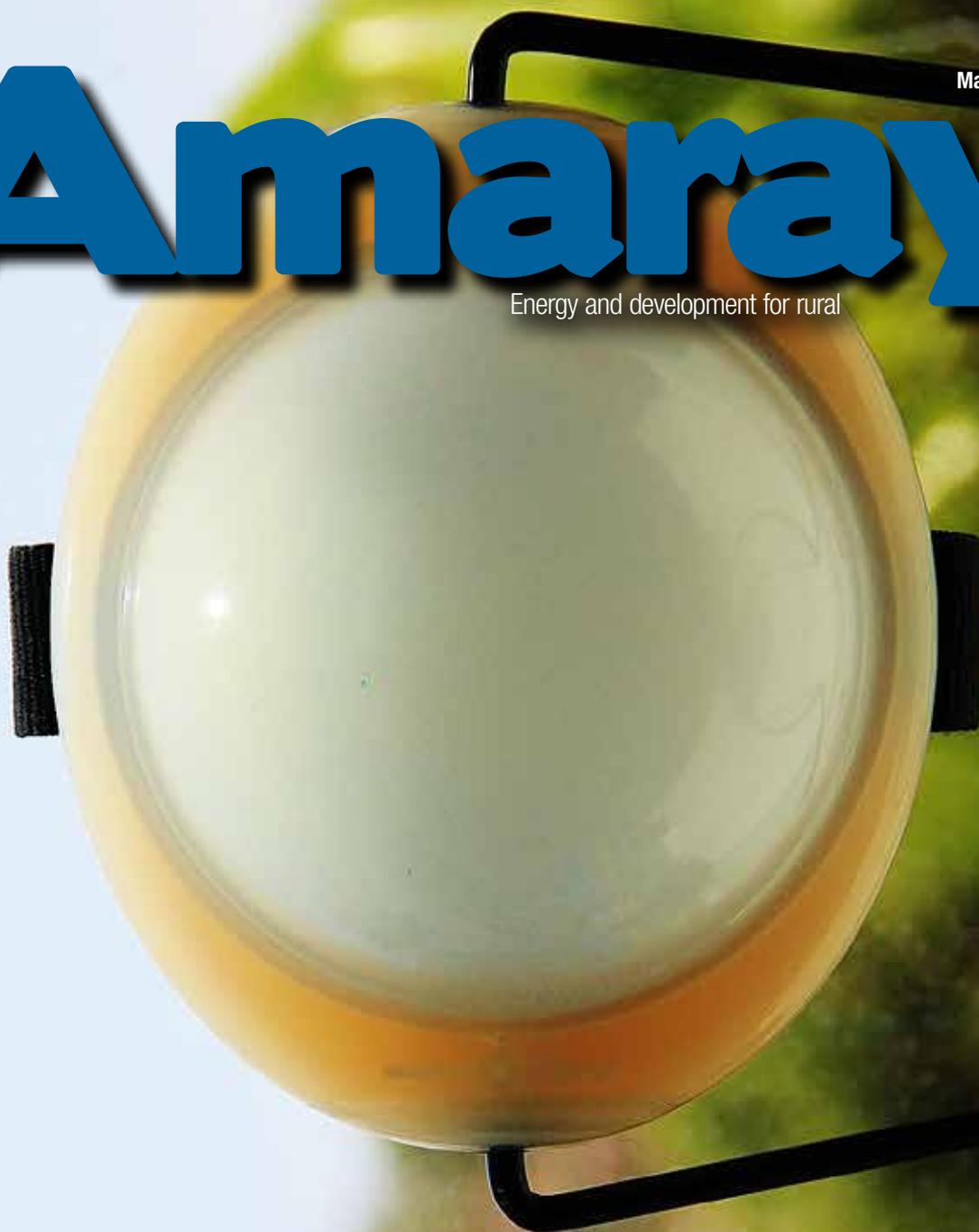


March 2014

Amaray

Energy and development for rural



Research and Development

Laboratories at the service of
technology

Solar Water Heaters

Hot water through microfinance

Artisanal Lamps

In Peru, about four million people in rural areas do not have electricity. Unfortunately, this reality causes many families to use rudimentary lamps, such as this diesel fuel burner for light. It is important to note that much pollution is produced at home by using such lamps.



A Portrait of Pollution

On the white sheet of paper, shown by the burner, you can see a smudge of black smoke that was generated after the paper was exposed for just a few seconds the burner flame. How much of this smoke will also be impregnated in the home's walls and lungs of the people who use these devices?



Here is the challenge

It is the work of many organizations and institutions to generate access to energy services that improve quality of life of people. This is accomplished through the efforts of researchers and companies using their creativity to propose solutions.

Herein lies the challenge: to make a device which not only illuminates the table at night, but a product which is efficient and environmentally friendly, like the pico-photovoltaic system shown on the right.



Oswaldo Orias - Un Pacman, 2013



"Imagination is the basis of all that is unique and characteristically human. It is the basis of language, the arts, science, philosophical systems and the immense complexity of human culture."

Ken Robinson with Lou Aronica in The Element.

Dear Readers ,

One of the strategies of the Energising Development Project EnDev-GIZ Peru is knowledge management. In that sense, we believe that the generation of knowledge through applied research plays an important role, as results observed and information validate new technologies, to meet the basic needs of the population through access to new and better types of energy.

Another important aspect is the dissemination of science and of experience gained in the implementation of projects. Thus, good knowledge generation contributes to innovation within organizations, which is an essential foundation for survival of institutions and companies who live in a highly competitive world.

This fifth edition of the magazine aims to show some of Amaray's efforts in research and development working with various institutions in Peru and the world, which are example, both in the field of energy, and in other related fields, which drive the flow of ideas and foster imagination, which shows an essential part of our human culture.

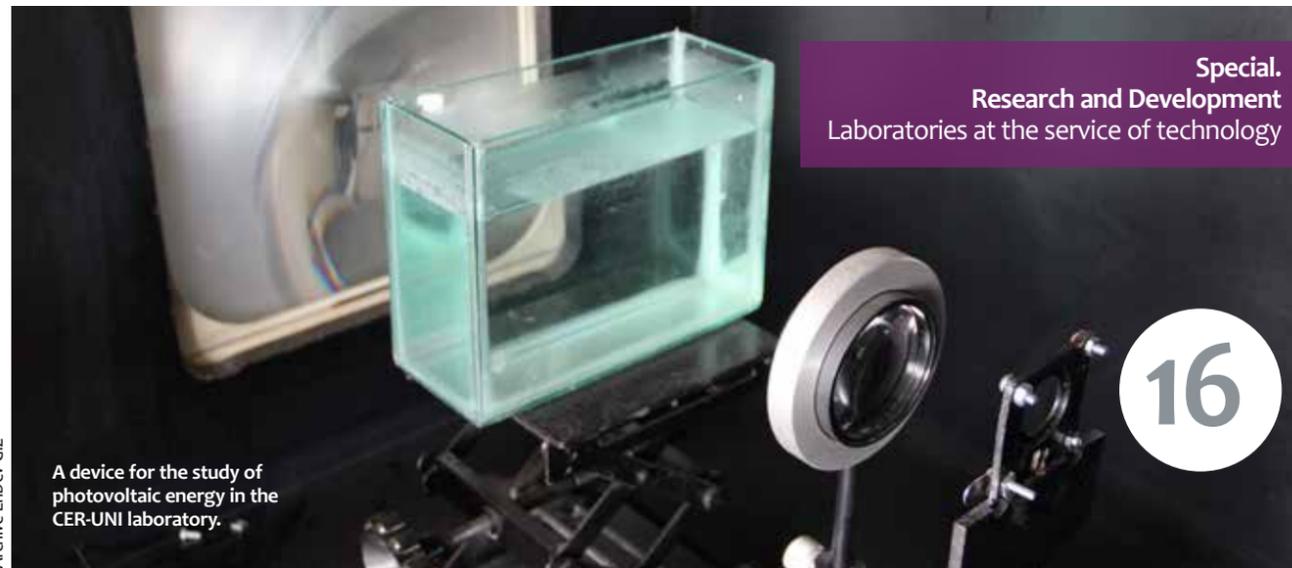
It is also to highlight the need for interagency partnerships between universities , enterprises and institutions of civil society , interested in making significant changes in living standards of the rural population. Similarly, companies or quality certification institutions play a fundamental role, because their work allows the expansion of new markets, gives confidence to users and ensures compliance with the predefined standards and support services, which are an alternative to the development of most vulnerable populations.

There is more to tell you, we hope you gain from the different approaches presented in this magazine, and we encourage you to make your comments to our new website, where you can download all editions of Amaray and find information on the contribution of EnDev-GIZ Peru, in the fight against energy poverty.

Warm Regards ,

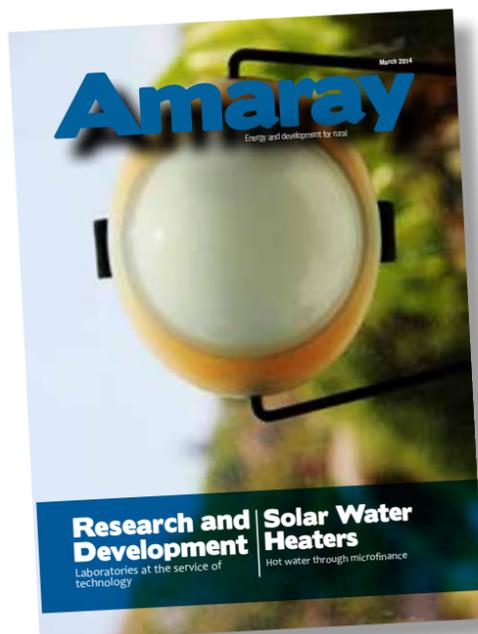
Ana Isabel Moreno Morales
Director, Energising Development Project EnDev-GIZ Peru

www.endevperu.org



A device for the study of photovoltaic energy in the CER-UNI laboratory.

Archive EnDev-GIZ



A Pico photovoltaic lamp is shown at the front, over a distant and undefined background. The image evokes a human head, reminding us the mind and creativity as fundamental tools, which allow us to survive and shape the world in which we live.

