GENDER AND RENEWABLE ENERGY IN THE PHILIPPINES: A community-based microhydro project in Kalinga and a PV-battery charging station in Southern Leyte[1]

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ACRONYMS

ABEP	Accelerated Barangay Electrification Program
ARI	Acute Respiratory Illness
BAPA	Barangay Power Association
BAWASA	Barangay Water and Sanitation Association
BEP	Barangay Electrification Project
CAR	Cordillera Administrative Region
CARP	Comprehensive Agrarian Reform Program
DA	Department of Agriculture
DAR	Department of Agrarian Reform
DOE	Department of Energy
DPT	Diphtheria, Polio, Tetanus
EDNP	Episcopal Diocese of Northern Philippines
FGD	Focus Group Discussion
IPP	Independent Power Producers
IRA	Internal Revenue Allotment
KAELCO	Kalinga Electric Cooperative
KaLiPi	Kalipunan ng Liping Pilipino
KEEP	Kyosato Experimental Education Program
LGU	Local Government Unit
MHP	Microhydro Project
MPDO	Municipal Planning and Development Office
NCSO	National Census and Statistics Office
NEA	National Electrification Administration
NGO	Non-Government Organisation
PAGASA	Philippine Atmospheric Geophysical and Astronomical Service Administration
PhP	Philippine Peso
PNOC-EDC	Philippine National Oil Company- Energy Development Corporation
PO	People's Organisations
PV-BCS	Solar-photovoltaic Battery Charging Station
RE	Renewable Energy
RRA	Rapid Rural Assessment
SIBAT	Sibol ng Agham at Teknolohiya
SOLECO	Southern Leyte Electric Cooperative

LOCAL TERMS

agamang- rice granary
amma- final ploughing
ani or *buras*- harvesting
basi- sugarcane-based alcohol
choschos- initial ploughing
dapilan- a wooden case juice extractor
kaat or *lichias*- cleaning
kaingin- swidden
lingliwen- woven blanket
osok- sewing
papur-as- finbal cleaning
pigwa- second ploughing
saleng- pithwood
tullog- weeding
uma- swidden farms
habal-habal- type of motorcycle used in Southern Leyte
tagak- abaca twine
tuba- coco toddy

Abstract

Community-based renewable energy (RE) projects have been shown to provide greater accessibility to community members in remote areas. Through two case studies, this report aims to document the role of women in community projects and the impacts of RE projects on women in the areas of production, reproduction and community participation.

The two projects covered are of a community-based microhydro project (MHP) in Tulgao, Tinglayan, Kalinga and a photovoltaic battery charging station (PV–BCS) in Malitbog, Southern Leyte. The two Tulgao villages (East and West) in Kalinga are populated by indigenous peoples belonging to the Tulgao tribe of the CAR. New Katipunan and Cadaruhan Sur in Malitbog, Leyte are populated by native Visayans.

Qualitative methods such as semi-structured, in-depth household interviews with husband and wife, key informant interviews with selected key people involved in the project and results of focus group discussions (FGDs) were used to gather data in the MHP case study in Tulgao. FGDs were conducted with women participants, with men participants and with mixed groups from the two communities.

In the PV-BCS charging station study, the assessment tools used were focused on uncovering the attitudes of project beneficiaries towards their solar lighting system in relation to livelihood activities and other aspects. Purposive cluster sampling was used to determine participants. FGDs and key informant interviews were also conducted to gather information. Rapid rural appraisal (RRA) results that were gathered before the installation of the projects were incorporated with the data later collected.

Both case study sites were excluded from the rural electrification programmes of the local electric cooperatives and the local public/private power distributors either because of the distances involved or the rugged terrain that separate them from the existing power grid. Given this situation, microhydro power as an alternative source was tapped in 2000 in Tulgao through community mobilisation led by three NGOs: KEEP, SIBAT and ENDP. Since installation, the MHP has provided electricity for lighting and small appliances to over 300 households and community buildings such as the church, the school and the health clinic.

In New Katipunan and Cadaruhan Sur, a three-channel PV-BCS plus residential lighting systems were installed in 2001 through a grant from the country's DOE and counterpart funding from the Municipality of Malitbog. The introduction of the solar energy projects to residents of the two barangays has brought convenience to their lives.

The findings of the two case studies confirmed that the installation of the MHP and the PV-BCS have contributed to improving the lives of the residents through increased economic resources, environmental protection, improved health and wellbeing and better socio-cultural and political activities.

Both projects also involved considerable contributions by women in mobilisation and task completion, thus enhancing community participation.

Of the significant benefits brought by the introduction of these RE projects, some were specific to the reproductive work and practical needs of women. In Tulgao, for example, the introduction of an electricity-powered rice mill freed women from the daily labour of pounding rice. This had a tremendous impact on women's time allocation, and on reducing drudgery, and opened up opportunities for substantive roles in production. The example of Estela Agalao described later in the paper shows how the

MHP contributed to improving the productive role of indigenous women.

The study recommends the following:

1 In terms of community projects, women should be involved in needs assessment and planning so that their concerns can be incorporated in project development processes.

2 Service providers, such as NGOs, need to develop methodologies that consciously address the participation, access, availability and benefits of women in community-based systems so that economic gains address gender diversity.

3 Development plans should broaden the stereotypical roles of women by increasing their knowledge, skills and participation in technical tasks and in the operation of community projects.

In terms of gender mainstreaming in policies on renewable energy:

1 To highlight the gains from renewable energy in general, and particularly in empowering women, there should also be more contact and documentation of similar studies on women and renewable energy.

2 Further, since this study has shown the successes and opportunities created by RE, up-scaling community-based renewable energy projects will ensure development and empowerment of all stakeholders in the community, especially women.

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The results of the study are disseminated in meetings, conferences, newsletters among our network members and partners in energy-related projects and programmes.

Executive Summary

Community-based renewable energy projects have proven to provide accessibility to energy services for people in rural and remote areas of the Philippines. The ability of such systems to provide multiple benefits to the communities has been observed. Today, there are several successful micro-power systems with capacities ranging from less than 1kW to 99 kW installed in the country, facilitated by government agencies led by the Department of Energy (DOE), non-governmental organisations (NGOs) and banking institutions.

The Study's Focus and Methods Used

This study attempted to document the role of women in such community-based renewable energy projects and the impacts of such projects on women in the spheres of production, reproduction and community participation. For this purpose, the study used two sites: a) a community-based micro-hydro project in Tulgao, Tinglayan, Kalinga; and b) a Photovoltaic Battery Charging Station in Malitbog, Southern Leyte. The two Tulgao villages (East and West) in Kalinga are populated by indigenous peoples belonging to the Tulgao tribe of the Cordillera Administrative Region. New Katipunan and Cadaruhan Sur in Malitbog are populated by native Visayans.

Neither case study site had been reached by the rural electrification programmes of the government and local electric cooperatives, or by local public/private power distributors due either to the distance or the rugged terrain that separated them from the power grids. Therefore, in Tulgao in 2000, an alternative source in the form of micro-hydro was tapped through community mobilisation led by NGOs such as SIBAT (Sibol ng Agham at Teknolohiya) and religious organisations active in the communities. Since then, the project has provided electricity for lighting and small appliances for over 300 households and community buildings such as the church, the school and the health clinic. In New Katipunan and Cadaruhan Sur, Malitbog, a photovoltaic battery charging station and residential lighting systems were installed in 2001 through a grant from the DOE and counterpart funding from the Municipality of Malitbog. More recently, New Katipunan village centre has been connected to the grid.

Qualitative methods such as semi-structured, in-depth household interviews with husbands and wives, key informant interviews of selected key people involved in the project, and focus group discussions were used to gather data in the micro-hydro case study in Tulgao. The focus group discussions were conducted in women's groups, in men's groups, and in mixed groups of both sexes from the two villages.

In the photovoltaic battery charging study, assessment tools focused on the attitudes of the project beneficiaries towards their solar lighting system in relation to livelihood activities and other aspects of living. Purposive cluster sampling was used to select participants. Focus group discussions and key informant interviews were conducted to gather information. Rapid rural appraisal (RRA) results that had been gathered before the installation of the energy equipment were incorporated into the data.

Women's participation in the projects

Despite the traditionally dominant role of men in water works, women contributed quite substantially to the micro-hydro project in its construction phase. Men and women shared the work; men doing the heaviest tasks and women hauling sand from the river, fetching water and preparing food for the workers. Although the women had not been present during the planning meetings, the focus group discussions revealed that the men had consulted with their wives at home and brought their views into the discussions. Three of the seven members of the project management team are women and are thus involved in making

decisions regarding the micro-hydro project. In terms of operation and maintenance, men are involved in the technical troubleshooting and repairs, while the women take care of administrative matters such as book keeping and payment collection. Women have not participated in any of the related technical training programmes and therefore have only very limited knowledge of the technical workings of the micro-hydro project.

In the case of the photovoltaic battery charging project, both the men and women were consulted during the planning stage. They saw the benefits of the project for themselves and their children (e.g. lights to work longer in the evening and for studying, listening to the radio, watching TV). The supplier was responsible for the installation of the system as well as for repairs. Mostly men were involved in providing assistance due to the heavy nature of the work – hauling material and equipment, setting up lighting fixtures etc. The women contributed by preparing meals for the workers. Women are now involved in simple operation and maintenance tasks such as cleaning the components (surface, terminals), monitoring the battery, switching the lights on and off. They also collect charging fees, monthly dues and keep records.

Some Benefits and Impacts of the Renewable Energy Projects

The case studies confirmed that both projects have contributed to improving the lives of the residents through increased economic resources, environmental protection, improved health and wellbeing and better socio-cultural and political activities.

Lighting is one of the major benefits of the projects mentioned by both men and women. Kerosene and pine pith traditionally used for lighting has been replaced by electric lights. Economically, electricity with the current tariff is cheaper than kerosene or pine pith. The working day has been extended and women are able to do some of their chores at night. This gives them more time for farm work during the day. The women also say that the better lighting in the home has helped them work easier and faster as they can better see what they are doing. For example, peeling sweet potato for daily cooking goes much quicker and is easier.

Lighting has brought health benefits too - reduced incidences of eye and respiratory diseases are reported due to reduced exposure to wood and kerosene soot. Lighting has also allowed the communities to hold meetings and festivals for longer hours in the evenings.

