cookers in Ceará and Minas Gerais. This work was performed in part in collaboration with the NGO Pro-Leña, and the *ecostove* manufacturer Ecofogão Ltda. Feasibility and market studies for efficient cookers in Brazil were developed.



Where: Barra do Córrego, Itapipoca, AL
Technology: efficient cooker
Manufacturer: Locally manufactured
Impacts: Healthier indoor cooking and heating practices at community kitchen

An analysis of efficient stove models was carried out by IDER, who selected the most appropriate model to conduct a field test in Ceará. IDER installed 17 low-cost efficient stoves at the Municipality of *Itapipoca* and monitored the impacts of the test. The stoves were made locally by the villagers trained by the Institute in stove construction. As an outcome of this pilot test, IDER is negotiating with the Municipal Government of Itapipoca to establish a program for the installation of another 50 stoves in other communities, and with the State Government for a larger program.

In Minas Gerais, the Small Grants Award Program funded another market test by the company Ecofogão and its local partner, *Sociedade São Vicente de Paulo*. Thirty “*Ecofogão Campestre*”

⁹ Source: Practical Action, UK

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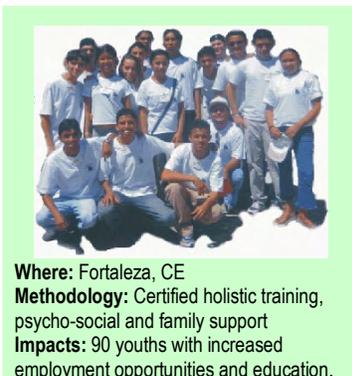
stoves were installed and monitored in low-income households. The American NGO Trees, Water and People (TWP) provided additional funding for monitoring the initiative during a period of 12 months, and for disseminating the results of the test in terms of performance, acceptance, economic impact and indoor air pollution. Under the agreement with TWP, Ecofogão will pursue the goal of selling 300 units of *ecostoves* for NGOs or public agencies, fostering the scale-up of this pilot. A proposal was submitted by Ecofogão to GEF/Caatinga Program to fund the installation of an additional 200 *ecostoves* in the Northeast.

Also in Minas Gerais, Winrock and Banco do Povo initiated a 100-ethanol stove market test at *Vale do Jequitinhonha*, one of the State's poorest regions. The installation of the stoves, partially funded by the manufacturing company Dometic of Sweden, the U.S.-based Stokes Consulting Group, and the Shell Foundation, is being followed by a six-month study, an analysis of the manufacturing and distribution of the ethanol-fueled stove and a feasibility study for the development of a local micro-distillery to supply ethanol. If feasible, the micro-distillery might later be financed by Banco do Povo. This work will continue after the end of *Energia Produtiva*.



Technology improvements for education in rural areas

The Program introduced technologies that improved education in four rural schools and provided increased employment opportunities for 90 disadvantaged youths.



Where: Fortaleza, CE

Methodology: Certified holistic training, psycho-social and family support

Impacts: 90 youths with increased employment opportunities and education.

Renewable energy training for disadvantaged youths

Energia Produtiva built upon earlier USAID Mission support for renewable energy training for disadvantaged youth in Ceará, completing in 2004 and 2005 the training of 90 students. In addition to promoting classes, field activities and visits, and encouraging students to develop social projects, IDER developed strategies for obtaining employment for Program graduates. Several institutions that have this kind of job-placement expertise as well as potential employers, were engaged (SINE, SINDUSCON, *Consórcio Social da Juventude*, *Central de Estágios*, CIEE and SEBRAE) to help with this effort. As a result, IDER was able to successfully insert

several of the graduates in the job market, through the Federal Government's *Primeiro Emprego* Program, and through partnerships with the industry. A cooperative agreement secured twenty trainee positions at Wobben Windpower. Currently, of the initial forty, over ten are employed or engaged in economic activities, while another five others are continuing their education in college. Due to the success of this initiative, USAID's Disadvantaged Youth Program *Enter Jovem* will fund a new 25-student class next in 2006.

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Digital Inclusion and multimedia labs in PV-powered rural schools

In cooperation with stakeholders such as IPDN, CDI and Telemar Institute, Energia Produtiva members IDER and Eco-Engenho installed *solar multimedia/digital centers* in Alagoas and Ceará, providing computers and distance learning tools to six rural schools. Each school received at least two computers and a printer, and in four of them TVs and videos were also installed. Unfortunately, the Program could not afford or secure broadband Internet connection for the schools yet, a service that will only be feasible if a remote link can be obtained from the federal government. The Program provided computer and citizenship classes for 234 local staff, and trained 60 young monitors, who are disseminating the use of ICT in these rural areas.



Where: Alagoas and Ceará, six schools
Technology: PV panels, computers, TV, internet
Impacts: Improved education for 865 students.

Training in PV operation and maintenance for villagers in the Mamirauá and Amanã Reserves

IDER and Mamirauá provided additional training on photovoltaic systems operation and maintenance benefiting 24 residents in the reserves, and distributed maintenance *toolkits*. The course was publicized to the communities via the local radio station, *Ligado no Mamirauá*.



Renewable energy training was carried out at the reserve

Cleaner Fuels for Electricity Generation in the Amazon

The Fossil Fuel Substitution initiative focused on the implementation of MHPs/SHPs and biomass power-plants in the Amazon Region, in substitution of fossil fuels. It also aimed to demonstrate to stakeholders in the region how to use alternative financing mechanisms for renewable energy projects, such as Brazil's CCC fuel subsidy and universal electrification funding, disseminating this experience in the Amazon.

The Program's efforts included support to entrepreneurs to develop technical and economic feasibility studies and projects, obtain environmental licenses, attract private financing, intermediate renewable energy projects negotiations, improve current legislation etc.

Policy improvement

With the support of Energia Produtiva team members, RENOVE proposed policy mechanisms to change a legislative flaw that excludes SHPs under 1MW from CCC benefits. By allowing micro hydro power plants to access CCC subsidies, private investors' interest in financing such projects is expected to increase. The draft law has received approval in two Congressional Committees ('House Mines and Energy' and 'Finance and Taxation') and is now under consideration in the 'Constitution, Justice and Citizenship' Committee before being sent to the Senate.

During the last two years, Energia Produtiva made important progress in laying the groundwork for the implementation of important pioneering projects in the Amazon, some structured to attract private investors while others designed to support the federal government's goal of universal access to electricity. This initiative reached important results, including the startup of the construction of the *Apertadinho* 30 MW SHP.

USAID / Brazil Productive Energy Program

Where: Apertadinho Valley, Vilhena, Rondônia
Technology: SHP
Goal: 30MW to displace fossil fuel consumption
Total investment: US\$ 36.5 Million
CCC benefits: US\$ 27.3 Million
Status: Under construction

As part of Energia Produtiva's efforts to address market and finance barriers, the *Apertadinho* SHP was sold to an investment bank based in Rio de Janeiro (Banco de Investimento Focus). This is an important deliverable for Energia Produtiva, a concrete response from the market regarding the feasibility of SHPs with CCC subsidies. The plant is now under construction. CERPCH's role in the SHP development was to provide assistance in the negotiation of the Power Purchase Agreement (PPA) and in the obtainment of CCC fuel subsidy. In addition, they

presented five groups of investors to the project owner and formatted the business framework. According to a study by CERPCH, the construction of the plant will generate **7,746 short and long-term job positions**, and **1,500,000 tCO² avoided carbon emissions** in a 10 years time frame.

Two other outcomes of this activity were the acquisition, by a European investment group, of two additional SHPs. This group, which was negotiating an investment for the *Apertadinho* project with CERPCH, decided to invest in two other SHPs, after *Apertadinho* was sold to a third investor: the *Areia Branca* 20MW SHP, and the *Pipoca* 20MW SHP both located in Minas Gerais. The details of the operation are being worked out. CERPCH expects that the construction of these SHPs will begin in a few months. Together, the construction of the plants will generate **10,328 short and long-term job positions**, and **980,000 tCO² avoided carbon emissions** in a 10-year time frame.

Where: Tiriós Mission, Amazon
Technology: MHP
Goal: 800kW to 1MW to power the Brazilian Air Force radars and 3 indigenous communities
Total investment: US\$ 1.9 Million
CCC benefits: In negotiation
Status: Waiting for Congressional approval

CERPCH also pursued the implementation of the Tiriós MHP in the indigenous reserve of *Tumucumaque*. This activity initiated upon a request made by SIVAM to CERPCH of a feasibility study to Tiriós MHP. However, the Center encountered obstacles in obtaining a Power Purchase Agreement with the Ministry of Defense. Congressional approval was found to be required for the installation of such a facility on an indigenous reserve, and the Ministry had not yet secured this approval. CERPCH has asked for RENOVE's support in moving this forward in the Congress and a requirement was to be submitted by

RENOVE. Once the project is allowed to go forward, approval of a draft law currently under consideration in the National Congress will provide additional incentives to the project via the CCC fuel subsidy. In the meantime, several private investors have expressed their interest in financing the project, once these barriers are overcome.

CENBIO undertook an initiative with Mamirauá Institute to explore the possibility of providing a sustainable supply of locally made biofuels to substitute for diesel in a highly polluting power generator in the city of Tefé, adjacent to the pristine Mamirauá reserve. The possibility of utilizing landfill gas from the open-air dump located in the city also has been explored. However, the analysis concluded that such a fossil-fuel substitution initiative is not presently possible in that location. The report was delivered to local authorities.

The early termination of the Energia Produtiva negatively impacted another Amazon initiative, namely the analysis of two small-scale biomass power plants that are in the test phase: a 92kW power plant fueled with palm oil for household electrification at *Vila Soledade*, in Pará State, and a 20kW *cupuaçu* shell gasification power plant for private pulp production at *Aquidabam*, in

USAID / Brazil Productive Energy Program

Amazonas State. These activities, which would need a longer timeframe for implementation, were cancelled, and the CENBIO team assembled for the project has been demobilized.

Decentralized Generation in Northern Brazil (PRISMA)

With vast, sparsely populated areas, Brazil faces particular difficulty in providing universal access to electricity, as required by law. How can remote power systems be operated and maintained on a sustainable basis? How can they contribute to raising incomes? These are just some of the many issues involved. The Amazon Region is an important case in point. If modern energy services cannot be provided there, the local population will continue to abandon the forest for nearby cities, leaving vast areas to predatory ranching. To stop deforestation, residents must have a stake in remaining in their villages, generating income through environmentally sustainable livelihoods. That is unlikely to happen, however, if electricity fails to arrive.

Winrock has developed an innovative, integrated model that overcomes the stumbling blocks that have hampered efforts to provide energy to villagers far from the electric grid. Called “PRISMA,” this model establishes community ownership and management of local infrastructure, such as power generating stations, while strengthening small local enterprises that then use the infrastructure for productive uses, raising incomes. In the case of electricity, the community “sells” the power to the local utility (which in Brazil holds a monopoly on power distribution) and villagers manage the local mini-grid under contract to the power company. In the event technical support is required, the electric utility is there to provide it, so villagers are not completely on their own. This is an important difference between PRISMA and some other models that have been proposed.

With the support of Energia Produtiva and other sponsors, this model is being tested in a remote community in the Amazon Region. Besides this PRISMA pilot project, CNPq/CT-Energ, a joint Ministry of Mines and Energy and Ministry of Science and Technology Program, approved two other innovative decentralized renewable energy generation projects associated with Energia Produtiva team members. The Program obtained the commitment of certain electric utilities in the Amazon to participate in the projects. The funds secured by the Ministry of Mines and Energy, initially anticipated for 2003, were released only in the first quarter of 2005. Delays were caused in part by MME/MCT’s concerns regarding the replicability and sustainability of certain approved projects. Winrock presented its approach to these issues, an approach which was later held up as an example for the other projects to follow. In addition to searching for alternatives in the Amazon Region, the Program worked to promote the replication of the “Luz Agora” model, a market-based PV rural electrification model successfully applied in South Brazil, in the poor Northeast Region. These initiatives are described in the following paragraphs.

USAID / Brazil Productive Energy Program

PRISMA Cachoeira do Aruã

The Prisma model is being tested in the community of Cachoeira do Aruã, located 145 km (a ten-hour boat ride) from Santarém in the State of Pará, northern Brazil, by Winrock Brazil, CERPCH (National Reference Center on Small Hydropower), Projeto Saúde e Alegria (a locally based NGO) and CELPA (the private electricity utility responsible for the state of Pará). A run-of-river micro-hydro facility will provide the community with 50kW of installed power, which will be distributed via a mini-grid — all governed under simplified contracts between the community and the electric utility. Three productive activities will be strengthened (with power tools, lighting, management training, and marketing support). One of these activities is ecotourism, raising global awareness of the environmental challenges that this region faces. Discussions with the local utility and regulatory agency, establishment of community management, facility and mini-grid construction and financial modeling are some of the activities currently underway. MHP Cachoeira do Aruã will begin operation before the end of 2005.



Where: Cachoeira do Aruã, Santarém, Pará

Technology: 50 kW MHP for rural electrification

Impacts: 72 families with access to energy; 3 productive chains improved

Where: Canaã Settlement, Pimenta Bueno, Rondônia

Technology: 50 kW MHP for rural electrification

Impacts: 53 families with access to energy

Canaã Settlement

This project is being implemented in the Canaã Settlement, located in the municipality of Pimenta Bueno in the state of Rondônia, northern Brazil, by CERPCH (National Reference Center on Small Hydropower), UNIR (University of Rondônia), Incra (National Agrarian Reform Institute), Eletronorte, and Ceron (electricity utility responsible for the state of Rondônia). CERPCH proposed the installation of a MHP at Quebra-Canoa falls, located at Roosevelt River, to attend 84 families. CERPCH is working to get authorization of the land owner to build the MHP, and also trying to establish a partnership with an Indian settlement, close to the community, to increase MHP's power. The implementation of the Canaã MHP, however, has not progressed much, despite the Program's efforts. CERPCH is seeking a subcontractor that can perform the construction within a budget that fits the funds available.