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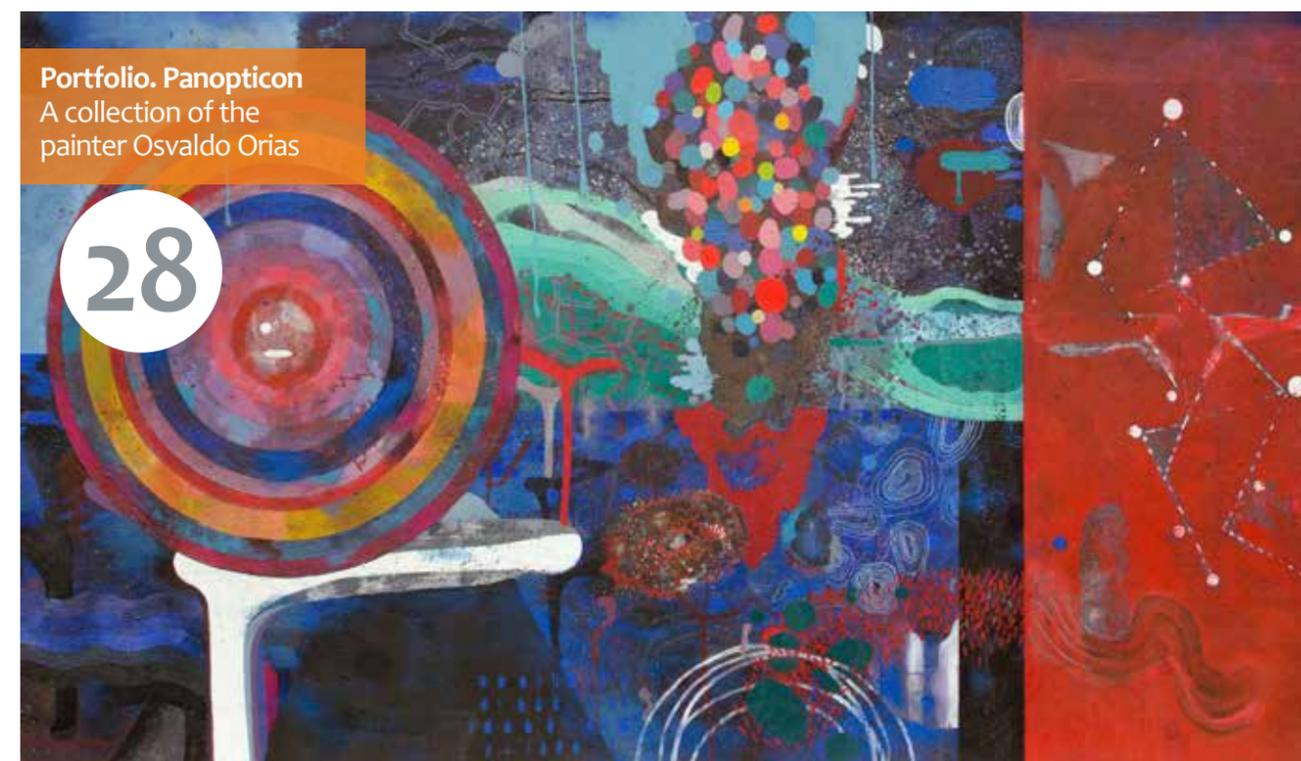
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Energy and development for rural areas

March 2014, N° 5

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Vibrations, 2013



Archive EnDev-GIZ

Innovation, Science and Technology Fund FINCyT

FINCyT is a leading institution in resource management for research and technological innovation in Peru. Alejandro Afuso Higa, executive director of the organization, illustrates how the program fosters innovation in companies, universities, and research centers.

By Katharina Brendel, Communications assistant, Energising Development Project EnDev-GIZ Peru

What is FINCyT dedicated to?

We are a fund that finances research and technological innovation projects, being an operating entity rather than a political one. Generally we are guided by policies that the government provides at a central level or policy on the issue of technological sciences. We are a fund that organizes competitions, based on which we finance the winning projects. We began operating in July 2007 and to date have approximately funded nearly a thousand projects.

What types of projects are funded?

We have three basic components: research projects presented by universities and research centers, innovation projects submitted by companies, and the third component, which seeks to strengthen human resources primarily through foreign and national PhD grants.

60% of our innovation projects come from the regions. In addition, 35% come from the agricultural sector, particularly exportation, 30% is information technology,

and the rest is divided into fishing, textile, and other sectors.

What is the fund-acquisition process?

All our funds are assigned through contests. In the innovation line, we are holding about two competitions a year, and in the past there have been on average 600 companies participating in each one.

First a project profile is presented. To those approved, a training workshop on project formulation and subsequent counseling is given. Then they present the project, it is reassessed, and if approved, we meet with the winning entity and plan how the project will be implemented. Generally there are four planned milestones with intermediate project results, and after completion of each milestone, we grant a disbursement.

Is there a fund to support university studies in the sciences?

We manage three funds. The first was a loan from the

Inter-American Development Bank (IDB) for 25 million dollars and 11 million from the public treasury. This was used up in mid-July, 2013. We are the technical secretary of a second fund of about 75 million dollars, Innóvate Perú FIDECOM, which is directed by the Ministry of Production with resources of the State, and which is exclusively for companies. We are also the technical secretary of a third fund that is a second IDB loan of 35 million dollars, plus 65 million dollars from the public treasury. We are so currently implementing a total of 100 million dollars.

With the first fund, 17 grants for PhDs abroad, 35 national PhDs, 60 grants for masters in technological innovation, and four reintegration grants for Peruvian scientists abroad were funded. This were done during a pilot-program and now, since we have 100 million, that amount has multiplied. We have 40 grants for PhDs abroad, 80 national ones, and a modality that seeks to repatriate Peruvian scientists working abroad so that they return again to work here. They are given two-year grants of 2,000 dollars per month, plus a 100,000 dollar research project. The idea is that they return. For example, of the 17 initial PhD fellows financed by the first fund, eleven have already returned to the country.

Have there been energy-related projects?

There are several projects, for example the Highland Coffee Company from Chanchamayo exports dehydrated products mainly to Europe and the dehydration process used to take them almost four days. We funded the design of a dryer run by solar energy, and that time has been reduced to six hours, so that their productivity has risen significantly. This company gathers the production of 1,200 producers in the central jungle.

With the National Engineering University (Universidad Nacional de Ingeniería - UNI), some filters have been developed to decontaminate tailings that mainly existed in the area of the Cumba river. These filters were also based on solar energy.

What issues has FINCyT faced in Peru?

This program is a model that the IDB has in all Latin America, and which has been operating for two or three decades. Brazil, Argentina, and Chile are ahead of us by 30 or 25 years since we just started operating six years ago.

Companies do not invest in innovation. So the first thing we had to do is to instill a culture of innovation in enterprises. Seven years ago, when we convened a contest, companies did not participate; we had to go bring them. Now, an average of 600 companies is participating in each call.

The other important issue is that the university was totally divorced from the companies. There was no communication. The university investigated everything but company problems. And the companies were wary of the university. To alleviate this problem, what we have

done is to give an incentive for them to come forward together. For example, instead of financing 50%, we give them 70% or more. Thus, we have achieved that 80% of our projects elaborated by companies are presented jointly. A few years ago there were no research vicerectorship in any university, but now many universities already have one.

What have been the achievements of the program?

The first fund which culminated in July 2013 was evaluated, and an interesting result is that for every dollar that the fund invested, it is estimated that revenue was generated in 7.1 times higher direct taxes over a period of five years. So the innovation projects are fully profitable. What the experience of neighbouring countries' funds has also shown is that a small group of successful projects can pay the investment in the entire portfolio of the fund. Some projects arrive to the market very quickly, others take quite some time, and others are just a learning process and lessons learned.

How do you see the future work of FINCyT to boost technological innovation?

All developed countries have shown that to reach the position they are in they have invested in science, technology, and innovation. Current funds will serve us two or three years, so that they need to continually increase. For example, through a fund similar to ours, Argentina is investing 500 million dollars annually, while we have 100 million for four years.

Another central problem is the lack of capacity, primarily in human resources. For example, if we were given 1,000 million soles at this time, we could not spend it. This is why people are trained. Peru will need an estimated 17,000 scientists by 2020, and currently there are no more than 1,500. Chile is sending 2,000 PhD students abroad each year, while our program has 80. Fortunately, soon 1,000 grants will be launched, but what are also missing is candidates.

“Peru will need an estimated 17,000 scientists by 2020, and currently there are no more than 1,500”.

El FINCyT

The Innovation, Science and Technology Fund (Fondo para la Innovación, la Ciencia y la Tecnología – FINCyT) was created by the Peruvian government and the Inter-American Development Bank (IDB) in 2006 with the goal of contributing to the increase of the country's competitiveness, generating scientific and technological knowledge, promoting innovation in enterprises, greater participation of the private sector, and strengthening technological research capabilities.

The program funds, with non-reimbursable monetary grants, technological innovation projects in companies, research and technological development projects in universities and research centers, and capacity building for science and technology through grants and internships.

The estimated program resources are equivalent to 100 million dollars, according to the following distribution by investment category and financing source.

www.fincyt.gob.pe

The BioSynergy project is developed in the community of Santa Rosillo, in the San Martin region.

BioSynergy Project

The purpose is to validate a new alternative form of rural electrification using organic livestock waste and agricultural crops for electricity generation from biogas. Installation and operation of a pilot project in the community Santa Rosillo, in San Martin Region has begun.

By Fernando Acosta Bedoya, Advisor Renewable Energy and Biofuels
SNV Netherlands Development Organisation

Status of rural electrification in the jungle

The Peruvian Amazon region accounts for nearly 60% of the country (754,139.84 km²), but it is also the least populous area of the country. Its 2,538,247 inhabitants, represent about 9.3% of the national population (considering only Amazonas, Loreto, San Martin, Ucayali and Madre de Dios). About 36% (910,444 inhabitants) of the Amazon population live in rural communities and have limited access to basic services such as energy, water and sanitation, among others.

According to data from the 2007 census by the National Statistics Institute (INEI), about 83 % of rural households in the Amazon region have no access to electricity due to the difficulty and high cost of expanding the electricity distribution network in the region. Of the approximately 196,000 living in Peruvian Amazonia homes, only 32,000 have electricity service, which in many cases is produced by generators that operate temporarily with diesel fuel or have stopped working for various reasons, such as lack of fuel and inadequate or no maintenance.

In addition, the transport of fuel to these localities is expensive, despite being subsidized, which means that people can not depend on this source of energy constantly and it can be used only occasionally. Families who do not have that service often use candles or lamps for light, and batteries to operate radios and flashlights.

Rural Electrification Community

In rural areas of the Amazon, isolated communities may be able to produce electricity and thermal en-

ergy based on their own resources, without relying on fossil fuels, and thus meet its energy needs completely or partially. This would be done by using appropriate, available and local waste technologies.

