



COMMUNITY-BASED RENEWABLE ENERGY FOR THE POOR

Community-Based Renewable Energy for the Poor

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Sibol ng Agham at Teknolohiya (SIBAT), Inc.

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Cover: Set against a solar array, the cover illustrates a turbine that runs the microhydro, a sugarcane press powered by the microhydro, and an indigenous Adugao woman freed from the drudgery of rice pounding through the microhydro-powered rice mill.

Community-Based Renewable Energy for the Poor

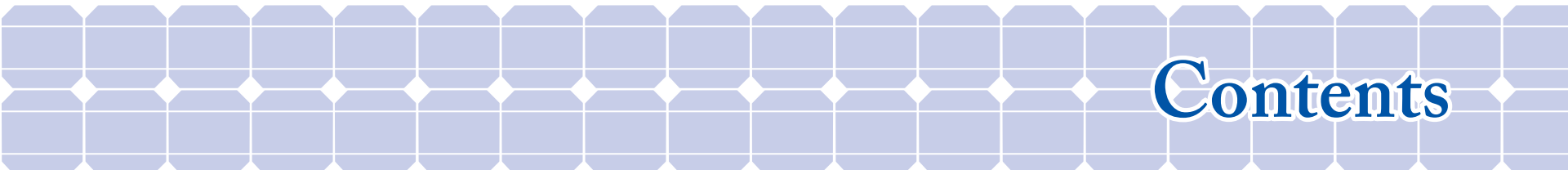
Sibol ng Agham at Teknolohiya (SIBAT), Inc.



Published by:



Dedicated
to
Engineer Christopher Alfonso
and
Engineer Minh Van Nguyen



Contents

Preface	ix
Introduction	x
CBRES Delivers Energy Access for the Poor in remote Off-Grid Areas	1
Local Renewable Sources Drive CBRES Technologies	19
CBRES Powers Productive End-Uses	39
CBRES are Appropriate to Indigenous Communities and Rural Women	51
CBRES is the Most Sustainable Small Renewable Energy System	63

PREFACE

This coffee table book is a result of efforts by local communities, indigenous peoples and SIBAT's renewable energy staff to capture the wide range of experiences in developing Community-based Renewable Energy Systems or CBRES.

This publication fulfils the aim of the Hydro Empowerment Network in South and Southeast Asia (HPNet) in early 2016, supported by WIsions, to empower the local change agents or community organizers to express themselves or relate their stories through media. SIBAT acknowledges Green Empowerment for providing the skills training in photography given to SIBAT staff and select community members. Old photographs were also used to depict and highlight the subjects that were featured in the book.

SIBAT acknowledges Tebtebba for its support to the publication of this book. For Tebtebba, CBRES supports the sustainable development of indigenous communities, living in the remotest and poorest parts of rural areas that are deprived of access to sustainable energy. Establishing indigenous community-owned and managed low-carbon renewable energy systems—and sustaining these—is an important pillar in the full development of indigenous peoples' communities.

Through this book, policymakers and the general public can be informed of the evidences of the viability of the CBRES strategy to provide sustainable energy access for the Philippine rural poor.

INTRODUCTION

Community-Based Renewable Energy Systems, or CBRES, have been established and continue to be operational since 1994. Remote rural poor areas, comprised largely by upland farming communities—a majority of which are indigenous peoples' communities—have owned, successfully managed and sustained renewable energy resources and made these as part of their daily lives.

These systems, powered or driven by local resources—water, wind and sun—are built in the midst of communities, hence, are easily accessed or delivered.

These systems have provided electrification in off-grid areas to light up surroundings for household work, children's home study, schools, health centers, and community events. Microhydros, in particular, allowed productive end-uses to spring in the midst of rural communities who subsist on resources around them, and are tools to help process their

agricultural produce, free the women and children from the daily drudgery of rice pounding, increase their productivity through irrigation, and earn income from power-driven activities.

These community-based systems provide the poor with energy to use, but more importantly, provide them with genuine access to allow for self-development.

In these communities, households are not mere users or consumers of electricity. They manage the whole system—tariff, operation and maintenance, and community enterprises powered by the system.

The SIBAT (Sibol ng Agham at Teknolohiya) Network has built CBRES through cooperative efforts with communities in 1994, guided by the beacon light of rural development and people-based appropriate technology. Together, their efforts on sustainable agriculture helped build the

base of community collectivism to combat poverty through diverse and productive agriculture. These efforts grew to realize the need for a lynchpin to drive home-grown development forward, that is, access to and control of energy supply.

Technology is important but not the key to CBRES developments—rather it is the organized and collective efforts of communities that make appropriate technologies possible and of genuine service to them. Fundamentally, it is the recognition of the people’s right to development that forms the premise of people’s capability to manage integrated community development.

CBRES developments, as presented in this book, are a sum of efforts by CBRES communities—including a big number of indigenous peoples’ communities that continue to benefit from CBRES—and by many other stakeholders or contributors to their realization. Among these are church people,

local government units and donors. SIBAT has become the communities’ consistent technical partner.

A most consistent partner of SIBAT and communities in developing CBRES is MISEREOR, to whom we give our utmost thanks.

To CBRES stakeholders, especially to the men and women of CBRES communities, we dedicate this book.

Victoria M. Lopez
February 2018

Victoria M. Lopez, the executive director of (SIBAT), Inc., is one of the pioneers and strong advocates of CBRES in the Philippines for genuine rural development. Ms. Lopez earned her Master of Science Degree in Applied Physics from the University of the Philippines in Diliman, Quezon City, Philippines.

CBRES DELIVERS ENERGY ACCESS FOR THE POOR IN REMOTE OFF-GRID AREAS

The decentralized community microhydro provides to rural areas more than 100 kW-hour per person per year on the average. It provides lighting for households, schools, clinics, streets, barangay halls, and small businesses. It makes nighttime study of children easier under good lighting. The capacity delivered by the microhydro is enough to power basic needs in rural production, such as rice and corn mill, and the sugarcane press. This access is enabled by the affordability of tariffs, which are agreed on in the community.