São Francisco de Aiucá

In May 2005, USP (University of São Paulo), Winrock and Mamirauá started the project at village of São Francisco do Aiucá, in Amazonas State, which is testing the criteria for rural electrification with photovoltaic (PV) systems. The systems were installed in 19 households at São Francisco do Aiucá, with active participation of the community. A maintenance fund was designed and implemented. The project was also preliminarily discussed with the local utility to increase its participation and awareness of the project's results. The outcomes of this test will only be known and possibly impact Brazilian PV



Where: São Francisco do Aiucá, Tefé, Amazon

Technology: 4 kW Solar PV for household rural electrification

Impacts: ANEEL's PV parameters in solar home systems tested in 19 households

Regulation for rural electrification with PV systems improved

The Program contributed to ANEEL's Resolution Number 83/2004 which defined the criteria for electrification using individual autonomous generation systems, including solar PV systems. This regulation represents an important step towards utilities being able to apply renewable energy-based systems in lieu of grid extension — without risking being fined for doing so.

USAID / Brazil Productive Energy Program

regulation after the end of the Program. The stakeholders are committed to continue the project.



Where: Bahia State
Technology: Solar PV systems for rural electrification
Impacts: Sustainable PV electrification model to be transferred to local Utility

Luz Agora

In the second year of Energia Produtiva, IDEAAS and Winrock implemented a new activity to promote the replication of IDEAAS’ “Luz Agora” model in the State of Bahia. The objective of this activity was to develop, test and implement a rural electrification market agent model with the use of solar PV technology in Brazil, taking into consideration the existing legal/institutional framework and making the necessary adaptations/improvements to fit the local context. The goal was to adapt and replicate in Bahia the previous successful experience of IDEAAS with the “Luz Agora” Program in the state of Rio Grande do Sul. The first draft of the business plan for the management model was developed and will be presented to COELBA by November. A “universal” version of the study is being prepared to be further disseminated among other utilities. The termination of Energia

Produtiva in FY2005 would not allow the Consortium to achieve the proposed goals of completing implementation of the model. This activity, as well as the dissemination of the PRISMA model, will continue in 2006, however, with support of USAID and other stakeholders mentioned earlier.

Capacity Building Efforts

Renewable Energy in Focus for Amazon NGOs

As part of the effort to create local capacity and mobilize stakeholders in the Amazon for the adoption of clean energy technologies, the Program carried out a Renewable Energy Seminar targeting local NGOs. Held on August 9th and 10th 2005, in Belém, Pará, it increased the audience’s awareness of productive uses of renewable energy in the Amazon. The agenda was designed to address the needs of the target NGOs identified through a previous assessment. Thirty participants from over twenty organizations attended, including representatives of GTA—Amazon Working Group, the largest network of Amazon-based NGOs.

Micro-credit Training

In 2005, Banco do Povo trained sixteen staff members of Energia Produtiva Program partners and other USAID partner NGOs. The objective was to provide instruction on how to become a micro-credit agent. Eco-Engenho, with support of the United Kingdom’s FCO and the Environment, Energy and Enterprises Ventures, also carried out a training program for rural associations in micro-financing for renewable energy, aimed at stimulating and training associations to create and manage micro-credit facilities. As a result of this initiative, three self-help groups were established in rural communities in Alagoas, under the Brazil Renewable Energy Finance Capacity Building initiative. The startup fund will be used for acquisition of solar driers installed under the *comodato* mechanism in the communities.

Micro-credit line. During the Program, Banco do Povo carried out negotiations with E&Co to create a micro-credit fund for renewable energy, to be managed by Banco do Povo. After a risk analysis, E&Co decided not to move forward with the investment since the project would not fit into E&Co’s *champion* model, whereby a single entrepreneur is responsible for taking out the loan.

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E&Co's decision of not financing Banco do Povo's credit line also interrupted negotiations the bank was carrying out with Mamirauá Institute for micro-finance of solar kits in the reserve.

Other Training Events Sponsored by the Program

The Program conducted several other specialized events, including:

- **Production of Dried Fruits and Tomatoes** – Four training courses on drying of fruits including tomatoes, attended by 117 private, non-profit and public sector organizations, students, cooperatives and entrepreneurs in Bahia and Alagoas. The goal was to disseminate solar drying technology and develop the market for solar food driers.
- **Planning and Operation of Biodigestors: Economic and Environmental Advantages** – Course in Alagoas attended by stakeholders such as SEBRAE, SENAI, Banco do Nordeste, INCRA, CEAL, Sansuy, cooperatives, universities, institutes and private companies.
- **Biodigestors: Adding Value to Family Production** – Three Workshops in Alagoas focused on biodigestion, co-sponsored by the State Agriculture Secretary. Approximately 100 people, including entrepreneurs and farmers, attended the events.
- **Social Responsibility in Environmental Management** (co-sponsored) – Extension course aimed at strengthening environmental organizations in Bahia.

Fairs, Festivals and Congresses

Through a series of other events sponsored primarily by partner institutions, mostly the Federal and State Governments, Energia Produtiva disseminated renewable energy technologies to a wide audience. Some of these events are:

- **AGRIFAM Family Agriculture Fair** – Winrock showcased biodigestion and efficient stove technologies at one of Latin America's largest fairs targeted at small farmers, sponsored by the Bahia State Government. Around 50,000 farmers attended the fair.
- **Marine Algae Festival** - The solar drying of algae was presented in this local festival in Ceará, in July 2005, promoted by the State Government of Ceará, the Food and Agriculture Organization (FAO) and SEBRAE. The project attracted the interest of several stakeholders participating in the event, such as FAO and local NGOs, which may lead to future replication of the technology.
- **Rural Settlements National Fair** – Winrock's biodigestion system to substitute woodfuel in the cocoa drying process in southern Bahia was exhibited at a national fair of re-settlement communities and agrarian reform movements sponsored by INCRA in September 2005 in Brasília, with an estimated audience of 60,000 participants.
- **Cabra Forte Fairs** – Biodigestion was showcased at *Cabra Forte* Program's fairs and capacity building events, reaching nearly 11,000 producers. In the last one, around 3,000 producers watched a play that introduced the visitors to the advantages of the biodigestion technology for family agriculture in the semi-arid.
- **Power Future** (co-sponsored) – RENOVE co-organized this major renewable energy event and had a stand at the technology expo, where members' products and services were exhibited, raising public awareness of the network.

The Small Grants Award Program also supported the participation of officials, NGOs and youth in a number of other national and international events, as described further on.

National Energy Policy

Identified and proposed improvements in legislation

Outcomes in the policy development and promotion arena were primarily a result of RENOVE's initiatives. Through several mechanisms and with active Energia Produtiva support, RENOVE proposed a number of changes in current renewable energy legislation. To implement this policy work, RENOVE carried out a number of steps to raise the awareness of key policy makers and influence the legislative process. In November 2003, with support of Energia Produtiva, RENOVE promoted the establishment of a joint public hearing at the House of Representatives, with the goal of raising awareness among Brazilian congressmen on the topic of renewable energy. Approximately 30 politicians and federal authorities attended. Since then, RENOVE's ties with the House were strengthened. RENOVE played a strong role in providing assistance to legislative consultants and congressional members responsible for legislative development and analysis. This assistance led to the development of several proposals and subsequent changes, the most important of which are described below.

Draft Law 3566-04. To change a legislative flaw that excludes SHPs under 1MW from CCC benefits, RENOVE submitted a draft law (No. 3566-04) to the National Congress to correct the problem. By allowing micro hydro power plants to access CCC subsidies, private investor interest in these projects will certainly increase. In the Committees on Mines and Energy and of Finance and Taxation, RENOVE succeeded in obtaining a favorable recommendation for approval of the draft law. The draft law is now under analysis by the last committee in the House of Representatives, and, if approved, will then be reviewed by the Senate.

Draft Law 3259-04. Within the House Committee on Mines and Energy, RENOVE proposed improvements to a draft law intended to create a Renewable Energy Incentive Program (PIER). RENOVE advocated the participation in the management of the Program of organizations directly involved in the implementation of social and income generating projects. RENOVE also mobilized support from Representatives for the project. The draft law was attached to another draft law (Number 630-03) under development in Congress that proposes the creation of a special fund to finance research and development of renewable energy. The draft laws must be approved by four Commissions of the House before being passed on to the Senate.

Draft Law 3368-04. RENOVE suggested improved language for this piece of biodiesel legislation, more effectively addressing poverty reduction and income generation aspects. Suggestions were incorporated in the final text of the draft law presented to the House of Representatives. During the course of urgent development for approval at the House, the Federal Government issued a provisional measure (Number 214/04) which was approved by the Congress and transformed into a new law (Number 11.0975/05), on the National Program for Biodiesel Production and Use. The new law regulated the introduction of biodiesel in the national energy matrix. With the new legislation in place, draft law 3.368 was filed. Gaps continue to exist, however, in the poverty reduction and income generation aspects of the Program.

Draft Law 4080-04. RENOVE promoted the development of this draft law that seeks to support small producers of biofuels in unfettered sale and use of these alternative fuels. The network

USAID / Brazil Productive Energy Program

identified the need for such legislation and assisted in its preparation and submittal to Congress. The draft law is under development at the Congress, in the Mines and Energy Commission. If approved, the law will represent an important step towards income generation for small producers.

Revisiting Draft law 3680-04. This law was proposed by a House Representative and rejected in 2004 by two Commissions at the House of Representatives. RENOVE analyzed the proposal and concluded that the draft law had had poor technical subsidies and for this reason had not been approved by the House. RENOVE identified that an economic feasibility analysis would need to be made and presented to the Commissions. The network went on to rewrite the text including technical and economic data and submitted to the Congress a **new draft law** to promote the use of solar heaters in poor households, with the assistance of members Onda Azul and Sociedade do Sol. The draft was submitted to the House of Representatives in September and will be analyzed by the Commissions in the next months.

In addition to the draft laws mentioned herein, RENOVE also provided technical support to a project that proposes to create a **Renewable Energy Development Agency**. RENOVE also closely monitored all legislation proposals related to renewable energy in the Congress, making contributions when applicable.

After the end of the Program, RENOVE will continue to be an active policy voice of the third sector. The network will organize a seminar focusing on public policies, which is planned for November at the House of Representatives. The seminar will allow RENOVE to start, maintain or strengthen relationship with key stakeholders while creating the path to new fund raising opportunities.

Approved changes in PRODEEM

Under Energia Produtiva, RENOVE continued to provide support to PRODEEM's revitalization. The network, particularly members Winrock and IDEAAS, provided valuable input to the Action Plan for the restructuring of PRODEEM. At periodic National Committee meetings, RENOVE shared its experience on sustainable renewable energy applications and helped improve the government's methodology. (RENOVE was the only non-governmental institution invited to be part of the Committee). The official Revitalization Plan that MME announced during the PRODEEM kick-off seminar in November 2003 reflects numerous suggestions from Energia Produtiva team members.¹⁰

Participation and Input

Resolution Number 83/2004 – During the Program, RENOVE established a good relationship with the Electric Energy Regulatory Agency, ANEEL, permitting in-depth discussion of PV systems and mini-grid regulation. By submitting contributions to ANEEL's Public Hearing No. 012/2004, RENOVE proposed improvements to the regulation of individual PV systems. The contributions were partially incorporated in ANEEL's Resolution No. 83/2004.

Proposal for change regarding connection in the power grid - RENOVE member CERPCH also identified a regulatory flaw and developed a proposal for a change aimed at lowering the cost for

¹⁰ These suggestions primarily focused on: (i) need for participation of local grass-root institutions to guarantee sustainability; and (ii) need for an improved communication mechanism to accelerate failures recovery.

USAID / Brazil Productive Energy Program

connection of small, mini and micro hydro power plants to the power grid. If the proposed change takes place, connection costs can be significantly reduced, bringing several small hydro power plants to economic viability. RENOVE is identifying the appropriate channels to move it forward.

RENOVE and GVEP (Global Village Energy Partnership) - RENOVE attended GVEP/Brazil meetings and participated in the discussions regarding the preparation of GVEP's integrated action plan. RENOVE's Executive Secretary was an official member of the Brazilian Government's delegation to the GVEP Latin America Summit in Santa Cruz, Bolivia, in 2003. RENOVE has also constantly advocated in favor of a broad, stakeholder-based approach to the provision of energy services in unattended communities, despite the Brazilian Government's tendency to sometimes favor federal "go-it-alone" and "top-down" approaches. RENOVE also provided input to the government's national GVEP action plan.

Public Hearing at the Amazon Commission of the House of Representatives for use of hydro power in indigenous lands – During the course of CERPCH's efforts to implement the Tiriós MHP in the *Tumucumaque* Reserve (see page 24), the Center found that a special authorization was needed from the Brazilian Congress to install a hydro power facility inside an indigenous reserve. Without this authorization, the Center was unable to move on with the project, despite the strong interest of investors and the Ministry of Defense. RENOVE provided support to CERPCH to call a public hearing at the Amazon Commission of the House of Representatives, for obtaining Congressional Approval to the project. The hearing will take place in the upcoming months.

Input to Federal Government's *Luz Para Todos* Program. Besides the above-mentioned efforts, RENOVE also provided input on strategies for providing energy services to remote communities in the Amazon to the Ministry of Mines and Energy, and begun negotiations with Eletrobrás to establish a partnership for joint development of proposals for improving renewable energy/decentralized generation legislation and regulations. These initiatives aimed to contribute to the successful implementation of the *Luz para Todos* rural electrification Program.

Network Strengthening

Energia Produtiva continued USAID's support to Brazil's largest network of NGOs active in renewable energy policy promotion. With the Program's funds, the network hired a full-time Executive Secretary and established an office in Brasília which is now in charge of all operational activities of the network. RENOVE's Executive Secretary carried out a number of activities for legal establishment of the organization. Additional effort was spent on fostering on-line communication among members and updating of RENOVE's communication material (website and folder).

Members approved RENOVE's new statute and elected a new president and board of directors. RENOVE representatives were also approved to join the REDEsenvolvimento Program, sponsored by ABDL, AVINA, ASHOKA and E-RITS. RENOVE submitted fund raising proposals to REEEP (Renewable Energy & Energy Efficiency Partnership), the Swiss Cooperation Agency, and GTZ, the German aid agency, and successfully raised funds from B-REED for policy promotion.