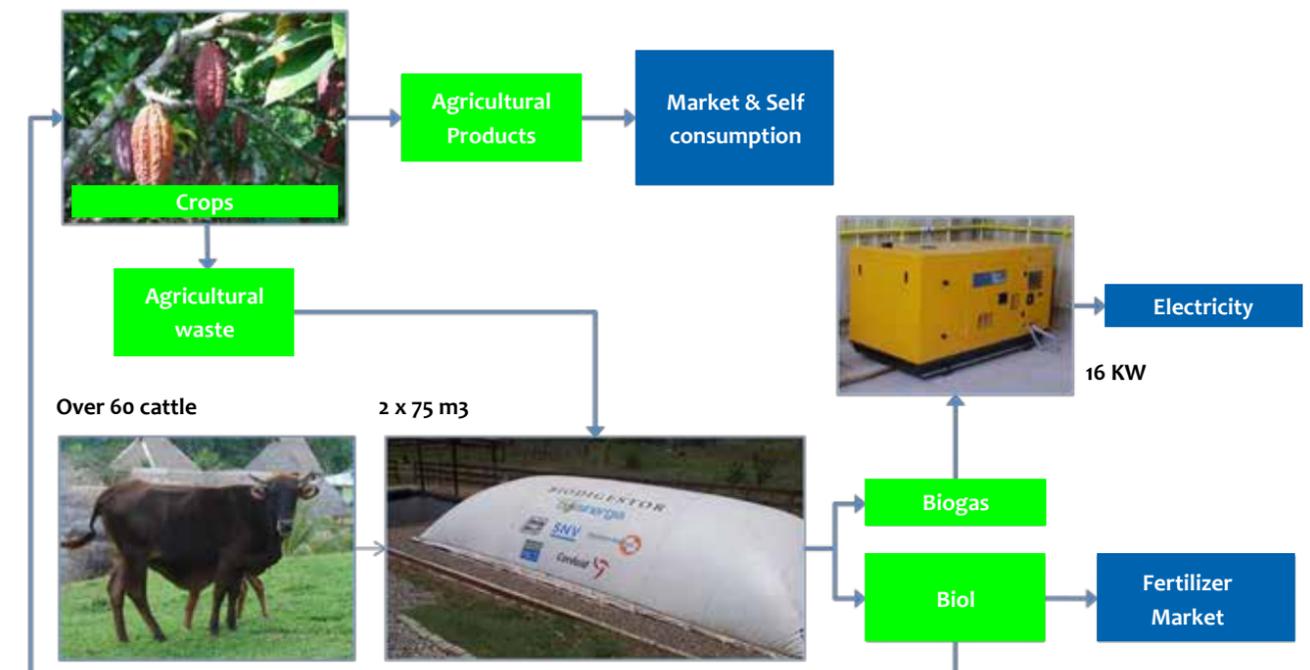
In this context, SNV and Practical Action started in 2010 the project Access to energy and promoting inclusive business with biofuels in the Peruvian Amazon. One is called BioSynergia Project in the community of Santa Rosillo in the San Martín Region. It has been funded by CORDAID and the FACT Foundation and has had the support of the Regional Government of San Martin through its Regional Office of Energy and Mines (DREM).

The BioSynergia Project is based on the generation of electricity from biogas, a fuel that is produced from the manure of 60 cattle of the community, which are kept in a partial barn. The manure is deposited into two digesters of 75m³ (liquid volume) each, then the biogas is used to power two generators with a combined power of 16 kW. The power generated is distributed to 42 homes, benefiting 224 people.

Inclusive Business

The described model works by creating a local small business energy generator and distributor, which provides services to all families in the community of Santa Rosillo. In this case, families recorded their electricity consumption by a traditional energy meter installed in the door of each house, then generate an invoice that must be paid. A percentage of each payment goes toward the public lighting ser-

In rural areas of the Amazon, isolated communities may be able to produce electricity and thermal energy based on their own resources.



Overview of the system
Source: SNV

vice, which allows for sufficient income to pay the workers of the management system, as well as to cover the maintenance costs of the equipment and network.

In general, when we talk about inclusive business, we think of a commercial and sustainable relationship between a large company (called anchor companies) and small producers, distributors, consumers, etc. However, an inclusive business is not limited to such a relationship, but can also be generated from a small business and consumers, as is the pattern BioSinergia project.

In this case, the electricity generator is created to meet a need in the community, which pays for the service. In turn, these revenues allow the proper operation and maintenance of the company, so the service becomes sustainable over time.

Management Model

To ensure the sustainability of the system, the project developed a model for appropriate management of the technology and reality of the area, which was based on that used in BMP micro hydraulic systems. This model seeks to define the roles of the actors

involved in the project and promote a community-based corporate culture, where decision-making is governed by the economic, social and environmental responsibility of the service. In that sense, it seeks to strengthen the local organization through the consolidation of a business institution that handles common good service and prospects for sustainability.

The implementation of this system requires the development of advocacy and awareness to all stakeholders, and then training in various aspects, such as the rational use of energy, operation and maintenance of the system, management and service management, biogas generation and energy production, etc.

The implementing institutions play a facilitating role in the process of implementation of the management model. Their main task is to involve all stakeholders and provide guidance in both the technical and legal, social and organizational aspects. All this is done, so that when the project is completely transferred to the community, they can continue to operate without dependence on other institutions.

The BioSinergia Project is based on the generation of electricity from biogas, a fuel that is produced from the manure of 60 cattle of the community.

Photographs: Fernando Acosta - SNV



The model creates a small, local business generating and distributing of energy.

Key lessons learned

The implementation of the management model should be done in parallel with the technical stage. The management model as an essential part of sustainability, must be worked on before, during and after the implementation of the technical part. Each stage has certain peculiarities and beneficiaries need to take ownership of existing technology. To do this, you have to work continuously, for long stages of inactivity can weaken the enthusiasm of community members.

Preparation of educational materials should be developed according to the skills of the villagers. Materials such as guides and information leaflets should be prepared according to the skills and level of

education of the population. We must pay close attention to these documents. It was concluded that the format containing a high content of text was not suitable, so it was changed to a comic format.

Effective management model and compliance with regulations. The strict enforcement of the management model, especially with cutting service to users who do not pay on time, makes the delinquency rate minimal. Initially, users refused to pay. However, once the service was cut and duties of users made clear, the people began to pay in a timely manner. More cases of default are unlikely.



Martijn Veen - SNV

SNV Netherlands Development Organization

The SNV Netherlands Development Organisation is an international nonprofit cooperation organization, established in the Kingdom of the Netherlands in 1965. It works to promote inclusive development, working with the private sector, governments, NGOs and communities to promote economic and social inclusion of low-income populations.

SNV operations began in Peru in 1966. In addition to a strong existing portfolio in development, inclusive business, renewable energy, SNV has consolidated its reputation providing consulting services to companies interested in local sustainable development.

www.snvworld.org

Professor Alberto Montoya of the State University of San Agustín in Arequipa performs validation tests on solar water heaters.

Research and Development

Despite the limitations that may exist in our country to generate research to contribute to the proper use of energy and reduce energy poverty, there are several experiences that demonstrate creativity and knowledge which have been instrumental in advancing the field.

Text and photos by Carlos Bertello, Communications Officer, Energising Development Project EnDev-GIZ Peru

Have we ever pondered what has made some countries more developed than others? Definitely, the answer is as large and complex as the history of mankind. However, we may be in agreement with the hypothesis which states that one of the causes is that many so-called industrialized countries have invested a significant portion of their resources to generate knowledge and train their people through solid educational structures. We conclude then, that the path of knowledge is an important tool for the development of a country. It is like a main artery, within which research streams with a cardinal role, opening doors to quality of life today and tomorrow.

In this context, Peru is still seeking answers to meet the basic needs of the population, which challenges the efforts of academic groups, offering products and validating proposals, seeking to face a fundamental issue in human development: the proper use of energy and the fight against energy poverty.

Here, we present three stories of such research centers and the people who make available their ideas, knowledge, experience and—especially—their willingness to show that, despite the difficulties in the country to strengthen its academic horizon, they can give valuable advances to address problems through the tools of creativity and knowledge.

Here, we present three stories of such research centers and the people who make available their ideas.

Renewable research

The Centre for Renewable Energies and Rational Use of Energy of the National University of Engineering is the main institution in Peru for solar research. Since the early eighties they have studied solar dryers and cookstoves, as well as the photovoltaic process. They are now looking for new renewable technologies for thermal comfort, to help fight the cold affecting Andean populations of low income, among other projects.

Rafael Espinoza and Manfred Horn are two scientists and researchers who carry the zeal of renewable energy in their minds and souls. Both have been pioneers in the development of this field in Peru and it is from this vocation that they have the task of carrying forward the Centre for Renewable Energies and Rational Use of Energy (CER) of the National University of Engineering (UNI), that could be considered the most important research institution in the country.

reasons: first, because Peru is a country of purely solar source, and second, because solar energy covers a wide range of applications, whether thermal or electric”, explains Espinoza.

The center began its studies in the eighties addressing solar water heating, solar dryers and solar cooking, and then dabbled with greater force in the photovoltaic process. Similarly, the assimilation of new colleagues in recent years has expanded the research and development of CER, which for six years has also been investigating technologies for thermal comfort with an eye for the Andean cold stalking the

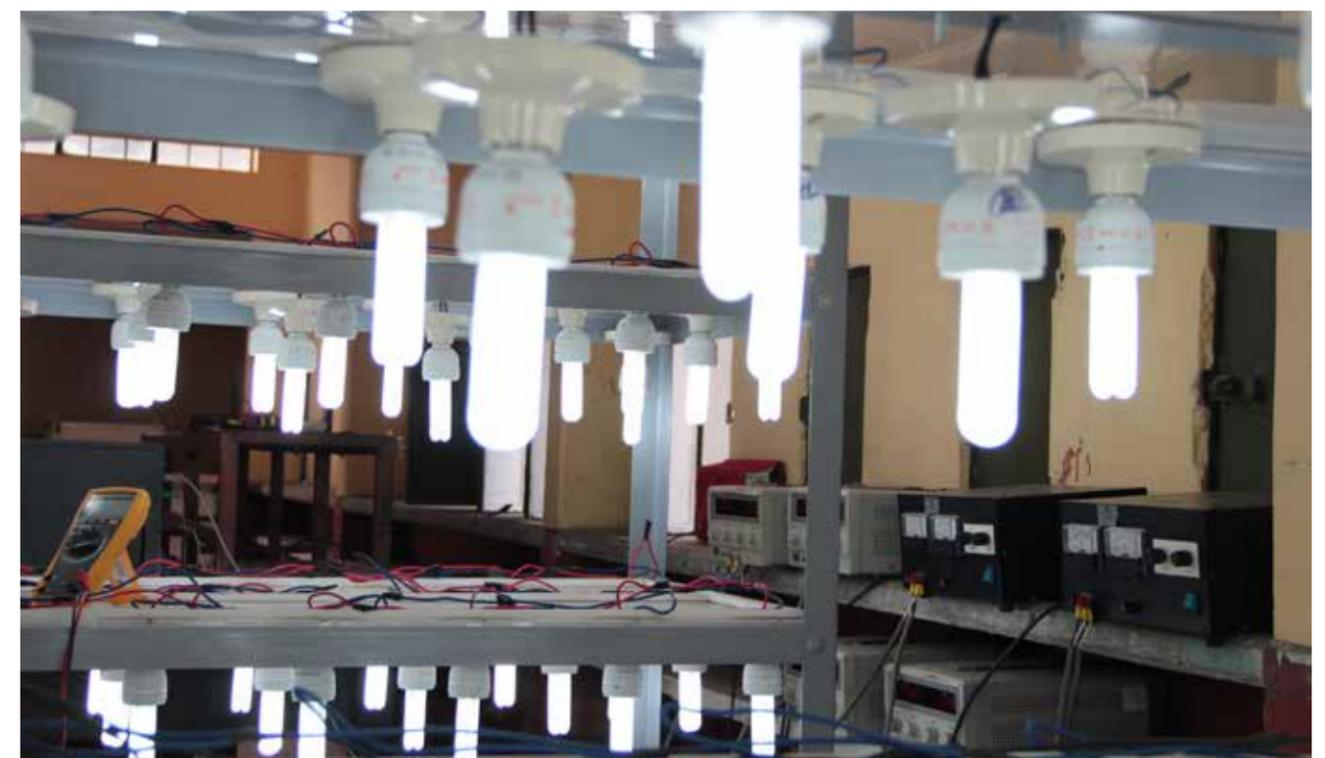
The efficiency and durability test for energy saving light bulbs is one of the processes made in the laboratory.