In terms of electrical appliances and equipment, many families have invested in televisions and radios. They do mention not only entertainment, but also education through increased access to news and information. Sitting together with the whole family in the evening to watch a TV programme or talking with each other, according to the women, helps strengthen family bonds. Appliances that assist in household work have been less popular, although rice cookers, grinders and washing machines have been acquired in limited numbers.

In Tulgao, a rice mill has made a great difference, especially to the women. Before the construction of the micro-hydro plant, women and girls used to spend tiring hours pounding rice for the daily meal. Now, the women have been relieved of this exhausting task and use their time and energy for other household activities, and can even afford to take short rest breaks. Women have also found more time to help men in the planting of rice and the management of the rice fields. More women now get a cash income from planting high-value cash crops, such as vegetables and beans, along the dikes and around the rice fields.

In Malitbog, women would have to walk over two kilometres or take a risky motorbike ride and spend more than a US dollar for transport and charging fees when going to town for charging batteries for lighting. Now, they only walk a few minutes to the solar PV-charging station and pay a little over US 50 cents to charge their batteries. Thus women save time to work on other productive activities such as cropping and making abaca twine.

Both renewable energy projects have boosted income generation in the villages. The men in Tulgao who weave baskets are now able to make more baskets in a month with access to lighting. In Malitbog, there is a marked increase in the volume of agricultural products such as copra, abaca twine, cut flowers and vegetables, particularly because women have more time to spend on these activities. A community bakery and several retail grocery stores have also been established.

In both communities, women find time to participate in community meetings and other activities, especially in gatherings related to improving family health, income, and technology-based livelihood activities. Their experience of saving time and finding other enterprises to augment family income from these projects motivates them to get actively involved in meetings and community development initiatives.

Recommendations

The study recommends the following: 1) Involvement of women in needs assessment and planning so that their concerns can be incorporated in the project development processes, especially in resource allocation; 2) NGOs develop methodologies that consciously address the participation, access, and benefits of women in community-based systems so that economic gains consider gender diversity; 3) Development plans broaden the stereotyped roles of women by increasing their knowledge, skills, and participation in technical tasks and operations of community-based projects, especially in water and energy technologies; 4) Gender should be mainstreamed in policies on renewable energy; and, 5) Enhancing women's leadership and management skills and enabling an environment for them to put these into practice.

To highlight gains in renewable energy in general, and empowering women in particular, there should be more studies and documentation of women and renewable energy. Further, the success and opportunities created by renewable energy as demonstrated through this study also suggest that scaling up community-based projects on renewable energy will ensure development and empowerment of all stakeholders in the community, especially women who are so often overlooked.

1 Introduction

1.1 Background/Rationale

Renewable Energy (RE) when linked to gender and poverty challenges has been established by development studies to be a tool for sustainable energy development and for greater equity in rural areas. Since poverty reduction and gender equality have become important goals for development institutions, studies on RE are now being explored for their potential to serve as models and approaches to respond to the needs of these institutions. In addition, gender issues have recently gained increased prominence among the various sustainable energy aspects. Energy programmes have increasingly focused on gender issues and initiatives, and have resulted in the development of national and international networks on gender and energy.

This paper, through two case studies, sets out to establish the effects of two RE projects on rural communities which, through the initiatives of NGOs, GOs and the support of community organisers and local organisations, have established their own interventions to meet the challenge of a lack of electricity in the locale. It focuses on the impacts of the RE projects on the production, reproduction and community participation roles of women in rural areas.

RE has been invoked by policymakers and proven in practice to be a viable and appropriate response to far-flung and poor rural conditions (in areas where it will take a long time, if ever, for the grid to reach). Presently, in the Philippines, a Renewable Energy Bill is being promoted to enhance the support to renewable energy development in the country.

In many of the statements made regarding renewable energy, decentralised RE electrification has been highlighted because of its impact on poor communities - if made affordable and accessible to those who need it. In this regard, the role of specific decentralised community-based systems, such as microhydro installations, has been encouraged. Today, there are more than a hundred microhydro systems (up to 100 kW output) installed in the country, mostly by government agencies led by the DOE and by NGOs.

The ability of such systems to provide multiple benefits, beyond electrification, in rural areas has been noted. The case study on the MHP in Tulgao proves that such benefits are possible and manageable in a community-based project, where primarily the stakeholders are spread throughout the community. The renewable energy system was built through organised community participation, i.e. in an approach where participation is regarded as a key aspect of stakeholdership.

Turning to the PV-BCS case study, the Philippine government first declared, in 1960, full electrification as a national policy objective. In line with this, the government has already achieved 100% electrification at the municipality level, and the present target is to achieve this at the barangay level in 2006.

To integrate all the DOE's rural electrification efforts, the government has established the O'Ilaw Program. This had already achieved 87.1% barangay electrification by 2002. The DOE also created, in April 2003, an Energy Response Team to effectively manage and integrate the country's rural electrification programmes. The barangays of Cadaruhan Sur and New Katipunan in Malitbog, Southern Leyte, were considered priority areas since they were excluded from the electrification plans of the Southern Leyte Electric Cooperative (SOLECO). A Rapid Rural Assessment (RRA) was conducted by DOE staff in these identified barangays. The RRA revealed that the residents owned standard car batteries that were used for lighting, radio, karaoke machines etc. Further, the car batteries were transported twelve kilometres to and from a town for charging at a rate of PhP 50 to PhP 70 which represents a large part of the income of household members given that daily wages are

typically PhP 90-150 per person per day. Coupled with a transportation cost of PhP 50, a household would thus have to spend about PhP100 to have their battery charged. Where charging is needed weekly, a battery owner would end up paying around PhP 400 per month and the batteries would also suffer from shocks due to the rough roads. As a consequence, a three-channel PV-BCS plus residential lighting systems were installed in the two barangays in 2001 through a PhP 1 050 000 grant from DOE and a PhP 50 000 contribution from the Municipality of Malitbog. The three channels enabled three end uses to be targeted: (1) battery charging, (2) residential lighting, and (3) electrical appliances. The project benefited seventy households in the two barangays. In addition, lighting systems in the community halls were also provided. A Barangay Power Association (BAPA) was organised to manage the operation and maintenance of the PV-BCS. At present, the cost of charging a battery is pegged at PhP 20 and an additional monthly fee of PhP 80 is required from the members to defray other expenses such as battery replacement, minor repairs etc.

1.1.1 Gender roles

The gendered roles and relationships in the communities have shown varying levels of inequality in productive, reproductive and community concerns. In many studies, gender inequality is revealed even in those areas where cooperativism has been traditionally strong. Burdens are placed on women in both productive and reproductive spheres. In many cases, women suffer even greater burdens because of the physical and cultural difficulties inherent in mountain areas and tribal communities.

1.1.2 Preview to the case studies and report structure

These case studies illustrate the relationships that result when a community-based project is directed towards the real needs of its stakeholders, especially those of women. In communities where women play crucial roles in economic activities, even where these remain unquantified, the value of the results within the framework discussed in the methodology in Section 2 are relevant inputs for future developmental work.

Section 3 describes the case studies: the socio-physical and economic characteristics of the study areas; the roles of men and women in relation to economic activities; the energy sources in the study areas before the installation of the RE equipment, the inception and completion of the programmes, and their impacts on the stakeholders and especially the women.

The major results and findings of the studies, including recommendations, are presented in the final two sections.

2 Methodology

Several meetings were conducted, especially in the project orientation and planning phase, during the preparation of the interview schedule, and while writing the report which involved young researchers and several reviews involving gender and energy experts in the country. The results of the study were presented at national and regional meetings and workshops attended by major stakeholders in energy, such as the Global Village Energy Partnership (GVEP) and the UNDP Regional Energy Programme for Poverty Reduction (REP-PoR) and referred to in the country report on energy prepared by the Philippine UNDP REP-PoR consultant.

This study is also linked with SIBAT's evaluation of its microhydro projects, DOE's assessment of the livelihood activities associated with BEP, Approtech Asia's Improved Cookstove Programme in the Philippines and other research and documentation activities on gender-energy-poverty.

2.1 Framework of the study

While providing greater access to energy for community members is seen to be a feature of community-based renewable energy projects, **the extent that women benefit depends on the opportunities offered by such projects.**

There are three areas that should be looked at in appraising the impact of renewable energy projects on women, namely:

(a) Production

In rural communities, productive work on farms is shared, and women may take on equal or even a greater number of substantial and diverse roles in most stages of farm work compared with their men. In indigenous warrior societies, women are the main farmers because men are busy with political conflicts. However, livelihood activities that involve income-generation are generally more accessible to men and, where waged work on farms is a feature, women are generally paid less than their male counterparts.

(b) Reproduction

In addition to their substantial roles in production, women take up most of the reproductive burden with occasional contributions by men. The majority of household chores are seen as women's tasks. For example, the important year-round task of rice pounding is normally carried out by women and children.

(c) Community participation

Community participation remains relatively strong in many rural communities, and cooperativism in many aspects of life still dominates. Men and women seemingly participate equally in many school, church and community affairs, although there are activities that are considered to be within the men's domain. The decision-making role of women is confined to household, school and church concerns, or outside of the political domain of men.

The situation of women in these three areas needs to be analysed in order to clearly understand the gender relationships.

2.2 Areas where renewable energy impacts

The impact of renewable energy projects on women, their access to a project and the benefits derived from it, can be best viewed within the broader economic, environment, socio-political and cultural contexts. Their roles in decision-making are best understood within the socio-political as well as in the socio-cultural contexts. Women's empowerment should touch those aspects of traditional culture that block their development.

2.3 Community-based development perspective

It is important that the perspective of the community as a whole is seen when looking at the changes and development outcomes of a renewable energy project. More opportunities for women-focused activities are possible if founded on a wider community outlook. The community-based perspective is important in comprehensively and decisively pushing to empower women, both as women and as community members.

2.4 Case study approach

These case studies aimed to document the impacts of the community-based MHP on women in the indigenous communities of Tulgao West and East near the town of Tinglayan in the province of Kalinga; and of the PV-BCS on women and their livelihood activities in Malitbog, Southern Leyte, in the Philippines.

The case studies utilised qualitative methods in gathering quantitative and qualitative data from respondents and beneficiaries in the study areas.

The methods used in the case studies as follows:

1. Semi-structured interviews:
   (a) Three in-depth household interviews (i.e. with husband and wife); and
   (b) Key informant interviews with selected key people involved in the project including women leaders.