USAID / Brazil Productive Energy Program

Cross-cutting Activities

Communication and Information Dissemination

Winrock and its partners implemented the Program's communications and information dissemination activities with special attention to USAID's new branding policy.

The Program issued twelve periodic electronic editions and printed two annual, hard-copy edition of the newsletter *Energia Produtiva Notícias*, delivered to a mailing list of stakeholders nationwide. The newsletters are available for download at the Program's website.¹¹ News on the progress of Energia Produtiva was continuously published on the website, too.

Energia Produtiva, through the SGAP, also supported the eighth edition of the America's Model United Nation, by the Brazilian Council for International Relations, addressing the production of environmentally sound energy, and the publication of a book on legal issues of energy sector, the "Thematic Seminars of the Energy Law Magazine".

Energia Produtiva's success was documented through extensive coverage provided by Brazilian print and TV media. Several articles were published in newspapers and magazines, and news reports were presented on Brazil's major TV networks. The subjects covered by the media included: Winrock's collaboration with the State Government on biodigestion to strengthen goat and sheep farming (Energia Produtiva and Cabra Forte Programs), Eco-Engenho and Winrock's pilot biodigestion project in Alagoas and Bahia, workshops in Alagoas and the Amazon, among others. These news pieces were run by major newspapers, such as *Correio da Bahia*, *A Tarde*, *Jornal do Brasil*, *Tribuna de Alagoas*, *O Povo* and *Gazeta Mercantil*.



Energia Produtiva was indeed marked by extraordinary TV coverage. Program-sponsored digital inclusion center and biodiesel production with efficient stove projects in Ceará were broadcasted on Rede Globo's *Jornal Nacional* and *Jornal Hoje*, the most important nationwide news programs in Brazil. Local TV channels also broadcasted news on the pilot projects in Ceará, Bahia and Alagoas.

The acceptance test of efficient stoves in Minas Gerais was also covered by the media. The project will be disseminated by the environmental NGO Greenpeace and is expected to be broadcasted on the Discovery Channel.

Monitoring and Evaluation

Monitoring and evaluation activities of the Program started even prior to the beginning of Energia Produtiva, with a proposed methodology and evaluation framework during the design phase of the

¹¹ <http://www.winrock.org.br/energiaprodutiva>.

USAID / Brazil Productive Energy Program

Program, which was constantly refined throughout the Program by Winrock in collaboration with USAID and the Consortium members. The M&E activities performed by the Program included:

1. Contribution to the development of USAID/Brazil Energy Program’s indicators and monitoring and evaluation plan
2. Development of Energia Produtiva’s M&E plan according to USAID’s M&E Framework guidelines
3. Training of Consortium members and field researchers on M&E framework and procedures
4. Development of indicators, targets and logical frameworks for the working groups
5. Development of a socioeconomic household questionnaire and database
6. Periodical update and analysis of impacts on indicators, and review of targets
7. Data gathering through application of questionnaires, focus groups and interviews
8. Consolidation and analysis of socio-economic data
9. Quarterly evaluation and reviews at Working group and Consortium meetings
10. Final participatory evaluation

The final evaluation analyzed the strong and weak points of following topics during the Program implementation, and performed a number of recommendations for future work by organizations and agencies working together to promote the market for productive applications of renewable energy:

Table 5 - Final evaluation notes

Topic	Strengths	Weaknesses	Recommendations
Communication	Spontaneous media coverage	Lack of a media plan Difficult to show USAID’s credits Lack of communication among members	Improve member communication Develop a single communications tool for the Consortium Use USAID web portal Create a brand strategy
Replication	Worked with private agents Replication concern in the design of projects Results already obtained in two years Sustainable models/examples People with increased awareness	Not identified	Not identified
Technologies	Community empowerment Capacity building Appropriate technologies demand-driven Local vocations considered	Not identified	The MHP potential for North Region should be further explored
Impacts	Environment Monitoring “Holistic view” versus “technologic view” Experimenting Seed planted	More time would be needed to see the impacts	Not identified
Learning Lessons	Process Constant evaluation Lessons shared on: biodigestion, drying, cooking, SHP, lanterns	Partial learning, potential not fully explored	Develop hands-on manuals Use RENOVE’s website
Partnerships	Replicability through partnerships Persistence Lessons learned	Not identified.	Persistence.
Targets	Achieved and surpassed Barriers overcome	Not identified.	Not identified.
Gender	Marine algae project with gender approach Cultural respect	Organizations could increase the use of use gender approaches Should have sought more cultural changes	Take into consideration division of tasks Explore links between gender and energy Consider people with special needs
M&E	Efforts to improve M&E “Quantum leap” in quality	Not identified.	Not identified.

USAID / Brazil Productive Energy Program

Working Groups	Groups structure favored collaboration among organizations Adjustment occurred in year 2 Experience was shared Winrock spent efforts to promote group work New experience Groups developed and changed along the way	Improvements needed to promote more collaboration among group members Weakest point	Use ITC tools
Sustainability	All actors taking responsibility over projects Other neighboring communities willing to adopt the technologies Networks developed help achieve sustainability	Technologies not yet mature enough	Existing demand for replication

Small Grants Award Program

The Small Grants Award Program (SGAP) was created with the objective of supporting trainings, researches, project development, as well as other activities that contribute to the adoption of clean energy technologies. During the Program, SGAP approved seventeen grant requests, listed below, for a total of US\$ 31,024¹².

Table 6 – Small grants awarded

Applicant: Value: Project Name: Description:	Instituto Eco-Engenho US\$ 3,000 Ninth Conference of the Parties (COP 9) The proponent participated in the Ninth Conference of the Parties (COP 9) seeking support to GVEP in Brazil and Latin America and to identify voluntary reduction schemes for greenhouse gases. The objectives of this activity were: <ul style="list-style-type: none"> To track the insertion of financial support to renewable energy under the Framework Convention, as well as the perspectives of impact on trading of such technologies in Brazil and Latin America inside GVEP (www.gvep.org); To accompany the negotiations and scientific discussions regarding the consequences of using renewable energy and the issue of global warming; To search for information on the alternatives for the reduction of GHG, and Voluntary Reduction Schemes. (Voluntary Reduction Schemes have been proposed by the US government and its delegation at COP 8); To contribute to the identification of methodologies for “voluntary reduction schemes for greenhouse gases”, and understand how these schemes can be integrated with GVEP initiatives in the trading and financing of renewable energy technologies.
Applicant: Value: Project Name: Description:	IDEAAS/Fábio Rosa US\$ 1,760 Electricity for All The proponent traveled to Bangladesh to visit the Grameen Bank and the Grameen Shakti (solar PV initiative for affordable energy services for low-income clients), guided by Mr. Muhammad Yunus.
Applicant: Value: Project Name: Description:	Petrobras/Ricardo Uchôa US\$ 2,515 International Conference “Natural Gas Technologies II: Ingenuity & Innovation” in Phoenix – Arizona A representative from Petrobras Gas & Energy participated in the conference to understand best practices in the United States in the natural gas industry, specifically as pertains to: <ul style="list-style-type: none"> Distributed Generation; Fuel cells/Hydrogen; Environmental practices
Applicant: Value: Project Name:	IDEAAS/Fábio Rosa US\$ 870 World Economic Forum in Davos – Switzerland

¹² CERB declined the grant in the amount of US\$ 197 due to difficulties to sign a grant agreement in English. The total amount paid is US\$ 30,827.

USAID / Brazil Productive Energy Program

Description:	A representative from RENOVE participated in the World Economic Forum (WEF) in Davos to develop the following activities: <ul style="list-style-type: none"> Dissemination of information about RENOVE among the participants of WEF (private companies, international organizations, governments, and NGOs); Fundraising to complement Energia Produtiva Program activities;
Applicant: Value: Project Name: Description:	Centro de Recursos Ambientais US\$ 1,300 Social Responsibility in Environmental Management Training Course Co-sponsorship of a training course with the following objectives: <ul style="list-style-type: none"> To strengthen 40 NGO representatives on the subjects of environment, organizational structure, project development and finance; To invite trained institutions to join RENOVE; To insert renewable energy and use of agro-industrial residues in the agenda of lectures
Applicant: Value: Project Name: Description:	Projeto Saúde e Alegria US\$ 1,300 Community Cultural Telecenters in the Amazon Region - 4 th World Summit on Media for Children and Adolescents Two adolescents and the coordinator of the project Communitarian Cultural Telecenters in the Amazon Region and Mocaronga Network of Popular Communication participated in the event in Rio de Janeiro during April 19-23, 2004. The World Summit on Media for Children and Adolescents joined representatives of media industry, researchers, educators, and adolescents of five continents to present, analyze and debate their experience. The project, Communitarian Cultural Telecenters in the Amazon Region, has been selected to present its experience in the World Panorama. The two adolescents have been selected to participate of the Adolescents Forum, involving 150 youngsters in debates and in arts, communication, and culture workshops.
Applicant: Value: Project Name: Description:	IDEAAS/RENOVE US\$ 2,160 Technical visit of RENOVE members to Macapá RENOVE members technical visit to the State of Amapá. The main objective was to seek oportunities to develop projects of common interest between RENOVE members and the Government of Amapá.
Applicant: Value: Project Name: Description:	Atlântico Eventos US\$ 2,000 Power Future 2004 Sponsorship of Power Future 2004 event. Power future was an international fair on Renewable Energy held in the city of Fortaleza, Ceará, on April 27-29, 2004. The objective of the event was to debate relevant issues related to renewable energy in Brazil, such as PROINFPA, new technologies, legislation, regulation, etc.
Applicant: Value: Project Name: Description:	CERB US\$ 197 Power Future 2004 Sponsorship to CERB to send one representative to participate in the Power Future 2004 event.
Applicant: Value: Project Name: Description:	Eco-Engenho US\$ 2,251 Solar Desalinator A demonstrative project of a low-cost solar desalinator was built at a school located in the community of Várzea Marinho, municipality of Ouro Branco, Alagoas. The project consists of two modules with dimensions of 2x30 meters (total area of 120 m ²) for water distillation. The daily expected average production is of 3-5 liters of treated water per m ² of system surface area.
Applicant: Value: Project Name: Description:	ICF Consulting US\$ 2,921 Renewable Energy and Energy Efficiency Capacity Building Program The consultant Dr. Richard Fioravanti was invited to participate in the training “Energy Efficiency with emphasis in Co-Generation from Natural Gas”, held in Natal (June 21-22, 2004) and in Porto Alegre (June 24-25, 2004), where he gave a lecture on US experience within the Natural Gas Cogeneration Market.
Applicant:	B&Q - Consultores Associados Ltda / Marcelo Barros Gomes (TCU)

USAID / Brazil Productive Energy Program

Value:	US\$ 2,111
Project Name:	Project to Improve the Public Services Regulation Controls
Description:	The proponent traveled to Madrid, Spain, to give a lecture on State Reform and Public Administration in the IX Congresso Internacional do Centro Latinoamericano de Administración para el Desarrollo – CLAD – November 02-05, 2004.
Applicant:	Ecofogão Indústria de Fogões Ltda / Rogério Miranda
Value:	US\$ 1,995
Project Name:	Demonstration and validation of low-cost eco-stoves in poor communities
Description:	To install 30 unities of the eco-stove (campestre model) in houses of a low income community in the suburbs of Belo Horizonte, MG. After training on installation, operation and maintenance of the eco-stove, a monitoring process is being performed for twelve months, house by house.
Applicant:	Associação Comunitária de Caxipauã/Diocese de Santarém/ IDER
Value:	US\$ 2,000
Project Name:	Solar Energy to Education
Description:	To install a Solar PV System, TV, Radio and Laptop to substantially improve radio and TV-based teaching possibilities (Radio program: To Listen and Learn (Para Ouvir e Aprender), TV program: Distance Education, and night classes to teach adults to read and to write.
Applicant:	Associação Comunitária de Muquém/ IDER
Value:	US\$ 2,000
Project Name:	Revitalization of the solar PV system of School José Domingos de Sousa
Description:	To implant a Solar Digital Nucleus, proposed by IDER, it was necessary to revitalize the solar PV system of the school, installing a new inverter and charge controller. In addition, an alarm system was installed to avoid future attempts at theft. A television was installed, to facilitate the Distance Learning Program of Brazilian Ministry of Education.
Applicant:	Instituto Brasileiro de Estudos do Direito de Energia - IBDE
Value:	US\$ 1,322
Project Name:	Thematic Seminars of the Energy Law Magazine
Description:	To promote and disseminate, scientifically, studies and researches on legal issues of energy sector: electric energy, nuclear power, alternative sources, natural gas, petroleum and respective regulations.
Applicant:	Conselho Brasileiro de Relações Internacionais
Value:	US\$ 1,322
Project Name:	Americas' Model United Nations
Description:	To support the Eighth Edition of the America's Model United Nation. One of the themes of this edition was the production of clean energy, discussed at the Science and Technology Commission.

Section III – Success Stories and Lessons Learned

A selection of interesting Energia Produtiva stories are presented in detail in this section. These short histories are intended to highlight those initiatives that, through both their triumphs and their difficulties, created the path to a new future for the productive uses of energy in Brazil. The cases shown in this section were chosen by the Consortium members, based on their perception of the impact and relevance of each. For further insight into the stories, please see the accompanying CD ROM #1, which contains photo records of many of such experiences.

Animal waste generates biogas and biofertilizer, reducing pressure on natural resources and strengthening family farming

Summary

Where

Rural areas of Bahia, Brazil

Problem

Poor families in Brazil's Northeast do not have access to clean energy

People

Over 50,000 farmers, 40 cocoa producer families, and 85 agriculture students from several municipalities in Bahia

Solution

Dissemination of the Brazilian biodigester model through the installation of biodigestion demonstration projects at a settlement, a technical station and a school, and technology showcase to small farmers at regional fair.

Results

- 85 students with information on biodigester installation and use
- Biodigestion technology showcased to over 50,000 small farmers
- Increased energy services for 40 families

Family farmers in Brazil's Northeast are becoming familiar with the benefits that biodigestion has to offer in adding value to local resources, improving energy services and increasing both human and animal well-being. After a decade of unsuccessful experiences with Indian and Chinese biodigestors models, from the mid 1970s to 1980s, domestic industry and know-how came up with a "Brazilian" model: low-investment and maintenance, easy installation, and high durability are the main characteristics of the flexible PVC plug-flow type biodigestors that have caught on in the past 5 years. In addition to the technical improvements brought about by this new model, the concept of the role of biodigestion was being broadened – in addition to on-site energy generation, great emphasis was being placed on the value of the biofertilizer and the improvements in sanitary conditions.