The 15-kW microhydro provides electricity for the 45 households of the indigenous Maeng community of Kili in Tubo, Abra.



The nearest grid point to Kili microhydro is at Agkawayan, 8 kilometers from Brgy. Tiempo. During summer, the public jeep reaches Kili in 4 hours from Bangued town, or via a 2-hour hike. During rainy season, Kili can only be reached by 5-hour 4x4 jeep transport.



The 16-kW microhydro provides electricity to 125 households of the indigenous community of Lapat-Nanawatan in Barangay Nabuangan, Conner, Apayao. This is the third microhydro in Barangay Nabuangan along with Buneg and Bubog microhydros. It can be reached 2 hours on foot from Malama, the town center of Conner.



The 20-kW microhydro that derives power from Bun-ayan Creek provides electricity for 98 households of the indigenous Lubuagan community in Ag-agama, Western Uma, Lubuagan in Kalinga.

The 10.6 kW microhydro provides electricity to 43 households in the indigenous Itneg community of Bayabas, Malibcong, Abra. It derives its power from Gopong Creek.





A 20-kW microhydro provides electricity for the 154 households, schoolhouse, church and parish of the indigenous Banao community in Balbalasang, Balbalan, Kalinga.



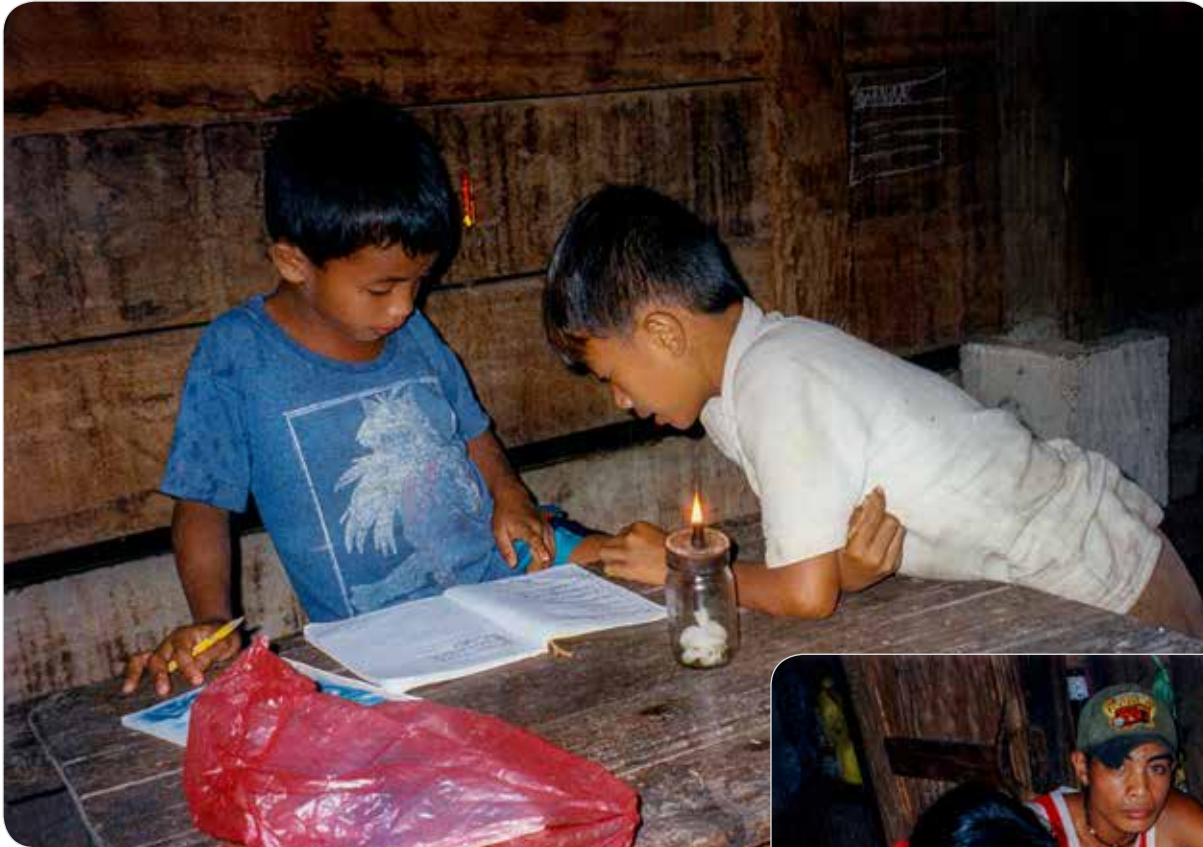
The Balbalasang community sits in the heart of the Balbalasang-Balbalan National Park. Its predominant old-growth forests remain relatively untouched, and are able to sustain relatively high level of plant and animal biodiversity. It is the watershed to the Saltan River that supplies the Balbalasang microhydro since 2001.



A 22-kW microhydro provides electricity to 85 households, streetlights, school, barangay center, and runs the community rice mill of the indigenous Itneg community in Mataragan, Malibcong, Abra.



The Gacab microhydro in Malibcong, Abra was built in 2004. It continues to power 85 households, streetlights and a rice mill. The microhydro derives its power from Bangan Creek.