2. Focus group discussions (FGDs) with three types of group:
   (a) With both men and women from the community;
   (b) With women participants; and
   (c) With men participants.

3. A detailed case development on one particular indigenous woman, focusing on the benefits of electrification in her productive work.

2.5 Limitations of the study

In Tulgao, there was limited time for interviews during the data-gathering stage because most of the women were busy in the field as it was the rice planting season. The FGDs and household case studies had to be done in the evenings.

Further, the study included only two of the three communities benefiting from the MHP project. The community of Dananao could not be included as it was too distant from two adjacent communities of Tulgao East and West.

In the PV-BCS project, the direct beneficiaries were limited to thirty households per barangay. The

research did not determine if there were any wider impacts on the communities as a whole.

3 The case studies

3.1 Case study 1: Microhydro power project in Tinglayan, Kalinga

The case study set out to investigate whether indigenous women were empowered through the introduction of a community-based renewable energy technology, namely a microhydro power project, in Tinglayan, Kalinga.

3.1.1 Characteristics of the study area

The beneficiaries of a 33 kW MHP installed in 1999 in Kalinga live in the three upland villages of Tulgao East, Tulgao West (collectively referred to here as Tulgao) and Dananao, located within the municipality of Kalinga, north of the Cordillera Mountain Region in Northern Luzon.

The province of Kalinga is bordered by the provinces of Apayao, Cagayan, Isabela, Mountain Province and Abra. The three communities are neighbours and a steep valley, through which flows Bunog Creek, separates Dananao from the Tulgaos. Bunog Creek, from where the MHP system gets its energy, forms a natural boundary between the two tribes.

The route from Tinglayan, the local town, to Tulgao is a steady uphill hike of three hours, followed by a steep descent into Tulgao. During the dry months, Tulgao is accessible by a four-wheel-drive vehicle. Dananao is never accessible by vehicle, but can be reached by a four hour hike along another route from Tinglayan. It takes around one hour on foot from Dananao to Tulgao.

Topography and climate

The entire Kalinga province is characterised by dramatic mountain ranges, and the major river in the region, the Chico, flows close to Tinglayan. The barangays tend to be situated along the steep slopes of the mountains, approximately 1100 metres above sea level.

The climate in the area falls under Type III of the PAGASA classification, with relatively unpronounced seasons and the weather relatively dry from November to April and wet for the rest of the year. The humidity is higher than in most of the country and varies depending on altitude. It has low temperatures, and on average seven to eight hours of sunlight due to the mountains. Statistics from 1995 show the annual rainfall to be approximately 280 mm.

Watershed and vegetation

Visually, grassland and pine forests appear to dominate the mountain areas around the villages. The remainder are taken up by swiddens (*kaingin*) and terraced farms. The natural vegetation, on both communal and private lands, is reported as having been depleted, and deforestation in the area has led to significant soil erosion in the vicinity. This situation has been slightly improved by a watershed protection scheme that has involved the planting of pine trees. Pine and pithwood (s*aleng)* are respectively used to provide fuelwood and light. Many parts of the catchment area have been cleared for swidden and wetland rice farming.

Demography

The two Tulgao villages have 213 households, while Dananao has a further 124 households. The total population is estimated at 1600 people.

Key informants claim that the infant mortality rate has fallen due to rising educational levels and the presence of a permanent midwife. There are a similar number of men and women, but the population

decreases rapidly with age.

The average number of children per family is seven in Tulgao and six in Dananao, with the largest families having around thirteen members. Culturally, a large family is regarded as a blessing. There has been a steady migration of people to Tinglayan, Bontoc and Tabuk seeking education, work and marriage.

Ethnicity and tribal conflict

The people in Tulgao belong to the Tulgao tribe and the people of Dananao to the Dananao tribe, both are part of the larger Kalinga ethno-linguistic group.

Conflicts among tribes in Kalinga, where disputes commonly arise from border or territorial and resource issues, are nowadays settled through the peace pact. Tulgao and Dananao have a long tradition of rivalry and disputes over territory and, as recently as 1997, a border conflict broke out between the barangays. It is worth mentioning that since the conception and installation of the MHP, any disputes arising between the two villages have been resolved without violence.

Religion

The population in Tulgao are Catholics (60%) and Episcopalians, members of the EDNP (Episcopal Diocese of Northern Philippines).

Education

Tulgao and Dananao each have an elementary school, with six teachers covering Grades 1-6, and an average class size of around thirty students. The nearest high schools are in Tinglayan, Tabuk (a neighbouring barangay) and Bontoc. University education is rare without outside funding or bursaries since very few people can afford to send their children to university. Those who go to universities go on to find work outside the municipality.

Health

Both communities have a resident midwife and two barangay health workers, who provide pre- and post-natal assistance and training, including family planning and care. The leading causes of morbidity are tuberculosis, acute respiratory illness (ARI) and pneumonia, with respiratory complaints increasing during the rainy season. Although there are certain immunisations that are given to all children, such as BCG (for tuberculosis), DPT (diphtheria, polio, tetanus) and against measles, others such as Hepatitis A and B are only given when there is excess in Tabuk that is made available. The drugs available at the medical centre are similarly limited and are reserved for emergency cases.

Facilities

Potable water is available in both barangays all year round through delivery pipes from springs. Communal irrigation facilities (canals built through the farmlands) exist but need improvement to service the rice fields in the villages of Tulgao and Dananao.

There are rice-drying areas in both communities, and recently rice mills were installed that run on the electricity provided by the MHP. A sugar cane press was provided in 2002, but was unused until it was connected to the MHP in November 2003.

The indigenous culture

Indigenous cultural practices have been sustained in these villages despite the inroads of religion and other external influences. Community rituals covering each stage of rice production in both wet rice terraced farming and swidden, following the traditional agricultural calendar, are still strongly observed and enforced by traditional elders. Community cooperation remains relatively intact for certain traditional activities such as harvesting, forest protection, and emergency assistance to members of the tribe.

This strong traditional cooperation has been tapped to build the community-based MHP.

The differentiated roles of men and women in Tulgao and Dananao villages are rooted in the typical warrior culture of these indigenous societies.

Indigenous agricultural production focus of the Tulgao villages

Kalinga province is identified as one of the poorest provinces in the Philippines. The average family income in the barangays is well below the poverty line set by the National Census and Statistics Office (NCSO 2004).

The Tulgao population relies on agriculture for food and grows rice as its primary subsistence crop, i.e. for household consumption. Wet terraced farming is the predominant form of rice agriculture supplemented by dry cultivation in the swiddens (*kaingin).*

The availability of prime agricultural land is limited by the steep mountain slopes. Due to the climate and also the long period to maturity of the rice varieties grown (5-7 months), it is only possible to grow one rice crop per year, with rice transplanted around January and harvested in June or July.

Rice Farming

Organic farming, which is the traditional practice among these communities, enables rice to be grown without the application of chemical fertilisers. The farmers leave the rice fields fallow for several months to allow the regeneration of soil nutrients before they start replanting. The traditional varieties of rice have also been noted for their good resistance to pests.

Wet rice production in these highlands remains limited to an average of 600 bundles of paddy per household per year for various reasons (as explained in the subsequent statements and reflecting the capacity of the household members to manage). For a start, the average household owns only two or three rice fields, or about one-eighth of a hectare. The lack of appropriate machinery and technology hampers the expansion of farmland in this mountainous area. The use of simple hand tools and a few *carabaos* (water buffaloes), which are used in land preparation for low-lying fields, make land improvement a laborious process. The amount of rice harvested is usually insufficient to last the whole year for most families, who need to buy rice for anything up to six months per year (called the lean months). Table 1 shows the production from one of the better-off families.

Table 1: Rice production in Tulgao

Rice field	Seedlings	Harvest
Field 1	12 bundles	6 *chalan* (360 bundles)
Field 2	18 bundles	*11 chalan* (660 bundles)
Field 3	4 bundles	3 *chalan* (180 bundles)
Field 4	16 bundles	5 *chalan* (300 bundles)
Total		25 *chalan* (1500 bundles of paddy or 350 *gantas* of rice)*

*1 ganta = 2.2k

Swidden farming and other food sources

Swidden farms (*uma)* provide year-round sources of vegetables and some upland rice, and this helps households through the lean months. These are planted mostly with camote, squash, native cabbage, legumes, tobacco and sugar cane. The sale of legumes and other vegetables from the swiddens are a source of income for most households in Tulgao.

The communities tend livestock for food as well as for ritual use. The practice is to let pigs and chickens roam freely within the village. In this way, the livestock do not substantially compete with humans for the limited food available.

Coffee and fruit trees are grown in the vicinity, and some of the products are sold in Tinglayan and Tabuk. Small fish are also caught in the river and streams.

Sugar cane production

Sugar cane is an essential secondary crop, for sugar and for making *basi* (native wine). The latter holds an important place in the cultural practices and rituals associated with agricultural production. The harvested sugar cane has to be processed to make sugar and *basi.* Sugar canes are brought to the *dapilan:* a wooden cane-juice extractor worked by a water buffalo. The rest of the process entails cooking, evaporation and fermentation until the wine is stored for some months for use in rituals.

Other livelihood opportunities

Aside from agriculture, there are other activities that augment the income of families especially during the lean months of rice and food shortages. These include basket weaving, carpentry, construction or road-building and blacksmithing. Men and women also carry out waged labour on other farms.

Gender roles

In general, both men and women in these upland communities are involved heavily in economic and community work. The subsequent discussions will focus on the roles of both within the framework discussed in Section 2 and will delineate the roles of each gender as necessary.

3.1.2 Productive Work

Rice Farming

Rice cultivation has defined roles for men and women in these upland villages.

Building rice terraces, land preparation and the repair of rice terraces are in the male domain,

although women provide assistance. Building a rice field is considered a laborious task in the absence of machinery, and is generally a man's job. With only a few hand tools for clearing, cutting and digging, it takes about two to three years to establish a single rice field. Women help by carrying black soil to be spread and levelled on the fields.

Farming on both wet terraces and in the swiddens involves diverse tasks that are generally considered to be women's work. After land preparation by the men, women take care of seedbed preparation and transplanting. For nearly three months from planting until harvest time, women regularly tend, clean and weed the fields. Harvesting is a much anticipated community event, and thus involves men, women and children. Table 2 shows the rice calendar and the allotted tasks for men and women.