USAID / Brazil Productive Energy Program

The increasing popularity of this technology, however, had been restricted to the more industrial and wealthy South and Southeast region of the country. Through the Energia Produtiva program, the benefits of the technology were broadly disseminated to farmers in the poorer Northeast. This Energia Produtiva initiative kicked off with the installation of a biodigester in an agrarian reform settlement community made up of 40 families, carried out in partnership with the local NGO Jupará. This first set of lessons learned and success stories was complimented by a joint effort with the State Government in the semi-arid region to pioneer the introduction of bio-digestion in the goat and sheep growing chain, one of the most important economic activity of the poor Northeastern small farmers.

These stories are presented in the next pages.

Sustainable cocoa farming: the Cascata case

At the Cascata settlement, the community was searching for a way to substitute wood from the native forest in the drying process of cocoa beans with a clean, renewable energy source. In addition, there was a need for low-cost natural soil amendment to apply to the cocoa cultivation, which had been certified Organic by the internationally-recognized Instituto Biodinamico since 2001.

The local NGO Jupará, a member of the RENOVE Network, had worked with the community for several years. In 2002, Jupará brought this issue to Winrock's attention. Winrock then performed an on-site assessment, and identified the potential to install a biodigestion system operating on the manure of a herd of 60 cattle. With Energia Produtiva, they were able to work together to carry out the project starting in 2003.

Community participation. Construction of the manure holding tank, excavation of the hole for the biodigester, and the expansion of the cattle corral took place over several months from 2003 to 2004, during which all men in the community (including younger men) took turns working. During the construction period, the men began penning the cattle at night, cutting grass for feed and washing the corral each morning in order to fill the biodigester. Between five and twelve men worked each day during almost a year in the excavation of the hole, extension of the corral, construction of the manure holding tank (between the corral and the biodigester), and laying the tubing. In order to use the biogas produced for drying cacao, it was necessary to modify the existing wood-burning cacao drier. Problems were encountered with the cover of the biodigester, which had to be exchanged due to leakages, and the tubing, which had to be elevated on posts due to the excess of water in the ground. The technical problem was condensation on the walls of the tube, requiring the installation of a drain. Since the resolution of these problems, the first of the two projected 40m³ batch-type biodigestors has been functioning well.



USAID / Brazil Productive Energy Program

This project benefited from the active participation of the manufacturer of PVC film, Sansuy Plásticos S.A., Latin America’s leading supplier of this material. Sansuy has provided technical assistance in addition to donating a portion of the materials used in the installation.



Innauguration with president of INCRA

The inauguration of the biodigester was held during a community festival in 2004. After converting the cacao drier from fuelwood to biogas, the drier was inaugurated in early 2005, when the president of the National Institute for Agrarian Reform visited the site. The community was excited about the event appearing on television.

Organizational changes. Since the installation of the biodigester and biogas burner, the community has developed a new collective system for drying the cocoa. Previously, each producer was responsible for sun-drying his own cocoa, a process which could take several days. As space for drying is limited (on the roofs of the buildings where the fermentation process takes place), they sometimes had to wait several days for their turn. When there was a large volume of cocoa waiting to be dried and the weather was rainy, they would sometimes use the wood-fuelled drier. Now, however, the association has elected one person to be responsible for the drying process. After fermentation, each producer’s cocoa is weighed and turned over to this person, who dries it in the sun, using the biogas drier when necessary. In return, the other members of the association look after his plot and harvest his cocoa. The person receives no payment for this service, but occasionally employs one or two boys to help him out with the work, and these are paid by the association. The other producers have more time to dedicate to the cocoa plots. Tasks (e.g. looking after the cattle) are assigned to groups of members in association meetings, according to a calendar, and rotated to distribute the work evenly.

As yet, few people have applied the bio-fertilizer, as they have not yet resolved problems related to storage (need a bigger container to catch the fertilizer as it leaves the biodigester) and transportation to the cacao fields. Those who have used a little in gardens and nearby cacao plots report positive results. Previously, many community members have purchased organic fertilizer from the cacao producers’ association, but Cascata has not purchased this year, as they plan to apply the bio-fertilizer.

Stakeholders attention. Even before the project was concluded, the National Institute for Agrarian Reform approved financing for a training course on biodigestion installation and operation for members of 6 settlement communities in 2005, with the prospect of developing new job opportunities for youths in the rural area. The biodigestion project at the settlement was also selected as a Certified Social Technology by Banco do Brazilthe Bank of Brazil Foundation for its innovative approach and sustainable purpose contribution to sustainable development.



Cocoa drying on the sun



Biogas-fired cocoa drier

USAID / Brazil Productive Energy Program

This project had a strong environmental approach that contributed to attracting the attention of stakeholders, since it contributes to the conservation of one of the most biodiverse and threatened ecosystems, the Atlantic Coastal Forest, an internationally-recognized *hotspot* of environmental importance, of which only 7% of the original area remains.

Evaluation. In August 2005, the project was evaluated by an independent consultant, who captured both the men and women's view and satisfaction regarding the project, as described below.

Women's view: In general, the women are satisfied with the project to date but feel that it will not have served its purpose entirely until they are able to use biogas in their homes. When asked whether it was more important to have biogas for the cacao drier or for home use, all felt that both were important, and some stated that the drier was the more important of the two. Given the opportunity, they agreed that they would do the project again. Depending on the needs of the community – for example, if they were to establish the fruit processing factory or a hotel – they would definitely consider installing another biodigester with their own funds, recognizing that development requires investment. They believe that the biodigester will still be functioning well in five years time, but stress that this depends mainly on community leadership. The current leadership has displayed great commitment to the project, but the future of the community will depend on decisions of younger generations.

Men's view: At the startup of the project, men were attracted to the possibility of avoiding deforestation as well as providing an economic advantage as they would no longer have to purchase fertilizer to use on their crops and could possibly even sell fertilizer. Both men and women were very receptive to the project idea and men specially participated active in the project. The project was seen as very positive, and all stated that given the chance, they would do it again, as many times as possible, and would also recommend other communities to implement biodigester projects. Now that they have experience in installation and operation and have experienced the benefits of a biodigester, they stated that they would consider purchasing another biodigester with their own money, although they would require credit to be able to do this. Men still have expectation to see another one or even two biodigestors installed in the community, in order to provide fuel for cooking in every house and possibly even electricity. They also have plans to use it for other productive uses, and to use fruit waste as fuel to the system. Shorter-term plans include installing tubing to supply biogas to the manioc flour factory to further reduce use of firewood.

Different views of project impacts were noted. Men and women agree that the quality of the product has improved as the cocoa no longer smells of wood smoke, and that considerable time has been saved by the new collective cacao-drying system. Women also noted increased productivity due to application of bio-fertilizer, and increased employment (a couple of boys employed occasionally to help with cacao drying). More time is required now to round up and pen the cattle, cut and chop grass, wash the corral, etc. However, some perceive penning the cattle at night as having a positive effect on the health of the cattle. Men perceive more precisely the environmental impacts than women, and are able to appoint some wood savings. They also mentioned that there is less water contamination as cattle manure is now collected, as well as improved air quality through smoke reduction in drying. In terms of quality of life, women noted that reduced workload in cacao drying is a benefit for older men and those with high blood pressure. Men viewed air quality as the major benefit in terms of quality of life. Both men and women believe the project had a positive influence in the community organization. Men appointed some small conflicts related to groups, but which

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were resolved. Men view women as having participated indirectly in the project. No impacts were seen in gender relations. Men and women say that to date no impact was noted regarding youths, but have the expectation that the fruit processing factory can represent in the future a source of employment for young people, avoiding migration to urban centers. The community has become relatively well known and receives many visitors.

Lessons learned related to construction aspects: the correct type of vinyl cover should be used from the start; the hole dug for the biodigester does not need to be lined with concrete or block, only the perimeter; it would be better to invest a little more in the tubing and purchase a stronger type than that used there.

Recommendations: During some periods, the biodigester is not used to maximum capacity. The cattle are only penned every two or three days, as otherwise more biogas is produced than is required for drying cacao. At the same time, it appears that on occasions, wood is still used for drying cacao.¹³ This indicates the need for the second biodigester for rainy and/or harvest seasons, and to explore other uses of the biogas during the other months of lower demand from the drier. The community also performed an attempt to connect biogas to the kitchen of a house, and use it for cooking, but said that the flow of gas was weak and the motor would need to be turned on, which was considered a waste energy for only one house. Some people in the community are also concerned about the regulatory and safety aspects of using biogas in the home, and are concerned about the costs. Further guidance for the community is needed in this regard.

Strengthening goat farming with biodigestors



From the humid, biodiverse Atlantic Forest of Bahia's coast, Energia Produtiva's Biodigestion front moved hundreds of kilometers inland to the harsh reality of the Semi-arid region, which covers 841.261km² and is home to thousands of poor farmers, many of whom live off raising goats and sheep, with limited access to water and forage for the animals, and annual losses of their herds of 40% due to parasite infestation. A state government program called Cabra Forte, or Tough Goat, led by the Bahia Department of Agriculture, is investing heavily to turn this reality around. With the goal of benefiting over

25,000 farmers in 17 municipalities, Cabra Forte is installing hundreds of well and river pumping systems, providing training, supplying selectively bred does and bucks, and assisting farmers in commercializing their products.

The clear synergy between the Department of Agriculture's mission of sustainable rural development and the Energia Produtiva program led to the signing of a Cooperation Agreement with Winrock in April of 2004. This partnership brought Winrock in direct contact with thousands

¹³ Ashes were seen in the drier by an independent consultant (August 30) and by a representative of the Bank of Brazil who visited on April 26. When this person remarked on the ash, community members said that they still occasionally use wood for drying.

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of rural farmers during field visits and participation in dissemination and capacity building events. This interaction led to the identification of the opportunity for Winrock to contribute in overcoming three barriers in goat and sheep farming production: 1. animal mortality due to parasite transmission through feces; 2. limited access to clean, affordable sources of energy; and 3. little or no cultivation of forage to maintain animals during the drought period.

Biodigestion arose as an important tool in tackling these problems, seeing as this technology destroys pathogens present in manure, produces clean-burning and renewable biogas, and provides a low-cost, highly effective liquid soil amendment, known as biofertilizer.

In a dynamic partnership between public, private and civil society sectors, a demonstration biodigestion project was installed by Winrock and Sansuy at the state agricultural EBDA Experimental Station, located in Jaguarari, Bahia. Designed for a typical herd of 150 goats and sheep, the biodigester has been successfully operating for three months thus far. The abundant biogas production of over 100m³/month has replaced both the station's consumption of butane and of wood, and is meeting the cooking, lighting and milk pasteurization needs of the station, which is off-grid. The next step will be to purchase a gas refrigerator which will permit the conservation of the milk for longer periods. Meanwhile, the biofertilizer is being applied to a half-acre plot of forage, with significant improvements in the growth and foliage of the plants.

As a result of the success of the Jaguarari project, Winrock was invited to demonstrate this biodigestion technology at the largest family agriculture fair in Brasil, AGRIFAM, which took place in Irecê, Bahia from November 18 to 21 of 2004. Over 46,000 participants visited the fair and had the chance to see, touch and ask questions about the family-size 3m³ biodigester that was installed within the fair's Model Farm. At the close of the fair, the biodigester was donated and installed at the local agricultural school, ESAGRI, which has 85 students from several municipalities in the region, to serve as a working example of biodigestion integrated in a farm's cycle of production.

Replication of these demonstration initiatives has already begun. As a result of the success of the goat biodigestion project, the Department of Agriculture committed to fund the construction of 6 new biodigestors within the Cabra Forte program. Three model farmers and model communities were selected to receive the biodigestion systems. A growing interest of both individual farmers and cooperatives in purchasing biodigestors leads to the next challenge: scaling-up this technology by way of financing from the development banks in the region.



Biodigester from goat manure



Biogas used for lighting

Renewable Energy and Education: A Partnership that Benefits Children and Youths

Summary

Where

Rural schools in the States of Alagoas and Ceará, Brazil, and City of Fortaleza, Ceará, Brazil

Problem

The Brazilian digital divide is enormous, with only 7.7% of the population online. In rural areas, access to information and a quality education is difficult, especially in communities isolated from the power grid. Without good education, disadvantaged youths living in the metropolis and its neighborhoods lack employment opportunities due to low qualifications and need psychological support for development of their leadership potential.

People

A total of 865 students in six schools, and 90 disadvantaged youths from the ages of 16 to 24

Solution

Installation of multimedia equipment, internet connectivity, and distance learning tools for education and citizenship improvement. Computer classes for kids and youths. Capacity building of disadvantaged youths through market-driven technical training with special attention to their unique needs. Psychological support and family engagement. Collaboration with the private sector for the development of job opportunities.

Results

- Better education for 865 students
- 857 families with access to ICT technologies for improved citizenship.
- Computer and citizenship classes for 234 local staff
- 60 young ICT monitors trained
- Increased self-esteem and employment opportunities for 90 disadvantaged youths
- Around 95% of participants successfully completed the technical training
- Ten youths employed
- Five youths accepted into college
- Significant positive changes in the youths' behaviors

Many Brazilian children and youths, and the majority of those located in rural areas, do not have access to quality education. Without good basic education and access to information, these kids have little opportunities for a college education, and are less capable to develop creative ways to escape poverty. Over 90% of the country's population is excluded from the internet, and almost the same percentage of households does not have computers. Other Latin American countries with much smaller populations, such as Argentina, Chile, Peru and Uruguay, have higher percentages of internet connectivity (above 10%). Research also reveals that there is a clear link between digital inclusion and improved education and higher income. Typically, in rural areas access to information and a quality education is difficult, since rural communities are isolated and sometimes have no electricity.