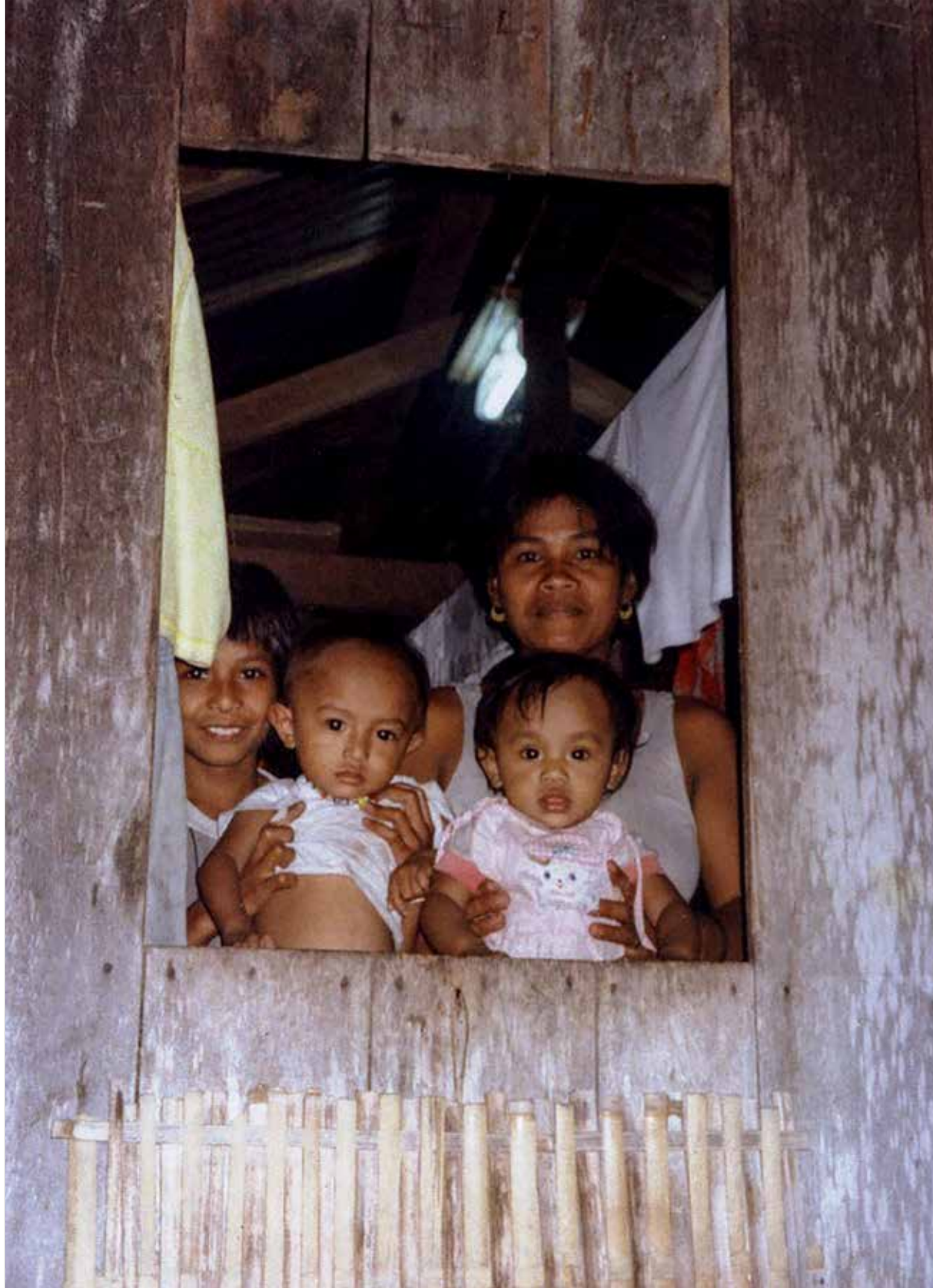


Kerosene lamps
traditionally provided
lighting to rural
households.









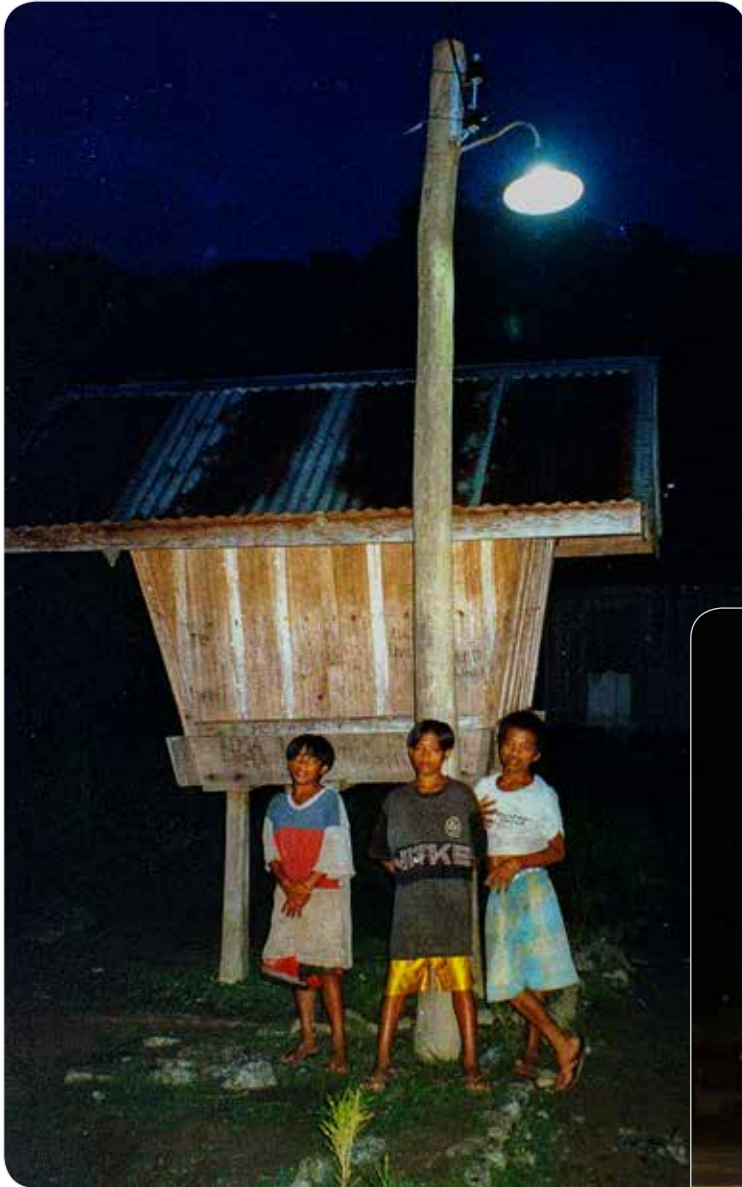
The
microhydro
lights up
rural homes.