“The main topic of the CER is research in solar energy, covering almost 90% of our work. This is for two



Above: Professor Rafael Espinoza shows a Thermal Home Scale Model.

Below: UNI students specializing in a major of renewable energies.



low-income populations.

“With Manfred, we have experienced virtually all solar history of Peru, working closely with the Ministry of Energy and Mines, since it started its activities in this field. Similarly, all rural electrification projects developed by the Ministry must submit a sample of 3% of their components for evaluation, with the CER being the only laboratory in Peru that has the complete testing equipment”, said Espinoza.

In addition, highlighting the academic and educational vision of the institution, the CER has developed a Master of Science with a major in Renewable Energy and Energy Efficiency. This proposal for novel specialization offers three lines of research: thermal comfort level, energy efficient LED lamps and sensitive photovoltaic surfaces.

However, Espinoza comments that they do not yet have enough means to promote this field, which may be due to a structural problem. “Students are interested in the topic, but do not always choose it

because they believe that the workplace is limited”, he says. Furthermore, this work often involves going to rural areas. In this sense, the Professor emphasizes that “all we have achieved is because Manfred and I have driven constantly until today”.

The academic future for research and promotion of renewable energy in Peru is still waiting for a long-term plan at institutional and political level, in which a network of universities can be committed to a nationally defined plan and work hand in hand with private investment in order to generate new jobs.

A Thermal Home Scale Model

Mitigating the cold that hits the poor Andean populations is one of the main interests of the CER, as researchers see great potential solutions from renewable energy and the use of local materials.

“Soil moisture is isolated through a stone base. Then overlapping wooden slats create an air mattress that does not allow heat to escape through the floor. Also, all doors and windows are insulated, leaving no gap”, explains Espinoza using the scale model of the thermal house that the CER developed.

He also indicates that the roof is insulated, for example with straw, and includes windows that allow the entry of solar radiation, thus heating the materials found inside the house. Also, the proposed model has a small greenhouse that allows adding heat to the house. The teacher adds that for years all materials have been available in the rural market. For example, it is proposed to use adobe, which has a pretty good thermal mass, improved with a fireplace, and if necessary solar photovoltaic panels to have electricity.

“Improving the house like this can achieve an increase of up to 10°C in the minimum home temperature, which typically occurs around 5am. This may seem small, but when the temperature drops to 0°C the difference with an ordinary rural house can be significant and the people who have experienced this seem to be happy”, said Espinoza.

And since the CER seeks to go beyond the boundaries of the laboratory, this initiative is included in the project “Implementing the Technological Basis for a Multi-Productive and Education System in the Community of San Francisco de Raymina” in the Ayacucho region, which aims to contribute to improving the living conditions of people through

The CER has recently started a line of research for the production of photovoltaic cells.

Professor Manfred Horn shows one of the devices used for the measuring of light sources.



diffusion of technologies with high social impact.

So, this would be the fourth project implemented by the CER since 2004 in Ayacucho, from external funding focused on the development of communities in extreme poverty and in close cooperation with the National University of San Cristobal de Huamanga. “From these experiences we seek to lay the foundations for a model of productive rural development from renewable energy”, argues Espinoza.

Currently being tested in the laboratory of physical engineering, is technology to increase the thermal efficiency of the rural household, from hot water produced by solar thermal energy, which can be used for heating the interior surfaces (floors and walls).

Energy saving light bulbs

Another of the tests performed in the laboratory, is to calculate the lifetime of a type of energy saving light bulbs. “The tested lamps alternate 60 seconds on and 150 seconds off, repeated automatically 5,000 times. Efficient bulbs are current being used for rural electrification based on Solar Home Systems (SHS). So we tested their durability”, explains Carlos Salvador, who holds a Bachelor Degree in Engineering Physics and is developing a Master's thesis.

This type of testing is done in order to ensure that public actions financed by the State buy elements that meet the durability requirements, which reinforces the sustainability of the program. Also, tests for lamps intended for public lighting in the streets of rural areas are performed.

Pico photovoltaic systems

Manfred Horn, Physics Graduate of the University of Munich in Germany, and a Ph.D. from the University of British Columbia in Vancouver, Canada, is currently one of the top researchers in the country, and has reached 50 years since he immigrated to the Peruvian coast.

“I've done my whole career in Peru. Around the year 1975, I began with the topic of solar energy. In 1980, we created a Graduate Program called Second Professional Specialization in Solar Energy. I would

say that a significant number of people who know about renewable energy in Peru are graduates of this specialty”, says Horn.

Also, the Professor indicates that the CER has recently started a line of research for the production of photovoltaic cells, with the intention that students learn up to date information which is outside of the Peruvian national industry.

Moreover, in recent years one of the main functions of the center has been to verify the purchase of photovoltaic equipment, when the government conducts a public tender. “Currently, the CER has laboratories that allow quality control and verification that the equipment offered, truly meet the characteristics that the supplier says they have”, says Horn.

In this context, the laboratory has specialized in the monitoring of efficiency and durability of photovoltaic systems and has been gaining experience on various types of models, such as the Pico photovoltaic systems (Pico PV).

On several occasions the center has been commissioned by the German Cooperation (GIZ), for testing Pico PV systems, in order to better understand the performance of products targeted to rural areas without access to the electrical grid. “We put the lamp in different positions and different sensors record the intensity of light according to the orientation of the object. In addition, other instruments can measure the total amount of light emitted”, says Horn.

Thus, the science laboratory has a goniophotometer and a spectrophotometer with an integrating sphere for such tests, while other elements, such as the temperature of the lamps, are also tested.

We understand then, why the CER is one of the most important scientific development laboratories in the country, helping in the training of new scientists and supporting the rural sector through its assessments and model development. However, Professor Horn said that it is necessary that the institutional framework becomes more favorable for research in the country. In that regard, he indicates that many

“With Manfred, we have experienced virtually all solar history of Peru”.

The Centre for Renewable Energy CER-UNI

The National University of Engineering (UNI) is a public institution located in the city of Lima. It was founded in 1876 and since then has been considered a leader in the creation of science and technology, committed to the development of a sustainable nation.

The Centre for Renewable Energies and Rational Use of Energy (CER-UNI) is a body that supports research that is organized on the basis of three lines of activity: research and development studies, projects and services, and the promotion and dissemination.

For this, this entity has a team of skilled professionals and infrastructure required to operate, accumulating several faculties having affinity with its vision and mission. Similarly, the CER-UNI projected activities nationally, with a preference for rural areas and close collaboration with public and private organizations, which by the nature of their functions have worked with remote communities and populations.

www.cer.uni.edu.pe

The certification of clean cookstoves



“When the process is finished, the cook stove is given a total score that indicates whether it is suitable for distribution, whereby the model receives a certification”.

María Vilcapoma takes a measurement for certification of an improved cookstove model.

Certification tests are essential to ensure improved cook stoves meet their goal of ensuring positive impact on rural households and does not harm user health. SENCICO is one of the entities that is responsible for the task of measuring their energy efficiency, for which protocols used meet international standards.

The laboratory certification of improved stoves, National Service Training for Construction Industry (SENCICO) is responsible to ensure that smoke is not part of the cooking practices in homes. As we know, improved stoves are intended to reduce the level of pollution in rural households, supplanting stove used by rural low-income people, in Peru, as elsewhere in the world. Actually, according to the Global Alliance for Clean Cookstoves (GACC) there are still 2,700 million people living daily exposed to smoke from wood-burning stoves, that figure in Peru reaches 10 million people, one third of the national population.

As an important part of public efforts and civil society that seek to counter this, the SENCICO laboratory is responsible for certification that models to meet certain standards, ie. to ensure a positive impact on family health care and environmental protection. Thus, the laboratory located in Lima receives different models of kitchens, as part of the "proponents", persons or organizations that require certification of

an improved stove model, which wants to be promoted somewhere in the country.

“From this application a technical file is created with the plans containing the design of the improved stove. After the respective payment, the proponent is welcome to bring materials and construction to his backyard laboratory model”, says Mary Vilcapoma, responsible for testing certification. After having completed the process of drying, which lasts about two weeks, they enter the kitchen lab, where tests are provided for certification.

Three tests are performed: 1. Measuring the level of pollution, ie. carbon monoxide concentration and particulate material 2. Measuring energy efficiency 3. the testing safety of the kitchen.

“We have procedures for each stage, which protocols were established in 2009. These are standards that we have developed together with the German Cooperation (GIZ), the which are based on international standards”, says Vilcapoma.

The SENCICO laboratory has storage for different models and parts of improved cookstoves.





is suitable for distribution, whereby the model receives a certification. To date we have certified 36 models although the results vary, some being more efficient or safer than others”, observes Vilcapoma.

The entire process takes place over seven days after which a report will be issued for certification. This allows end-users have an assured quality product and producers of certified improved stoves can be submitted to public competition. In some cases, the report contains recommendations for the model used, as over the years they have gained valuable experience to produce excellent cooking characteristics and techniques.

In addition, the institution is currently looking to create, with the National Institute of Defense of Competition and Protection of Intellectual Property (INDECOPI) a “standard technique for improved stoves”, which includes both the construction process, as well as rules for suppliers and distributors product.

Left: standard firewood sticks are used for the measure of the efficiency of cook stoves.

Below: Pablo Puentes is a technician of the laboratory since year 2009. The tests include a comparative analysis of traditional cooking fires.

In this context, the laboratory simulates conditions of a rural house. To measure the level of pollution, a sensor is placed close to the stove and 1.40 meters high, simulating the average size a person living in the highlands. Thus, the measurement is performed while a pot, with five liters of water is heated for an hour, burning eucalyptus logs 30 cm long.

Subsequently, in the second test is how long does the stove take to boil five liters of water on the main burner. A limit of 35 minutes has been established which if exceeded, would mean that the kitchen does not pass the test of energy efficiency.

Finally, the safety tests evaluate factors such as the surface temperature of the stove and fireplace, the height of the burners to protect young children, movement flame, etc.

Of course, this is a quick overview process, since many other factors must be taken into account, such as weather conditions and the moisture level of the wood, among others. The whole procedure is explained in detail in a technical document, which is available on the website of the institution. There is also all available information on the costs and procedures to make the request. Thus, improved cook stove producers may know what criteria must be met to be certified.