Table 2: Seasonal calendar for wet-rice farming (Tulgao)

Month	Activity	Participant
November - December	Land preparation/sowing	Men/Women
January – February	Transplanting of seedlings	Women
March –May	Cleaning and weeding	Women
June – July	Harvesting	Family
August	Second crop, (rarely sown)	Family

The woman is given the role of seed selector. She selects ten stalks of paddy which she wraps in a *lingliwen* (woven blanket) to be stored in the *agamang* (rice granary) for use in the following planting season.

Swidden Farming

Swidden farming in Tulgao predominantly involves women in all the tasks shown in Table 3. Women play the major part in the production of legumes and vegetables. Traditionally, it is the women who sow the legume seeds, although men dig the holes for the seeds to be sown. Legumes are sold by women in nearby towns for cash. As in wet rice agriculture, women select and store the seeds for the following crop.

Table 3: Women's work in swidden farming

Activity	First Crop	Second Crop	Number of work days
Clearing	March-April	September - October	8 days
Burning			½ day
Final cleaning (*papur-as)*			3 days
Sowing (*osok)*	May	December	2 ½ days
Weeding (*tullog)*	June –July	January – February	2 days
Harvesting (*buras)*	August	March	6 days
Drying			2 days
Winnowing, pounding, cleaning			4 days
Marketing			6 days

Table 4 below summarises the farm work for a family with four fields in Tulgao

Table 4: Farm work and time allocation (Tulgao)

Activity	**Number of works days** (m) = male, (f) = female and (p) = people			
	Field 1	Field 2	Field 3	Field 4
Initial ploughing *(choschos)*	2 days (m)	3 days (m)	1 day	2 days
Cleaning *(kaat)*	3 days (f)	2 days (f)	½ day	2 days
Second ploughing *(pigwa)*	1 day (m)	1 day (m)	1 day	2 days
Final ploughing *(amma)*	1 day (m)	1 day (m)	1 day	2 days
Transplanting	4 days (f)	5 days (f)	2 days	5 days
Weeding *(sagamsam)*	2 days (f)	2 days (f)	1 day	2 days
Cleaning *(lichias)*	1 ½ days (f)	2 days (f)	½ day	2 days
Harvesting *(ani)*	1 day (18 p)	1 day (22 p)	1 day (8 p)	1 day (25 p)
Drying	3 days	3 days	3 days	3 days
Repair and maintenance of irrigation canals and rice terraces			As required (m)	
Total	**18 ½ days**	**20 days**	**11 days**	**21 days**

Income Generation

Income generation is seen as part of the male domain in these upland villages. The Tulgao men produce several handicraft items (baskets, soft brooms and mats) using traditional weaving methods. They also manufacture traditional blacksmith tools for use within the community and for selling in nearby towns. Carpentry is another livelihood source for the men, within and outside the community. In some families, both the men and women carry out waged work on farms within the community, or beyond, to generate additional income. The average payment for men and women are 175 and 75 pesos, respectively, per day.

Reproductive Work

The women, apart from their productive roles, perform most of the household chores since these are considered in these indigenous villages as women's tasks (Table 5). Fuelwood gathering, on the other hand, is men's work.

Table 5: Roles and responsibilities of men and women in Tulgao

Domains	Male-dominated Activities	Female-dominated Activities	Shared roles
1. Reproductive: household work and family affairs	Firewood gathering House repairs	Washing of family clothes House cleaning Food gathering Rice pounding	Food preparation/cooking Child rearing and discipline of children Caring of sick
2. Productive: On farm work 2.1 Rice Farming	Land preparation (trampling) Scarecrow making Water maintenance	Seed preparation Transplanting Weeding	Field hygiene, clearing the surroundings Harvesting Drying Storing in granary
2.2 Swidden Farming	Scouting for land Carry seeds to farm Hauling to market	Sowing Weeding Drying, pulling and sorting	Field care inc. cleaning, cutting bushes, spreading ash from fires to lower soil pH Firebreak making Harvesting Storing
3. Productive: off farm		Rice winnowing and pounding	
4. Productive work: livelihood	Basket weaving Soft broom making Blacksmith Buy and Sell Carpentry		Hired labour (shared role, depending on age of children)
5. Community participation: Involvement in community affairs	MHP: planning, maintenance		Watershed management MHP: construction, management School-related such as meetings Church-related activities Community festivities such as weddings and rituals

Community Participation

As shown in Table *5,* most of the community affairs related to school, church and community festivities involve both men and women. Decision-making is a shared role on matters pertaining to households, the family and children, church and school. The women were observed as being predominantly active in school and church concerns.

However, decision-making on issues of a political nature, such as those related to tribal conflicts, remain in the traditional domain of men. Women do not participate in peace-pact gatherings and ceremonies.

Community labour for waterworks construction is in the domain of men. In the case of the MHP, however, women shared in some of the manual tasks such as hauling. This was a result of the community mobilisation invoked by the lead organisations for this innovative project.

The two barangays have had several community projects to improve the local area, carried out by both the local government (through LGUs) and NGOs, some with funding from KEEP. Within the community, there are a number of people's organisations. In Tulgao, the principal of the elementary school heads the women's organisation that assists in upholding welfare and order in the barangay. The other people's organisations include a farmers' association and a church-led youth group.

3.1.3 The intervention

One of the systems selected for this research was the community-based microhydro project (MHP) located in the cluster of remote and upland barangays of Tulgao East, Tulgao West and Dananao in Tinglayan, Kalinga. Already for five years, these three barangays have been benefiting from the electricity from a 33kW MHP system, drawing its energy from the Bonog Creek which passes through the cluster of villages.

The focus of the actual data-gathering, and hence the case study, are the two Tulgao villages of Tulgao and Dananao. The communities are made up of indigenous peoples belonging to the Tulgao tribe of the Cordillera Administrative Region (CAR). These two tribes have an age-long warrior tradition, and have been tribal enemies in recent history prior to the establishment of the MHP. This project had enabled them to work together in its installation and subsequent operation.

SIBAT had undertaken the technical assistance for this project, which was initiated by EDNP and funded by KEEP of Japan. The Tulgao Farmers Association has been the core organisation which has owned the operation and management of the project from its conception onwards. Its members represent the community in this project.

Tulgao MHP: feasibility study

The MHP project site which provides electricity to the barangays of Tulgao East, Tulgao West and Dananao was initially surveyed in 1997. The feasibility of the MHP project was established in 1998 which led to the construction of the system and its commissioning in 1999.

Research conducted by SIBAT as part of the feasibility study in November 1997 showed that Kalinga was among the least-served provinces in CAR, with less than 16% of its barangays having an electricity supply. The nearest point on an electricity grid was more than 30 kilometres away from the communities and, moreover, operated by MOPRECO whose area of operation was limited to Mount Province and so did not cover these three villages. The nearest point on KAELCO's grid, the operator most likely to connect Tulgao and Dananao, was, in 1997, more than 70 km away. Further, discussions with members of these electricity cooperatives revealed that these communities were unlikely to be connected to the grid within the next 10-20 years due to the distances involved coupled with the rugged terrain which made connection expensive. As of 1996, MOPRECO and KAELCO stated that the installation costs for transmission lines only was about PhP 450 000 per km. Thus, alternative energy sources for these barangays needed to be explored.

The energy consumption in the community before the installation of the MHP was primarily for lighting and cooking, with additional battery-powered flashlights and transistor radios used by some residents. Only one in five households had a transistor radio. There were typically one or two kerosene lamps per household, but fewer than 40% of the households regularly used kerosene due to its high cost and the problems of transporting it from Tinglayan or Tabuk. All the post-harvest activities, mainly related to rice production, were performed manually by women and children. Each barangay had a small-capacity diesel generator, potentially useable to charge batteries, but the five households in the three barangays who did own rechargeable (car) batteries would take them to Tinglayan or Tabuk to be charged. The Anglican Church had a solar PV system for lighting and battery charging connected to the multi-purpose centre in Tulgao West, site of the clinic and reading centre.

A needs assessment yielded the community's desire for better lighting. The reasons given for this emphasis were the cost of kerosene, and the dirty soot that it left behind in the houses. A rice mill was also said to be a good option, to reduce the workload of women and children.

The feasibility study showed that, on average, PhP 38 per month was spent on kerosene, by the minority who used it. The average monthly expenditure on *saleng* was given as PhP 79 per household per year.

3.1.4 The community-based MHP

The community's roles in the project's development were through community mobilisation and counterpart contributions in the form of labour and locally procured materials. A community plan was developed for the entire installation phase; where the roles of the community, the church and SIBAT were outlined. The community organised various committees to organise the tasks relating to their counterpart role.

A watershed preservation and enhancement project was also undertaken in cooperation with SIBAT, with thousands of pine tree seedlings successfully planted. However, this project was discontinued in 2003, just over half way through its planned duration of 2000-2004.

The microhydro project was officially inaugurated in November 2000, with festive ceremonies attended by representatives from many indigenous villages in Kalinga.

The project has been fully operational since then, except for an eight-month shutdown in 2003. The lead organisations involved in the project were the Episcopal Diocese of Northern Philippines (ENDP) and the Sibol ng Agham at Teknolohiya (SIBAT), which divided the tasks between them of organising the community and providing technical assistance. The project was funded by the Kyosato Experimental Education Program (KEEP). The total investment cost was projected as PhP 2 587 450, with the value of community work and materials provided locally estimated at PhP 293 000.

The microhydro project uses the energy of moving water to turn a turbine, like a water wheel, which turns a generator and so produces electricity. Bunog Creek has a typical flow of 0.17 m^3/sec which is also tapped for the community's communal irrigation system. To achieve a 30kW power output, the flow was diverted to a forebay site from where it drops 40 m to the turbine. The powerhouse site is approximately 1.5 km from Tulgao and 1.2 km from Dananao.

The project fulfilled its objectives of providing enough electricity for lighting and small appliance use in over 300 households; as well as in community buildings such as the church, the school and the health clinic. Although the capacity of the system is 30kW, only 4-5kW are currently being used. Two rice mills were installed in 2002, and a sugarcane press in November 2003. These facilities are powered during the day, thus generating additional income for the community and reducing people's workloads.

3.1.5 Beneficiaries of the MHP

The target beneficiaries of the MHP were the entire communities of Tulgao East, Tulgao West and Dananao, comprising of 300 households, plus various communal buildings including the church, a multi-purpose hall, the school and health clinics. In practice, the MHP was able to reach around 80% of the total population of the three communities (see Table 6). The number of beneficiaries has fluctuated due to the migration of some families to other places. Most of the households have one or two light bulbs in their houses linked to the system.