The children of the indigenous Tulgao community in Kalinga had a first experience of television with the switch-on of the microhydro in 1999. Learning became a rule in managing television for children in indigenous CBRES communities.



Gacab residents enjoy television powered by microhydro.



The microhydro today provides electricity to remote upland communities to provide for households and streets of the community.





The microhydro provides lighting for community centers and small businesses in remote areas.

LOCAL RENEWABLE SOURCES DRIVE CBRES TECHNOLOGIES

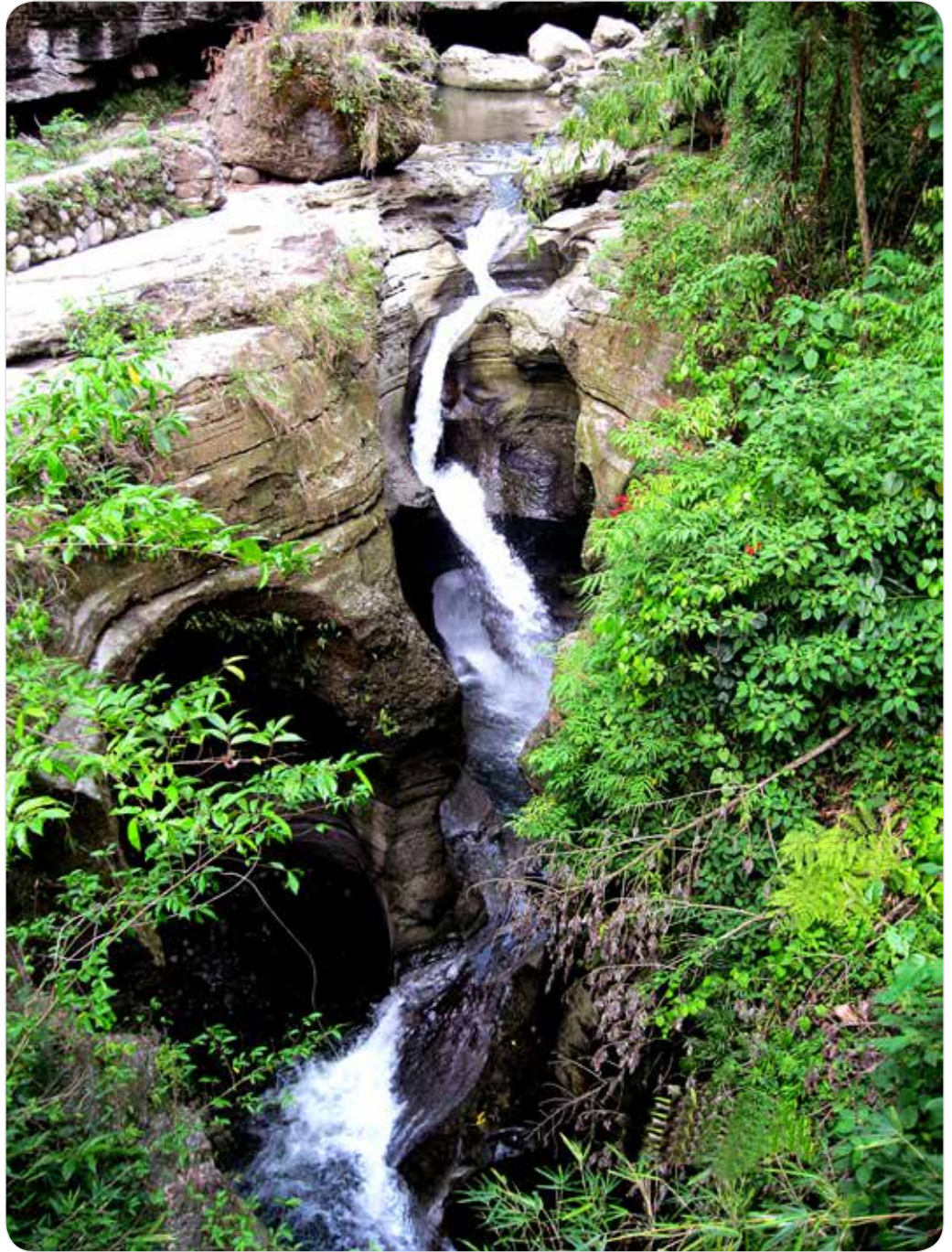
CBRES are built from renewable energy sources: water, sun, wind and biomass.

More than 27 megawatts of microhydro power sources have been identified by the government. "Good-to-excellent wind availability" is found throughout the country. There are nearly 300,000 square kilometers worth of solar energy to provide annual average potential of 5 kilowatt-hour per square meter per day.

These resources have been tapped by the communities in many rural parts of the country.

The microhydro is a run-of-river system that derives power from the head of falling water that is directed to a power canal, then to a penstock, with measured discharge to run a turbine. This is connected to a generator that produces power.

To run a microhydro, an
adequate head of free
falling water to drive the
potential flow of a river
is required.





The 50-meter head from the Caguyen Falls in Baay-Licuan in Abra provides 17.5 kW of power for the microhydro of Sitio Caguyen.



The Baroro River downstream of Tangadan Falls had produced 20kW potential for 78 households of the indigenous Lon-oy community in San Gabriel, La Union.