“When the process is finished, the cook stove is given a total score that indicates whether it



Gabriela Esparza, Head of the Research and Standardization SENCICO

“We have positioned ourselves as a reference center in the region”

“NGOs working in this sector have realized that there were widespread improved cook stoves in rural areas, but many left much to be desired, ie not meeting provisions to improve the quality of life of the user. So, it was decided that there is need for a certification entity. It was believed that many models were a hoax for the population. We sought an institution that can supervise the certification of improved stoves and since we work in the evaluation of systems of unconventional construction.

We made a project proposal, with advice from EnDev-GIZ and we could access different programs training internationally to develop our proposal. Then we call on the related entities to revise the regulations, which included 14 public organizations and various thematic

areas, such as the World Health Organization and the Peruvian Ministry of Energy and Mines.

Thus, in 2009 a Supreme Decree was given (Ministry of Housing 015-2009 DS), which made SENCICO responsible to the agency to evaluate and certify the different models, which made us Technical Support officer of the National Campaign of Improved Cookstoves for Smokeless Peru. Similarly, in 2011, Peru hosted an international forum on improved cookstoves, in which we could share the knowledge gained and we have managed to assist with similar events, thanks to the support of the German Cooperation (implemented by GIZ). In that sense, I think we have positioned ourselves as a reference center in the region”.



Gabriela Esparza, in the middle, beside two technicians of the laboratory.

SENCICO

The National Service Training for Construction Industry (SENCICO) is a public institution that takes care of the training, research and the creation of regulations and safety standards for the construction processes in Peru. The institution is in charge of the training of construction workers, the teaching of technical non graduate education, the development of studies aimed to deal with the household's problems of the population and the creation of

national technical procedures for the construction industry.

SENCICO starts its institutional life in year 1976 and to date is formed by 11 training and research centers, six technical schools and nine laboratories for the testing of materials, located in different parts of the country.

www.sencico.gob.pe

Validating solar water heaters

The Renewable Energy Department of the National University of San Agustín in Arequipa, with the support of the German Cooperation (GIZ), has played an important role in validating solar water heaters throughout the region. Since 2005, they have maintained a program to certify the type of heaters used in both rural and urban areas.

Arequipa is one of the regions of Peru that enjoys excellent sunshine throughout most of the year. According to the National Service of Meteorology and Hydrology of Peru, the solar radiation recorded in the Andean city ranges from 850 to 950 W/m², considered one of the highest rates of solar insolation registered in the country. This makes the southern region an inexhaustible source of solar energy, which has been used for several years to heat household water in this high Sierra, at an average altitude of 2,335 meters above sea level in the capital city and reaching extreme heights in the Colca valley, which rises up to 4,350 meters.

In that sense, the popularity of solar water heaters and market development around them is also due to low temperatures at night and in the winter, where people may feel "frost" and temperatures that drop below 0°C.

Alberto Montoya, a physicist who specializes in renewable energy at the National University of San Agustín in Arequipa (UNSA), talks to us about his work responsibilities in the Department of Solar Energy of the Faculty of Physics and how important their contributions in solar heater validation has been for the entire region.



The validation process is performed via a datalogger, used to record data on internal and external temperatures.

“We set up an evaluation system that is based on a technical standard developed by the Ministry of Energy and Mines in conjunction with the National University of Engineering (UNI). Our document is based on ISO certification named the National Technical Standards for Water Heating Systems with Solar Energy”, indicates Montoya.

However, despite having this official standard, the research centers in Peru at the time lacked the necessary infrastructure to effectively implement and validate technologies for solar water heating. So, with help from the German Cooperation (GIZ), the UNSA was able to implement the necessary evaluation system, from which tests could be developed on the roof of the Science Faculty, where the impact of solar radiation is similar to the Arequipa houses.

This initiative was started in 2005, by the need to certify these types of water heaters in the region, which were distributed in the market or were part of social projects seeking to provide beneficial technologies for human development of the rural population, considering that these devices are also used in urban areas.

“Even the manufacturers wanted their products to be certified. At that time, they manufactured heaters with flat plate panels, because this was the technology that was available. They had been associated, since they felt increased competition and wanted a quality seal to give added value to their products. It was the manufacturers who drove the development of the National Standard”, said Montoya.

However, today they have entered the market with vacuum tubes, which have replaced the flat plate. Therefore, domestic producers have also started to import these vacuum tubes for incorporation into their new models. Fortunately, the Standard is valid for any heating system using solar energy, which can be used to evaluate both models, focusing on the performance of the water heater itself.

“The technology of vacuum tubes is definitely better. The heaters are more efficient and better quality water remains, as it is in contact with the glass and not with copper pipes, which can cause oxidation. I would say that almost all manufacturers are changing”, says Montoya.

It is noteworthy that much of the implementation of the laboratory for testing has been commissioned by the German Cooperation (GIZ) who asked for the laboratory of renewable energy and was able to finance the purchase of equipment to perform the tests.

Thus, the process consists of cooling the water and then making it enter the solar heater at constant flow. Various measurements of the temperatures of ingress and egress over a given period of time are then performed. In addition, weather conditions and the level of solar radiation

and wind speed are recorded to finally allow these elements show the energy efficiency of the heater and present a forecast for other weather conditions. This whole process takes about five days to produce a detailed report, to be positive and according to the technical standard, and ultimately leads to completed certification.

To date, several solar heaters have gone through this ordeal and thereby have been certified as models for the target rural areas, for example through the program Renewable Energy Solutions (RES) implemented by microfinance institution Fondesurco, which is focused on offering products that generate economic and social impact for their clients and contribute to environmental protection.

In this context, the obtained certification guarantees that the product meets the requirements of the National Standard, which in turn gives an advantage to the provider, such as for solar thermal company D'Sol. And from this successful experience, where we can see how the academic area is at the service of private enterprise and allows the creation of structures that enhance the quality of the products to be offered in the rural market.

“It would be good to have a major boost from the government, as some universities have included the issue of renewable energy in our goals. We need to invest more resources, since many laboratories fund their activities only from the income generated by the services we provide”, states Montoya, who has worked for 20 years in the UNSA, emphasizing that academic research should be progressively understood as an essential element for the development of Peru.

National University of San Agustín in Arequipa

The UNSA is considered one of the major universities in Peru and its foundation dates back to the time of the Spanish colonialism when King Felipe V granted License for the Royal University and Pontifical "Intra Clastra" at the Convent of Santo Domingo in 1714. Since then, it has not neglected its commitment to academically train many generations of professionals in various areas of study.

The Centre for Renewable Energy and Energy Efficiency at the National University of San Agustín was created in June 2006 with the main objective of adopting measures to promote renewable energy, energy efficiency and collaborate on the care of the environment.

www.unsa.edu.pe

To date, several solar heaters have gone through this ordeal and thereby have been certified as models for the target rural areas.

Panopticon

The view of the world is constantly in flux

By **Carlos Bertello**, Communications Officer, Energising Developing Project EnDev-GIZ Peru
With texts and information provided by the painter.

Are we in a world of constant transformation? If we believe this, then we extend our vision and generate new knowledge. It is the only way to find solutions to new challenges facing society in this “new everyday”.

There are no traps when art does communicate, when it gets us to extend our vision, feeling, thinking. Similarly, there is no doubt that some technologies connect with the consumer, change your way of living and generate a profit for their development.

In this context, the fight against energy poverty requires creative solutions that -like the works of Orias- start with the observation of the everyday, then move to the use of imagination, develop gradually and imagine proposals, which finally mean better access to energy.

Thus, we see the invasion of new technologies in recent years are remodeling and changing lifestyles of whole populations. All this from an idea, a vision, imagination made by a break from work, thanks to a permanent effort, essential for any idea to “come alive”.

The project EnDev seeks those ideas, because we are convinced that they will bring solutions for the energy shortages of rural low-income populations . Thus, we promote creativity, since without interaction, without research, without being part of the self solution, we can not move forward and will be only a part of the problem.

We want a broad vision for a world in constant transformation, a world vision where we see the problem, then let connections appear that make ideas come to life and the materials are formed to create true works .

Society, technology and art change; everything is in constant motion and the commitment of a country to make decisions to develop, also falls on those who investigate, whether to generate schemes or break existing patterns, hoping

ultimately, that these steps generate a strong case for improvement.

Researchers, whether artists, economists, historians or scientists, we need your knowledge to continue growing and driving the country. History is written by ourselves and involves everything that we are and see, it is, as the work of Orias says, panopticon. Thus, the patterns are repeated in our minds, either for a new pico photovoltaic lamp shown on the cover of this magazine or for a profoundly inspiring artistic proposal by the painter on the following page.

Our human creativity -panoptic- perhaps is connected in some way and we should let it breath, make room for it. Through art and science, we assume our role in this story, maybe not fully understanding how, but still let's move on researching, creating, seeking new horizons.

Oswaldo Orias. San José, Costa Rica, 1967. The painter Oswaldo Orias, born in Costa Rica but naturalized German, synthesized in the work the disparate influences of Latin years of his youth and Europeans adulthood. From the Academy of Arts in San Jose to the Düsseldorf Academy, Orias evolved an art linked to a cosmic relationship of men with nature and the world, which reflects the anguish and hopes of men of the 21st century.

The background of his paintings remain colors, crushing of sheer force that move the fabric at a slow rate, but figures become progressively more abstract over time. Color is mixed with materials that offer textures and structures, materials such as sand (volcanic, beaches and deserts), marble or metal powders. He also throws materials on the surface of fresh oil or acrylic, achieving to give shine and unique nuances.

Phanter, 2012



Leas, 2012





Days and flowers, 2012



In Urubamba, 2012



Nighttime, 2012



The word Panopticon has its root etymology in the Greek pan "all" and optical "to be seen". The artist Osvaldo Orias is inspired by the general idea of Panopticon: "the whole being watched"; understood here as the whole city, its objects and people. Not a sociological perspective on the city, but the eager and curious look analyzing, decoding and internalizing impressions lived in everyday.



FondeEnergy, green loans for rural areas

This program, developed by Fondesurco, provides alternative tools to have a positive impact on the residents in rural areas, while at the same time protecting the environment. For now, they offer solar hot water heaters and improved wood-burning stoves, which can be purchased on credit, and they are testing new technologies like solar dryers and Pico systems, among others.

By Carlos Bertello, Communications Officer, Energising Development Project EnDev-GIZ Peru

Creating green loans for rural areas

Fondesurco, one of the largest microfinance institutions in the southern part of Peru and focused on rural areas, has been committed for 19 years to the development of low-income populations and currently serves 19,000 customers, with loans totaling 50 million soles (about 18 million US dollar).

The company is located in major rural towns of Arequipa, Moquegua and Ayacucho, so that residents and Fondesurco "live" a common reality, not only physically, but that the company seeks to meet the needs of local people.

Usually, the client approaches a lender to apply for credit, with the idea of giving a boost to their economic activities, especially agriculture. A micro-loan, then, strengthens the activity, providing money to buy equipment or expand the area under cultivation. However, Fondesurco also provides advice to further boost the economic development of their client and to ensure the continuity of their productive activities.