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By understanding that there is a clear link between education and poverty, Energia Produtiva invested on a number of initiatives that aimed to improve the ability of children and youths in rural Northeast Brazil to access better quality education. In all cases, renewable energy was used as a vector to such initiatives, either by powering computer and multimedia labs, or by opening horizons for a new profession: the renewable energy technician.

These stories are presented in the next pages.

Renewable Energy and Sustainable Development Capacity Building Provide New Horizons for Disadvantaged Youths

According to official 2002 estimates, 14.6 million Brazilians are illiterate (approximately 11.8% of the population 15 years and older). Many of these individuals are teenagers and young adults from disadvantaged backgrounds and have little opportunity for a college education. These youths face sometimes insurmountable barriers in attempting to secure employment in a highly competitive job market where only the educated have a fighting chance. In the absence of special attention to their unique needs—which are not only educational but also psychological—these youths remain trapped in poverty and often at risk for entering more accessible, illegal pursuits.

Through the Brazil Productive Energy Program, USAID funded a renewable energy capacity building program for at-risk and disadvantaged youths. This initiative was implemented by IDER – Instituto para o Desenvolvimento Sustentável e as Energias Renováveis – in the city of Fortaleza, far northeastern Brazil.

The program was designed to provide theoretical understanding and specialized technical know-how regarding renewable energy systems—all within a sustainable development framework. The goal was to improve young participants’ employment prospects, thereby generating income, a sense of citizenship, and self-esteem.

From local public schools, IDER selected 90 course participants from the ages of 16 to 24, strategically engaging youths’ families to enlist their ongoing psychological and moral support for students throughout the seven-month course (384 hours in total). Over that time, students learned basic electrical engineering, PV solar energy systems, solar-thermal energy, environmental issues, and workplace safety. Working in groups, performing research, and practicing hand-on skills were among key elements of the applied methodology. By incorporating families into the process, the educational team was not only able to track student performance but was also able to monitor students’ behavioral changes.

Besides engaging parents, the initiative was also highly successful in engaging numerous stakeholders. For example, the Federal Center for Technology Education – CEFET, a major player



Families were visited by Program staff

USAID / Brazil Productive Energy Program

in the educational arena, was an important partner and provided nationally-recognized course certification.

Out of the initial group of 20, 19 or 95% of participants successfully completed the program. Half of the students graduated highly motivated to pursue careers in the emerging renewable energy market. Most of the parents reported significant changes in their children’s attitudes toward themselves, their families, and their future. Family and educator psychological support were critical to the success of this type of initiative, in addition to successful institutional partnerships.

This activity, which began in 2003 as a small pilot program (in 2002 and 2003, under a previous USAID-sponsored Program, IDER had also trained 40 youths), became more firmly established in 2004, attracting the attention of private companies, public institutions, the television and printed media, and, especially, other disadvantaged youth in Fortaleza in search of a more promising future. In the last year of the Program, IDER developed strong strategies for obtaining employment for Program graduates. Several institutions that have this kind of job-placement expertise, as well as potential employers, were engaged (SINE, SINDUSCON, *Consórcio Social da Juventude*, *Central de Estágios*, CIEE and SEBRAE) to help with this effort. As a result, not only was IDER able to expand the course to an additional 30 students, but also to successfully insert several of the graduates in the job market, through the Federal Government’s *Primeiro Emprego* Program, and through partnerships with the industry. A cooperative agreement secured twenty trainee positions at Wobben Windpower. Currently, over twenty are employed or engaged in economic activities, while around ten others are continuing their education in college. Due to the success of this initiative, USAID’s Disadvantaged Youth Program *Enter Jovem* will fund a new 25-student class next in 2006.

“Sustainable Development was a knowledge I integrated into my life. Today I can say that I am qualified for the job market.”
Renato Moraes, course graduate

Renewable energy improves education and citizenship through digital inclusion

According to IBGE, Brazil’s national census and population research agency, only 10.6% of Brazilian households had computers in the year 2000. Today, Brazil has approximately 12.6 million internet users representing only 7.7% of the country’s population. Other Latin American countries with much smaller populations, such as Argentina, Chile, Peru and Uruguay, have higher percentages of internet connectivity (above 10%). Research also reveals that there is a clear link between digital inclusion and improved education and higher income. In Brazilian states with less



PV-powered digital inclusion center in Alagoas

educated, poorer populations, the digital divide is greater yet. Typically, in rural areas access to information and a quality education is difficult, since rural communities are isolated and sometimes have no electricity. While some of the many schools far from the electric grid are now generating their own electricity thanks to solar PV power systems, multimedia equipment to support education is the privilege of a very few. The introduction of distance learning tools, computers and internet access can not only improve education for students at the school but also increase a sense of citizenship for the entire community.

USAID / Brazil Productive Energy Program

To help rural Brazil cross the digital divide, the Brazil Productive Energy Program sponsored a number of educational activities. IDER and Eco-Engenho began a multi-state effort to provide rural schools with multimedia equipment, internet connection, and distance learning tools. The Program also secured participation of such institutions as IPDN, CDI and the Telemar Institute, all local NGOs that also work with this issue.

Through these and other partnerships, six rural schools benefited from the provision of computers, printers, TVs, videotape players, and office and support materials.

Both the Telemar Institute and IPDN have a well-established teaching methodology that uses the multimedia laboratories to improve education, which was the focus of this initiative in three of the four schools. In the fourth school, dissemination of information to promote a sense of citizenship and ICT capacity building are also services offered to the community.

The digital centers provide two types of training: 1) computer classes for kids, targeted at children 5 years and above (using games and multimedia software); and 2) computer classes for youths to promote inclusion in the digital world while building student capacity, community development, and citizenship. Thanks to this initiative, 865 students have better education, and 857 families have access to ICT technologies for greater citizenship.

The Program had hoped to bring Internet connections to these schools with support from the Ministry of Communications, which offers a program providing free Internet links for schools, provided the community meets certain pre-requisites (is sufficiently organized, has a digital center management system, is electrified and equipped with computers). When connected to the internet, the telecenters would offer services such as securing social security numbers, birth certificates, and other legal documents on-line, activities that would otherwise be very difficult and expensive for remote communities to undertake. Unfortunately, obtaining internet connections turned out to be harder than expected. The envisioned support from the Federal Government's digital inclusion program did not materialize, either due to the Government bureaucracy or the excessive demand that this program was facing.

An operational barrier was also encountered. All four computers at the Bom Jesus digital center, donated by the local NGO CDI, had to be changed for new ones. The reason was that the maintenance costs of refurbished computers turned out to be too high for the project. The old computers were returned to CDI, the NGO that had donated the equipment.



Installation of PV system for school digital center



PV-powered digital center in Ceará

Using renewable energy to increase food production, food security, and income

Summary

Where

Maceió Settlement, Municipality of Itapipoca, State of Ceará, Brazil

Problem

In the semi-arid region of Northeast Brazil, water scarcity is a major threat to livelihoods, severely impacting agricultural production, especially for small farmers. The region is subject to constant droughts.

People

40 small-scale farming families

Solution

Installation of a water pumping and micro-irrigation system powered with renewable energy technology. Capacity building provided for farmers in organic agriculture. Support in commercialization through a contract farming mechanism. Assistance in business planning, entrepreneurship and credit acquisition provided for the association.

Results

- Forty families adopted renewable energy technology coupled to organic and sustainable agricultural practices
- Improved food security for approximately 240 residents
- Increased income for 26 rural families already achieved, 40 families expected in the next months

In the semi-arid region of Northeast Brazil, most small producers rely on agriculture for subsistence and as their major source of income. However, the scarcity of water and long drought periods create very hard living conditions, provoking malnutrition and mass migration to city slums. For those who venture to the metropolis, urban misery typically awaits.

The situation of the Brazilian Semi-Arid region requires immediate action to revert the increasing degradation of the environment and recover the life quality of the caatinga inhabitants. Improving the productive process for families or rural communities in Northeastern Brazil can help mitigate perverse social and economic indicators, mainly the ones that refer to hunger and exclusion.

With this in mind, the project focused on family farming and the rural community, starting from the analysis of the current situation and aiming to develop broad solutions that could contribute to improve the life quality of these families in many aspects, such as work, nutrition, health, habitation, economic and social relations, gender relations, self-esteem, etc.

The recovery of the soil, flora and native fauna in rural properties, the implantation of perennial crops and the creation of a permanent structure of sale to the consumer were both the goals and instruments of environmental, professional and social education of the community.

Organic agriculture market. One of the first steps of the project was to carry out a market assessment. This analysis showed a number of facts: although Brazil occupies the thirtieth place in the ranking of the exporting countries of organic products, in recent years, sales increased at a rate

USAID / Brazil Productive Energy Program

of 50% a year. It was estimated that close to 100 thousand hectares in about 4.500 units of organic production were already being cultivated. However, approximately 70% of the Brazilian production was located in the more prosperous South and Southeast Regions. Around R\$1 million circulated yearly at the organic fairs in large cities in these regions. The agriculturists who organize the fairs were, in their majority, small and affiliated to associations. The Brazilian exports reached about US\$100 million annually, being 80% from the products originating from medium-sized producers, 10% of small producers and 10% of large rural producers. The statistics showed that there was a great potential of expansion of organic production in Brazil. Some products, such as fruits, cereals, milk derived products and meat, are still under-explored but are expected to be developed in the next years. Although the majority of the organic production was still destined to the external market, there was an increase of the domestic demand, stimulated by the increasing number of consumers looking for "clean products".

Aiming to mitigate the risks of survival in this region, and with the market confirmed, this innovative initiative was carried out under the umbrella of the Brazil Productive Energy Program. Implemented by local NGOs IDER and NEPA, the project began with development of the community's first organic vegetable garden. Since part of the community was not connected to the power grid, the program installed solar PV panels to power water pumps. These pumps now irrigate the gardens, allowing for reliable vegetable production regardless of rainfall. In total, IDER designed, developed and implemented organic gardens that use wind and solar photovoltaic energy for the irrigation of 4 ha of lands in four communities: Bom Jesus and Barra do Córrego in the Assentamento Maceió – municipality of Itapipoca, north coast of Ceará, Prainha do Canto Verde – municipality of Beberibe, and Lambedouro – municipality of Viçosa of Ceará. The last two communities (Prainha Bebedouro) still meet in the recovery and soil preparation phase for the culture of organic vegetables, although all the irrigation systems are installed and in full operation.

A unique aspect of this project was the coupling to this "upstream" renewable energy solution of a "downstream" strategy for organic product marketing and working capital finance. A socially-responsible contract model is being applied whereby urban consumers pre-pay US\$ 40.00 monthly for delivery of a customized "basket" of produce. Groups of buyers "adopt" a rural farming family in the Maceió Settlement, Itapipoca, State of Ceará, committing in advance to purchase production. This integrated approach to developing chains of production is a signature characteristic of the Productive Energy Program as a whole.

With support from Energia Produtiva, IDER provided the growers with technical assistance and training in organic cultivation, planning, management and marketing. The Institute also assisted the association in obtaining credit for consolidating the marketing and distribution side of the business and by expanding the *Aliança Social* network, now with 45 active members.



Soil being prepared



PV systems for water pumping



Organic produce

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This project built the capacity of about 10 families per community or 40 families in these areas. With the average of 3 people per family, 120 people were directly trained in the production and management of agro-organic process of cultivation. Through a participatory approach, the Production Plan was defined, and has a number of different varieties of tubers, roots, vegetables, cereals, flowers and fruits. The production of each area was calculated to guarantee the supply of weekly baskets for 70 family consumers allied to the network of Social Alliance. Aiming at organic food production, the proposal was to involve the families in a qualification process which involved principles of sustainability, natural resources, basic practical techniques of agro-ecology, soil recovery, plantation, harvest, management, commercialization, quality control and certification.

Due to their history of land reform conflicts and labor exploitation, Maceió settlement communities were highly organized. This facilitated the extensive community mobilization and capacity building required for success. For three months, the IDER/NEPA team met with mostly female members from all eleven Settlement communities and, based on level of interest, technical abilities and site conditions, identified Bom Jesus and Barra do Córrego as ideal communities for undertaking the project.

The organic gardens installed were each one hectare and each consumes 4,000 liters of water per day. To power the irrigation systems, 1300 watt solar PV panels were installed at each site. After a participatory planning, project technicians trained the families in organic production, beginning with soil preparation, a process that takes several months before the land becomes suitable for organic cultivation. In total, the community chose to cultivate 90 different species of fruits, vegetables, flowers and grains. For the families, the organic cultivation of the seeds themselves was a continuous learning process. Over one year after the project began and with 40% of the total project area cultivated, organic vegetables are being consumed locally and also being sold through the Aliança Social contract farming mechanism.

The project, which is regarded as the initial phase of a broader, scaled up effort, can be considered a success. The families adopted renewable energy technology coupled to organic and sustainable agricultural practices leading to improved food security for approximately 120 residents in each garden. A less quantifiable but equally important result is greater awareness in the Settlement communities of the issues surrounding sustainable development and the health impacts of pesticides, as well as the potential for establishing a socially responsible marketing mechanism in partnership with residents of the city of Fortaleza.

The project led to a number of lessons learned. The main challenge was reaching the sustainability of the activity in three aspects: 1. ecology; 2. local knowledge; and 3. socially-responsible economy. The need to profoundly change cultural labor and eating habits was one of the major obstacles that needed to be overcome. The major lesson learned was that the dynamics of social and natural processes cannot be controlled by human beings. Instead, we must learn from them, to wait patiently after planting the seed for the right time to harvest.

Evaluation. In August, IDER carried out a project evaluation with 40 beneficiaries from the communities. The participants also performed a planning exercise for the future activities.

USAID / Brazil Productive Energy Program

The major project impacts reported by the participants regarded: improvement in food security, health and quality of life, environmental education and awareness, learning new skills, love of life and work, strength to persist and team work. Improved gender relations, renewable energy, organic products, sound relationship with the environment, and hands-on experience with organic agriculture were pointed out as the group's strengths.

The following issues were raised as needing further work: marketing, commercialization and production planning, relationship among groups, equipment supply, family engagement, water supply, commitment, organization, technical assistance, and respect for team work.