Table 6: Beneficiaries (households) of the MHP electrification

Community	2000	2001	2002	2003	2004
Tulgao East	83	83	84	80	81
Tulgao West	70	67	68	68	62
Dananao	93	97	101	103	91
Total	**246**	**247**	**253**	**251**	**234**

Some families chose to invest in appliances, and it total there are 21 families with 24 appliances (see Table 7). Aside from own entertainment use, the VHS and televisions are used as additional sources of income, with children in particular paying to watch videos. Payment is one pine pithwood (a log or piece of wood from a pine tree), used for fuel, per show. It was commented that this causes problems within the community as children steal the pithwood. It was also mentioned in the male FGD that the purchasing of appliances highlighted the wide range of economic capacities of families within the community. Most of the families able to afford appliances had income from outside employment, such as as teachers and government employees.

Table 7: List of appliances in the community (as of 2004)

Appliance	Number of units
Entertainment	
• CD and TV	15
• CD cassette	4
Kitchen	
• Rice cooker	1
• Grinder/blender	1
Laundry	
• Washing machine	2
Others	
• Sewing machine	1
TOTAL	24

What Table 7 highlights is that most appliance purchases are related to entertainment rather than alleviating household chores. Only the rice cooker, the food grinder and the two washing machines can be seen as in the latter category, and just one sewing machine was bought for productive purposes.

3.1.6 Energy Consumption

The output from the microhydro plant is primarily used for lighting, with some small appliances, plus for processing farm produce with a rice mill and sugarcane press, and some blacksmithing (making farm implements). The system generally operates from 4.40 pm to 7 am (based on an agreed policy), and during the daytime if needed for the rice mill or lighting for the school. As agreed by the community, each household pays a monthly tariff of PhP 25 for their first 10W bulb and an additional PhP 5 for each extra bulb. For appliances, a household pays an additional PhP 30 per month per appliance.

3.1.7 Operation and Management

The MHP is managed by the Board of Directors, and there is a Manager responsible for the day-to-day operations. The Board of Directors is composed of three women and four men. The Manager is the pastor of the Episcopal Church. The MHP has a staff comprising one cashier/bookkeeper, three fee collectors and two operators.

3.2 Case study 2: PV-battery charging in Malitbog, Southern Leyte

The case study focussed on assessing the impacts on women and their livelihood activities of the PV-battery charging station in Malitbog, Southern Leyte, and in particular in the two remote villages of New Katipunan and Cadaruhan Sur.

3.2.1 Characteristics of the study area

New Katipunan is 1.5 kilometres farther away from the town of Malitbog (13 km), from the town market (also 13 km) and also from the nearest city of Maasin (55 km), than Cadaruhan Sur. Moreover, New Katipunan remains two kilometres away from the nearest electricity grid whereas Cadaruhan Sur is now connected. While Cadaruhan Sur can be reached by four-wheel drive vehicles, New Katipunan has to rely on motorcycles, locally known as *habal-habal.*

Demography

New Katipunan is larger (263 081 ha) and on steeper terrain, with the road climbing uphill through about 200 metres before reaching Cadaruhan Sur with an area of 221 542 hectares. Whilst Cadaruhan Sur is smaller in area, it is slightly nearer to key locations and has a larger population than New Katipunan (see also Table 8).

The total population of Cadaruhan Sur is 456, of which 263 are males and 193 females, and the total population of New Katipunan is 294 (159 males and 135 females). The numbers of households in Cadaruhan Sur and New Katipunan, as of the 2000 NSO Census, were 73 and 55 respectively. In Cadaruhan Sur, the households are close together, whereas they are more dispersed in New Katipunan.

The Internal Revenue Allotment (IRA) for Cadaruhan Sur is PhP 384 636 and for New Katipunan PhP 368 000

Facilities

Natural resources such as land, forests, waterfalls and rivers are owned by the government. However, the residents are in the process of acquiring the land through the Government's agrarian reform programme, and so they are seen as an agrarian reform community. Despite this situation, all the residents can freely tap the waterfalls for irrigation and water supply, and gather twigs and branches for cooking etc.

Gender roles

It was observed that women in the two target areas, just like the men, are involved in development activities and share livelihood tasks with them. Women are prominent in growing and harvesting root crops and cut flowers, small-scale selling in the neighbourhood, and layering the single abaca twine. Women also appear to be the more dominant gender in meetings; they often represent the households while the men tend to the farming and other tasks.

Traditional reproductive role of women

The traditional role of women focuses primarily on the rearing of children – from feeding, babysitting, providing child care and health care, to tutoring and overseeing their activities in school, at church and in the community. Apart from this, they have to ensure that food is available at every mealtime, and then wash the dishes and pots. Matters regarding family size and the futures of their children are

usually discussed between couples and are mutually agreed upon.

Roles of men and women in agricultural production

Men dominate in farm work, although women assist, particularly in planting, weeding, harvesting and post-harvest activities such as threshing and milling. Women play a major role in the marketing of the produce and in the purchase of insecticides, fertilisers etc. Related to this, women take charge and manage the family income, and decide on any purchases. Besides rice production, men engage in carpentry and provide farm labour at PhP 120 per day as additional sources of income. Similarly, women provide farm help at the same rate while children are hired at PhP 50 – 80 per day. Often, women produce abaca twine (*tagak*) for sale.

Roles of men and women in the community

In terms of participation in community activities such as organising festivities or ceremonies, planning and decision-making, men play a major role while women get involved in social activities that require detailed work and planning. Both men and women perform assigned tasks, and both genders can perform all the tasks if necessary.

Socio-political positions and decision-making of women and men at the household and community levels

Usually in such communities, the socio-political institutions are the Barangay Organisation and the Credit Cooperative. As such, the barangay officials, in consultation with selected community residents, usually make any decisions on community concerns and affairs. However, during elections, the political party members and leaders have a direct influence on the choice of candidates. Women can stand in local elections. In the community, women actively participate in the decision-making process, especially when they are barangay officials and take part in discussions and voting on issues that affect the community.

Roles in the PV project

It was mainly the men who were involved in providing assistance in the installation of the PV system: due to the heavy nature of the work, the skills required and their experience such as in hauling materials and equipment and in the installation of lighting fixtures. The women took charge in the preparation of food for the workers. The tasks of collecting charging fees and monthly dues, and keeping records were assigned among the women. Further, the project involves women in the operation and maintenance of household systems since they decide when to switch the light on and off, maintain the battery by cleaning the surfaces and terminals and monitoring when the battery needs to be recharged.

Table 8: Demographic Information on Cadaruhan Sur and New Katipunan

	BARANGAY		
	Cadaruhan Sur	**New Katipunan**	**Total**
1. Land area in hectares	221 542	263 081	484 623
2. Distance in kilometres to: a. Malitbog town b. the nearest City c. the town market d. the electricity grid	 11.5 53.5 11.5 now connected	 13 55 13 2	
3. Internal revenue allotment (IRA)	384 636	368 000	
4. Total population a. Male b. Female	456 263 193	294 159 135	750 422 328
5. No. of households (2000 NSO Census)	73	55	124
6. Household distribution	main cluster of at least 20 houses, the rest dispersed	dispersed	
7. Available infrastructure	With the future improvement of the farm to market road (a government priority), all villages will be reachable by four wheeled vehicles		
8. Main agricultural products and estimated area in hectares a. corn b. vegetables c. pigs d. chickens e. cattle/carabao f. cut flowers	 109 15	 100	
9. Crafts	tagak	tagak (abaca twine)	
10. Informal group/organisations	Brgy. Power Association (BAPA) Brgy. Water & Sanitation Assn. (BAWASA) CARP Beneficiaries		

3.2.2 Scope of the study

This study attempted to determine the continuity and productive outcomes of the Barangay Electrification Project (BEP) of the Department of Energy (DOE) that resulted in a solar-photovoltaic battery charging station (PV-BCS) in Southern Leyte. It focused on the long-term impact on women and on the livelihood activities that promise sustainability following the implementation of the off-grid barangay electrification programme. The study particularly looked at the distant barangays of New Katipunan and Cadaruhan Sur in Malitbog, Southern Leyte. Furthermore, an emphasis was on the role of women in project development and other community projects.

In 1960, the Government of the Republic of the Philippines first stated that total electrification was a national policy objective. The DOE, in cooperation with its agencies, has consistently implemented programmes that support the Government's poverty alleviation efforts through providing wider access to electricity supply and services. These programmes include: (1) Accelerated Barangay Electrification Program (ABEP) in 1999, (2) O'Ilaw Program in January 2000 to March 2003, and (3) the Expanded Rural Electrification Program (ERAP) in April 2003.

The barangays of Cadaruhan Sur and New Katipunan in Malitbog, Southern Leyte were considered

priority areas since they were not included in the electrification schedule of the Southern Leyte Electric Cooperative (SOLECO).

Livelihood institutionalisation

Data gathered to guide the process of incorporating prospective livelihood components of the BEP from the planning phase focused on information pertinent to generating livelihood activities. Table 9 includes the organisational scheme; income-generating activities and concerns; and the overall outlook towards the Barangay Electrification Program, existing livelihood activities and prospective or new livelihood projects to be established. The approximate volume of products from the entire villages is shown in Table 10. Respondents were asked about their *attitude towards the BEP*, *their existing livelihood activities*, and the *prospective projects to be established*. Table 9 consolidates vital information on Cadaruhan Sur and New Katipunan needed to institutionalise livelihood activities. The related activities in the off-grid Barangay Electrification Project in Malitbog will generate and intensify income-generating activities, such as vegetable production and cut-flowers, by enabling electricity-powered irrigation. These activities will not only pay for the cost of electricity to the households, they will also maximise the use of lighting for development-oriented activities.