The 50-meter head of Desay Waterfalls forming the Desay Creek at the foot of Mt. Alibanua, provides 5 to 21 kW of power for the run-of-river MHP for the community of Bagong Bayan, Roxas, Northern Palawan.



The head of falling water drives the flow of creeks.



Kansingan Creek utilized for the Bubog MHP in Conner, Apayao.



Water from creeks is channelled to a power canal, then to a penstock (right).





The penstock runs into the powerhouse which houses the electromechanical heart of the microhydro, the turbine.



The powerhouse houses the electromechanical parts of the microhydro, comprised by the turbine, generator and load control.



Crossflow turbine
of the Balbalasang
microhydro.



Crossflow turbine of
the Lapat-Nanawatan
microhydro.



The crossflow turbines of Katablangan microhydro (left) and Bubog microhydro (below).





The Adugao microhydro was built in 2002.
The 7.5kW MHP had served the small community of 18 households for 15 years. It was rehabilitated and upgraded in 2016 to be able to operate for 24 hours each day.

Rehabilitation of the power canal improves performance of the Adugao microhydro.





The Electronic Load Control enables 24-hour operation.

The 2-kW hybrid wind-solar system for water supply in Brgy. Bonbon, Municipality of Looc, Lubang Island, Occidental Mindoro.





Wind turbine supply built in Sitio Buli, Cabra Island, Municipality of Lubang, Occidental Mindoro.



Cabiokid Wind Turbine in Cabiao, Nueva Ecija.



Lamag Wind Turbine,
Ilocos Sur.



Solar power is utilized to run water pumps for the supply of rural households.



Solar-powered water pumps built in Eastern Samar, after Typhoon Haiyan.

CBRES POWERS PRODUCTIVE END-USES

Productive and social end-uses are integrated in the planning of a Community-based Renewable Energy System, particularly microhydro, solar and wind. CBRES directly powers electrical and mechanical tools and implements that lend efficiency and productivity to economic work of rural households and communities. Community power enterprises emerged from CBRES, and afforded the following: accessible and affordable rice and corn milling (see photo, next page), sugarcane press for the

production of local wine and muscovado sugar, wood planer for furniture making, welding tool, potable water supply and partial irrigation. Indigenous women have been freed from the daily labor of rice pounding by the introduction of the community rice and corn mill powered by MHP.

The community formulates the policies that ensure direct benefits and affordability to all members of the community.





A microhydro is built with a provision for the tailrace to contribute to irrigation water.



The microhydro powers the Buneg rice mill (above and next page).







The traditional dapilan method of sugar pressing (left) is now replaced by the efficient microhydro-powered sugarcane press in some areas (above).



Hours of rattan and
abaca weaving are
lengthened with the
availability of good
lighting.





Microhydro powers wood planers, welding machine and other tools.

The hybrid solar water pumps in 4 barangays in the municipalities of Lubang Island and Looc in Occidental Mindoro deliver potable water in tapstands to 872 households.





CBRES ARE APPROPRIATE TO INDIGENOUS COMMUNITIES AND RURAL WOMEN

Of the more than 100 microhydro power systems built in the country, 60 are found in the Cordillera Administrative Region and 27 are found in the Lumad communities of Mindanao. These are being managed and sustained by the indigenous communities residing in these regions. Communal ownership of water resources and their watersheds are bound to the lives of indigenous peoples in their ancestral domain, reflected in the care of the microhydros by the communities. The microhydros have been built by the indigenous communities themselves, demonstrating basic respect to customary tradition—of cooperative labor, of natural resource protection, of indigenous practices—with deepest respect of cultural roots.

SIBAT had built 30 community-based microhydros among 10 indigenous groups of the Philippines, who have sustained these for more than two decades.



Traditional cooperative labor is practiced in doing the many tasks of building the microhydro.



Cooperative labor in construction of the powerhouse.



Policies and issues on microhydro development are formed and resolved in community meetings.



The indigenous community welcomes the microhydro with community dances, the pattong, and the traditional feast.







Community dance celebrating the switch-on of the Bayabas microhydro in 2010.





The indigenous women of the community played key roles in microhydro power development: as participants (co-equal with men) in planning the project and in articulating the needs of mothers and children in the household. They contributed to the actual construction work, including hauling of materials, and providing the needs of the construction teams. Then they were elected in the management team, where they made their voices heard in the decision-making pertaining to the CBRES project. They continue to take part as active members in helping solve problems, and in improving and sustaining their microhydro (left).

Indigenous women
take part in
community labor
in building the
microhydro.