The consolidation of a network focused on renewable energies

Summary

Where

Brazil

Problem

The need for a single and strong voice to promote renewable energies in Brazil

People

Winrock International and 18 Brazilian NGOs

Solution

Creation of a nationwide network of NGOs to share experiences and join forces to promote renewable energies in the country

Results

- Increased understanding by the third sector of the legislative process
- A number of proposals and improvements in renewable energy legislation and regulation
- Collaboration among members leading to important innovative projects

The success of Energia Produtiva in the policy arena can be attributed to the engagement of RENOVE and its members in promoting legislation and regulations favorable to renewable energies.

Created in 2000 with USAID support, RENOVE is now the most active policy voice in the field of renewable energy in Brazil. During the BCEEP Program, from 2000 to 2003, the network was created and strengthened, joining 30 Brazilian NGOs that see renewable energy as a key vector for sustainable rural development.

The past two years of Energia Produtiva support allowed RENOVE to consolidate itself an important policy actor, recognized by the energy commission of the Congress and by several ministries as an active player in the field of renewable energy in Brazil. The network's intense policy activity in the period can be witnessed by the number of draft laws now under development at the National Congress that benefited from RENOVE's input or advocacy efforts at some point. Through several mechanisms, RENOVE proposed a number of changes in current renewable energy legislation. Step by step, RENOVE worked to raise the awareness of key policy makers and influence the legislative process.

One of the network's key achievements was the promotion of a public hearing at the House of Representatives in November 2003, with the goal of raising awareness among Brazilian congressmen on the topic of renewable energy. The hearing was attended by approximately 30 politicians and federal authorities. Since this event, RENOVE has been in constant contact and providing assistance to legislative consultants and congressional members responsible for legislative development and analysis. This collaboration led to the development of several proposals and subsequent changes, such as the following

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- Draft law 3566-04 advocates a change in the legislation to allow SHPs under 1MW to access CCC benefits, thus increasing economic attractiveness of such projects.
- Draft Law 3259-04 proposes improvements to another draft law intended to create a Renewable Energy Incentive Program (PIER).
- Draft Laws 3368-04 and 4080-04 address biodiesel legislation, with RENOVE contributions regarding poverty reduction and income generation aspects of the national biodiesel program.
- A new draft law recently submitted to the Congress promotes the use of solar heaters in poor households.

Besides identifying the need for specific legislation and working with congressmen to propose the draft laws, RENOVE succeeded in obtaining favorable recommendation for approval of some of them in House Committees.



A collaboration of RENOVE members is powering 72 households and 3 productive chains at the Village of Cachoeira do Aruã, in Pará

The network also provided direct input to policy-makers, such as ANEEL and the Ministry of Mines and Energy. RENOVE’s contributions can be found on the revitalization plan of PRODEEM, a national, renewable energy-based, rural electrification program, on ANEEL’s (the Electric Energy Regulatory Agency) PV systems regulation, and on the government’s national GVEP (Global Village Energy Partnership) action plan, among others.

With the Federal Government and Utilities, RENOVE constantly provided input to successful implementation of the *Luz Para Todos* Program. In this regard, special emphasis was put on how remote power systems can be operated and maintained on a sustainable fashion. Three innovative decentralized renewable energy generation pilot projects were started during Energia Produtiva, as a result of collaboration between RENOVE members, and with support of the Federal Government. These projects are testing different models to address this issue. The PRISMA, for example, is a model for electrification based on community ownership and management of local infrastructure and strengthening of local productive chains, is being tested in a remote community in the Amazon Region. RENOVE started efforts to promote the replication of the “Luz Agora” model, a market-based PV rural electrification model successfully applied in South Brazil, in the poor Northeast Region.



19 Villagers of São Francisco do Aiuacá, in Amazonas, are testing household electrification through solar PV systems. RENOVE will share results with ANEEL.

Moreover, with Energia Produtiva support, the network hired a full-time Executive Secretary and established an office in Brasília which is now in charge of all operational activities of the network, now with a new statute and a new president and board of directors.

All these important achievements helped to strengthen RENOVE and its role for the future of renewable energies in Brazil. Another indicators of RENOVE’s strengthening was the leveraging of additional funding from B-REED and support from ABDL, Ashoka and Avina Foundation.



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During these five years of USAID support, RENOVE has grown and become an important vehicle for policy promotion in the country. With seed funding from USAID decreasing in the next years, the future of the network is now in the hands of its members and will rely on the network's capacity to continue attracting additional funding and engaging its members.

USAID / Brazil Productive Energy Program

Solar Móveis: a new market agent

Summary

Where

Alagoas State, Brazil

Problem

The lack of a low-cost solar drier affordable to small farmers

People

A rural entrepreneur, small farmers in Alagoas

Solution

Identification, and strengthening of a local entrepreneur and finance for the company to become a manufacturer of low-cost solar driers

Results

- One renewable energy business strengthened
- 242 people benefiting from renewable energy technology to add value to the family production

In Brazil, 40% of agricultural products harvested rot due to inadequate preservation. Energia Produtiva applied dehydration processes as an alternative to increase the shelf-life and ease of transportation of such products, besides increasing product value.

The Program stimulated equipment supply by creating a new manufacturing enterprise, and provided capacity building and commercialization support for market penetration of dried products.

Eco-Engenho Institute supported the manufacturing of a low-cost, indirect, through-pass, solar thermal drier prototype based on a design by the Appalachian State University. Eco-Engenho selected this design as the best option for small producers, in terms of both cost and ease-of-use.



Solar drying equipment

The incident solar energy on the collector is transformed into heat and absorbed by the ascending air flow in natural convection. The solar drier makes food dehydration possible, a procedure that concentrates the flavor and maintains of the nutritional value of the products, besides facilitating transport, handling, conservation and preparation.

The equipment was first tested for drying bananas in the community of Ilha do Ferro. Eco-Engenho developed the business plan for the new enterprise, Solar Móveis, which was financed by E&Co. In 2005, Solar Móveis manufactured the first 10 drier units, which were either sold or delivered to small farmers in the *comodato* mechanism. The following communities received the driers: Baixas, in São José da Tapera (2 drieres), Copeagro Cooperative, in Maragogi, Pedrão, in Olho D’água das Flores, Barro Vermelho, in Arapiraca, and Ilha do Ferro, in Pão de Açúcar (3 driers). Another Solar Móveis drier was delivered to an entrepreneur in Bahia. The drier was also adapted to allow for the use of a back-up heating source.

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At these sites, the equipment is being used to dry fruits, mostly bananas, and in some cases, tomatoes, increasing the family income of 242 people. At three of the communities, micro-credit self-help groups were established to help farmers acquire the equipment after the trial period.

USAID / Brazil Productive Energy Program

Section IV. IMPACT OF ACTIVITIES ON SO9 INDICATORS

Impacts of Energia Produtiva’s interventions on USAID’s Intermediate Results Indicators¹⁴ are listed below.

Table 7 – Impacts on USAID Energy Program Indicators

Result	Indicator	Anticipated FY2005 ¹⁵	Achieved FY2005
SO 9 - Global Climate Change Mitigated through Market-Based Renewable Energy and Energy Conservation	IR 9.0.1 - Number of people that adopt new practices that reduce greenhouse gas emissions	2,525	8,246
IR 9.1 – Improved policy and regulatory framework promoting renewable energy and energy efficiency	IR 9.1.1 - Number of steps accomplished at the policy-making level for the promotion of renewable energy and energy efficiency	5	16
IR 9.2 - Increased technology cooperation and transfer between U.S. and Brazilian firms to support clean and efficient energy production and use	IR 9.2.1 - Number of non USAID-funded organizations engaged in renewable energy or energy efficiency technology cooperation initiatives	4	7
	IR 9.2.2 - Number of people directly and indirectly benefiting from increased energy services and/or more efficient energy services as a result of USAID-supported technology cooperation initiatives	600	610
IR 9.3 - Market development for renewable energy and energy efficiency	IR 9.3.1 - Funds mobilized from other bi/multilateral donors, commercial, and local sources for the development of renewable energy and energy efficiency projects as a result of USAID intervention	US\$1 Million	US\$ 45.2 Million

¹⁴ Intermediate Results and Indicators are described in USAID/Brazil’s Performance Monitoring Plan, on December 5th, 2003, according to the new Strategic Objective (SO9) for its 2003-2008 Energy Program.

¹⁵ These accumulated figures were initially estimated by Winrock per Mission’s request by the time the SO9 Performance Monitoring Plan was being developed (December 2003), and later revised on Year 2 of the Program.

USAID / Brazil Productive Energy Program

IR 9.3.2 - Number of people directly and indirectly benefiting from increased energy services and/or more efficient energy services as a result of USAID-supported market development activities	2,525	8,246
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Intermediate Result 9.1 – From 2003 to 2005, Energia Produtiva members contributed to the policy development process through the following steps:

1. **Identification** of improvements/necessary changes in PRODEEM revitalization plan, **development** (technical assistance from Winrock and RENOVE to MME), and, finally, **approval** of suggestions.
2. **Identification** of topics related to PV and mini-grid systems regulation that need improvements, **development** (submission of a proposal for ANEEL and input for public hearings 012/2004, 015/2003 and 012/2001), and partial **approval** in ANEEL’s Resolution No. 83/2004¹⁶
3. **Development** of draft law no. 3368/04 on biodiesel at the House of Representative’s Technology Evaluation and Studies Council (with contributions by RENOVE).
4. **Development** of draft law number 3566-04 at the National Congress regarding inclusion of SHPs under 1MW in CCC benefits (RENOVE was the main author of this proposal), **approval** of the draft law at 1) the Commission of Mines and Energy, and 2) the Commission of Finance and Taxation, both at the House of Representatives.
5. **Identification** and proposition of contributions for a substituting proposal for draft law no.3259-04 to Congress that proposes the creation of a renewable energy incentive Program - PIER (with contributions by RENOVE).
6. **Identification** of the need for legislation to support small producers in free commercialization and use of biofuels, and **development** of Draft Law 4080-04, submitted to the Congress.
7. **Identification** of a legislation working point (promotion of the use of solar heaters in poor households), and **development** by RENOVE of a draft law, being submitted to Congress.
8. **Development** of a draft proposal for a regulatory change aiming at facilitating the connection of small, mini and micro hydro power plants in the power grid.

Intermediate Result 9.2 – Energia Produtiva members promoted the engagement of the following organizations in Brazil-U.S. technology cooperation:

1. The U.S.-based organization, **La Guardia Foundation**, engaged in technology cooperation with **Instituto Eco-Engenho**, for implementation of two renewable energy-powered organic and hydroponic garden projects in Alagoas, benefiting 281 people.
2. The U.S. company **Energy Security Group** (ESG) collaborated with **Eco-Engenho** in the Brazil Finance Capacity Building Program, expected to benefit approximately 500 people (4 communities). 242 people already benefited by the end of the Program.
3. **CEAL** engaged in a cooperation project with **NRECA** for GIS-based rural electrification planning in Alagoas. Sponsored by Energia Produtiva, Eco-Engenho had a key role in establishing this institutional partnership. (NRECA collaboration was not counted, however, because it was funded through other US Government sources.)
4. Several Brazil-based institutions (**Winrock, UNIFEI and Banco do Povo**), a multinational manufacturer of stoves (**Dometic**), and a U.S.-based consulting services firm (**Stokes Consulting Group**) cooperated to combine lessons learned in Nigeria, Ethiopia, South Africa and Brazil in meeting low-income household demand for clean cooking applications. The collaboration involves a market test of ethanol stoves involving 100 families.

¹⁶ For more information on public hearings and resolutions see www.aneel.gov.br .

USAID / Brazil Productive Energy Program

5. The American NGO, Trees, Water and People (TWP), and the private micro-enterprise, Ecofogão Ltda, partnered for information dissemination of *ecostoves* in Brazil, expected to reach 300 families with significant health improvements benefits.
6. The Humanitarian Assistance Program of the **U.S. Military Liaison Office** and the local organizations **IDER and APAEB** collaborated for the supply of clean water in the semi-arid region. U.S.MLO funded the installation of cisterns in four communities in Ceará and Bahia. The cisterns were inaugurated in August, benefiting over 16 families (88 people).

Intermediate Result 9.3 – From 2003 to 2005, the Consortium actively pursued the development of the market for renewable energy and energy efficiency. The total resources leveraged from this effort amounts to **US\$ 45.2 Million**¹⁷. Details are provided below:

Table 8 – Cumulative Impacts on IR 9.3.1, Amount Leveraged from Other Sources

Project	Where	Amount	Who
Organic agriculture	Pão de Açúcar (AL)	\$25,000	Fundação La Guardia, CEAL
Organic agriculture	Itapipoca (CE)	\$82,041	E&Co (\$47,500 loan), SEINFRA, Inwent, cooperative
Pollen drying	Canavieira (AL)	\$27,000	E&Co loan
Marine algae drying	Trairi (CE)	\$11,900	InWent
Micro-credit capacity building	4 communities (AL)	\$44,000	e3V/FCO REEP
Banana drying	Wenceslau Guimaraes (BA)	\$27,333	CAR-Banco Mundial/ Programa Produzir
Biodigestion	Aurelino Leal (BA)	\$8,400	Sansuy, Municipal Government and Community
Solar driers factory – Solar Móveis	Alagoas	\$18,330	E&Co loan
Digital inclusion	Alagoas (5 schools)	\$27,930	IPDN, Instituto Telemar
Digital inclusion	Itapipoca (CE)	\$26,160	CDI, GESAC, SEINFRA
Digital inclusion	Trairi (CE)	\$2,800	Telemar Institute
Biodigestion	Jaguarari (BA)	\$1,500	EBDA, Sansuy
Biodigestion	Pão de Açúcar (AL)	\$3,000	Mayoralty, Sansuy, O Ferrageiro Store
Hydroponics Garden	To be defined	\$25,000	Fundação La Guardia
Biodigestion	Barra Bonita Farm	\$18,800	CNPq, EBDA and UNEB
PCH Canaã	Pimenta Bueno (RO)	\$305,000	MME/MCT/CNPq
PRISMA	Santarém (PA)	\$447,000	MME/MCT/CNPq, UNIFEI, CELPA, PSA
PV Systems Criteria testing	Mamirauá Reserve (AM)	\$208,000	MME/MCT/CNPq, USP, IDSM
Cocoa drying	Aurelino Leal (BA)	\$740	Cascata Settlement Association
Digital inclusion	Itapipoca (CE)	\$1,777	Mayoralty, SEINFRA (PV panels)
Biodigestion	Jaguarari (BA)	\$18,000	EBDA, UNEB, CNPq

¹⁷ The investments for Areia Branca and Pipoca SHPs are not yet being counted since the details of the contract are still being worked out.