For example, in the highlands of the south, where year after year they suffer icy winds commonly called "frost", farmers can lose entire harvests to this phenomenon of nature. However, there are ways to mitigate these impacts and that is where the contribution Fondesurco comes in.

Knowing this reality, advisors offer their clients alternative solutions. In the case of frost, that may be planting trees to create a barrier that protects and provides windbreaks for the planted fields. Also, different types of activities that allow them to adapt and mitigate climate change, such as the financing of organic products, such as quinoa and amaranth are recommended.

"Originally the customer comes to apply for a credit product, for example, for agriculture, and we will also suggest addition of alternative activities. We have been developing this product in conjunction with local NGOs and research centers abroad, who give us the necessary technical advice", says Jonathan Nuñez, Head of Research, Development and Innovation of Fondesurco. The idea is that "so customers can use part of the credit sought for innovative solutions to strengthen their business", added Nunez.

In this context, Fondesurco is committed to finding new tools and loan products that generate a positive impact on rural areas, which is why since 2010, it has offered a half- solutions environmental profile through green loans program, called FondeEnergy (FondeEnergía). To date, the purchase of solar water heaters and improved wood-burning stoves, two products with obvious benefits for the local inhabitant and the environment, have been provided.

The company is located in major rural towns of Arequipa, Moquegua and Ayacucho.

The agency Fondesurco Chivay, in the region of Arequipa, has served the rural population for over two decades.



Moreover, the company has just won an award from Citibank and entrepreneurs school IPAE for being the most innovative financial institution of the year: the PREMIEC 2013. This award rightly recognizes FondeEnergy's innovation, which may be a model for other financial institutions.

"We seek to combine renewable energy and energy efficiency in microfinance, all focused on rural areas", said Nunez. Besides, it is an approach that addresses both the social and environmental issues.

It is also important to mention the support provided by ADA and MicroEnergy, organizations that provided advice for creating FondeEnergy and made available a fund for the implementation of the program, covering various topics such as market research, advertising, validating technologies, etc.

Finally, they plan to do a study assessing the financial sustainability of the technologies previously implemented. Thus, both solar water heaters and improved ovens are being very useful for the people who agreed to the microcredit. While the ovens are offered in a standard model, the solar water heaters vary in price and size according to user requirements, and both are eligible in monthly installments ranging from one to four years.

New technologies in view

Due to innovation, FondeEnergy has a promising future. Thanks to the good response achieved with solar water heaters and improved ovens, the program is looking to expand and is currently testing new technologies such as solar dryers and photovoltaic systems for lighting (Pico PV).

Roberto Rojas, technical energy consultant, tells us that Fondesurco promoters often tour the area and promotional campaigns are made to offer green loans.

The applicant needs to have a valid identity document as well as one for his or her spouse. It is also necessary to endorse the residence, property, and prove the monthly income, whether self-generated or as a paid worker. Then, the client passes an assessment that allows them to qualify for the program and access credit.

"Once the order is made, the product is requested from the supplier, who would cancel the cost of equipment, and the customer or beneficiary agrees to pay us through monthly fees, which are included in interest", says Rojas.

The deal includes a solar water heater, which is installed by the vendor, who also provides the customer with a warranty and after sales service, and provides training in the handling and care of equipment.

"We seek to combine renewable energy and energy efficiency in microfinance, all focused on rural areas".

For example, improved ovens burn fuel much more efficiently, compared with a traditional clay or adobe oven, allowing more than 50 percent savings of firewood. Another advantage is that the smoke does not come into contact with food, since it has a direct path to the chimney. This also has a positive impact on health, since people are not exposed to the smoke and other gaseous pollutants. Also, the product is adapted to the habits of a population, a resource that is a fundamental part of their daily lives. Another advantage of the improved oven is that it is mobile, since it has wheels that allow for easy relocation in the workspace.

And as for solar water heaters, correct installation is ensured, an important factor for proper operation, also complemented by a customer service over five years. Other than that, the only maintenance required is the regular external cleaning of the glass tubes.

"The cold water enters the heater and passes through the glass tubes, where it is heated with solar energy. Then the hot water tends to rise and is stored in the tank, while cold water is kept in glass tubes, heated again", says Rojas, emphasizing that this process yields hot water 24 hours a day. Sometimes, the water actually reaches boiling and mixing is required with cold to avoid the risk of burning. The high temperature reached by the water, also allows its use for productive or commercial purposes.

Both technologies are aimed at both the production sector and the household sector. As for the water heater, the main customers are hotels and in the case of improved ovens are restaurants offering the daily "menu". However, in both cases the household sector is also a major demand. Thus, both the heaters and ovens have had an excellent reception, with 20 to 25 financed each month.

Rojas also indicates that improved ovens are a technology developed entirely by CTM, a company that manufactures metalworking products in Arequipa. On the other hand, solar water heaters are imported from China by the company D'Sol and have a certificate of international quality. In addition, the two technologies have been validated in the laboratory for renewable energy at the National University of San Agustín in Arequipa (UNSA).

"So far we have had no complaints and users only contact us for more accurate information about the use and maintenance of the heaters and ovens, a service which is included in the warranty information," adds Rojas.

Finally, FondeEnergy is seeking to introduce new technologies such as solar dryers, improved cookstoves and pico photovoltaic systems (Pico PV), which are in a pilot testing for responses from



potential customers.

Chivay is the provincial capital of Caylloma, known as an important tourist center in Arequipa.

"This is all very new to a financial institution, which is why we are motivated to move forward", adds Rojas. The award that FondeEnergy received also means that it has become an important national example, highlighting Fondesurco's work in the field of innovation through renewables.

Fondesurco

Leaders in Peru, a global benchmark in financial services for rural development and headquartered in the city of Arequipa, Fondesurco has 18 offices located in the rural area of Arequipa, Moquegua and Ayacucho.

The NGO started in 1994 as an alternative financing economic activities of the people who developed their agricultural activities in the departments of Arequipa and Moquegua, initiative was led by the Center for the Study and Promotion of Development (DESCO) and the Center for the Study for Regional Development (CEDER), both NGOs, in the development of their activities identified these unmet needs.

In its 19 years of existence, Fondesurco has developed a credit technology that allows it to serve their customers efficiently and effectively and to develop their business in rural areas, becoming successful, experienced and recognized internationally.

www.fondesurco.org.pe
www.ceder.org.pe
www.desco.org.pe



A local villager consults management in the agency.



Fondesurco CEO, Gabriel Vasquez Meza, highlights the role of this institution in the rural sector of the country with the aim of promoting the development of economic activities using renewable energy. His secret has been to identify with the people and their needs and to innovate relentlessly. He argues that while the urban market is saturated, the rural market is an opportunity. The next step is to become a EDPYME.

What is the primary mission of Fondesurco?

Fondesurco has worked for 19 years in the rural sector and our vision is focused on the development of income generating activities for poor families. Furthermore, what defines us is the quality of care. Our consultants are in the area, know the weather, speak the language, know the concerns and can understand customers well. Thus, this identification is what brings us closer to them. Currently we have 18 agencies that are at the heart of every province and even in areas where other financial institutions have no presence.

How do they find their work areas?

We opened offices in the footsteps of our partners, CEDER and DESCO, both NGOs promoting local development through the support chains. They are opening the path. For example, one DESCO project developed livestock breeding in the areas of Coracora and Pausa in Ayacucho, then those beneficiaries required funding. So this is where Fondesurco came in.

It is said you have a social vision and are the first to arrive.

Right. This means we have higher costs, but we have the advantage of being the first and can win the trust of customers. Therefore, if we compare ourselves with other financial institutions nationwide, we are as well positioned as an entity that has exclusive customers. This means that 70 percent of our clients are

exclusive and will not work with other financial institutions. This is somewhat important, as the exclusive national average reaches 30 percent.

Do you find documentation problems, including lack of titles or ID?

The ID is essential and is something that can always be regularized. However, for the property itself, there can be problems. By custom, often the property is communal, so we also accept documents generated by the community. We try to adapt to the environment.

How about the topic of green credits?

To all this there is a previous process, for example supplier selection and validation of technologies, then it was essential that the supplier guarantees the product. So, we had to investigate, select and certify. All this means a cost which the client can not provide, because it would raise the price of the product. Therefore, at this stage we rely on international cooperation organizations such as ADA, MicroEnergy, GIZ and other organizations that promote it. In addition, as we have had success with the products, we continue to seek similar solutions for this advantage.

What is the vision of the company in the future?

We aim to create a greater impact in 2014. The vision is to continue to reach the poorest people in rural areas

“Maintaining and focusing our work in the rural sector will give us advantages”.

and continue to support green projects. The need is present and we also see it as an opportunity. Furthermore, while the urban area market is already saturated, there is still the rural sector. All this is in line with our vision and gives us an advantage because we are already positioned and offer the right products. We are leaders in the rural sector credit and when they speak about credits, they speak of Fondesurco.

We are also improving the management of the institution and in 2013 we generated profits. Therefore, we see a promising future and expect to become an EDPYME, for which we are working hard.

Will becoming an EDPYME bring more benefits?

In 2012 we managed to get the license to become EDPYME and since 2013 we are adapting to regulation, as we expect to enter the sector in this year of 2014. This means that we will be supervised by the Superintendency of Banking and Insurance (SBS) and move from being an NGO to the formal microfinance sector.

This will allow our work to be more professional and will provide greater assurance to our creditors. In addition, we can access cheaper funds and save on General Sales Tax, offering our customers more competitive costs. It is worth mentioning that we currently offer very competitive rates, on par with other municipal funds, depending on the product or other factors.

I understand that you also won an award in 2013.

We got the award through our program of green credits, related to topics that relate to the environment, based on our development and innovation. They also took into account that after-sales service is provided by the suppliers of the technology.

“We have four strategic areas of development:

1. We are rural: We believe that maintaining our work in the rural sector will give us advantages. The 92 percent of our customers are in the rural sector between Arequipa, Moquegua and Ayacucho. However, we understand that this concentration is too risky, so we shall change the ratio to 80-20 between rural and urban areas.

2. Social Performance: Our activities promote the development of our clients. Therefore, we measure the poverty level by indicators such as the Progress out of Poverty Index (PPI). So, we can say that to date 20 percent of our clients are poor, which is consistent with our vision. Moreover, we also indicate how many of them were poor and then had their situation improved.

3. Innovation: We are constantly looking for new markets and products to suit the needs of our customers. Similarly, we also seek to improve our processes. We're dabbling with smartphones, which we have managed to adapt to the customer and our advisors can track and monitor the performance of their activities. For example, we can track their routes, so that visits are better organized and more efficient. This enhances our productivity and customer service because many times the routes are long and villages visits can be optimized.

4. Green Credits: We are betting on solar water heaters and improved ovens, which are important and sustainable initiatives. Thus, we focus on both the quality of the product and its benefits, and the economic profitability of the project, which is a better way to make this experience sustainable. Additionally, this positions us and our customers see us not only as a lender, but they note our commitment to the development, since the quality of life improves with these technologies”.