Table 9: Information required for the institutionalisation of livelihood activities

INFORMATION CATEGORY	**Cadaruhan Sur**	**New Katipunan**
1. Organisational scheme Existence of group establishing livelihood activities Has identified contact person Available key informant Consensus to organise livelihood activities	✓ Antonio Linguta NoliCapilitan, MPDO ✓	✓ Alberto Aroyo Malitbog, So. Leyte ✓
2. Income-generating/livelihood activities and concerns	coconuts abaca rice corn root crops vegetables	cut flowers abaca rice corn root crops
2.1 Highest priority livelihood commodities	coconut (copra) abaca rice	coconut (copra) abaca rice
3. Marketable livelihood products	Vegetables (average)	Cut flowers (average)
4 Approximate livelihood income Before BEP After BEP	 Low Low	 Average Average
5 Status of livelihood To be maintained Needs intensification/expansion	 ✓ ✓	 ✓ ✓
6. Approximate volume and income of product before and after BEP Barriers to livelihood activities	See Table 10 Price, lack of rainfall, lack of capital, inadequate tools/farm equipment	
7. Needed skill competency or upgrading for livelihood projects	Application of appropriate technology	
8. Overall attitude towards: BEP Existing livelihood activities Prospective livelihood or establishing new livelihood projects	 Highly positive, many changes Positive change noted Highly positive, many changes	 Highly positive, many changes Positive change noted Highly positive, many changes

Table 10: Approximate outputs before and after electrification in Cadaruhan and Katipunan

		BEFORE BEP		*AFTER BEP*	
		Cadaruhan Sur	**New Katipunan**	**Cadaruhan Sur**	**New Katipunan**
1.	Copra	9 tons/qtr	8 tons/qtr	12 tons/qtr	10 tons/qtr
2.	Abaca	1500 kg/semester	100 kg/semester	3000 kg/semester	200 kg/semester
3.	Corn	500 kg/semester		1500 kg/semester	
4.	Rice	5000 kg/harvest	2500 kg/harvest	10 000 kg/harvest	4000 kg/harvest
5.	Camote	1000 kg/yr	1000 kg/yr	2000 kg/yr	2000 kg/yr
6.	Cassava	1000 kg/yr	1000 kg/yr	2000 kg/yr	2000 kg/yr
7.	Carlang	1000 kg/yr	1000 kg/yr	2000 kg/yr	2000 kg/yr
8.	Banana	2000 kg/yr	2000 kg/yr	3000 kg/yr	3000 kg/yr
9.	Vegetable	1000 kg/yr	1000 kg/yr	2000 kg/yr	2000 kg/yr
10.	Cut flowers		50 bunches/wk		100 bunches/wk
11.	Tinagak	20 kg/month	10 kg/month	25 kg/month	20 kg/month

In terms of organisation, both barangays have existing groups to establish livelihood activities with identified contact persons and an MPDO (Noli Capilitan) from Malitbog covering both areas. Both areas have income-generating projects involving coconut (copra), abaca, rice, corn and root crops. Only Katipunan engages in the cut flower business in addition to the other upland crops, although Cadaruhan grows more varied root crops than Katipunan. The first three commodities in terms of livelihood activities as a source of primary income are coconut (copra), abaca and rice which all have average marketability. Overall, income from livelihood activities is generally low in Cadaruhan Sur both before and after the electrification programme, and average in New Katipunan since the electricity projects provided no benefits to the vegetable garden and farming activities except in abaca twining, which was extended by four to six hours at night time. Approximate product volumes before and after the BEP are presented in Table 10. Products include copra, abaca, rice, camote, cassava, carlang, banana, vegetables, and tinagak. All the commodities listed in Table 10 show a significant growth in production in both villages following electrification, many more the doubling. Some products are subject to the requirements of middle-men and not directly sold on the open market. In the planning phase, projected income was computed by summing the total income for all commodities. Overall, livelihood incomes were estimated as little changed by the BEP. This apparently conservative approximation of income gains lacks the positive outlook compared to the approximated volume of production in all commodities which doubled or tripled in both barangays after the BEP. In terms of barriers to livelihood projects, both barangays face low prices for commodities, lack of rainfall, lack of capital, and inadequate tools or farm equipment. Not surprisingly, they clamour for appropriate technologies and the competencies needed to improve and intensify livelihood prospects. This implies a need for training and hands-on practical experience. Although both Cadaruhan Sur and New Katipunan need to maintain the present sources of income (essentially farming) generally, priority needs to be given to the intensification and expansion of livelihood activities or projects that will increase income). Finally, a graduated scale was used to

determine the attitudes of respondents from Cadaruhan Sur and New Katipunan, the districts where the FGDs were conducted, towards certain components of the project. Overall reactions in both villages were the same: highly positive towards the BEP and prospective livelihoods, and also positive towards existing livelihood activities.

Project Performance Assessment in Cadaruhan Sur and New Katipunan

Assessment of project performance in each of the two barangays provides insights into the implementation of the project. This off-grid BEP in Malitbog, Southern Leyte, has established the need for sustainable livelihood projects to pay for the electricity. However, the availability of electricity and lighting extends working hours, which can be used for productive livelihood projects.

The foci in assessing project performance in the two hillside barangays were the following: organisational scheme, resource availability for livelihood activities, attitudes before and after the project, nature of livelihoods, and other related concerns such as gender participation, environmental considerations, and status of poverty alleviation, quality of life prognosis, and LGU incentives for livelihood activities (Table 11).

Table 11: Project Performance Assessment in Cadaruhan Sur and New Katipunan

ASSESSMENT FOCUS		CADARUHAN SUR	NEW KATIPUNAN
A. Organisational Scheme			
1.	Role of each person		
	a. Accessibility	Always	
	b. Specific role known to all	Known to All	
2.	DOE initiative		
	a. Sanction of project	Approved	
	b. Project commitment to DOE	Required as part of training	
3.	Local network		
	a. Barangay-Municipality linkage	Very strong	
	b. Informal group	Strong	
4.	Operational process		
	a. Guided movements	Guided with alterations	Very well guided with alterations
	b. Cooperation (beneficiaries)	Highly cooperative	
B. Resource availability for Livelihood Activities			
1.	Origin		
	a. Resource used for existing livelihood activities	Natural	
	b. Resource availability for livelihood projects to be maintained	Available	
2.	Expected resource sustainability for livelihood		
	a. For livelihood activities	Needs replenishment	Sustainable
	b. For new livelihood activities	Replenishment required	

3.	Status of livelihood category	**CADARUHAN SUR**		**NEW KATIPUNAN**	
		Before	*After*	*Before*	*After*
	Copra drying	17 tons	22 tons	Figures to left are combined totals for both areas	
	Sari-sari	5 stores	12 stores		
	Charcoal	20 tons	32 tons		
	Food processing				
	Coconut product (tuba)	30 gallons	48 gallons		
	(Also refer to Table 10)				
4.	Skills training for new livelihoods				
	a. Skills for new Livelihood	Partly possess skills	Possess skills	Partly possess skills	Possess skills
	b. Training needed	Need additional training			
C. Nature of Livelihood					
1.	Volume of product or output	Minimal production, such as in twine manufacture and in removing corn kernels from husk		Minimal production, such as in abaca twining and reeling	Maximum utilisation of products: corn husking and cooking into food or feeds at night using extended lighting
2.	Volume of product stored & sold	Stored for family	Stored partly for commercial purposes	Stored for family use	Stored for commercial purposes
3.	Beneficiaries' perception of income level	Never enough	Some increase noted	Typically insufficient	Increased family income
4.	Barangay to market road improvement	Dirt road rough and muddy during rain	Wider and better. A second road added to market	Rough dirt road: muddy when it rains	Maintained; LGU to construct a one-lane road in 2005

Concerning the first three foci mentioned, both Cadaruhan Sur and New Katipunan beneficiaries understand the role of the project mobilisers and their responsibilities. The MPDO and DAR representatives are accessible for consultation. Barangay leaders also lend a hand at any time when needed since earlier briefings and meetings have made this possible. Beneficiaries, LGU officials and DAR representatives are aware of the DOE initiative that led to the Barangay Electrification Project. They have accepted the emergence of income-generating projects resulting from the BEP, which the LGU, the DAR supervisors and CARP beneficiaries in Cadaruhan Sur, and DOE representatives all strive to enhance. People involved in the BEP know that the electrification programme has DOE's approval and they have a commitment to the DOE. The Barangay-Municipality linkage is very strong, and there are also strong links to informal groups spearheading participation and cooperation among the beneficiaries. The BEP operational process and the emergence of livelihood activities are guided by the policies of BAPA albeit with alterations in New Katipunan. All the individuals involved are highly cooperative since they foresee shared benefits in the use of solar PV-charging stations.

Table 11 also indicates that the existing livelihood activities to be continued make use of natural resources. Katipunan, known for its production of cut flowers, but with more limited livelihood activities than Cadaruhan, claims to have a sustainable resource for its livelihood activities. Both barangays highlighted, however, that these required replenishment if new livelihood projects were to be established.

The MPDO of Malitbog, Southern Leyte, provided the estimates for the combined production figures for copra, sari-sari, charcoal from coconut shells, and coconut toddy (*tuba*) from both barangays. The estimates did not cover small-scale livelihood categories such as eating establishments, handicrafts and food processing. In the livelihood categories with significant production, the gains from before to after the electrification programme were: five tons of copra (17-22); seven sari-sari stores (5-12); 12 tons of charcoal from coco-shells (20-32); and 18 gallons of coco toddy (30-48). Before electrification, products were only stored for family use in both barangays. After electrification, products were also stored for commercial purposes in Cadaruhan Sur and *only* for commercial purposes in New Katipunan. Both barangays need additional training for new livelihood skills. Although programme participants have gained new skills, possibly in anticipation of livelihood expansion and initiating new livelihood activities, Cadaruhan and Katipunan villagers still need additional training for new livelihood activities which offer a realistic promise of income.

Beneficiaries' perception of income levels prior to the project (see Table 11) is "never enough" for Cadaruhan Sur and "typically insufficient" for New Katipunan. After the PV project, Cadaruhan records "some increase" in income and Katipunan an "increased family income". The road linking Cadaruhan Sur to the market has improved after the project from being "rough and muddy during rain" to "wider" and "better" as a result of gravel surfacing. A second road to the market has been constructed and is now passable. In addition, the LGU has planned the construction of a one-lane road from New Katipunan to the market in 2005.

Additional general observations in Cadaruhan Sur and New Katipunan centre on gender participation, environmental concerns, status of poverty alleviation, prognosis on quality of life, and the LGU's contribution to the people's livelihood activities. It appears in Table 12 that women in the two target areas, just like the men, are involved in development and share livelihood tasks with them. Women are prominent in growing and harvesting root crops, cut flowers, small-scale vending in the neighbourhood, and producing the single abaca twine. Women also appear more dominant in meetings. They often represent the households while the men tend to farming and other tasks. Environmental protection has always been considered. DAR, DA and LGU representatives visit and monitor activities in the two barangays. However, no specific targets have been set for monitoring such as assessing community rubbish and human waste disposal, smoke pollution in charcoal making and tree planting along the cleared and sloping sides of the two dirt roads. Generally, the areas of Cadaruhan and Katipunan, as well as the residents, appear environment friendly.