USAID / Brazil Productive Energy Program

RE Training for disadvantaged youths	Fortaleza (CE)	\$11,420	<i>Consórcio da Juventude/Primeiro Emprego Program</i>
Efficient stoves	Vale do Jequitinhonha (MG)	\$113,970	Shell Foundation, Dometic Sweden
Efficient stoves	Belo Horizonte (MG)	\$6,000	Trees, Water and People
Healthy & Profitable Small Farms in NE Brazil	Juazeiro (BA)	\$105,900	World Bank
Apertadinho 30 MW SHP	Vilhena (RO)	\$ 43.8 Million	Investment bank based in Rio de Janeiro
Agro-industrial biodigestors	Bahia (5 Municipalities)	\$ 100,000	AgCert
Total (accumulated)		\$ 45.2 Million	

The number of people directly and indirectly benefiting from Energia Produtiva’s field projects developed or underway totals **8,246** as detailed below:

Table 9 – Cumulative Impacts on IR 9.3.2, People Benefiting Directly from EP’s Interventions

Project	Community	Municipality	People
Dissalinization and hydroponics	Baixas	São José da Tapera (AL)	180
Organic agriculture, drying, digital inclusion (NDS in Bom Jesus), efficient stoves	Barra do Córrego	Itapipoca (CE)	303
Solar drying of fruits and micro-credit	Barro Vermelho	Arapiraca (AL)	44
Organic agriculture and Drying of fruit, vegetable and spice	Bebedouro	Viçosa (CE)	55
Water desalinization for human consumption	Boa Vista	Traipu (AL)	182
Organic agriculture, drying, digital inclusion, efficient stoves	Bom Jesus	Itapipoca (CE)	297
PRISMA	Cachoeira de Aruã	Santarém (PA)	396
Water desalinization for human consumption	Cachoeira Velha	Canapi (AL)	165
Biodigestion	ESAGRI School	Irecê (BA)	100
Algae drying	Flexeiras e Guajiru	Trairi (CE)	132
Training for at-risk youth	Fortaleza (07 bairros da periferia)	Fortaleza (CE)	495

USAID / Brazil Productive Energy Program

Fruit drying, biodigestion, education and micro-credit	Ilha do Ferro	Pão de Açúcar (AL)	138
Digital inclusion (NDS in Bom Jesus)	Mata fresca, Córrego da Estrada, Apiques, Maceió		1210
Fruit drying	Nova Esperança	Wenceslau Guimarães (BA)	457
Pollen drying	Operárias do Mel	Coruripe (AL)	83
Biodigestion	P.A. Cascata	Aurelino Leal (BA)	220
Solar drying of fruits, biodigestion and micro-credit	Pedrao	Olho D'água das Flores (AL)	61
Organic agriculture and Drying of fruit, vegetable and spice	Prainha Canto Verde	Viçosa (CE)	55
Education	Recanto	Senador Rui Palmeira (AL)	2217
Efficient oven	Santa Maria	Quixeramobim (CE)	165
Critérios Sistemas PV	São Francisco do Aiucá	Reserva Mamirauá (AM)	105
Digital inclusion - NDS	São João	Itapipoca (CE)	237
Solar drying factory	Solar Móveis	Maceió (AL)	33
Efficient stove market test	Suzana	Belo Horizonte (MG)	150
Education	Timbó	Pindoba (AL)	220
Organic agriculture	Traíras	Pão de Açúcar	83
Water desalinization, education	Várzea do Marinho	Ouro Branco (AL)	468
Total			8246

Over 20,000 people are expected to benefit from initiatives that are starting and will continue after the end of the Program.

Section V. THE ROAD AHEAD

From the previous sections, it is clear that most of the activities started under the Brazil Productive Energy Program will be continued in the next years, be it under the new USAID Brazil RE&D Program or through other fronts initiated, promoted or leveraged by Energia Produtiva. This will be further facilitated because the core group of EP partners will continue to work together under ER&D.

1. Sustainability of Renewable Energy Projects Installed in FY 2004 and 2005

Part of Energia Produtiva's strategy was to install technically and economically sound demonstration projects to be showcased to stakeholders capable of co-sponsoring, sustaining and scaling up the use of renewable energy technologies for productive purposes. The Consortium installed over 30 such demonstration projects in several states for a full range of applications. A wide range of key stakeholders engaged the program, including such strong supporters as EBDA, CEFET, INCRA and MME Even with EP's term being reduced to half of the predicted duration (the Program was designed for a four year term), the team managed to work with these stakeholders and bring in other co-sponsors that helped to mitigate the negative effects of an early termination. Synergies explored between EP and other wide-reaching programs such as Luz para Todos, Cabra Forte and the National Forest Program, among others described in this report, are already boosting important EP outcomes. Complementary funding leveraged from other donors will also allow consortium members to continue providing technical or managerial assistance to the individual projects initiated under EP, such as in the decentralized generation projects sponsored by the Ministry of Mines and Energy.

2. Market Agents

Some of the activities will be led by private companies that were established or strengthened by the Program, and which will continue to develop the market. The following examples can be highlighted:

Crop Drying - During the last two years, Energia Produtiva worked with two companies, Solar Móveis and Meloni Consultoria, to promote the local manufacture of solar driers, a gap that needed to be addressed for development of this potentially large market. In 2006, *Solar Móveis* will continue to deliver low-cost solar driers to entrepreneurs and farmers in Alagoas. Expected sales of the first units delivered in *comodato* will allow the company to reinvest in the manufacturing of additional units in the following year. Winrock and Eco-Engenho are both working on the market development side. *Meloni Consultoria* has also incorporated the solar and biogas thermal drying technology in its product portfolio and/or dissemination material¹⁸.

Biodigestion – The biodigester installer UsiSoldas, aided by the Program, intends to continue developing the market for small and medium biodigesters in Bahia. UsiSoldas is currently installing 1 agro-industrial biodigestion system in Ilheus, BA and is discussing 2 more projects with new clients. Meanwhile, the Canadian company AgCert is expected to continue pursuing

¹⁸ CD-ROM *O Mundo da Desidratação*

USAID / Brazil Productive Energy Program

opportunities for large biodigesters in the Northeast, in partnership with Sansuy, after the initial demand stimulated by the Program. Energia Produtiva also contributed to facilitating access to credit for biodigesters through BNDES, an important development bank in Brazil. With easier access to financing, adoption of these systems is expected to continue increasing in the Northeast.

With the objective of adapting biodigestion technology to the reality of family farmers in the Northeast, Winrock and Sansuy developed a simplified biodigester for small-scale applications. This pre-fabricated model joins the cover and liner in a single, air-tight unit, facilitating installation and reducing the cost. The “budget-biodigester”, as it is called, has been successfully tested at three demonstration sites and is now part of the Sansuy product portfolio.

Efficient stoves – The company Ecofogão, one of Energia Produtiva’s partners and leaders in the manufacture of efficient stoves in Brazil, is pursuing the goal of selling 300 units of *ecostoves* for NGOs or public agencies, fostering the scale-up of the pilot test sponsored by the Program. The GEF/Caatinga Program is expected to fund the installation of an additional 200 *ecostoves* in the Northeast. Ecofogão’s activities will continue after the end of the Program. Winrock and Banco do Povo, meanwhile, will continue the ethanol-fueled stove market test at *Vale do Jequitinhonha*, seeking to develop a supply chain in the region.

3. Scale-Up and New Projects Opportunities

Energia Produtiva’s follow-on project, the Renewable Energy & Development Program, keeps the core of EP’s implementation team, which will continue and scale-up most of the activities and field interventions started under Energia Produtiva. Additionally, several stakeholders, such as State and Federal Governments, local NGOs, newly created self-help groups, foundations and other donors, have committed to promote renewable energy income-generating solutions advocated by the Program. The following new initiatives are other examples of how important outcomes of the Program are leading to new funding opportunities:

World Bank’s Development Marketplace – Winrock was one of the winners of the World Bank’s Development Marketplace Contest, and won a \$106k grant to implement a project in the San Francisco River Valley Region. The objective is to reduce human exposure to and environmental contamination from pesticides by developing the regional market for organic and dried produce. The project will enable poor farmers to migrate from conventional, pesticide-intensive agriculture to environmentally-sound and value-added organic agriculture. Winrock will collaborate closely with the Coopervida farmer cooperative, directly engaging 135 farmers in the training courses and certification process, and with five local schools in as many municipalities for hosting the demonstration organic farming and solar drying projects. Another 265 farmers will participate in capacity building workshops. The project is beginning in September and will be an important cost sharing source to the ER&D Program.

Biodigestion - Winrock submitted a proposal to INCRA for wide replication of the biodigestion systems. INCRA is analyzing this proposal for the installation of 200 biodigestors in rural settlements in the Northeast. Winrock will also continue the biodigester capacity building initiative under the USAID global IRES IQC project that will train agents to replicate the technology in semi-arid Bahia. Furthermore, Winrock will continue to showcase biodigestion at Cabra Forte Program’s

USAID / Brazil Productive Energy Program

fairs to thousands of small farmers in Bahia. In Alagoas, Eco-Engenho joined forces with the NGO Movimento Minha Terra to promote the adoption of biodigestion for agro-ecologic production.

The Bahia State Agriculture Secretariat approved Winrock's proposal to scale-up the demonstration biodigestion projects installed over the last two years. The proposal includes six integrated renewable energy projects, including interventions such as water pumping, biogas production and community gardens, in municipalities of the *Cabra Forte* Program.

Water - In Ceará, *Aliança Social* will continue to be an important commercialization channel for the Program's family agriculture products. *Aliança Social*'s demand for organic products continues to grow, and new individual families of small organic producers have joined the supply pool. The volume of sales to local hotels, which are closer to the production sites, has also increased.

The Ministry of Science and Technology released the funds for the pilot project at the *Barra Bonita* Farm, in Juazeiro, Bahia, which started in October and is being implanted by Winrock and its partners UNEB - Bahia State University - and EBDA – Empresa Baiana de Desenvolvimento Agrícola. The project will carry out several integrated sustainable activities with the objective of improving the livelihoods of goat and sheep farmers. The *Barra Bonita Farm* will serve as an information dissemination/ capacity building focal point for the Bahia State's *Cabra Forte* program.

4. RENOVE and Public Policy Development and Promotion in Brazil

RENOVE has been a key player in the national renewable energy policy development arena. Since its creation in 2000, the network has contributed to the proposal, development and approval of draft laws, new regulation, and suggested changes and improvements in programs such as PRODEEM.

After five years of USAID sponsorship, the Agency's funds for RENOVE will be significantly reduced over the next two years, with limited funding from the USAID's Brazil Renewable Energy & Development Program being allocated to the network's policy activities. The support of Energia Produtiva allowed the network to open important doors in the National Congress and open an office in Brasília. On the other hand, to continue making use of these opportunities, and to maintain its office and Executive Secretary support in Brasília, RENOVE will need to address its sustainability more aggressively.

Brazil's largest network of renewable energy NGOs will continue to promote public policies that are supportive of increased application of renewable energy technologies in Brazil and represent civil society in the Global Village Energy Project (GVEP), with the expected USAID funding, but so far it has not been able to raise the complementary funds to maintain its contract with a legislative advisor.



USAID / Brazil Productive Energy Program

Attachments

USAID / Brazil Productive Energy Program

A. Real and personal property procedures: disposition of all acquired property and equipment

Table 11 - Winrock International - Brazil Office Inventory 1996 - 2004

DATE	Qtde.	TYPE OF ITEM	FUNDING SOURCE OF PURCHASE	PURCHASE VALUE (RS)	STATUS
1996					
30/05/96	1	FAX MACHINE	4053 - NGO REI		GOOD
27/06/96	1	FILE CABINET	4053 - NGO REI	90.00	DISPOSED
19/07/96	1	CLOSET	4053 - NGO REI	100.00	DISPOSED
19/07/96	1	BOOK SHELVES (WOOD)	4053 - NGO REI	60.00	GOOD
19/07/96	1	BOOK SHELVES (PAINTED)	4053 - NGO REI	30.00	DISPOSED
19/07/96	1	UNIDEN 900MHz CORDLESS PHONE	4053 - NGO REI	200.00	DISPOSED
19/07/96	1	FILE CABINET	4053 - NGO REI	90.00	REGULAR
22/08/96	1	TABLE FOR THE DIRECTOR WITH 6 DRAWERS	4053 - NGO REI	225.00	GOOD
22/08/96	1	CHAIR FOR THE DIRECTOR	4053 - NGO REI	140.00	GOOD
22/08/96	1	TABLE 1.20 * 0.60	4053 - NGO REI	100.00	GOOD
22/08/96	1	ROTATIVE CHAIR	4053 - NGO REI	79.00	REGULAR
22/08/96	1	ROUND TABLE	4053 - NGO REI	150.00	GOOD
22/08/96	3	SEAT COUCH	4053 - NGO REI	170.00	REGULAR
22/08/96	1	TABLE FOR COMPUTER	4053 - NGO REI	70.00	GOOD
21/11/96	1	AIR CONDITIONER springer 12500	4053 - NGO REI	879.00	DISPOSED
1997					
28/01/97	1	SMALL REFRIGERATOR	4053 - NGO REI	370.00	GOOD
28/01/97	1	COFFEE MAKER	4053 - NGO REI	50.00	DISPOSED
19/03/97	1	TEPHONE SYSTEM EQUIPMENT	4053 - NGO REI	550.00	GOOD
15/12/97	2	02 UNIKITS	4053 - NGO REI	932.00	GOOD
1998					
20/08/98	2	COMPUTERS - Pentium II 8 Gb	4053 - NGO REI	3540.00	GOOD
18/09/98	2	TABLES WITH 3 DRAWERS	4053 - NGO REI	244.00	GOOD
18/09/98	2	SECRETARY CHAIRS	4053 - NGO REI	198.00	GOOD
18/09/98	2	CLOSETS	4053 - NGO REI	474.00	GOOD
18/09/98	2	STEEL FILE CABINET	4053 - NGO REI	135.00	GOOD
21/09/98	1	COMPUTER Pentium II	4053 - NGO REI	1770.00	GOOD
21/09/98	2	PRINTER - HP 695	4053 - NGO REI	530.00	GOOD
27/11/98	1	SCANNER	4053 - NGO REI	128.00	GOOD
1999					
21/01/99	1	AIR CONDITIONER	4053 - NGO REI	1152.00	GOOD
14/01/99	1	TABLE WITH 6 DRAWERS	4053 - NGO REI	228.00	GOOD
14/01/99	2	TABLES WITH 3 DRAWERS	4053 - NGO REI	246.50	GOOD