Two European organizations promote the work of Fondesurco

Appui au Développement Autonome (ADA) is a Luxembourg NGO dedicated to the development of inclusive finance. ADA is committed to the development of financial inclusion around the world, believing that access to financial services can sustainably improve the living conditions of the poor.

www.ada-microfinance.org

MicroEnergy International (MEI) is a private consulting firm with over 30 employees and a strong background in energy engineering, economics, microfinance, management and social sciences. With headquarters in Berlin, Germany, and with over ten years of experience in over 30 countries in Latin America, Africa and Asia, MEI works with microfinance institutions, suppliers of energy products and services, international development partners and research institutions, in order to establish microfinance programs for clean energy.

www.microenergy-project.de



Israel Huayra and Ana Morón are owners of the Colca River Hotel, which recently acquired a solar hot water heater.

Solar Water Heaters

Chivay, a community in the highlands of Arequipa, has begun using solar energy to produce hot water instead of the ice that used to have. Thus, its inhabitants have improved their living conditions and tourists attracted by the beauty of its landscapes, are more than satisfied. This was made possible by the presence of microfinance, that facilitates the acquisition of solar water heaters.

By Carlos Bertello, Communications Officer, Energising Development EnDev-GIZ Peru

The Colca River

It really is a great difficulty living in cold areas where you do not have hot water. I remember a trip where all our entire team passed many days without bathing. It was already difficult to bear the cold, but the thought of ice water on the body was impossible to bear.

In Peru, most of the people of the Andean highlands live this reality every day and the lack of hot water also reaches to travelers and tourists seeking for comfort and shelter in these remote locations, since in this area many communities are enthusiastic to exploit their potential touristic routes and offer their landscapes for backpacking guides.

Thus we arrive at Chivay, capital of Caylloma province in the department of Arequipa, today a well-known entry point to explore the heights and depths of the Colca Canyon and its surrounding towns. Chivay reaches 3,635 masl. and despite its sparse atmosphere, visitors are shown as a cozy and picturesque place surrounded by mountains and people in colorful traditional costumes.

Israel Huaraya and Ana Morón own and run the hotel in Chivay called Colca River. “We look for ways in which to better serve our guests. Here you can get very cold and people can not clean themselves if there is no hot water, as it reaches zero degrees easily”, they tell us.

And as they dared to put the hotel name in English, did not hesitate to buy a solar water heater. “We saw the Fondesurco promotion and I opted for the largest heater, which is 650 liters. When we get large groups, we can accommodate up to 40 people and everyone wants to bathe”, says Israel.

“The water heater works perfectly. We installed it on the roof and all went well. We have 18 rooms, all with hot water, because from the beginning we had decided to have hot water. If we are working with tourism, we have to provide hot water. There are over 100 hotels in Chivay, for all tastes and prices, and most already have hot water”, he adds.

We climbed to the roof to see the water heater and he told us that initially they used electricity, but it was a large expense. Some hotels also use gas, but



many are opting for solar energy, which Israel says is the most economical way. “It pays for itself and requires little maintenance”, he says.

The Fondesurco microfinance offers installation of the solar heaters and provides a guarantee of five years. Moreover, Chivay enjoys a blue sky and a bright sun, which is also an assurance that there will be a constant source of heat for hot water stored in the tank. Isarel and his wife agreed to a two-year financing with nothing down and find it quite manageable. Also, maintenance is very simple and consists mainly in cleaning the tubes.

Ana also tells us that her 11 year old son is excited about the heater. “Now, he can bathe everyday after coming home from school. The heater helps a lot and there is enough hot water for everyone”, he says.

Rooms for rent

We walked a few more blocks down the small town, the capital of the valley, and found Mrs. Antonia

Left: the bathrooms now have hot water.

Right: the hotel is located in the heart of this center of Tourism.





Two women in costumes typical of the locality, which is 3,635 meters above sea level.

“Here you can get very cold and people can not clean themselves if there is no hot water, as it reaches zero degrees easily”.

at home. She also provides a hosting service to people who come to stay for seasons, such as public employees, teachers and sanity workers. “I use solar hot water for dishwashing in the kitchen and laundry, but especially as a service for my guests”, she says, as we enjoy the view from the roof of her home.

She installed the solar water heater just a few months after opening the guest house, since potential guests requested hot water. Antonia has nine rooms rented, that is, all of her two-floor house. “Having hot water is virtually a requirement to rent

rooms. People bathe, especially in the evening and the morning”, she says. She acquired her solar water heater two years ago and has finished paying off the Fondesurco financing.

My husband and four children

We return to the village and decided to take a motorcycle taxi to go to the house of Helena Huaracha, who lives outside of Chivay, in a place called “Pueblo Joven de Chivay”, a sort of new district next to the town. We have had the solar water heater for more than a year. It gives intense heat and the water is always boiling. All year we

have hot water, especially in frosty weather for bathing and washing clothes”, she tells us.

She and her husband decided to buy a solar water heater when information came from a promotional campaign by Fondesurco. In six months they paid off the loan. She also runs a small shop and her husband works in a hotel. “My husband takes care of the water heater, he does the maintenance, cleans the tubes or removes garbage that sometimes comes with the water and prevents the normal flow of the pipes. Also, installation was easy because we had everything ready at home”, adds Helena as she offers a soda from the counter of her small shop on the side of the house.

We also asked her what it meant in their lives to have daily hot water. Helena is 33 years old, has four children and was born in the town of Chivay, where she has spent all her life. “When we did not have the solar water heater, we had to heat water with gas or go to the hot springs, but we could not carry the babies every day. Now, the solar water heater means a lot of savings. We do not spend on electricity, since it is totally heated by the sun”, she says, clearly emphasizing the benefits offered by this technology.

She tells us that the heater even keeps the heat at night, despite the low temperatures. “Sometimes you can feel even freezing temperatures outside, but the water is still warm in the morning when we open the drain, even in the winter months when the cold is intense”, she says.

Eventually, she would like to open a hotel, because her husband knows this business. “My husband



works in a local hotel and there the water was heated with gas, but they now have three large solar water heaters. It is one of the leading hotels in the city”, she explains.

Helena Huaracha displays the solar water heater on the roof of her home.

Bottom left: during the day, Helena offers groceries at her store, which is part of her house.

Gradually, our visit to the village ends and these three stories leave no doubt that hot water is possible, even in the most remote areas of Peru. Undoubtedly, the abundant sunshine that distinguishes the country, the “Inti”, which is the word for Sun used by the Incas, is a good ally for it. In addition, various organizations and microfinance institutions, such as Fondesurco are present to promote and provide alternative technologies that enable new ways to use the solar energy source, for example to get hot water, essential to our daily life, and even more so, in the country highlands.



Fondesurco in Chivay, the first financial institution in the Colca

“The agency Fondesurco has been in Chivay for 20 years and was the first financial institution in the town. So, if you wanted a loan, you had to get close to the agency. I'm with them for four years, I am from here and microfinance has always been well accepted by people. Today there is a greater supply of financial institutions and much of the population must have some microfinance credit, especially for agriculture and livestock. There are also longer loans for land purchase and construction. In the case of solar water heaters, there is a program called FondeEnergy, which we have had for two years.

The solar water heaters work pretty well. Here it is quite cold and very necessary. We offer heater of 120 liters for family use, which is our most required product. For example, in Madrigal, a neighboring district, people have already begun to try them and also to spread the word, because the credit is a good opportunity. In addition, the technician is included in the installation service. In general, we try to reach all the 24 districts of the province”.

Rosa Luz Puma Aquino, Customers Service from the Agency of Fondesurco in Chivay, Arequipa.

“The rural area is the market of the future”.



The commercial manager of INDECO SA, Jose Ortiz Ugarte, notes that they entered the Safe Rural Home program as a way to be an alternative secure at low cost compared to electrical products of poor quality entering the market.

Text and photos by Carlos Bertello, Communications Officer, Energising Development Project EnDev-GIZ Peru

Could you give us an overview of the company?

INDECO S.A. began in Peru 62 years ago from a national investment and today is part of the French corporation Nexans, which has factories in more than 50 countries. The range of products manufactured locally are various types of copper or aluminum cable that span the entire range for electric power transmission and telecommunications.

We also have a chain of 36 dealers nationwide and work with three main companies of “retail” which together have about 60 stores in Peru. This ensures that our products are available all over the country.

Why did you enter the initiative Safe Rural House (SRH)?

For two fundamental reasons. One is safety, which has also been our backbone for many years. Therefore, we saw a convergence with SRH, where quality products that give the user security are provided.

In this regard, to have electricity is very positive, but also very dangerous. We know that in the market, at this time, there is a huge presence of products of poor quality, which do not comply with any standards and are sold at low prices, most of them imported.

Given that, people buying these products are people with limited financial resources, we noticed that their inclination to cheaper product was evident. However, this means having a bad result in the use

of electricity and not properly using it.

Besides, our second aim is to position ourselves as a valid supplier in the rural low income sector, offering products at a fair price through SRH. We are simply recovering the cost, but we give these people the peace of mind of a facility that does not cause problems.

In summary then, our first reason is to provide security and the other is to position ourselves as valid rural supplier for people.

Do you see the potential for this market to expand?

The rural area is for us the market of the future. Cities have almost no where to grow and to the extent that rural populations begin receiving electricity and communications, they will no longer have the need to migrate to cities.

Our participation has been in all projects of this type that has the German Cooperation (GIZ) or any other organization. We have entered the second stage of SRH in the regions of Cajamarca and San Martin, and we’re looking forward for new ventures.

There is then the possibility of including this strategy as part of the business structure of INDECO?

Surely, when people from rural areas improve their economic conditions, they will be potential consumers of the company, at normal prices.

“For INDECO in Peru, research has also been a constant and our goal is to develop two new products every year”.

Furthermore, the reason that finally made us decide to enter SRH, was that in this program, the resident purchases the product. When you give away things, the recipients do not care and it is better that people appreciate their investment and care for it.

However, there is also a sensitive issue that we need to address. In SRH our cables are offered at a discounted price, so we try to insure that the product will not “be misused”. In other words, if the beneficiaries resell products, this will distort the true objective of SRH, which is a very well designed program and best of all, it works.

Have you had any other collaboration in the rural area?

We have a close relationship with “electricians without borders”, where we donated products to projects in Iquitos and Madre de Dios. However, they are small and are not as a massive impact as SRH.

On the other hand, how important is the research process for the company?

As a corporation we have two laboratories, one in France and one in Germany. Besides, we have 14 competence centers, which are in countries where a specific activity is most intense. For example, we have a competence center in Brazil, where a single transmission line is equal to the sum of all transmission lines in South America.

Thus, in these two laboratories 150 scientists are developing patents. On average two per day, whether products, materials, processes, etc., fact that shows how important research is for Nexans.

Also, for INDECO in Peru, research has also been a constant and our goal is to develop two new products every year. This process is focused on improving the quality of the cable, its safety and its performance. For example, when the Standard asked to produce a cable of 60 degrees, we developed a 70 and so on. This means greater safety and says that we are leaders in this field. It is something that requires investment and other companies tend to follow our development to the extent of their ability, since we also have the support of these two mega laboratories.