Table 12: General Observations on Project Performance Assessment

Additional General Observations in Cadaruhan Sur and New Katipunan	
1. Gender participation	Woman equally involved with men in development and share livelihood activities with them.
2. Environmental concerns	Environment always considered in the development Representatives from concerned agencies monitor barangay activities.
3. Status of poverty alleviation	Poverty has been addressed by the BEP and supplemented by introduction of livelihood projects to afford the cost of electrification, improve living conditions, and keep the family busy by utilising and extending working hours.
4. Quality of life prognosis	Additional interventions by concerned agencies have helped improve quality life.
5. Added information	Rice production, cattle dispersal, and mango production assisted and supervised by the LGU.

On the whole, respondents in both barangays have highly positive views on establishing new livelihood projects. They have also identified focal points to consider in introducing new livelihood activities, especially the need for moral and material support from the municipal council; the role played by the municipal planning and development officer in establishing and monitoring livelihood activities; the need to take into account available natural resources and market accessibility; and the introduction of livelihood activities organised through community leaders and building cooperativism and pride in livelihood products.

3.2.3 Gender Assessment

Role of Women in Project Development

It was observed that the women in the two target areas are involved in development and share livelihood tasks with the men. Women are prominent in growing and harvesting root crops and cut flowers, small-scale vending in the neighbourhood, and layering the single abaca twine. Women also appear the more dominant gender in meetings: they often represent the households while the men tend to farming and other tasks.

Further, a detailed interview schedule was prepared to gather more information on the role of women in project development. In both barangays, the project was introduced basically to address the problem of a lack of electrification through initiatives by the DOE and by the LGU through the Municipal Planning Development Office. The women expected that the project would extend their available hours for household chores while the men thought they would have more time to repair farm tools and that the children would have better lighting for studying. The community was looking forward to the project enabling families to be together while listening to their favourite radio programmes or watching TV shows.

The newly created Barangay Power Association (BAPA), under the leadership of the LGU, was the overseer and decision-maker in the installation of the PV-BCS and in wiring households. The systems were installed by the supplier. Men were mostly involved in providing assistance in the installation due to the heavy nature of the work, and their skills and experience in areas such as hauling materials and equipment and installing lighting fixtures. The women, however, took charge of preparing food for the workers.

After the PV-BCS and household lighting fixtures were installed, the BAPA was responsible for the operation and maintenance of the systems through hired technicians who were trained by the supplier to do simple repairs and troubleshooting. However, the task of collecting charging fees and monthly dues and record keeping were assigned to women. Further, the project *has* involved women in the operation and maintenance of the household systems since it is they who decide when to switch the lights on and off, and look after their battery by cleaning the surfaces and, terminals, and monitoring its condition to determine when it is to be recharged.

4 Major results and findings from the case studies

4.1 Case study 1: Microhydro power project in Tinglayan, Kalinga

The case study set out to investigate whether indigenous women were empowered through the introduction of a community-based renewable energy technology, namely a microhydro power project (MHP), in Tinglayan, Kalinga.

Women's participation in the community-based microhydro project

Despite the customary predominant role given to men in the construction of waterworks, women had contributed to community-wide efforts in building the microhydro system in the community. Specifically, women helped to haul sand and aggregates from the river, to fetch water and to prepare food. Widows, in particular, spent long hours in the work camp. If their husbands were away, wives ensured participation in the construction work. This shared character of the mobilisation efforts was confirmed during the FGDs for men and women.

However, it was mentioned that women had no substantial role or presence in the planning stage of the MHP. This can be attributed to the traditionally weak participation of women in community and political affairs; and that women tend to work long days on the farm. Men, as customary, were able to sit and become involved in meetings such as those planning the MHP. Despite this, during the FGD, the men did mention that they discussed outcomes and issues with their wives, and reflected their wives views during the meetings. This confirms that consultations between husbands and wives do take place in Tulgao households.

Project management. Three out of the seven officers and members of the project's board of directors are women. One is a teacher, the second a municipal employee and the third is the barangay midwife. This assignment of women to the board is not typical of Tulgao projects, but probably reflects the leading role of the church in the MHP project, and the active role of women in the church.

It has also been mentioned that the male manager of the MHP (who is also the pastor of the local church) has a near monopoly when it comes to decision-making. The FGDs viewed the situation as needing attention and some remedy, but regarded the manager and the board members, including the women among them, as having important roles to play in deciding MHP matters.

Operation and maintenance. In terms of operation and maintenance of the microhydro project, the women carried out the functions of bookkeeping, cashiering and payment collection. Actual repair, maintenance and troubleshooting are regarded as within the men's domain.

Technical training. The women have not participated in any of the technical training provided for operators and other members of the community. Most of the MHP training programmes undertaken by men in the community are technical in nature and are related to repairs and maintenance. The lack of involvement in the technical matters seems to limit women's knowledge in managing the MHP.

To summarise, the community-based MHP project has witnessed the active mobilisation of, and contribution by, women towards its completion. It has also seen them in an untypical position of being involved in project management. While the management per se may have problems, the three women involved at the board level have opportunities to take a substantive role in decision-making on the operation, maintenance and sustenance of the project.

The impact of the community-based microhydro power project on the community and on women in particular

Findings of this research confirm that the five-year old microhydro power project in the communities of Tulgao East and Tulgao West has evidently contributed to improving the lives of the Tulgao people, in terms of increased economic resources, environmental protection, improved health and wellbeing, and enhanced socio-cultural and political activities.

Economic aspects

The linkage of a rice mill to the microhydro plant has produced one of the important economic benefits. The rice mill was a donation from the European Union and the Australian Board of Mission, and facilitated by the Episcopal Church. The rice mill was fabricated by the Department of Engineering at the Benguet State University. The charge for milling is 15 pesos per can (approximately 18 kilos) if the client has provided labour or materials during the construction of the rice mill; if no input was made the milling charge is 20 pesos per can. The earnings from the rice mill are divided into three equal parts, going to the operators, the church and the MHP project itself.

Because it is the men who are predominantly involved in house-based income, the provision of MHP-powered lighting is a direct benefit to them. The FGDs and key informant interviews confirmed this, with increased hours for men to weave baskets in the evenings. In one interview, a respondent commented that he had increased his production of winnower items from 15 to 20 pieces a month through the availability of electricity, giving an additional household income of 750 to 1000 pesos per month.

Given that women's main contributions to production are in agriculture, which is largely manual labour, and that the energy produced by the microhydro plant is not appropriate for easing such tasks, women have, by and large, not directly benefited at this stage. However, the provision of lighting has enabled some women to have an income from food vending.

A further benefit has been that the rice bran from the milled rice has been found to be a good source of feed for pigs and other livestock. The rice mill operator said that milling a can of *palay* produces one kilogram of rice bran. Although the gathering of feed for animals has traditionally been the work of both men and women, little time has been saved since the task has never taken up much time (as the pigs are allowed to roam for food). However, the availability of rice bran provides opportunities to improve livestock feed leading to better quality food which, if sold, commands a higher price, and this is an area where women can play a part and benefit.

Improving or mechanising farming techniques would certainly result in greater benefits to women who are predominantly in charge of this major area of economic activity.

Another economic outcome is the savings made from the reduced use of kerosene and the pine pithwood traditionally used for lighting. From the figures for before the installation of the MHP, households spent an average of 38 pesos per month on kerosene and 79 pesos per month on pine pithwood, against the current MHP tariff of 30 pesos.

The availability of some savings and increased incomes, no matter how small, improves the sense of stability for cash-scarce households, especially women who are mainly in charge of budgeting for daily expenses.

Respondents also mentioned the increase in the number of retail establishments or sari-sari stores since the provision of electricity. There are now fifteen stores operating in the community, compared

with less than ten before. This is providing additional income to the new shop-owners and both men and women are benefiting from this endeavour.

One case with clear benefits for a woman's productive role concerns Estela Aggalao who bought a sewing machine to repair clothes (*see her story below).*

Mini-case: The impact of MHP on a women's economic productivity

With the availability of electricity, one woman in the village purchased a high-speed sewing machine. Estela Aggalao is 29 years old with four children with ages 7 years, 5 years, 2 ½ years, and 3 months. She bought her sewing machine for 7,000.00 pesos in 2002. She accepts tailoring jobs from residents of the community as well as nearby villages. Her customers are usually fellow residents asking her to repair clothes. She charges 10-15 pesos per pants repaired and 5 pesos for other clothing. Her average customer is 5 persons per month and her average monthly income is 150 pesos per month. Her earnings are used for food and paying the electric bill. She pays 30 pesos per month for the electricity. She said that with electricity, she was able to earn her own money through sewing. When asked how she feels about the electricity, Ms Aggalao said that this made her happy.

Reproductive role of women

Women and children also save time and labour on rice pounding, an all-season activity they normally undertake. With the setting up of the rice mill in 2002, women and girls were unburdened of this task since most of them use the services of the rice mill. On average, about an hour a day used to be spent pounding to produce a *ganta* of milled rice. The mill has resulted in more time being free to devote to other household chores and farm work.

Before the installation of the rice mill, rice was pounded at night mostly by women and children. There was a concern that women's work load would increase with this project but, in fact, most have the same workload and longer time in which to fit it. This is especially useful for the majority of women who have babies and young children to look after. Some women now complete housework at night and so can work longer in the fields during daylight, and thus have increased their workloads.

According to the respondents, women's work at home has been made easier by the better lighting since most household chores have always been carried out at night because of farm work filling the day. It was also mentioned that women are able to extend their working hours for household chores further into the evening, and thus more work can be done. This gives them a feeling of satisfaction because work is more easily accomplished. The women specifically mentioned that peeling sweet potatoes, which is done almost daily, is much easier. The women also noted that they could work early in the morning to prepare food because of the availability of light.

Women also mentioned that washing clothes is easier because there is less soot on white clothes. Respondents said they are able to save time and soap. Such savings are added to funds for family expenses.