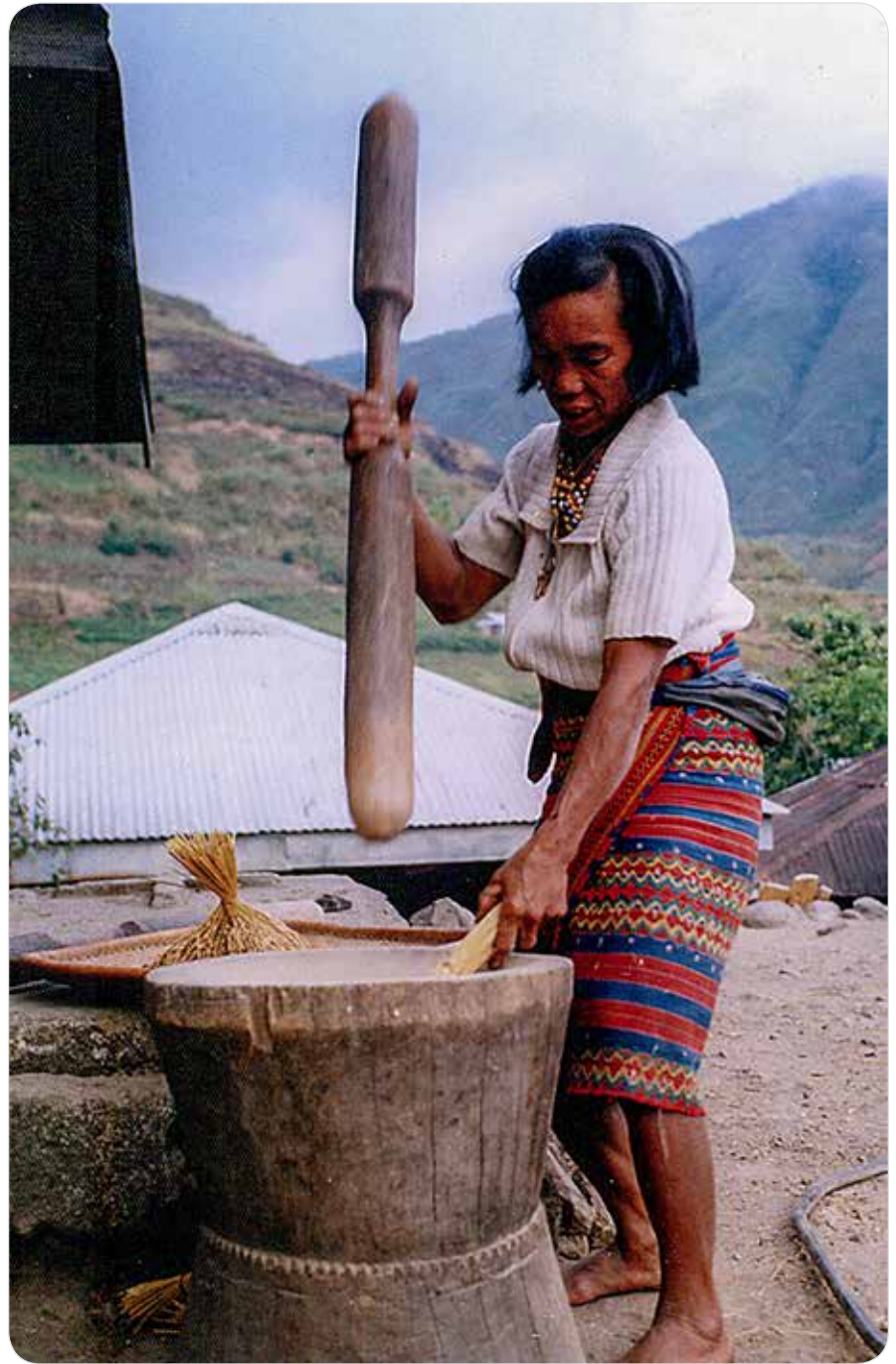




Indigenous women
contribute to
agricultural work
from planting to post
harvest.



Traditional rice
pounding has been
replaced by the
microhydro-powered
rice mill in many
parts of the Cordillera
region. This greatly
relieves the labor of
indigenous women
in the daily rice
pounding for the
household.



CBRES IS THE MOST SUSTAINABLE SMALL RENEWABLE ENERGY SYSTEM

Good management by the community is a primary reason that the MHP (microhydro power) goes even beyond its lifetime of 20 years. Good community leadership sustains the participation of the community in the decision-making process regarding policies on tariff, operation and maintenance, load management and community end-uses. A good community power organization manages the governance issues, including financial administration. Issues and conflicts are managed along customary resolution practices among indigenous communities.

The technical reliability of the system is a crucial factor of sustainability. Operators are trained by SIBAT, monitored in their practice, and motivated to serve with determined efficiency.

System repair, rehabilitation and upgrading are provided by SIBAT's Center for Renewable Energy (RE) and Appropriate Technology or CREATech, which ensures that the technical life of the microhydro is sustained in a self-reliant way.

With water availability, improvement in maintenance and rehabilitation, the life of microhydro projects has been extended for decades.

The impact of electrification that powers productive end-uses, such as rice mills and sugarcane press, has encouraged indigenous and upland farmers to care for their microhydro.

The unbroken supply of water is ensured by the community's role in conserving and protecting the watershed catchment area. The community commits to this task in managing the microhydro. Indigenous communities' watershed protection policies are revived to meet this requirement.

The donors, local government units, local parishes, academe, the private sector, support the needs that sustain the life of the microhydro.



Sustainability of CBRES is based on good management by the community. Community participatory processes are sustained regarding policy formulation, tariff, load allocation, community end-uses, and issues on management.



BMFO OFFICERS

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 Treasurer : Crista Lammawen
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Advisers:

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2. Pablo Agagen
3. Felix Bacuyag
4. Sonny Bag-ayan

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6. Edmon Dalingay
7. Antonio Bacuyag
8. Marcela Dalingay
9. Ricardo Dalingay
10. Ileen Wangdayan
11. Nora Damaso
12. Carlos Bowet

Community power cooperatives or association take on the responsibility of managing the microhydro. Officers who are elected take the lead in convening organization and community meetings, and in managing the processes.