And any comments on the subject of renewable energy?

We are currently engaged in activities with these new forms of energy, because it is something that interests us. However, we have seen many instances of concern regarding the issue of electrification with solar panels.

The panels are what they are, but the cable that carries power to the battery is not always adequate, as the cheapest product will not last long, since electricity can destroy a cable, if the right one is not chosen.

In this regard, using a cable designed for interior use out in the sun, especially in places where solar panels are exposed to more radiation, I would say that the cable can last only six months. In contrast, a cable designed to withstand ultraviolet rays can last even ten years.

The INDECO Production Centre in Lima stores cables that will be distributed in all regions of the country.

INDECO S.A.

With energy as the basis of its development, INDECO S.A. has been for 62 years the leader in the cable industry in Peru, offering products that play an important role in the lives of Peruvians. Since 2008, INDECO S.A. is a member of the Nexans group, becoming Nexans INDECO.

As a worldwide leader in the cable industry, Nexans provides a wide range of cables and cabling systems to raise industrial productivity, improve business performance, enhance security, enrich the quality of life and ensure network reliability long term. With an industrial presence in 40 countries and commercial activities worldwide, Nexans employs 23,700 people and in 2010 had revenue of 6 billion Euros.

www.nexans.pe



Safe Rural House

The Energising Development Project (EnDev) in Peru -implemented by the German Cooperation (GIZ)- through its Energy for Lighting program, has managed to implement the initiative Safe Rural House (SRH) to facilitate and improve access to electricity for over 21,000 homes and social institutions in rural and marginal urban areas in 10 regions of Peru.

The SRH initiative aims to promote and insure that the population has secure and sustainable access to electricity for domestic use through the installation of Secure Basic Indoor Electrical Connections, in partnership with the Peruvian Copper Promotion Centre (Procobre Peru), companies INDECO, Ticino Peru and Philips Peru, who participated in a pilot project, which facilitated access 1,000 poor families in rural communities in the departments of Cajamarca and San Martin, to quality materials, safe to install basic electrical connections in their homes.

www.endevperu.org



Organic quinoa for the world

COOPAIN Cabana is an organization of small producers that has become a success story of how modernization of production processes is an effective way to improve the quality of life of rural people whose main source of income is agriculture.

2013 has been declared by FAO as the International Year of Quinoa in Peru and other countries of the region.

Right: COOPAIN Cabana demonstrating products at the Mistura Gastronomic Fair in Lima.

By Liliana Sanchez, Productive Use Advisor, Energising Development Project EnDev-GIZ Peru

This group is undoubtedly a role model. Quinoa producers in Cabana, in the department of Puno, began to organize and commence business in 2001 with 80 members, in different parts of the district. They began working, with technical assistance from the regional government, to improve the production of quinoa.

Subsequently, in 2007, the NGO SOS Faim got interested in this effort and proposed technical assistance and support for the construction of a quinoa processing plant, while farmers undertake the necessary material inputs to the designated plant and perform various tasks. Thus, the cooperative has increased to a total of 120 partners and SOS Faim provides capital for the collection of the product.

A year later, several internal changes were made to the organization and a technical management team was hired to improve productivity, and the group gained even more partners.

All this work and effort paid off well in 2010, when the German organic certification BCS was achieved, by reaching the requirements and technical specifications. In addition, on July 12 of the same year, the “Cooperativa Agroindustrial Cabana” (COOPAIN Cabana) was founded with 215 members and aims to make the business work to generate profits to be distributed among the partners.

So, thanks to the significant impact of having a modern processing plant in the area, most producers in different parts of Cabana have joined the organization, which by the end of 2013 had 498 members, representing approximately 1,000 hectares of quinoa at harvest time.

Significantly, the processing plant uses modern technology for the treatment of quinoa. It is also developing a business plan to apply for an incentive (non-refundable) to the AGROIDEAS program of the Ministry of Agriculture, which will expand the technology of the processing plant and buy a grain dryer to further raise product quality.

Currently, COOPAIN Cabana sells an excellent product to overseas markets, that is also a symbol of the Peruvian flag. Production of Premium white organic quinoa is directed mainly to the United States, France and Germany. Future expectations are to get more customers and expand its agricultural frontiers of organic production through agreements with municipalities, thus generating a greater incomes.



Cabana Agro-industrial Cooperative

The Cabana Agro-industrial Cooperative Ltda. (COOPAIN Cabana) was founded on July 12, 2010 bringing together 15 associations and with 498 direct beneficiaries in the district of Cabana in Puno.

The association aims to permanently improve the quality of the production and marketing of various organic Andean products, contributing to progress, better nutrition and quality of life for farmers, as well as the generation of jobs for the inhabitants.

Currently, the association has completed the construction of a processing plant that has modern machinery and equipment. It also has a national and international markets for the trading of various certified organic products.

In the socio-economic framework, the initiative has helped to improve the living conditions and the environment in the Cabana district.

www.coopaincabana.com



SOS Faim

SOS Faim was formed by two NGOs created in Belgium in 1964 and joined by another created in Luxembourg in 1993. Currently, it has over 80 partners in 12 countries in Africa and Latin America, as well as the support of 15,000 donors.

www.sosfaim.org

Fraunhofer Institute for Solar Energy Systems (ISE)



Norbert Pfanner, engineer specialized in Lighting Systems of the Fraunhofer Institute for Solar Energy Systems ISE, explains why the largest solar energy research institute in Europe is revolutionizing the lighting field.

Small pico photovoltaic systems (Pico PV) are part of the studies conducted. They also stand as a social element for vulnerable populations.



Photovoltaic energy systems

In little over thirty years, the Fraunhofer Institute for Solar Energy Systems ISE grew from a team of a few people to having nearly 1,300 employees, making it the largest center of applied solar energy research in Europe.

It has a large number of laboratories, among which one stands out as being particularly involved in the testing of photovoltaic Lighting Systems. The engineer specialized in Lighting Systems, Norbert Pfanner, highlights that the founder of the institute, Adolf Goetzberger, had realized already in the 80s that “photovoltaic energy has great potential for creating sustainable energy”.

With this in mind, the Electrical Energy Systems (EES) department of the Fraunhofer ISE began working with pico-photovoltaic systems (Pico PV) in 2007, developing quality standards as requested by the German Cooperation (implemented by the GIZ), thus strengthening the solar lighting field since until then nothing similar had been done.

After these first few steps, the off-grid team of EES continued to work with other partners, such as the World Bank, Lighting Africa, and Global Lighting, with whom it continually developed quality standards for products offered, especially to people who lack lighting energy.

Pfanner was fortunate enough to work eight months as a technical adviser to a field implementation project of Solar Home Systems in Pakistan, while the institute in general rarely has the opportunity to do field studies. The engineer

emphasizes the importance of incorporating information from other organizations working permanently in the field and who are in direct contact with the end users of these products, which is why this data is also included in developing testing standards.

For example, when a study by the German Cooperation in Uganda showed that Pico PV systems were failing despite having been previously tested at the institute, the Fraunhofer ISE investigated and concluded that it should expand its battery tests.

“This is a point which differentiates this research center from others”, says Pfanner. He notes that often the mistake is made of thinking that the institute is a purely scientific body, while they actually develop applied research. “We move at a rate commensurate with industrial requirements”, he says.

Continually innovating in the field

Fraunhofer ISE is not only interested in testing, but also in contributing to innovation. Thus, when the off-grid team detects something noteworthy while testing PV systems, they give a number of recommendations to the companies which requested these studies.

For example, some manufacturers have begun to replace nickel-metal hydride batteries with lithium ones because although the variation in price between the two is minimal, a big difference in power is evident. “We do have some influence in that respect, as evidenced by improvement, or

The modern laboratories of the the institute are located in the city of Freiburg, in Germany

“ ”

“We can contribute a lot with our experience, but only if it is known we exist”.

increase of quality”, says Pfanner.

In recent years, innovations in the field of solar energy have also led to a decrease in the price of Pico-PV- systems. However, the engineer notes that this continued price reduction cannot continue indefinitely, nor should it because “a limit will be reached where it will no longer be possible to deliver the required quality”.

Currently, the cheapest photovoltaic systems that are on the market only have a shelf life of about two years. In addition, there are aspects that institute testing cannot cover. Therefore, Pfanner considers it important that long-term assessments are carried out, which would mean more investment from producers. Yet when systems are so cheap, companies do not believe it will be worthwhile to perform them.

Considering the social aspect

Although the institute is focused on technology, it is not considered only a testing laboratory since it also offers project counselling and development. “As part of these activities, in recent years we have also been heavily involved in the socio-economic and socio-technical aspects”, Pfanner states.

Unfortunately, experience shows that customers consider this aspect interesting and important, but choose to focus on the technology and don’t include the social element in their budgets, a factor that the institute continues to work on.

In this context, and using the example of PV systems, Pfanner recommends that instead of pursuing the cheapest system, microfinance alternatives that help low-income families to access better systems that last longer, can be repaired, and may have additional functions should be generated.

However, he warns that while Pico PV systems are useful to replace appliances such as Kerosene lamps - which are expensive, dangerous and unhealthy - these systems represent only a first step in the process of electrification. That is, they are a way of “pre-electrification” that does not offer enough power for the development of productive uses, businesses, and economic activities.

Thus, even after 18 years at Fraunhofer ISE, the work remains interesting for Pfanner, who also is motivated by wanting to know what the next step is. In his words: “I’m curious about what lies ahead, and I’m motivated to continue contributing our experience and learning through cooperation”.

Precisely this attitude makes Fraunhofer ISE a leader in its field. And so that everyone can share their achievements and innovate in their own way, the center publishes the results of their studies online through its website.



Fraunhofer ISE is at the forefront of Solar research in Europe.

The Fraunhofer Institute for Solar Energy Systems ISE

In 1981, Adolf Goetzberger founded the Fraunhofer Institute for Solar Energy Systems (ISE) in Freiburg, Germany, which currently has 1,300 employees and an annual budget of 86 million euros (total, in 2013).

This center is focused on promoting energy supply systems which are sustainable, economic, safe, and socially just, creating technology bases in an environmentally sound manner in industrialized, emerging, and developing countries.

With activities that extend far beyond scientific research, the institute is committed to the development of production technology and prototypes, the construction of demonstration systems, and the operation of testing centers. It plans, reports, tests, and provides knowledge as well as technical means and services.

www.ise.fraunhofer.de

The Fraunhofer Society

The Fraunhofer-Gesellschaft (translated as the Fraunhofer Society) is a German research organization that brings together 67 institutes and independent research units spread throughout Germany, each with a specialization in a different field of applied sciences.

The organization is also active internationally, having affiliated research centers and representative offices that maintain contact with the main regions in Europe, the United States, and Asia.

Annually, the organization has two billion euros (2013) for research, generated through research contracts with industry, government, and the service sector. Part of the budget is provided by the federal government.

www.fraunhofer.de



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