To sum up, the availability of light has had a substantial impact on women's household chores. The benefits in terms of meeting the practical needs of women should be expanded to further enhance their wellbeing and development. Community-based development projects could address this area.

Environmental aspects

Both men and women benefit from the environmental effects of the MHP system. As mentioned in the FGDs, with the electricity supply, less pine pithwood is gathered for fuel from the forests, easing the pressure on the depleted forests and helping their conservation. The community has also been replanting pine pithwood in the surrounding forests, through an ENDP project with funding from KEEP. An increased appreciation and awareness of the importance of forests and their conservation, among the perception changes confirmed by this research, is another important result of the MHP.

Health and wellbeing gains

As explained by the barangay health worker, the health benefits derived from having an electricity supply include a reduction in the incidence of respiratory and eye diseases. The women also mentioned that their families can "breathe" better because of the absence of the dark soot produced by burning pithwood.

The FGD revealed that the women now claim that child delivery is easier. Better lighting facilitates easier childbirth, especially because most women traditionally give birth alone or with minimal assistance.

It was also mentioned that children now can read and study at night. There is also some increase in children's awareness through increased access to news and information. The women in particular mentioned that the family has more time to sit and talk in the evenings. Thus, family bonding has increased with the availability of electricity.

Socio-cultural and political impacts

The biggest socio-political impact is the abatement of conflicts between the Tulgao and Dananao tribes since the establishment of the MHP.

There are both socio-cultural benefits and problems created by the electrification. One benefit is that meetings and festivities can be conducted longer into the evening. The MHP has improved socialisation and increased participation of women in community affairs, largely because they are freed from certain household tasks such as rice pounding.

The biggest impact has been as a result of the commercial use of Video Home Systems to show films. Many children have resorted to stealing to get the PhP 5 (in cash or in kind) payment to watch a film and, as most children do, they imitate the actions and language in the films they see. This was especially noticeable with *kung fu* and *karate* moves being practiced or imitated by children and teenagers, and concerns were aired over the possibility of excess violence and sex being shown. This problem is currently being resolved through community policies.

In general, the MHP has provided good service to the community including its women. The project has seen women participating in its operations and management. They have also had access to the resources and benefits of the MHP, especially the rice mill. However, the control of the MHP is still male-dominated in terms of repair and maintenance, and to some extent the decision-making. This is reflected in women's non-participation in planning meetings and training activities. However, overall, the benefits far outweigh the problems brought about by the MHP (see Table 13).

Table 13: Positive and negative impacts derived from the electrification of the community by the MHP (m-male, f-female)

Aspects	Benefits	Problems/Conflicts
	• Increase number of baskets weaved due to extended light in the evening (m)	
	• Additional source of income from sari-sari store (m/f)	
	• Savings from not buying kerosene (m/f)	
	• Saved time in rice pounding (f)	
	• More food for animals – rice bran for pigs which can decrease time spent gathering feed (f)	
	• Time-saving in washing clothes because of less soot; also reduces the amount of soap used (f)	
	• More chores can be performed in the evening and early morning (f)	
Environmental	• Less pine pithwood cut for light (m/f)	
	• Increased awareness by children of outside events (m/f)	
	• No soot from "saleng" results in cleaner clothes and less respiratory diseases (m/f)	
	• Childbirth is much easier (f)	
	• Family gather in the evening to talk (m/f)	
Socio-cultural and political	• Meetings conducted in the evenings (m/f)	• Children steal pithwood for payment for watching videos (m/f)
	• Extended festivities and activities in the evenings (m/f)	• Exposure of children to adult scenes in videos (m/f)
		• Misunderstanding on payments/unpaid accounts (m/f)
		• Obvious gap between families who can and cannot afford appliances (m/f)

4.2 Case study 2: PV-battery charging in Malitbog, Southern Leyte

The case study focussed on assessing the impacts on women and their livelihood activities of the PV-battery charging station in Malitbog, Southern Leyte, and in particular in the two remote villages of New Katipunan and Cadaruhan Sur.

Socioeconomic impact of PV-Battery Charging Station on women

Although the PV-BCS has not increased food production, it has created additional sources of income and brought about changes in the productive roles of women in both barangays investigated. There are more hours during which women can do weaving, sewing and other productive activities rather than going to bed early. In some cases, they have ventured into making blankets to meet a specific demand. During the planting season, they may help their husbands in preparing the seeds for sowing.

Similarly, the availability of electricity has encouraged the children to spend more time at home, especially when it starts to get dark, thus enabling the mother to spend more time with them. Further, the women are more active and fit which reduces the time spent in idle chatter and so reduces the likelihood of conflicts in the family which can spread to the entire community.

In general, the project motivated the women to become more involved in its activities as it affected their daily routines. It further stirred their interest in exploring other projects that could benefit them. They would like more training programmes on livelihood activities. Another benefit of the project is its impact on their health since it has reduced their exposure to kerosene soot. Both men and women perceived the project as having contributed to the development of the community and the quality of life.

Poverty alleviation has been always addressed in this project, and supplemented by the concern for livelihood projects that would pay for the cost of electrification, improve living conditions and keep the family busy by utilising the extended hours for productive activities. It cannot be overlooked that an improved quality of life takes years to establish. It requires synergy among the concerned agencies and determined efforts by LGUs. Here, the Malitbog LGU assists and supervises rice farming, cattle dispersal and mango production in Cadaruhan and Katipunan. The collaborative interventions and social engineering by certain agencies in Malitbog, in conjunction with the BEP operations introduced by the DOE, should lead to an improved quality of life in Cadaruhan and Katipunan.

Overall impact of the PV-BCS

The introduction of the solar technology to the barangays was eased by a previous solar project installed in the elementary school and implemented by the Department of Interior and Local Government. The latest project has improved the villagers' way of life and makes them proud to be able to switch on a light which was once just an impossible dream. However, to sustain the project, livelihood and financing services are required and should be provided preferably by non-governmental organisations (since NGOs have operational schemes, successful experience with high repayment schemes, and best practices on micro-financing).

5 Conclusions and recommendations

5.1 Conclusions

The **community-based MHP and PV-BCS energy interventions** have had significant impacts on peoples' lives in the study areas. Men, women as well as children have greatly benefited from the services that the renewable energy systems have provided in a number of significant ways.

The largest socio-political impact has been the abatement of conflicts between the Tulgao and Dananao tribes since the establishment of the MHP project in the Bunog Creek that passes through the Tulgao and Dananao tribal villages. It afforded the two tribes an opportunity to work together and emphasised the need for unity and cooperation. Community solidarity has been enhanced, a direct outcome of the development and community-based nature of this project. This outcome needs to be sustained by continuing the organised and collective development efforts between the two tribes.

In general, the MHP and the PV-BCS projects have helped the beneficiaries in the following ways:

1. The projects have provided added income, i.e. employment and other sources of living.

2. With the improvement in cooperative efforts (through organisational and management training activities), other projects may be improved and further development projects may be generated. Hence, there is a greater potential for community-based efforts to improve the economic lives of households in the community.

3. The electricity has resulted in a real increase in livelihood opportunities through the establishment of sari-sari stores, and the increase in basket-weaving and other activities. Again, there is a potential to improve the economic lives of the individual households.

4. The MHP and the PV-BCS systems have provided better lighting, enhancing the wellbeing of the families, and giving access to information and events from outside the communities.

5. The renewable energy projects have also improved the attitudes and perceptions of community members towards the environment.

6. The renewable energy projects have improved the sense of peace and order through the street lighting.

In particular, the renewable energy projects have had tremendous impacts on women as shown in the following examples:

1. The benefits brought by the electricity in the reproductive work and practical needs of women are significant. Specifically in Tulgao, women are freed from the daily labour of pounding rice, one of the daily chores endured by women farmers in upland agriculture. This has had a tremendous impact on women's time allocation and on creating opportunities for substantive roles in production, and on reducing the drudgery in their daily lives.

2. It has been established that women in the case study villages play substantial roles in productive and reproductive areas, both as farmers and as women. The community-based projects created opportunities for women to do women-focused projects, such as: (a) the improvement of livestock feeding and production for food and income; and (b) enterprise projects such as a community bakery.

As mentioned, women's main contribution to production is in agriculture, and is characteristically in the form of manual labour. With the absence of opportunities for the microhydro project to make hand labour processes faster and easier, women have not directly benefited at this stage. The improvement or mechanisation of farming techniques would bring greater benefits to women. Further development efforts on appropriate technology for women should be able to respond to this.

3. The renewable energy projects have improved socialisation and led to the participation of women in community affairs. However, this should be translated into empowering them through decision-making in the socio-political affairs of the community.

5.2 Specific Recommendations

Given that the projects have been produced by community or collective efforts, with everyone contributing to all the phases of their establishment, there is a need to ensure that everyone has access to and benefits from all the project development processes. There is a need to involve women significantly in needs assessment and planning so that their concerns are incorporated in the said processes.

There is a need to consciously address the participation, access and benefits accruing to women in a community-based system. Service providers, such as NGOs, need to assist in the development of instruments and methodologies that ensure that these concerns are incorporated in all project development processes. There is a danger that most of the economic gains (as shown in the Tulgao MHP) will be limited to men if the matter is not consciously handled.

There is a need to increase women's knowledge, skills and participation in tasks related to the operation and maintenance of renewable energy projects, in order to broaden their understanding and perspective of the system that they help to manage. Women presently are still regarded as mere end-users of electricity, despite their contributions to the projects. Given their equal right to the utilisation and development of uses of the systems, they should not be limited by the given stereotypical roles.

Gender mainstreaming in policies on renewable energy. The study shows the contributions that can be made by appropriate renewable energy technologies to communities and to women if development measures are taken into account or are ensured. Thus, the mainstreaming of women's issues and concerns in policies on renewable energy within the community development framework is recommended to genuinely address the plight of women.

Documentation and studies on women and renewable energy. Documentation is a major contribution to understanding the impact of renewable energy technologies on women. It would be ideal if similar studies were conducted to highlight gains from renewable energy in general and in empowering women in particular.

Scaling-up of community-based projects on renewable energy. The renewable energy projects provided opportunities to create greater economic impacts on the rural communities. If utilisation can be maximised, both the MHP and the PV-BCS will be cheap sources of energy in comparison to diesel and even to grid power. What needs to be looked at, however, is whether these economic opportunities, and not just electrification, can be made accessible to the rural poor through a community-based approach in which the community is empowered to design applications for the benefit of all, and especially women.

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