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ROX	1	3					by [signature]
Robina B	9	25					by [signature]
Robalio	8	1					by [signature]
Landan	2						by [signature]
Marlon	1	2					by [signature]
Abdigan	1	1					by [signature]
Eita	1	3					by [signature]
Roy	1	3					by [signature]
Wedy	1	4					by [signature]
Boget	1	20					by [signature]
Rubi	1	2					by [signature]
Panang	1	2					by [signature]
Melba	1	8	28				by [signature]
RJ	1	20					by [signature]
Jong	1	3					by [signature]

October 10 2016

Roy	11	20	10	by [signature]
Joseph	1	20		by [signature]
Rosario	2	5		by [signature]
Pleer	1	2		by [signature]
Mario	1	10		by [signature]
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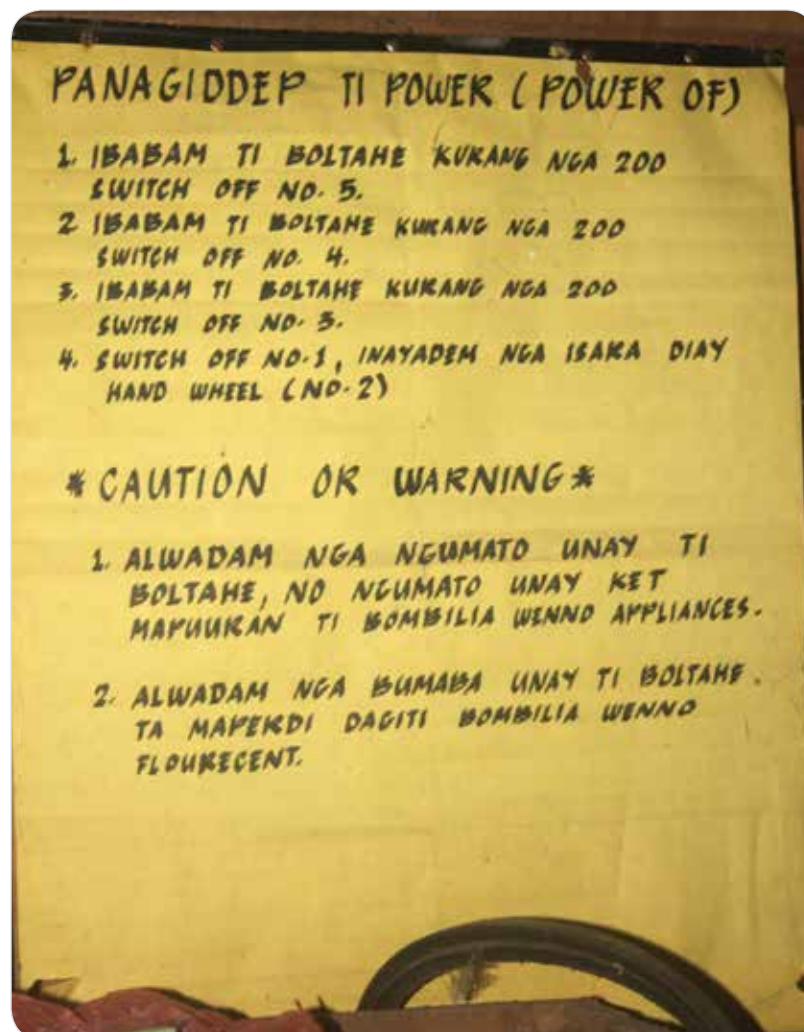
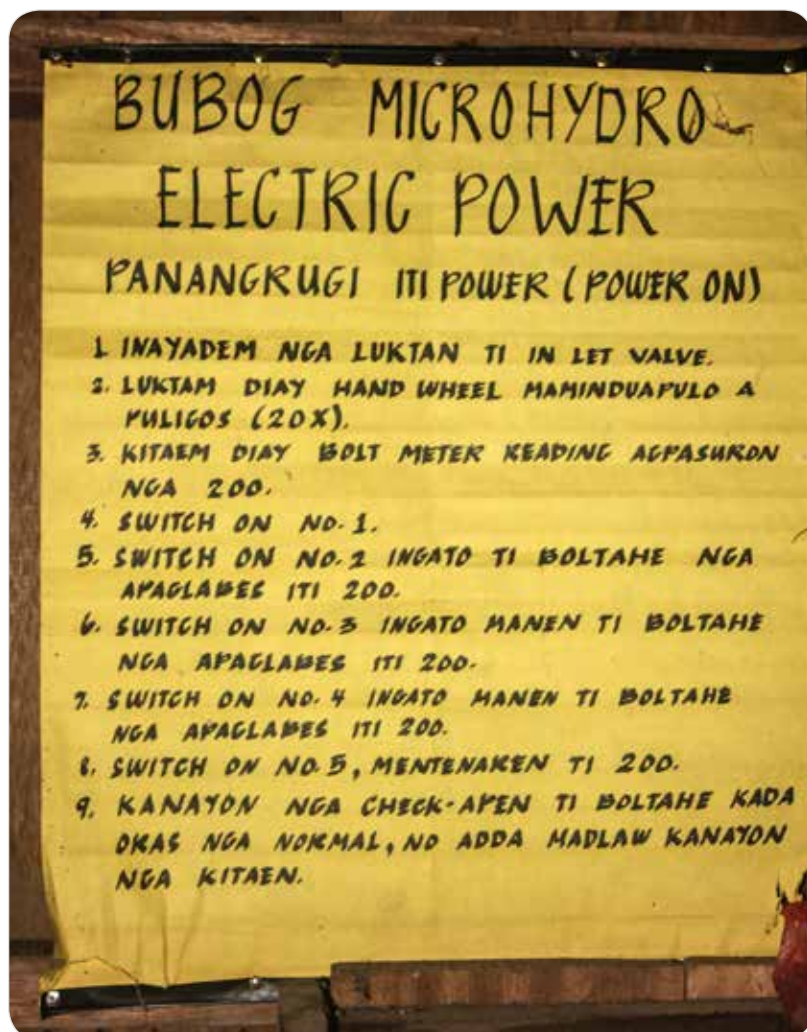
Lito	4			by [signature]
Bry	5	14		by [signature]
Wedy D	13			by [signature]
Joyce A	1	3		by [signature]
Benora	1	2	17	by [signature]

BANAGAN MICRO HYDRO POWER ASSOCIATION		
GACAB, MALIBCONG, ABRA		
Monthly Report		
Date: March 9 - June 9, 2012		
Income:	Description	Amount
Power Bills:		3,635.50
Payment of Loans:	Rep. ADREMPCO	6,500.00
Other Income:	Interest paid	1,300.00
Gross Income:		12,435.50
Less/Expenses:		
Operator Share:		1,390.65
Collector Share:		
Repair & Maintenance:	Carbon brush/Grease	500.00
Seminar's & Training:	Provincial Capital	600.00
Office Supplies:		
Other Expenses:	Trip to hk Transing Benguet	5,400.00
Total Net Income:	NO NET INCOME	(2,844.93)
		2,455.15
Noted By:	Prepared By:	
Mr. Rolando D. Salimbay	Mrs. Rosenda B. Dinagtuan	
Chairman	Treasurer	
	MARLOD J. SAEADO	
	AUDITOR	

Monthly tariffs are collected from households and community end-uses. The amounts are approved by the community, based on the capacity to pay. There is usually a minimum amount to which tariffs for additional usage (bulbs, appliances) are added. Tariffs are used to pay for maintenance and operation expenses.