USAID / Brazil Productive Energy Program

14/01/99	2	STEEL FILE CABINETS	4053 - NGO REI	310.00	GOOD
14/01/99	2	CLOSETS	4053 - NGO REI	477.70	GOOD
14/01/99	3	DIRECTOR CHAIRS	4053 - NGO REI	306.00	GOOD
14/01/99	3	COMPUTER TABLES	4053 - NGO REI	260.10	GOOD
26/02/99	4	COMPUTERS - AMD K-6 450 MHZ	4053 - NGO REI	6696.00	GOOD
19/03/99	1	FILE CABINET	4053 - NGO REI	155.00	GOOD
23/03/99	1	AIR CONDITIONER	4053 - NGO REI	1174.00	GOOD
29/04/99	1	ZIP DRIVE	4053 - NGO REI	330.00	GOOD
03/09/99	1	TABLE 1.2 X .60 W/3 DRAWERS	4053 - NGO REI	143.00	GOOD
03/09/99	2	CHAIRS	4053 - NGO REI	204.00	GOOD
22/10/99	1	PRINTER HP695 (A BROKEN HP 680C AS EXCHANGE PLUS R\$320,00)	4053 - NGO REI	320.00	GOOD
09/12/99	1	CLOSET	5122- LWA	256.00	GOOD
09/12/99	1	TELEPHONE TABLE	5122- LWA	63.00	GOOD
09/12/99	1	FILE CABINET 2 DRAWERS	5122- LWA	206.00	GOOD
2000					
18/01/00	2	COMPUTERS - Pentium III 8.4 GB	4053 - NGO REI	4657.00	GOOD
28/01/00	2	TABLES 1.7 W/06 DRAWERS	5122- LWA	560.00	GOOD
28/01/00	3	COMPUTER TABLES	5122- LWA	240.00	GOOD
28/01/00	1	CHAIR	5122- LWA	156.00	GOOD
24/05/00	1	FILE CABINET WITH 03 DRAWERS	5122- LWA	198.00	GOOD
24/05/00	1	CLOSET	5122- LWA	330.00	GOOD
06/11/00	1	COUCH AND ARM CHAIRS	5122- LWA	550.00	GOOD
06/11/00	1	TABLE	5122- LWA	72.00	GOOD
16/10/00	4	CHAIRS (FIXED)	5244 - BCEEP	220.00	GOOD
16/10/00	5	CHAIRS (FIXED) WITH ARMS	5244 - BCEEP	325.00	GOOD
16/10/00	1	FILE CABINET WITH 04 DRAWERS	5244 - BCEEP	219.00	GOOD
16/10/00	1	DIRECTOR CHAIR	5244 - BCEEP	145.00	GOOD
16/10/00	1	TABLE WITH 03 DRAWERS	5244 - BCEEP	147.00	GOOD
16/10/00	3	STEEL FILE CABINET	5244 - BCEEP	420.00	GOOD
16/10/00	5	CLOSETS	5122- LWA	1250.00	GOOD
16/10/00	1	TABLE FOR FAX MACHINE	5122- LWA	45.00	GOOD
16/10/00	1	MEETING TABLE	5244 - BCEEP	108.00	GOOD
16/10/00	1	FILE CABINET (2 DRAWERS)	5244 - BCEEP	147.00	GOOD
16/10/00	4	CHAIRS	5122- LWA	460.00	GOOD
07/11/00	1	COMPUTER PENTIUM III 550 MHZ	5122- LWA	1666.00	GOOD
07/11/00	1	COMPUTER MONITOR 14"	5122- LWA	256.00	GOOD
07/11/00	1	NO BREAK IF 1200B	5122- LWA	490.00	GOOD
28/11/00	1	TABLE WITH 6 DRAWERS	5122- LWA	222.00	GOOD
28/11/00	2	FILE CABINET	5122- LWA	254.00	GOOD
2001					
1/26/2001	1	CHAIR PURCHASE	5122- LWA	370.00	GOOD
2002					
29/01/02	1	TELEPHONE	5244 - BCEEP	792.00	GOOD

USAID / Brazil Productive Energy Program

03/06/02	1	SECURITY SYSTEM	5122- LWA	406.38	GOOD
8/21/2002	1	DELL LATITUDE C400 LAPTOP	5244 - BCEEP		GOOD
03/09/02	1	GLASS FRONT DOOR	5122- LWA	425.00	GOOD
26/09/02	1	SECRETARY CHAIR	5244 - BCEEP	91.20	GOOD
26/09/02	4	CHAIRS	5244 - BCEEP	277.40	GOOD
26/09/02	3	DIRECTORS CHAIR	5244 - BCEEP	646.40	GOOD
26/09/02	1	DESK 1.6x.71x0,58 W/3 DRAWERS	5244 - BCEEP	396.00	GOOD
03/10/02	2	DIRECTORS CHAIR	5244 - BCEEP	454.00	GOOD
17/10/02		SOFTWARE LICENSES	5244 - BCEEP	3978.00	GOOD
17/10/02		SOFTWARE LICENSES	5244 - BCEEP	9702.00	GOOD
2003					
1/27/2003	1	SOFTWARE LICENSES	5244 - BCEEP	3,000.00	GOOD
1/27/2003	1	SOFTWARE LICENSES	5244 - BCEEP	2,060.00	GOOD
2/27/2003	1	SOFTWARE LICENSES	5244 - BCEEP	2,462.50	GOOD
2004					
2/1/2004	1	BLACK CHAIR	5122- LWA	185.00	GOOD
7/4/2004	1	OFFICE WALL CABINETS	5486 - EP	1,111.50	GOOD
7/4/2004	1	OFFICE WALL CABINETS	5122- LWA	311.50	GOOD
05/17/04	1	OFFICE WALL CABINETS	5486 - EP	1,111.50	GOOD
05/17/04	1	OFFICE WALL CABINETS	5122- LWA	311.50	GOOD

Disposition Plan

On July 8th 2005, by way of a letter from the Agency, Winrock received USAID approval for the final disposition of the property as requested and also for the proposal on the future use of it.

USAID / Brazil Productive Energy Program

B. Description of contents of enclosed CD-ROMs

The enclosed CD-ROMs contain all relevant digital files that resulted from program activities, including official documents, partner's deliverables, clipping of the media coverage, photo album, presentations, projects histories, publications and others. These files are organized in a list of directories as follows:

CD-ROM #1

[Apresentações Comitê Coordenador]
[Atas de Reuniões do Comitê Coordenador]
[Clipping]
[Descrição do Projeto e Planos de Trabalho]
[Escopos de Trabalho dos Parceiros]
[Fotos]
[Infomativos]
[IRs]
[Match]
[Relatórios]
[Small Grants]
[Strategic Objective 9]

CD-ROM #2

[Produtos do Winrock]
[Produtos dos Parceiros]

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C. List of acronyms

ABDL	Associação Brasileira para o Desenvolvimento de Lideranças Brazilian Association for Leadership Development
ANEEL	Agência Nacional de Energia Elétrica National Electric Energy Agency
APAEB	Associação de Desenvolvimento Sustentável e Solidário da Região Sisaleira Association of Sustainable and Solidary Development of the Sisal Production Region
B-REED	Brazil Renewable Energy Enterprise Development Project Projeto de Desenvolvimento de Empresas de Energia Renovável no Brasil
CAR	Agência de Desenvolvimento Rural do Estado da Bahia Bahia State Rural Development Agency
CCC	Conta de Consumo de Combustíveis Fuel Consumption Account
CDI	Comitê pela Democratização da Informática Committee for Democratization of Informatics
CEAL	Companhia Energética de Alagoas Alagoas State Power Company
CEFET	Centro Federal de Educação Tecnológica Federal Center for Technology Education
CELPA	Centrais Elétricas do Pará S.A. Pará State Power Company
CENBIO	Centro Nacional de Referência em Biomassa National Reference Center on Biomass
CERB	Companhia de Engenharia Rural da Bahia Rural Engineering Company of Bahia
CERON	Centrais Elétricas de Rondônia Rondônia State Power Company
CERPCH	Centro Nacional de Referência em Pequenas Centrais Hidrelétricas National Reference Center on Small Hydropower
CIEE	School-Enterprise Integration Center Centro de Integração Empresa Escola
CNPq	Conselho Nacional de Desenvolvimento Científico e Tecnológico National Council for Scientific and Technological Development
COELBA	Companhia de Eletricidade do Estado da Bahia Electricity Company of the State of Bahia
COOPASB	Cooperativa de Pequenos Produtores Agroecologistas do Sul da Bahia

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	Small Agro-ecologists Producers Cooperative of South Bahia
E&Co	Energy through Enterprise
E3V	Environment, Energy and Enterprises Ventures
EBDA	Empresa Baiana de Desenvolvimento Agrícola Bahia Agricultural Development Company
E-RITS	Rede de Informações do Terceiro Setor Third Sector Information Network
ESAGRI	Escola de Agricultura de Irecê Agriculture School of Irecê
ESG	Energy Security Group
FAO	Food and Agriculture Organization
FCO	Escritório de Relações Exteriores do Governo Britânico
GEF	Global Environment Facility
GESAC	Governo Eletrônico – Serviço de Atendimento ao Cidadão Electronic Government – Citizen Support Service
GIS	Geographic Information System
GTA	Grupo de Trabalho Amazônico Amazon Working Group
GVEP	Global Village Energy Partnership
IBDE	Instituto Brasileiro de Estudos do Direito de Energia
IBGE	Instituto Brasileiro de Geografia e Estatística Brazilian Institute of Statistic Geography
ICT	Information and Communication Technology
IDEAAS	Instituto para o Desenvolvimento de Energias Alternativas
INCRA	Instituto Nacional de Colonização e Reforma Agrária National Institute for Land Reform
IPDN	Instituto de Pesquisas e Desenvolvimento dos Municípios do Nordeste Institute for Research and Development of Northeastern Municipalities
MHP	Micro-Hydro Power Plant
NEPA	Núcleo de Ensino e Pesquisa Aplicada Learning and Applied Research Center
NRECA	Associação Nacional de Cooperativas de Eletrificação Rural National Rural Electrification Cooperatives Association
PIER	Renewable Energy Incentive Program
PPA	Power Purchase Agreement
PRODEEM	Programa para o Desenvolvimento Energético de Estados e Municípios Program for the Energy Development of States and Municipalities
PROINFA	Programa de Incentivo às Fontes Alternativas de Energia Elétrica Incentive Program to the Alternative Sources of Electric Energy
PSA	Projeto Saúde e Alegria

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	Health and Joy Project
PV	Photovoltaic
PVC	Poly Vinyl Chloride
	Cloreto de Polivinila
REEEP	Renewable Energy & Energy Efficiency Partnership
RENOVE	Rede Nacional do Terceiro Setor para as Energias Renováveis
	National Network of NGOs for Renewable Energy
SEAGRI	Secretaria de Agricultura
	Secretary of Agriculture
SEBRAE	Brazilian Service of Support to Micro and Small Enterprises
	Serviço Brasileiro de Apoio a Micro e Pequenas Empresas
SEINFRA	Secretaria da Infra-Estrutura
	Infra-Structure Secretary
SENAI	Serviço Nacional de Aprendizagem Industrial
	National Training Service for the Industry
SGAP	Society for Growing Australian Plants
	Small Grants Award Program
SHP	Small Hydro Power Plant
SINDUSCON	Sindicato da Industria da Construção do Estado da Bahia
	Construction Industry Syndicate of the State of Bahia
SINE	Sistema Nacional de Empregos
	National Job System
SIVAM	Projeto Sistema de Vigilância da Amazônia
	Amazon Vigilance System Project
UNDP	United Nations Development Program
UNEB	Universidade do Estado da Bahia
	Bahia State University
UNIFEI	Universidade Federal de Itajubá
	Federal University of Itajubá
UNIR	Universidade de Rondônia
	Rondônia State University
USAID	United States Agency for International Development
	Agência dos Estados Unidos para o Desenvolvimento Internacional
USEPA	United States Environmental Protection Agency

USAID / Brazil Productive Energy Program

D. Final Financial Report

ACCRUALS/ PIPELINE REPORT

Partner:	Winrock International
Contact:	Joe Newman
Phone:	55 71 273-6100
Fax:	55 71 273-6101

Agreement Number:	EPP-A-00-33-00009-00
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Start date:	9/30/03
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[Definition: Date agreement was awarded.]

End Date:	9/30/05
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[Definition: Date agreement ends.]

Agreement Ceiling:	\$1.938.138
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[Definition: Total amount of agreement.]

Total obligated toward ceiling:	\$1.938.138
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[Definition: Total amount of actual funding USAID has obligated.]

Ceiling remaining:	\$0
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[Definition: Agreement ceiling minus the total obligated funding.]

Total disbursed (invoiced):	1.878.986
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[Definition: Total amount for which you have invoiced USAID.]

[Last invoice date of 08/30/05]

Accruals:	\$59.152
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[Definition: An estimate of the value of the services you have provided to USAID but have not invoiced USAID for (this includes amounts that you have agreed to pay vendors for services rendered regardless of whether vendors have billed you).]

Combined Total:	\$1.938.138
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[Definition: Total disbursed plus estimated accruals.]

Pipeline Balance as of 08/31/05:	\$0
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[Definition: Total obligated minus combined total.]

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Adjusted Pipeline Balance as of 08/31/05:	\$0
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[Definition: Pipeline balance plus ceiling remaining.]