Metered usage
is increasingly
adopted.



Operational procedures are standardized in all microhydros.



SIBAT provides special trainings for operators. Trained operators are crucial in sustaining the microhydro.





Training of operators in SIBAT's machine shop (left and above).



SIBAT holds workshop-trainings on organizational and finance management.



SIBAT designs and manufactures small crossflow turbines and production tools powered by microhydro in its CREATEch workshop.



SIBAT RE engineers and technicians work as a team.





Imperial
College-UK
working on the
MHP Data
Logger.



Engineers without
Borders (EWB) –
UK volunteer Dan
Frydman working
on the Electronic
Load Control.



The RE Team immerses in the community, and works with unbending purpose to deliver and build a reliable MHP together with the people. After every field work, SIBAT's technology workers leave the community with a legacy of goodwill.

The MHP has immensely helped our community. There is lighting, households can watch television, they can use the planer for woodworks for house construction, and they can operate a welding machine to repair broken tools. These are basic things being served by the MHP to the community of Pacqued. The tariff can already help us with our needs in the community. This is the reason why our community has remained active and determined to sustain the MHP.

Some agencies come, committing to help us, but have not been effective. We see SIBAT as the one who remains determined to continue helping us. We are hopeful on the prospect of upgrading and other possibilities or opportunities to enhance the usage of MHP.

We thank SIBAT for the management training being given to us to improve our management skills. We hope that after this training, many things can be improved in our organization.



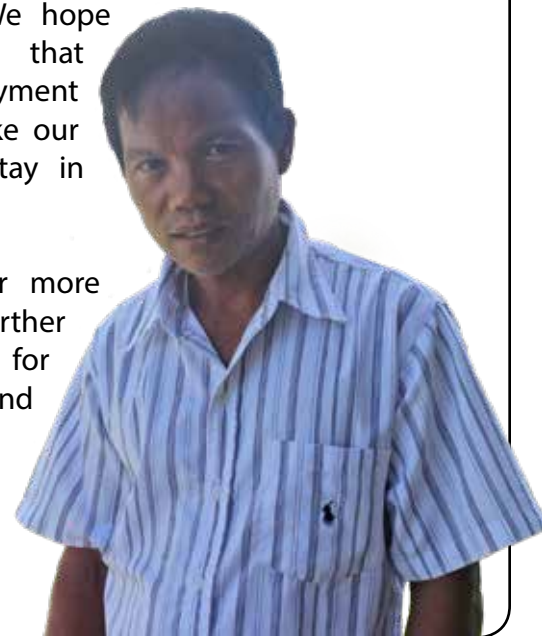
Estrellita Balutoc
Adviser, PMHA Pacqued
Malibcong, Abra

The MHP had helped the community in great ways... [We] have gone from the times that we used bolo and kerosene for lighting. Even if we are a very remote place here in the mountains, the farthest village of Conner, we seem equal to other communities because of the MHP. Our children are updated of events because of the television.. the things that are enjoyed in the city are somehow being enjoyed by us in the mountains here in Katablangan.

Through the MHP, our people have improved appreciation and care of the value of forests, to conserve the water that provides lighting through the MHP.

The need for more improvement of the MHP is important. If our MHP is upgraded, more livelihood opportunities can be availed of. Lighting is not enough. Livelihood will provide bigger satisfaction for our people. We hope for opportunities that can give employment here, and will make our educated youth stay in the community.

We also hope for more trainings to help further improve our skills, for both the young and old.



Benito Lugayan
Chairperson
KUFO, Katablangan
Conner, Apayao

Before the MHP came to Buneg, the people suffered hardships, we lacked many things... life was difficult without lighting for the households.

Our difficulties were eased when the MHP came. No longer did we need to buy gas or kerosene, pound our rice because of the rice mill installed... [T]here are many more benefits that we reap because of the MHP. It has lightened our lives in many ways.

MHP had given great help, hence, we thank SIBAT for helping bring this technology to us. Even if our community is very far, such technology had reached us because of SIBAT.



Anselmo D. Taclawan
Vice-Chairman of BMFO
Buneg, Abra

The MHP has been a big help to the people of Gacab. It has improved our lives, provided us firstly, with ease, comfort and safety in our households and in our surroundings. Lighting has been of great help for our children who have improved their studies.

MHP has great impact in terms of minimizing the use of woodfuel and kerosene. This better preserves our forests that supply water to the MHP.

This is a modern technology that the people already greatly appreciate. But we will appreciate more if we achieve whole day operation with the installation of the load control. There are many things we need to do with the availability of electricity.



Rolando Salimbay
Chairperson, BASECO
Malibcong, Abra

Community-Based Renewable Energy Systems, or CBRES, have been established and continue to be operational since 1994. Remote rural poor areas, comprised largely by upland farming communities—a majority of which are indigenous peoples' communities—have owned, successfully managed and sustained renewable energy resources.

Through this book, policymakers and the general public can be informed of the viability of the CBRES strategy to provide sustainable energy access for the Philippine rural poor, including indigenous communities.



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